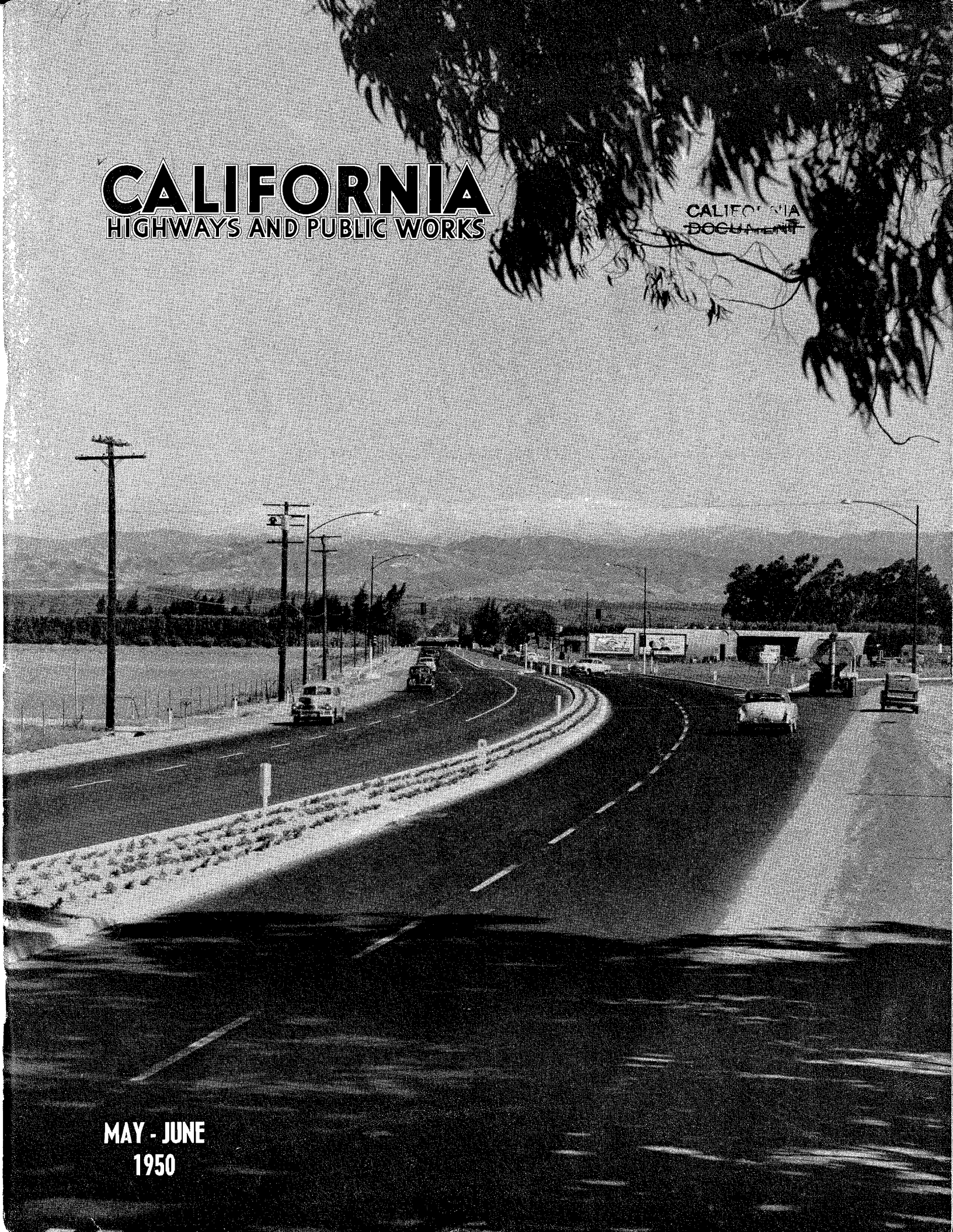


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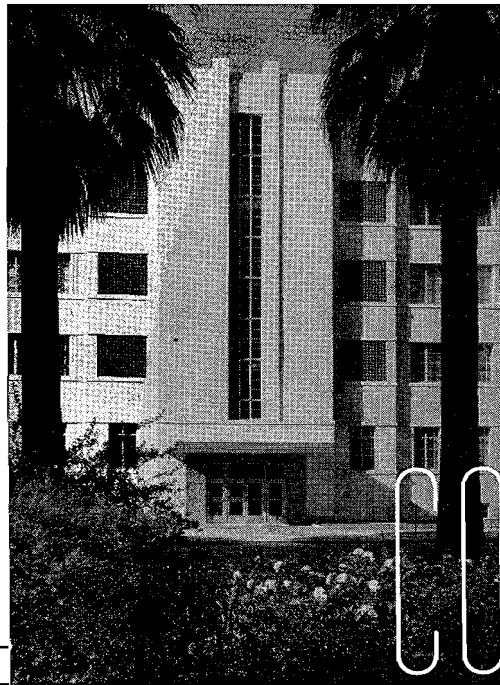
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CONTENTS

	Page
This Photo Shows Section of Four-lane Divided Highway on U. S. 101 Between Oxnard and El Rio Junction.....	Cover
<i>Photo by John Shaver, Public Works Photographic Section, M. R. Nickerson, Chief</i>	
Auburn Study Shows Freeway Benefits Business, Illustrated.....	1
<i>By W. Stanley Young, Headquarters Right of Way Agent</i>	
Progress of California Freeway Program.....	7
<i>By Harrison R. Baker, Member of California Highway Commission</i>	
Robert E. Reed, Chief Counsel of Department.....	8
In Memoriam—Clifton R. Montgomery.....	9
Forest Roads, Illustrated.....	10
<i>By J. H. Obermuller, Assistant Planning Engineer</i>	
District Engineer F. W. Haselwood Retires, Illustrated.....	19
Congestion Relief, Illustrated.....	22
<i>By J. M. Cowgill, District Planning Engineer</i>	
New Unit of Bayshore Freeway, Illustrated.....	26
San Fernando Highway Construction, Illustrated.....	28
<i>By F. E. Sturgeon, Resident Engineer</i>	
Ramona Freeway, Illustrated.....	30
<i>By Roy Cooley and H. R. Lendecke, Resident Engineers</i>	
Santa Ana Freeway, Illustrated.....	32
<i>By J. W. Green, Southern Representative, Bridge Department</i>	
Fluorescent Highway Intersection Lighting, Illustrated.....	33
<i>By F. M. Carter, Senior Highway Engineer, and Roy W. Matthews, Associate Electrical Engineer</i>	
Erosion Control, Illustrated.....	34
<i>By H. Dana Bowers, Supervising Landscape Architect</i>	
Prison Labor, Illustrated.....	41
<i>By G. A. Tilton, Jr., Supervising Highway Engineer</i>	
New Cement-treated Base Road-mixed Method, Illustrated.....	46
<i>By H. W. Benedict, Assistant Highway Engineer</i>	
In Memoriam—Robert M. Haverstick.....	48
An Englishman Writes on Federal Aid.....	49
The California Highway Hand Shovel, Illustrated.....	52
<i>By H. L. Ferron, Assistant Stores Engineer</i>	
Robert M. Shillito Named Assistant to Public Works Chief.....	54
Highway Bids and Awards.....	56

Auburn Study

Economic Survey of Placer County
Freeway Shows Business Benefits

By W. STANLEY YOUNG, Headquarters Right of Way Agent

BY-PASSING the business section of the mountain city of Auburn, Placer County, two years ago with a freeway presented the Division of Highways with an excellent opportunity to learn what effects on business and property values can reasonably be expected whenever the typical small highway city has nonbuying through traffic removed.

By studying the volume of traffic on the highway and within the city before and after installation of the freeway and comparing the volume of retail business of all businesses to a wider base during a two-year period before and following the freeway opening, as well as consideration of all the real estate sales and other influencing factors, it has been possible to evolve a fairly accurate answer to the question of what effects a freeway installation around a city has on the retail businesses and property values.

Serves Recreational Motorists

Typical of many small cities along our highways throughout the State,

Auburn has depended on agriculture as its principal source of income, but supposedly also with considerable reliance on the stream of highway traffic which had previously passed along its main streets.

Being a gateway to the Lake Tahoe recreation area with its two seasons of appeal—skiing in winter and vacationing in summer—as well as located on a main transcontinental route, Auburn was in an excellent position to derive considerable income from services to travelers. That this income is of considerable significance is evidenced by the number of cafes, bars and service stations existing within this city of under 5,000 population as well as by the type and quantity of merchandise, such as ski togs, camping supplies, fishing tackle and hunting equipment which is stocked in the various stores, well in excess of local needs.

Many vacationists and ski enthusiasts from the San Francisco Bay area were regular customers of the Auburn merchants, probably because of the friendly service and availability of a

wide selection of recreation goods, and also because Auburn is about half way in driving time between Lake Tahoe and the Bay area.

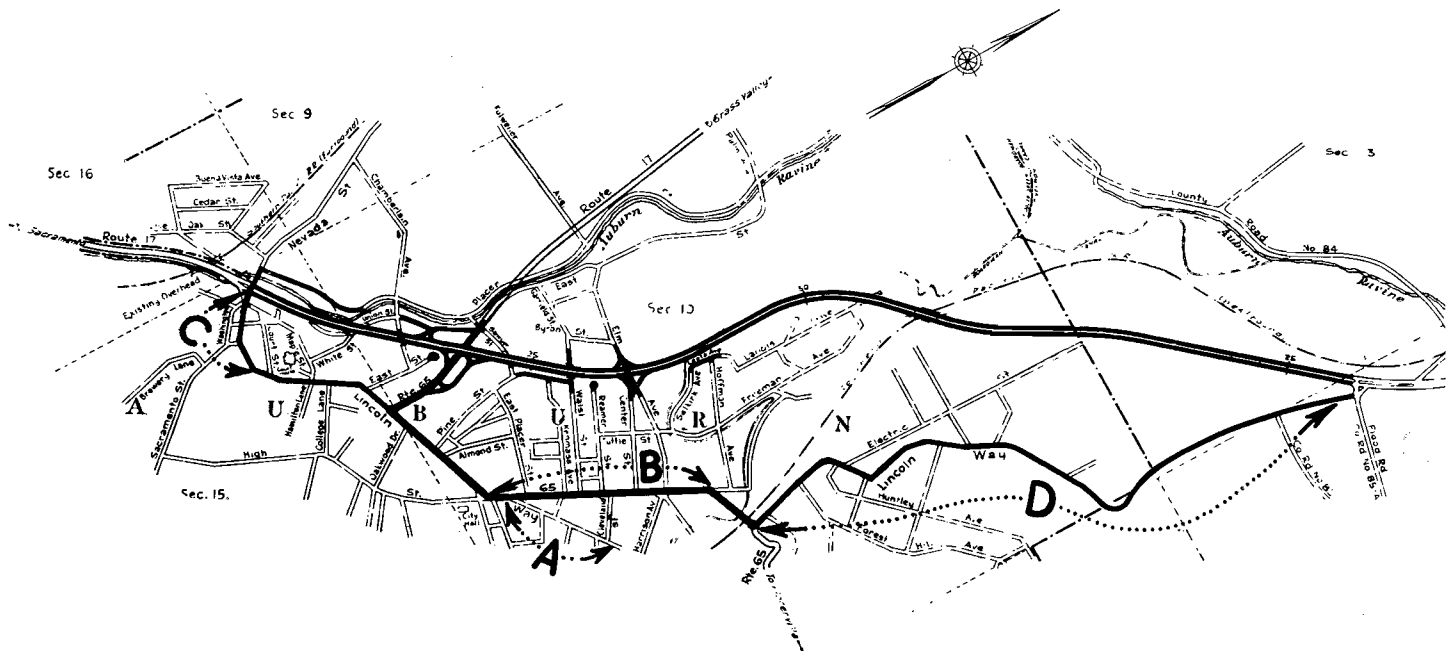
Business Benefited

What would be the results of the installation of the freeway completely by-passing the business section of Auburn? Very few people in Auburn doubted that it would benefit the city generally, but many feared for the businesses of service stations, cafes and bars which supposedly were deriving a considerable portion of their income from the nonlocal motorist.

This expectation appears to be rather generally held—especially by those persons not operating these particular types of business.

Our completed factual study, in which all the retail sales of the stores along the main streets in Auburn during the two-year period preceding opening of the freeway and the two-year period following its opening, are compared to the state-wide average for each type of business, has definitely established that all types of busi-

Map showing the old and new routes through Auburn. Sections A and B represent the center of business activity. Section C is the old section of Auburn near the freeway. Section D is the section which is utilized for both commercial and residential purposes





ness were benefited by removal of the non-buying traffic from the congested city streets.

While all retail business in the State as a whole showed an increase of 14 percent since the end of 1947, the over-all volume of business in Auburn increased 17 percent.

Service Stations Helped

Service stations disclosed the greatest benefits due to the freeway by registering a gain of 17 percent in gross retail sales compared to a loss of 4 percent on the state-wide average. However, the number of gallons of gasoline sold to service stations in Auburn during the two years following the freeway opening paralleled almost exactly the state-wide average by showing a 10 percent drop in volume sold.

Consideration of the general volume of traffic in the vicinity of Auburn as compared to traffic volume throughout the State is necessary in order to appreciate the fact that Auburn service station gallonage did not drop well below the state-wide gallonage figures.

There was approximately a 10 percent drop in traffic in the vicinity of Auburn (both on and off the highways) as compared to a 12 percent rise in the traffic count in the State as a whole so that, if the ratio of traffic to gallons of gasoline sold



Aerial view looking northeasterly from the westerly end of the freeway. The superseded route is the street to the right of the freeway which meanders through the city to a junction with the freeway near the upper left-hand corner of the picture. Main business is in the right of the picture

remained fairly constant, the reasonable expectancy was a severe drop in gasoline sales in Auburn, all other factors being unchanged in relationship.

Despite this poor outlook, service stations, as stated before, far outstripped service stations on the average throughout the State in retail sales and compared favorably in number of gallons of gasoline sold.

General Business Increase

Cafes and bars, when compared to the state-wide average, also were found to be in a better position in spite of a poorer expectancy based on general local economic conditions. During the two-year period cafes and bars in Auburn averaged a 6 percent loss in gross volume while the state-wide figure was an 11 percent loss.

The classification, "All other businesses," which includes drug, department, variety, grocery, apparel stores and the like, enjoyed an increase of 20 percent in gross volume of business, which was exactly the same as the gain registered by these businesses throughout the State.

Of considerable interest in this category is the story of one prominent chain store firm with department stores in both Auburn and Grass Valley, a city very comparable to Auburn in size, sources of income, and all general characteristics, except that Auburn was situated astraddle of a more heavily traveled highway. This company disclosed comparative gross sales figures of its store in each city during the two-

year period before and the two-year period following the freeway.

It was found that prior to the freeway the Grass Valley store had been running about 5 percent more in gross sales volume than the store in Auburn. At the precise time that the Auburn freeway opened the comparison between these stores almost exactly reversed, so that the Auburn store has since been grossing consistently approximately 5 percent more than the Grass Valley store.

Other Factors

The excellent trend of retail business in Auburn becomes even more apparent when the other factors in business fluctuations are compared to the same factors on a state-wide basis.

Population in the vicinity of Auburn based on assessment rolls, school enrollment, employment rolls and Chamber of Commerce estimates, has increased between 5 and 6 percent. During this same time the State's population increased more than 11 percent.

While dollar pay-rolls in the Auburn vicinity only increased 10 percent the pay-rolls within the entire State increased 13 percent.

In addition to these factors which were below the state-wide average, there has been a decrease in use of the recreational facilities in the region as evidenced by the 10 percent drop in traffic along the highway and reports of resort owners in the region.

New Livingston building abutting former highway (Section B of map). Stores are featured both at street level and on the second floor with entrances from a long hallway





UPPER—Scene in historic old section of Auburn near the westerly city entrance from the freeway. All highway and local traffic formerly used this street. (Section C of map.) LOWER—Street scene during midday, showing normal parking and traffic conditions in the business section of Auburn. (Sections A and B of map)

Court Decisions on Highway Law Awaited

Litigation of great importance to the Department of Public Works in connection with modernization of the California State Highway System was decided in the appellate courts during the last week of April.

In *Holloway v. Purcell*, arising out of the proposed relocation, as a freeway, of the state highway (U. S. 40) between North Sacramento and Roseville, in Sacramento and Placer Counties, the Supreme Court decided that the California Highway Commission has authority to approve the relocation of state highways, including highways constructed or acquired under the State Highways Act of 1909 (the original state highway bond issue), and in the same case also decided that the Freeway Law is valid and constitutional.

A petition for a rehearing has been filed by the appellants.

In *Holman v. the State of California*, an inverse condemnation action growing out of reconstruction of the state highway (U. S. 99) through Bakersfield, the Fourth District Court of Appeal decided that the placing of a physical center dividing strip in the highway, as a safety measure to prevent left-hand turns, was a valid exercise of the police power and that abutting property owners were not entitled to damages by reason of the improvement of the highway in such a manner.

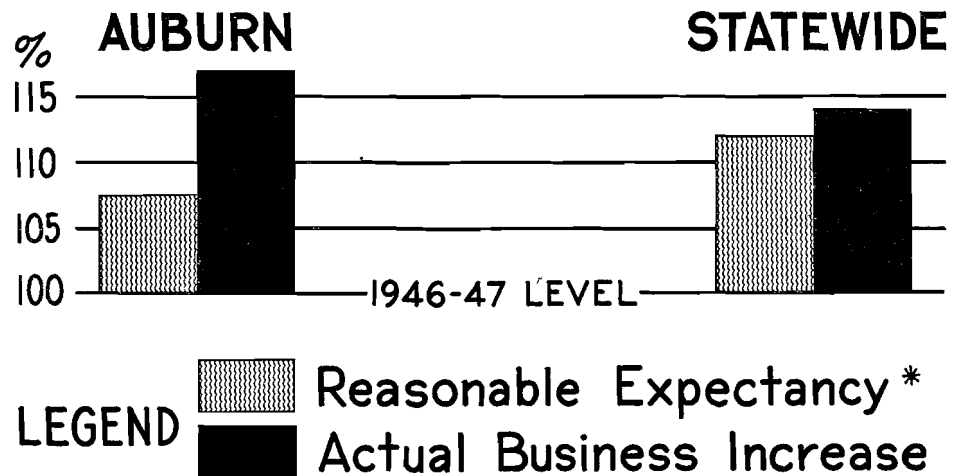
It is expected that the decisions in these cases will have become final prior to the July-August issue of *California Highways and Public Works*, and a comprehensive review of the opinions in both cases will be presented in that issue.—EDITOR.

Another contributing factor was the severe drop in income from 1949 fresh fruit sales, which is one of the two main sources of agricultural income in this principally agricultural community.

State-wide Average

Despite these several factors which would rather clearly predict a substantially poorer business trend than the state-

GROSS VOLUME OF BUSINESS SINCE FREEWAY



* BASED ON POPULATION GROWTH AND INCOME INCREASE

wide average, each type of business in the City of Auburn fared at least as well as, and in many cases, better than the state-wide average.

Reason for the selection of the state-wide figures as a yardstick to measure the effect of the freeway on the City of Auburn is that it was found to follow more closely than any other available base the business trends of Auburn during the years preceding the freeway, and therefore the same relationship could be expected to exist following opening of the freeway unless a substantial variation in the major contributing factors occurred.

Gross Retail Sales

In weighing the relative merits of increasing gross retail sales or number of gallons of gasoline sold, it is obvious that the net profit would be greater in the case of a retail sales increase due to the much higher mark-up percentage in sales-taxable items than gasoline. Conversely, any loss in gasoline gallonage would result in a smaller dollar loss in net profit than the same percentage-wise loss in gross retail sales.

In further studying the retail sales of the Auburn merchants and also considering the volume of traffic within the city before and after opening of the freeway, it is clear that very few, if any, former customers have forsaken Auburn establishments as a result of the freeway installation.

Traffic in the City of Auburn dropped approximately 11 percent on weekdays after the freeway opening, which corresponds closely to the 10 percent drop along the highway during the same period. Traffic on Sundays within the city dropped 20 percent.

Increase in Shoppers

Despite the traffic drop along the main streets of the city, parking meter returns, as well as heavier use of city-provided free parking lots, indicates an increase in number of shoppers by automobile. This is reflected in the over-all increase in retail sales of 17 percent.

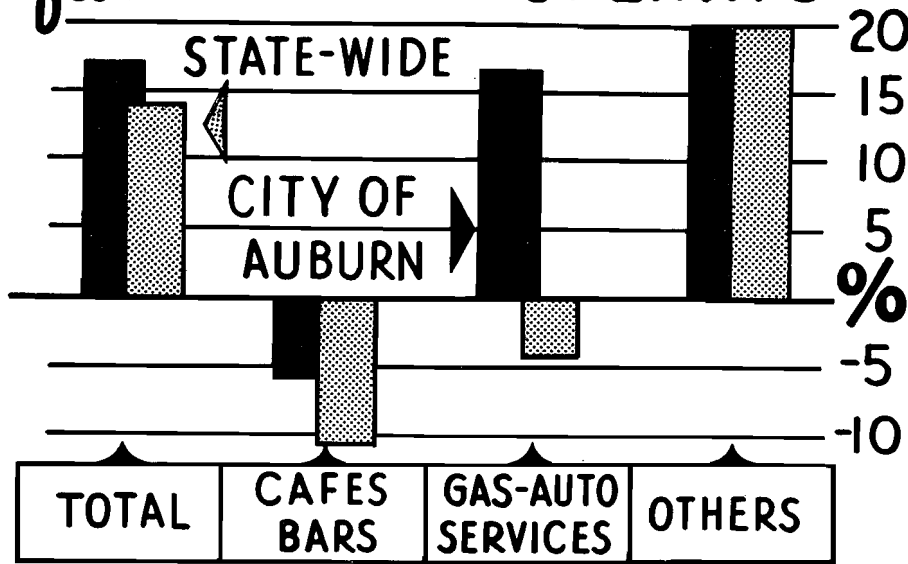
The thorough analysis of all important factors contributing to business fluctuations in Auburn has conclusively established that the freeway installation, by its removal of non-buying traffic from the city streets, has benefited retail business along the former state highway.

Real Estate Trends

How have real estate values along the by-passed section fared since the building of the freeway?

In analyzing all of the 66 sales of real estate which have occurred since the beginning of 1945, it was not possible to plot graphically the increase or decrease in values on a before-and-after basis, as was accomplished in our

GROSS RETAIL SALES *after* FREEWAY OPENING



Fresno and North Sacramento freeway studies, because very few properties sold twice during the period of the study. However, the three before-and-after sales of business property which did occur indicated increases in value of 61½ percent, 21 percent, and 20 percent.

Nor was it possible to develop the 23 sales of vacant property into a precise graphic curve because of the wide differences in value along the bypassed section. Most of the downtown business property sales occurred during the construction of the freeway. During this period of activity the

highest prices ever paid per front foot in the city were recorded—by business men of many years' residence there.

Property Values Up

These properties, with values ranging from \$300 to \$375 per front foot, have since been improved with the most modern and attractive store buildings in the city. Pictures of some of these new buildings which would be a credit to any city of any size, are shown on these pages.

Inasmuch as the greatest activity and highest prices in business property were during 1947 while the freeway was under construction, at which time all of the first-class vacant property was bought up, the confidence of the local merchants in the benefits from the freeway are evident. This fact was borne out in our interviews with these business people.

Because of the varied character of the property along the superseded section of highway, the effects on the various components are more easily explained by reference to the map which is reproduced on these pages showing the new freeway route and the by-passed route through the city.

... Continued on page 62

Scene showing modern building constructed since the freeway at the 100 percent business location. (Section A of map)



PROGRESS OF CALIFORNIA FREEWAY PROGRAM

By HARRISON R. BAKER, Member California Highway Commission

IT HAS NOW been five years since Governor Earl Warren called the attention of the California Legislature to the pressing need for the reconstruction and modernization of the California Highway System in order to meet the demands put upon it by the great increase of population in California and the consequent strain on our highway facilities. Governor Warren particularly pointed out the need for an integrated system of freeways to solve the traffic problem over the heavily traveled main arteries, with special emphasis upon the metropolitan areas.

The California Legislature, following the report of its interim committee, passed the Collier-Burns Highway Bill in 1947 augmenting the financing available for the construction of the highway and freeway program in California.

First Two Years

The California Highway Commission has now completed two years of construction under the increased highway program made possible by the Collier-Burns Bill and we are now entering into the third year of construction under this program. In the light of this experience it is appropriate to review the scope and size of the task presented in this modernization program of the California Highway System, with particular emphasis on the freeway program, to review what has been accomplished to date in carrying out this construction program, and to outline some of the problems which have developed and which need a more adequate solution provided this program is to operate efficiently and in the best interests of carrying forward this highway and freeway modernization program.

Enormous Task

The size of the task of modernizing the highway system and building an integrated system of freeways is enormous. What has been accomplished to



Harrison R. Baker

date only emphasizes the tremendous scope of this problem and the great need for its solution. The continued growth of the population of California, with the attendant increase of motor vehicle registrations, continues to accentuate and aggravate the traffic congestion problem requiring solution by bringing our State Highway System up to the standard needed to handle the demands put upon it.

The 1940 population of California was slightly over 7,000,000 people. In 1950 the estimated population is 10,875,000, an increase of 57 percent. In 1939 our motor vehicle registration was approximately 2,800,000 and in 1950 it is in excess of 4½ million, an increase of 63 percent, incomparably the greatest of any state in the Union.

Construction Costs

From the standpoint of the cost of construction, our California highway construction cost index shows that

using 1940 as a base of 100, construction costs today stand at approximately 179. This is a decline from the high point reached in 1948 of 216, but it indicates that it still requires almost \$1.80 in 1950 to accomplish work that would have cost \$1.00 in 1940, the increase being approximately 80 percent.

Since the passage of the Collier-Burns Highway Bill in 1947, the added financing made available to the California Highway Commission by this act has been actively put to work toward the solution of the highway and freeway problem in California. An examination in the field will reveal many miles of completed divided highways and freeways and many more miles under construction. However, the size of the task to be accomplished, as compared with the completed program to date, only emphasizes the scope of the problem and the fact that it will require a considerable period of time to carry this modernization program through to completion.

Freeway Mileage

With respect to the freeway program in California, as of September 1, 1945, we had a total mileage of declared freeways of 588.8 miles; as of January 1, 1950, this total declared freeway mileage is 1,440.3 miles. In California, at the start of the current fiscal year, we had 626 miles of completed freeway on the State Highway System of which 346 miles had been completed since the war.

Turning to the freeway picture in the southern 13 counties, which comprise the Southern California group, the California Highway Commission has authorized and the Division of Highways has completed or has under construction a total of 260.3 miles of freeway. In the postwar period from November, 1945, to March, 1950, the construction cost of this group of freeways in Southern California has been approximately \$93,400,000 not including the cost of right of way.

Breakdown by Counties

A breakdown of this freeway construction by counties is as follows:

County	Miles	Construction cost (not including right of way)
Tulare	12.9	\$2,496,000
Kern	18.3	4,942,000
San Luis Obispo	9.7	4,287,000
Santa Barbara	18.8	5,933,000
Ventura	8.0	2,733,000
Los Angeles	85.6	52,644,000
Orange	12.8	1,708,000
Riverside	9.0	1,795,000
San Bernardino	47.5	7,035,000
Imperial	13.1	1,724,000
San Diego	24.6	8,103,000
Totals	260.3	\$93,400,000

For the ensuing 1950-51 Fiscal Year the California Highway Commission has budgeted for construction of state highways in Southern California a total of \$34,116,000. Of this total, \$24,673,400 or 72 percent is allocated for the construction of freeways. Right of way costs are not included in the above figures.

Freeways Cost Money

As an example of the heavy cost and extreme difficulty of completing freeways in the closely built-up metropolitan areas, I might cite the following example: The estimated cost of completing that portion of the Hollywood Freeway 2.8 miles in length between Grand Avenue and Virgil Avenue is \$17,480,400 or \$6,243,000 per mile. Nearly one-half, or \$8,342,000, of this was for right of way. There were 20 separation structures required in this 2.8 miles, built at a cost of \$5,913,400.

In addition to solving traffic congestion and delays, one of the major objectives of the freeway program has been the safety factor and the endeavor to reduce accidents and protect human lives. The record of the use of the parkways, which have been opened to travel, has shown the benefit of the safety features built into these modern freeways by our highway engineers. The average fatality record per one hundred million vehicle miles on our rural State Highway System is approximately 13.3. The same record on the Arroyo Seco Parkway for the period 1941 to 1949 indicates a factor of 1.9, showing that the fatality record on this parkway is only about 1/7 of the

Robert E. Reed Chief Counsel of Department

Robert E. Reed, Principal Attorney of the Department of Public Works, was named by Director of Public Works C. H. Purcell to be Chief, Division of Contracts and Rights of Way, to succeed Clifton R. Montgomery who died suddenly on April 19th.

Reed has been in state service since March, 1930, when he went to the Legislative Counsel Bureau in Sacramento from private practice in Oakland. He remained in that position for four years and returned to private practice for a period in connection with the liquidation of northern California banks by the State Superintendent of Banks in 1934. In December of that year, he joined the legal staff of the Department of Public Works. He transferred to the Attorney General's office in June, 1944, as Deputy Attorney General, returning to the Department of Public Works as Principal Attorney in February, 1949.

Born in Piqua, Ohio, August 10, 1905, Reed moved to Coeur d'Alene, Idaho, with his family in 1909. He attended grade and high schools there and then entered the University of Idaho, obtaining a B.S. degree in 1926, following which he entered Stanford University and got a J.D. in law in 1928. He was in private practice in Oakland for a year prior to entering state service.

Reed resides in Sacramento with his wife and three children, Jane, Robert, Jr., and Elizabeth.

state-wide average and, as compared with an ordinary city street carrying the same volume of traffic, this comparison would be even more favorable to the freeway type of construction.

Cooperation Required

The enumeration of the accomplishments to date is not given with the idea of emphasizing their importance but rather to stress the scope and the size of the required freeway program and the need for cooperation and assistance by all interested citizens and groups

who are familiar with the urgent need for expediting the freeway program.

From the experience to date in the unfolding and development of the freeway program, several aspects of the problem presented become increasingly apparent and must be given serious consideration.

First, from the standpoint of the State Highway Commission, there is the necessity for a *continued program of public education* as to the urgent need for highway modernization and the freeway system in California, and the desirability of expediting its construction. The impact of a highway construction program in California amounting to between \$85,000,000 and \$90,000,000 per year is so great and widespread in its effect upon individuals and communities that it is important that the public be informed, insofar as possible, of the need for this freeway program, the plans being made for its solution, and the desirability of the use of the freeway as a means of solving this problem.

Program of Education

The construction of freeways is a relatively new development in highway engineering. As the public becomes more accustomed to the use of freeways and more conversant with their use and effect upon the local communities, many of the problems which now appear to loom as serious objections will be dissipated, and the desirability and advantages of freeways will become more apparent and more universally understood. Meanwhile, from the State standpoint, there is the need for a *continued program of education and an improved public relations policy* in respect to the planning and development of the state-wide freeway program.

Second, the need for *improved cooperation* from local communities and governing bodies is apparent. The law requires a freeway agreement between the State and local governing bodies covering the location of freeways through local communities where the street pattern is affected. To the extent that the local governing body takes part in planning the location of a freeway through the local community by

... Continued on page 31

In Memoriam

CLIFTON R. MONTGOMERY

THE ENTIRE Department of Public Works was saddened by the sudden death of Mr. Clifton R. Montgomery, Chief Counsel of the Department and Chief of the Division of Contracts and Rights of Way, on the morning of April 19, 1950.

At his death, Mr. Montgomery was only 44 years of age. A native of Lodi, California, he attended Lodi High School, being prominent in athletics, as well as establishing a brilliant scholastic record. He attended Stanford University, graduating with a Bachelor of Arts Degree in 1928, with honors, and obtained the degree of Juris Doctor upon graduation from Stanford Law School in 1930.

During his undergraduate and law school years at Stanford, Mr. Montgomery maintained the scholastic brilliance of which he had shown such great promise in high school, and was rewarded by election to Phi Beta Kappa in his senior year at the University, and to Order of the Coif, the scholastic honor legal fraternity, in his last year at the law school. He was also a member of the social fraternity of Beta Theta Pi and the legal fraternity of Phi Delta Phi.

The great contributions of Clifton Montgomery, known to his many friends as "Monty," to the development of the present and future highway systems of California and the Nation have been known only to his close associates, due primarily to his innate personal modesty. Monty became associated with the department in 1931. His brilliance as a legal scholar, and the fact that he had in him the makings of a sound lawyer quickly came to the attention of his chief, Mr. C. C. Carleton, in connection with drafting of legislation and legal research on highway problems, particularly those having to do with the conception and development of statutory authorization for divided highways and freeways, and the sustaining of the constitutionality of these statutes in the appellate courts.

During the 1930's Mr. Montgomery came to be known and liked by the personnel in all of the district offices as well as at headquarters, for his activities in right of way ac-



quisition, contractors' and damage claim cases took him to all parts of the State on many occasions. As time went on the task of drafting amendments to the Streets and Highways Code, and representing the department in legislative committee hearings, was thrown primarily upon his broad shoulders. That the Collier-Burns Act, which has made possible the department's present freeway program, is on the statute books today, is largely due to the masterful drafting and committee job done by Mr. Montgomery, in the 1947 Legislative Session. So outstanding was his work during this session that district attorneys, city attorneys and legislators throughout the State thereafter came to rely upon his advice and counsel on matters of interpretation of the Collier-Burns Act, and on highway matters generally. Since California is in the forefront in the development of limited access freeways, highway officials and attorneys in other states looked to the California statutes and court decisions, and to Mr. Montgomery personally, for suggestions based on precedents established in this State.

In 1948, when it became known that Mr. Carleton was about to re-

tire as Chief Counsel for the department, it was recognized by everyone in the department that Monty was well qualified as a lawyer and an administrator to step in as head of the Legal Division, which was then undergoing rapid expansion due to increased right of way acquisition activities as a result of the enactment of the Collier-Burns Act. When Mr. Montgomery entered the department in 1931, the Legal Division, aside from several part-time condemnation attorneys having offices in San Francisco, was composed of Mr. Carleton, Frank B. Durkee, now deputy director, and himself. At the time of his death, slightly more than a year after his appointment as chief counsel, there were 22 attorneys in the division, all of whom took great pride in their association and friendship with Monty, and in all of whom he had a close personal interest.

Among the prominent court cases in which Mr. Montgomery participated were those confirming the validity of the financing of the San Francisco-Oakland Bay Bridge by the issuance of revenue bonds.

On March 8th of this year, following preparation of briefs, Mr. Montgomery argued the case of Holloway vs. Purcell, which involved the basic power of the Legislature, the Highway Commission, and the department to relocate and improve highways which were originally financed by the bond issues of 1909, 1915 and 1919. Everyone regrets his untimely passing occurred one week before the Supreme Court wrote an opinion following, not only the contentions, but largely the language of his brief and oral argument.

Mr. Montgomery's death leaves a tremendous void in the department. He was at all times highly regarded, not only by his associates in the department, but by his opponents in court cases and legislative hearings, as an able and vigorous, but eminently fair, advocate of the interests of his client, the State of California.

Everyone who knew Monty, in the department and outside, expresses heartfelt sympathy to his widow, Mrs. Margaret Montgomery, and his daughters, Ann and Elizabeth.

Forest Roads

Californians Use National Parks
and Highways in Large Numbers

By J. H. OBERMULLER, Assistant Planning Engineer

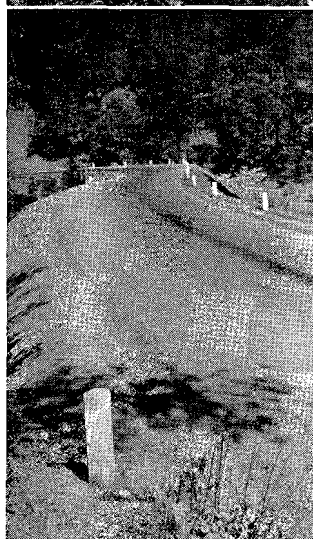
CALIFORNIA is justifiably proud of its national forests and national parks. Many of its residents and visitors know our national parks—Yosemite, Sequoia, Lassen—but are not familiar with the extent, the use, the significance of the 18 national forests in this State. The national parks primarily preserve outstanding examples of scenic natural wonders, and their preservation permits only developments required for comfort and convenience of visitors. National forests are for wider utilization.

National forests are selected areas established by Presidential proclamations through reservation of lands in the public domain, supplemented by purchase, donation and exchange. The instruction regarding their administration, issued by the Secretary of Agriculture 45 years ago, still stands: "It must be clearly borne in mind that all land is to be developed to its most productive use for the permanent good of the whole people."

Federal Aid for Forest Highways Initiated

The development of the many uses of these lands depends chiefly on roads and trails to give access to and to traverse the predominantly rugged mountain areas. Then, too, between and within the exterior boundaries of the national forests there are parcels of private holdings and whole communities, all of which require transportation service.

Many roads must pass through the national forests that command the outlying regions of the Sierra Nevadas, the Coast Range and the transverse ridges which separate the State into the heavily populated valleys and coastal plains and the deserts. Small wonder that, in recognition of the nontaxable status of the federal lands and of the peculiar transportation needs within the national forests, the Federal Government should adopt a form of federal aid specifically for forest highways. The for-



UPPER—1919 construction on Klamath River awaits reconstruction. LOWER LEFT—Average forest highway standard 10 to 20 years ago. LOWER RIGHT—Width and surface unsuitable when timber production utilizes low or medium classes of forest highway

mulation of a National Forest Highway System followed.

Federal Aid Funds

The extension of federal aid to the forest highways herein discussed is a supplement to the excellent articles by Mr. C. H. Purcell and Mr. R. F. Reynolds in the November-December, 1949, and the January-February, 1950, issues of *California Highways and Public*

Works. They presented comprehensive information on federal aid highway enactments, excepting reference to the forest highways.

The first congressional appropriation for developing roads and trails in the national forests was made in 1912. That was 20 years after President Harrison created the first national forest, "Yellowstone Timber Reserve." California's first apportionment of forest

funds, derived from 10 percent of gross receipts of timber and forage revenues, was \$25,000. The 1916 Federal Aid Road Act continued forest road and trail appropriations and was known as "Section 8" provisions. The 1919 Federal Aid Act increased the original \$1,000,000 per year for the states as a whole. The aggregate of apportionments to California under these early enactments amounted to about \$4,328,000. The money was spent mostly on forest trails and minor forest development roads, and not until 1919 was road work of a more important type started with some of these funds. The Klamath River Highway was initiated in this way.

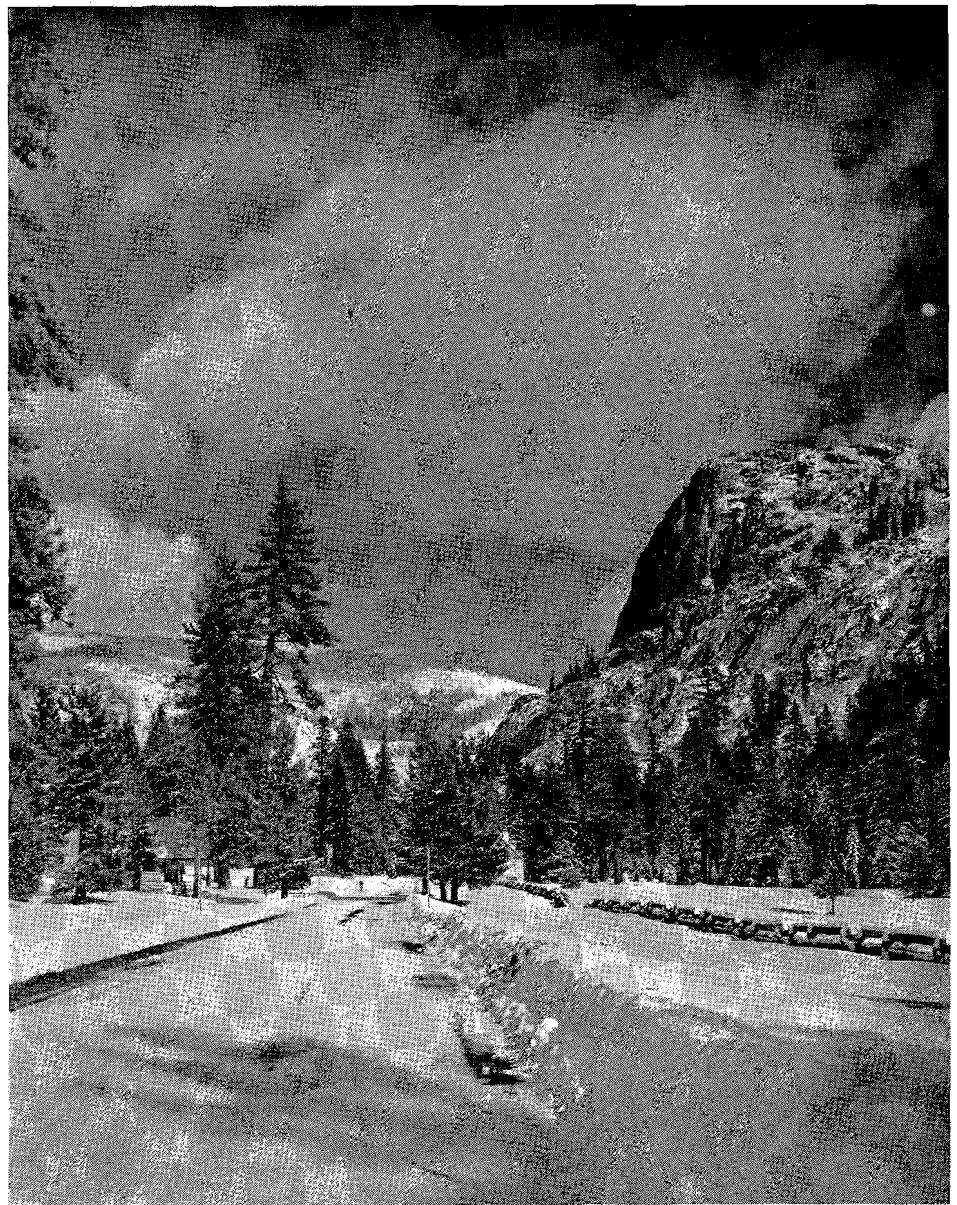
There is a distinction between the national forest highways and the forest development roads, and this distinction appeared with the 1921 Federal Aid Highway Act. Appropriations for development roads and trails within forests are for protection, administration and utilization of the forests. They should not be confused with the funds and the appropriations for forest highways.

Forest Highway System Established

The 1921 act introduced "Section 23" containing reference to forest highways independent of other roads and trails. This necessitated the designation and approval of a National Forest Highway System of "forest roads of primary importance to the counties or communities within, adjoining or adjacent to national forests." Rules and regulations for the administration of and procedure on national forest highways were issued by the Secretary of Agriculture. These rules and regulations, although somewhat revised as forest highway appropriations continued to be included in succeeding federal aid highway acts, remain substantially the same as initially set forth.

First Program in 1921

It is recalled that when the initial list of projects or routes for the National Forest Highway System was adopted and the first program was prepared in 1921, a Forest Service Board including members from Washington, D. C., sat with the California Highway Commission and representatives of the Bureau



On the Placerville-Lake Tahoe Forest Highway

of Public Roads for these determinations.

About 70 highways were initially adopted. Subsequent additions to the system have been made jointly by Forestry, Bureau of Public Roads and the State by much the same procedure as is now followed. The State Division of Highways submits a map of eligible roads of primary importance to the Bureau of Public Roads. The latter furnishes copy to Forestry and arranges a joint conference of the three agencies for agreement on recommendation of routes. Routes so agreed upon and recommended by the Regional Forester,

the Division Engineer of the Bureau of Public Roads and the State Highway Engineer are forwarded with supporting data to the Commissioner of Public Roads and the Chief of Forest Service for approval.

Additions to or modifications of the system are not made except on important warrants, and then only after reconsideration of the entire system. In general, it is advisable to restrain the system from reaching a size out of proportion to the ability to bring it to adequate condition with revenues that may be expected within a reasonable period.

System Has 2,445 Miles

On June 30, 1949, the system contained 2445.6 miles of forest highways:

- Class 1. On the Federal Aid System..... 677.8 miles
- Class 2. On the State System, other than
 - Class 1 1233.0 miles
- Class 3. Other forest roads not in
 - Class 1 or Class 2 534.8 miles

Due to the 1933-1935 inclusion in the State Highway System of some 6,800 miles of county roads, 669 miles of roads taken into the Forest Highway System as Class 3 became Class 2 roads and changed the approximate 50-50 ratio of county and state highways theretofore comprising the system.

A list of the forest highways, subject to minor correction, will be found on pages 86-87 of the Third Annual Report of the Division of Highways.

New Classification

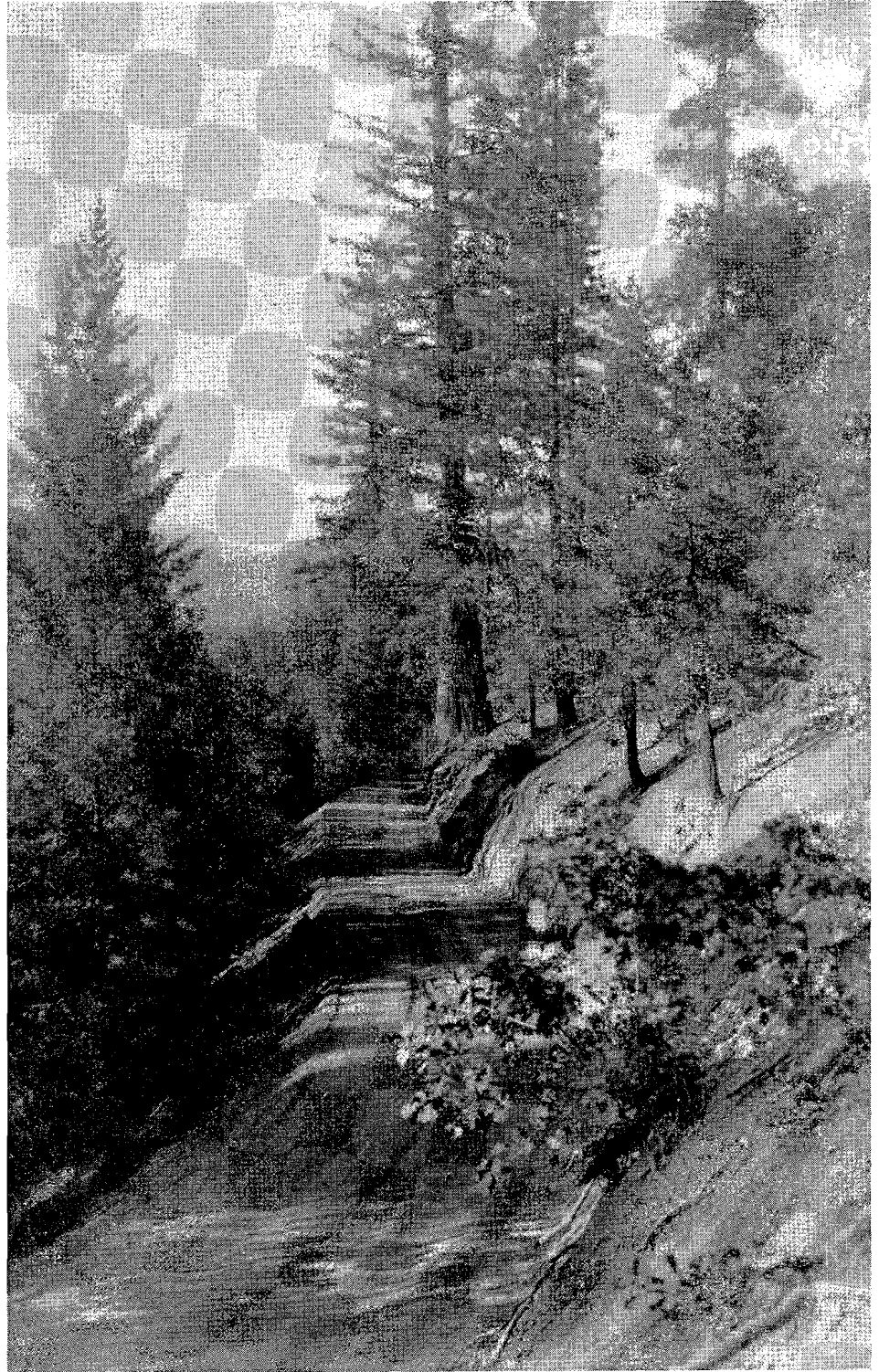
On March 30, 1950, a new classification was authorized to emphasize the federal aid factor so more effective presentation of the Forest Highway System can be made to Congress. The mileage in each of the following new classifications has not yet been worked up.

- Class 1. On the Federal Aid Primary System
- Class 2. On the Federal Aid Secondary System
- Class 3. Other forest highways

Forest Highway Appropriations

The apportionment of forest highway funds to each state is made on the basis of one-half in the ratio that the area of national forest land in any state bears to the total area of such land in all states and one-half in the ratio that the value of national forest land in any state bears to the total value of such land in all states. It is readily understood why states with a small amount of forest land are reluctant to support recommendations to Congress for forest highway appropriations large enough to satisfy the group of western states that contain so much forest area.

Exclusive of the 3,000,000 acres in national parks within national forests boundaries, the 18 national forests in this State contain about 20,000,000 acres. That is about one-ninth of the area of the total 150 U. S. National Forests. It is approximately one-fifth of the area of California. Incidentally it is interesting to note that another two-fifths of California area is classified as woodland, brush and private forests,



Characteristic of many early forest highway projects providing urgent transportation needs but now outmoded by change in traffic

one-fifth is developed chiefly in agricultural land and the other one-fifth is desert type.

Apportionments to State

The following tabulates in brief form the amount California was apportioned

for national forest highways out of the Federal Aid authorizations to date:

Fiscal Years	Amount
1922-1936	\$11,318,760
1937	1,003,403
1938	1,334,121
1939	1,330,615
1940	952,825



Calaveras Big Trees, a major factor in the Ebbetts Pass highway project years ago. The State is reconstructing the road on which lumber hauling sets a new road standard

Fiscal years	Amount	Fiscal years	Amount
1941	\$1,237,745	1949 .....	.....
1942	995,522	1950	\$2,845,848
1943	994,301	1951	2,856,198
1944 .....	.....	Total to date	\$31,991,812
1945 .....	.....	Average per year	\$1,066,394
1946	3,562,884	Cash appropriations to date have not	
1947	3,559,590	been as much as the full authorizations	
1948 .....	.....	

in all cases. The deferment of cash appropriations for the postwar authorizations and the cancellation of the ones for 1948 and 1949 have been particularly disappointing. It has the effect of retarding for a still longer period the postwar forest highway program that already had a late start.

Ten percent of the amount apportioned to each state must be placed in a reserve to cover administrative requirement of the Bureau of Public Roads, purchase of equipment, administration by the forest service and in special cases to provide additional funds for programmed projects. Any balance remaining at the end of the year is made available for the forest highway program.

Federal Aid Act of 1948

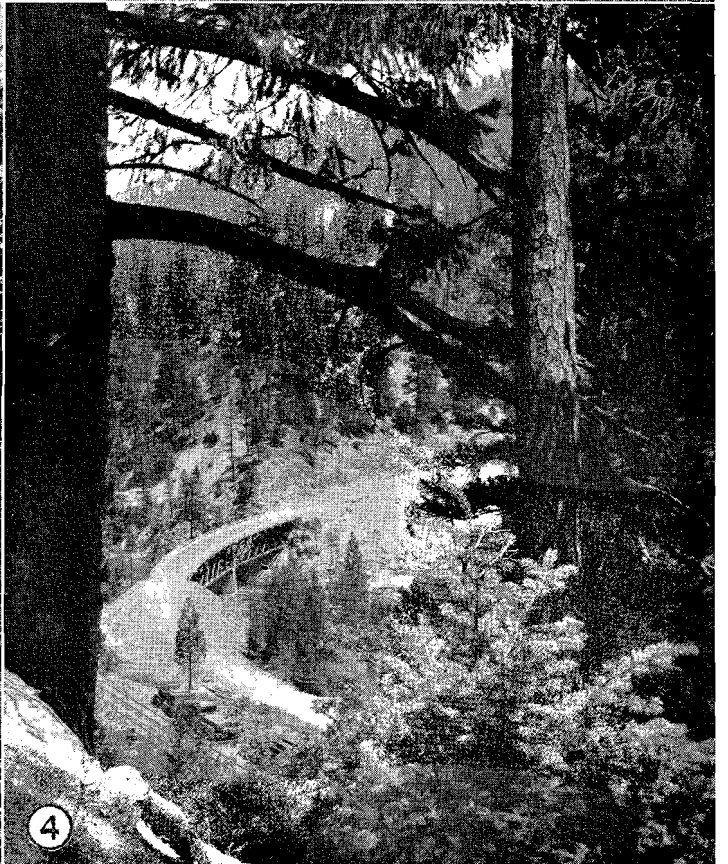
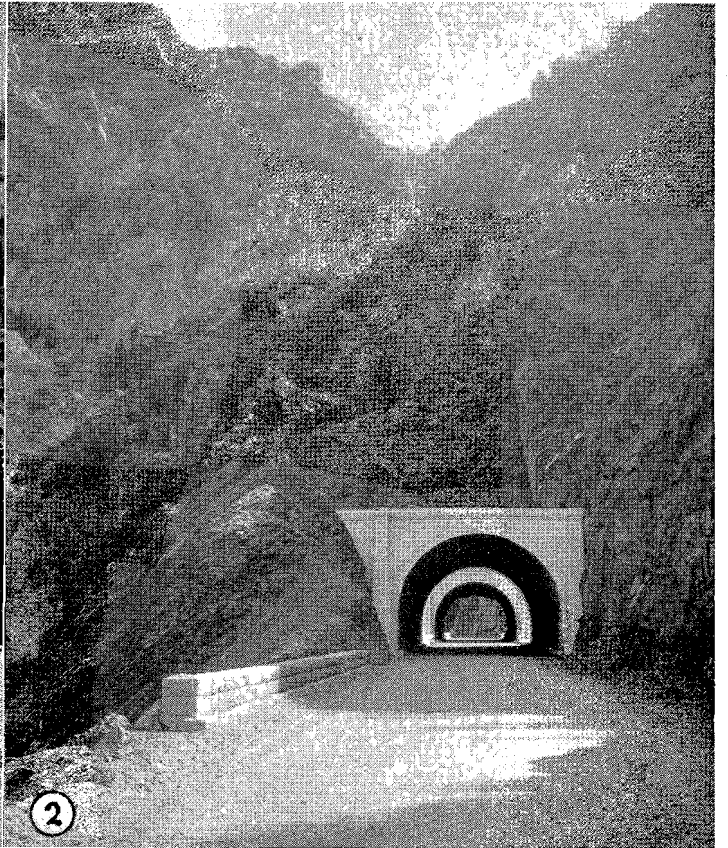
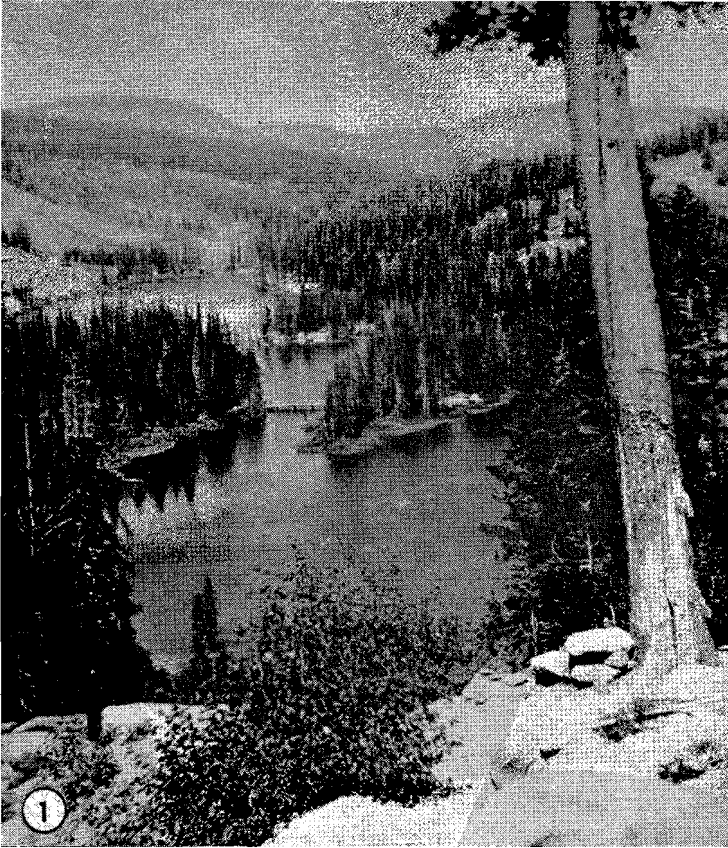
The 1948 Federal Aid Act made an important improvement in the former unreliability of getting appropriations to cover authorizations. It stipulated that appropriations made pursuant to authorizations enacted for forest highways shall be considered available for discharging obligations created by the acts. At the discretion of the Commissioner of Public Roads this facilitates getting programs under way and constructed during favorable seasons. Most of the forest highway projects are within snow areas where the construction season is limited. It had been a serious handicap to withhold advertising until after cash appropriations were released at the end of fiscal years.

Unless otherwise provided by legislation the annual apportionment to the states is now made by the Secretary of Commerce on or before January 1st of each year.

Forest Highway Programs

Selection of the forest highway program for each apportionment is made by joint agreement of Forestry, Bureau of Public Roads and State Division of Highways in accordance with the following rules:

At request of the bureau the state submits a proposed list of projects supported by a map, together with recommendations on any projects proposed by counties, communities or other agencies. Copies are forwarded to Forestry with further information of the bureau if Forestry desires it. The



1—Twin Lakes from Mammoth Forest Highway. 2—Tunnels improve alignment on Ventura-Maricopa Forest Highway. 3 and 4—Representative forest highways designed for moderate traffic

bureau then arranges for a joint conference of the three agencies. Joint report in form of recommended forest highway program is filed with and is subject to the approval of the Commissioner of Public Roads and the Chief of the Forest Service.

Project Requirements

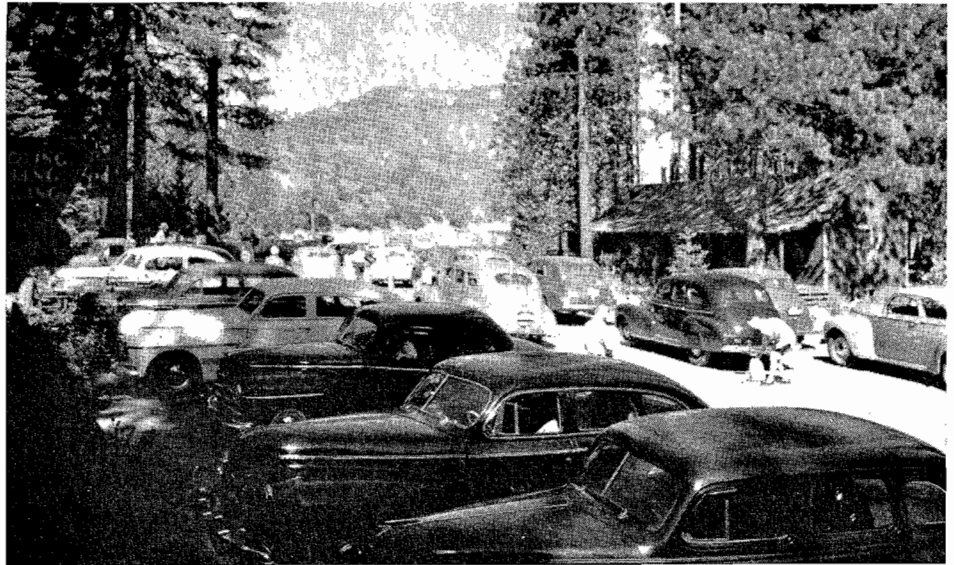
Projects included in these programs must be based upon the following considerations:

- (1) Provisions for the maintenance of the forest highways.
- (2) The completion of necessary surveys.
- (3) Findings of the highway planning survey.
- (4) Benefit to forest development, protection and administration.
- (5) Requirements for production of timber and mining.
- (6) Construction correlation with military requirements and with adjacent federal and state road programs.
- (7) The economy of continuity of operations.
- (8) Ability of cooperators to maintain adequately the improvement.

Surveys and Plans

Forestry, Bureau of Public Roads and the Division of Highways jointly agree on necessary survey programs by procedure similar to that used in preparing construction programs. A shelf of prepared plans has been kept up well ahead of construction budgets, preceded by reconnaissance studies on any project on which urgencies can be foreseen. The Bureau of Public Roads carries the engineering responsibilities on forest highway projects, although plans prepared by other agencies may be turned over to the bureau for completing contract specifications and contract proposals on forest highway projects. State surveys and plans have thus been utilized in a number of cases.

No construction may be undertaken on a project in a designated forest highway program until survey and estimates are approved by the Bureau of Public Roads and the State Highway Department. Forestry must be given an opportunity to review surveys and plans and to indicate any details of location desirable for the protection or development of the national forests.



Recreational uses of forest highways. UPPER-CENTER—At Pinecrest on Sonora Highway. LOWER—Scene between San Bernardino and Big Bear Lake. Some 10,665,000 vehicles per year use national forests

On the whole, there is very fine correlation of efforts among all three agencies throughout the entire procedure from initiation to completion of the forest highway improvements in California.

Construction

Unless impracticable to construct by contract method forest highway construction must be performed by contract. The Bureau of Public Roads places the advertisement, awards contract and performs the construction engineering on all the projects in forest highway programs.

It should be understood that procedure on forest highway programs for the expenditure of forest highway funds does not limit the work counties and Division of Highways may do on forest highway routes. The whole or parts of routes in the Forest Highway System may be independently located and constructed by the state agencies. When so constructed or reconstructed the projects are not forest highway projects included in the category of federal financed programs discussed herein.

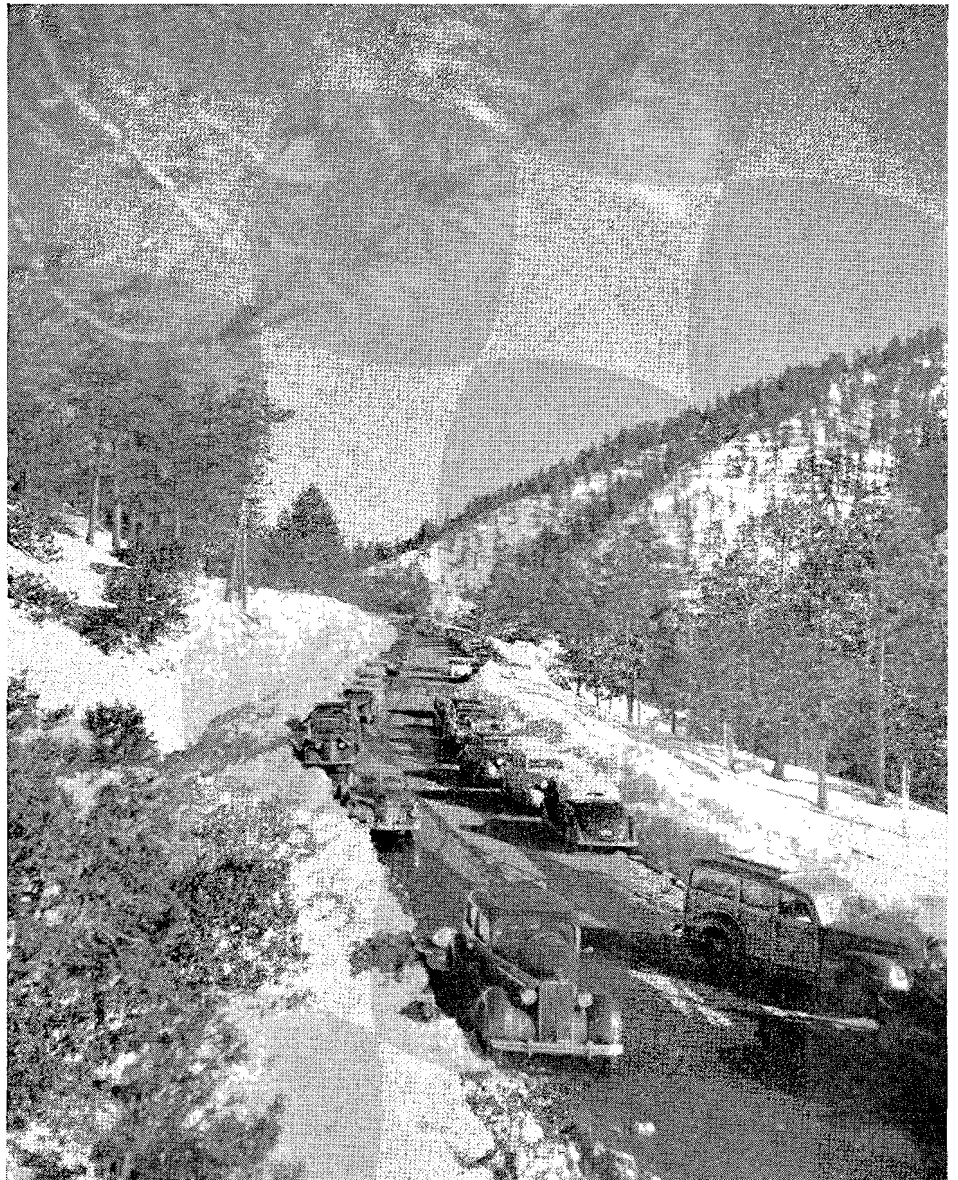
Prominent Routes

Among the more prominent of the 56 routes constructed or under construction with forest highway funds are the following routes:

Routes	Forest
Bear Valley and Mill Creek	San Bernardino
Angeles Crest, Swartout and San Gabriel	Angeles-San Bernardino
Huntington Lake and Oakhurst	Sierra
Maricopa-Ventura	Los Padres
Sonora Pass	Stanislaus
Nevada City-Downieville, Yuba Pass	Tahoe
Placerville-Tahoe	El Dorado
Mt. Shasta-Mt. Lassen	Shasta-Lassen
Quincy-Beckwourth	Plumas
Lava Beds	Modoc
Crescent City (U. S. 199) and Klamath River	Siskiyou, Klamath-6 Rivers
Mosquito Ridge and Douglas City-Peanut (Timber access)	Tahoe and Trinity

Cooperative Financing

Cooperative agreements between the government and the county or State are executed for every forest highway project financed in whole or part by forest highway funds. They contain the detailed provisions agreed upon by each party, including financial contributions from the cooperator, period of federal maintenance and provisions for



Heavy traffic on forest highway through winter sports areas

rights of way and for road materials involving right of way negotiations on private parcels.

The government may accept cooperative financing from other agencies. In the early years of forest highway appropriations it was considered highly desirable, although not mandatory, that county or state contribute part of the cost of projects. In some cases up to 50 percent of the cost was so provided as indication of the importance of projects to the cooperator or to insure more construction than might be warranted or possible with available forest highway funds. State contribution to the Big Bear Lake Forest Highway and federal participation in the joint high-

way project from Ventura to Maricopa are examples of early forest highways jointly financed to facilitate completion of lengthy routes.

Cash Contributions

Whenever cash contributions are made toward construction costs of a project on a forest highway program the funds must be deposited with the Treasurer of the United States in advance of construction. The government does not turn over forest highway funds to county or state, except as reimbursement for construction materials, traffic striping and similar items that may be furnished by the cooperator on a regular forest highway proj-

ect. The regular cooperative agreement or a memorandum of understanding covers these provisions.

Upon completion of construction and after the specified period of federal maintenance, the maintenance of forest highways is the responsibility of the cooperating agency. The federal maintenance generally extends for two years after construction is completed in order to insure the road is stable before it is turned over to the cooperator.

Rights of Way

Rights of way over private lands on forest highway projects are furnished by the agency having the projects in its highway system. A careful distinction is made between construction costs borne by the Government and rights of way costs, the obligation of the cooperator. Unless federal approval of the project program is made well in advance of proposed construction there may be difficulty in getting right of entry for construction without delay.

Forestry's approval of plans, surveys and estimates for construction on forest highway projects establishes rights of way across forest land parcels. With respect to future jurisdiction of the cooperating agency the right of way is the same as though the latter had applied for and received a special use permit. It is not an easement in the ordinary sense—the areas bordering the road remain under forestry control. Forestry's Regulation L-7 provides one-chain width each side of state highway center line. Actually no limitation is placed on width justifiably required for cut and fill slopes or for other highway appurtenances included in the plans. Any material change in original plans or any revision or relocation subsequent to initial forest highway construction over forest lands is subject to application to forestry for a supplementary special use permit. No encroachment on forest lands is permitted without special use permit.

No Encroachments

Highways across forest lands enjoy a set back regulation under which forestry will not permit encroachments by use of lands within specified distances each side of the highway. On

state highways this protection of landscape extends over a strip 200 feet each side of center of the road.

Scenic value and roadside appearance characterize the location and the plans of the forest highways and are predominant factors in the policy of all the agencies. Accepted practices to which each agency is sincerely subscribing include flat slopes rounding and blending into the natural contours of the ground, removal of slash, snags and refuse from bordering forest cover, prevention of avoidable construction scars, permitting no borrow sites that will be visible from the highway, preservation of timber screens and extensive erosion control. Erosion control on all our highways has been developed for maintenance benefits as well as for landscaping values. In the forest areas the stability of cuts and fills is equally important in eliminating silting of adjacent streams, a serious problem in many localities where slopes are steep. Methods of erosion prevention are being covered in a series of articles now running in *Highways and Public Works*.

Problem of Adequate Improvements

In early days of national forest management (the Forest Service was created in 1905) the forest roads served primarily for fire protection. The use and management of the forests, which is Forestry's responsibility, extends to more comprehensive programs for protecting and developing their resources. These resources—recreational opportunities, timber, grazing, water, minerals, fish and game—cannot be utilized advantageously without roads. The forest development roads alone cannot satisfy the requirements. After all, the service to the people is the important issue. The National Forest Highway System was set up, as heretofore stated, to be "roads of primary importance to the counties or communities within, adjoining or adjacent to national forests."

State Contributes Share

The present problem of carrying out forest highway programs that will be well balanced in relation to the respective resources is recognized by Bureau of Public Roads, Forestry and Division

of Highways. Adjustments must be made to correlate national policies with local requirements. The determinations must be adaptable to changing needs. The problem is further complicated by the insufficiency of federal appropriations for adequately improving the Forest Highway System.

The California Division of Highways has carried its full burden in financing the Forest Highway System. On the 96 routes and 2,445 miles in that system 1910.8 miles are state highways. The total expenditures on the Forest Highway System to the end of the 1949 Fiscal Year were \$112,756,798 according to a recent report of the Bureau of Public Roads. All forest funds account for \$25,320,709 of that amount. State, county and other agencies contributed \$87,436,089 or about three-fourths of the total expenditures. Of course, the state funds comprised the greater part of the nonfederal cost. On many of the forest highway routes, including many miles of major state highways, no forest highway funds have been expended or can be expected.

Timber Access Roads

Production of lumber has been a predominant consideration in programs for forest highway funds for a number of years, and timber access roads are still a major item of forest resource development. Meanwhile, the public is demanding better roads through the forests and to recreational areas in the forests. There are 11 trans-Sierra routes through the National Forests of California. There are 1,100 camp grounds in the forests, innumerable picnic areas, 9,500 summer homes on forest leases, many resorts and many developed sites for youth, civic and other organizations.

More and more the rapidly growing population of California is showing tremendous interest in recreational travel and pursuits. Camping, hiking, swimming, boating, hunting, fishing, skiing, or just plain touring induced about 13,000,000 people to travel over federal forest highways last year.

Serve Multiple Interests

Some of the forest routes serve multiple interests. Some have only seasonal use. Some are developing extensive winter sports use. On many, the peak



Placerville-Lake Tahoe Forest Highway. An example of roadway sections the Bureau of Public Roads is building in rough country as well as in milder terrain

traffic loads exceed comfortable road capacity. Heavy hauling is requiring costly bases and surfaces or causing serious damage and maintenance outlays. Only those roads built on good standard of alignment, width, grade and surface type in heavy snowfall areas can be kept open by heavy snow removal equipment.

It is estimated that the cost of bringing the presently designated Forest Highway System in California to a standard ade-

quate for traffic requirements will be approximately \$191,391,000. Apportionments of forest highway funds to California in 1950 and 1951 Fiscal Years have been at the rate of less than \$3,000,000 annually for administration, engineering, maintenance and construction. Even with the expenditures the counties and the State are currently able to finance for improving parts of this Forest Highway System, spreading funds thinly over many routes will undoubtedly result in many of the roads becoming obsolete before they

can be brought to an adequate or near-adequate standard.

California has been favored with a wealth of magnificent forests and forest resources. It is fortunate in having well qualified, competent and experienced representatives in the U. S. Bureau of Public Roads and in the U. S. Forest Service. It has the appreciation, the sincerity and resolution of the counties and State in the forest highway problem. It cannot do less than hope its people and its Congress will provide.

Road Building Setting All-time High in 1950, ARBA Survey Indicates

ALL HIGHWAY construction dollar volume records are being shattered this year, with \$1,446,732,000 in road improvements—exclusive of maintenance—going into place on the systems of the 48 states and the District of Columbia.

A state-by-state survey made by the American Road Builders' Association shows a 15 percent increase this year over 1949's previous record road construction total of \$1,262,506,000. In making the figures public, Lt. Gen.

Eugene Reybold, ARBA executive vice president, pointed out that maintenance costs—up an estimated \$12,761,000 to \$452,782,000 from the 1949 expenditure of \$440,021,000—will boost the total state highway program for 1950 to \$1,899,514,000, as against the previous record high of \$1,702,527,000 set in 1949.

Total highway mileage involved in the scheduled 1950 improvements is 46,676, compared with 41,925 miles in

1949. Of the 1950 improvements, 1,718 miles of concrete, 29,977 miles of bituminous mixes and treated types and 14,981 miles of other types of highway (gravel, etc.) are programmed for construction. Expenditures and mileage have no direct relationship, because some more populous states may have to concentrate on construction of more costly expressways, while those with smaller population can build on a smaller scale.

Adieu

District Engineer Fred W. Haselwood, Pioneer Road Builder, Retires From State Service

ON MAY 31, 1950, Fred W. Haselwood, District Engineer for the Division of Highways for the past 24 years, retired.

During 38 years of service with the State, Mr. Haselwood has played an active and responsible part in the expansion of the California Highway System from a few scattered dusty roads to the great network of paved



F. W. HASELWOOD 1950

highways which is the proud boast of the State today.

On February 15, 1912, early in the organization period of the California Highway Commission, he accepted an appointment as Principal Assistant Engineer to Division Engineer F. C. Somner, District I at Willits, and became one of 260 employees of the Division of Highways. The early years in District I were pioneering years, as elsewhere in the State, where traffic developed from nothing to a substantial volume even before the Redwood Highway was opened to Oregon. The few hundred employees of the Division of Highways during this period were

the real pioneers of our present highway system.

Pioneering Work

In 1923 when R. M. Morton succeeded A. B. Fletcher as State Highway Engineer, he transferred to the newly organized Bridge Department as field investigator and construction engineer.

In August, 1924, he was appointed Division Engineer of District III with headquarters at Sacramento. In spite of 12 years of progress, he found there was still much pioneering left to be done. Oddly enough, the pioneering in District III was largely on the oldest highway in the State, U. S. 50, between Placerville and Lake Tahoe, which in the fifties and sixties was the route between San Francisco and the Comstock Mine in Virginia City, and carried much more traffic than it did in 1924.

In June, 1929, he was transferred back to District I, the headquarters of which had been moved to Eureka. Times had changed and many of the dusty roads had disappeared, but the increase of traffic was still gaining on highway construction, and there was plenty to be accomplished.

In February, 1932, he was transferred to District II with headquarters at Redding.

Designed Many Highways

In 20 years the highway work and organization had grown tremendously in volume and complexity. Contrasted with the early days when the division engineer did everything, including the acquisition of right of way, work was now divided among assistants, each proficient in his own line, and the more definitely administrative duties were greatly increased. In spite of the increased duties involved in directing the multiple activities of a large district, Mr. Haselwood has found time to devote his personal attention to one of his chief interests, the location and design of new highways. He is responsible for the excellent location and design of hundreds of miles of our modern high-

ways which serve as a monument to his efforts.

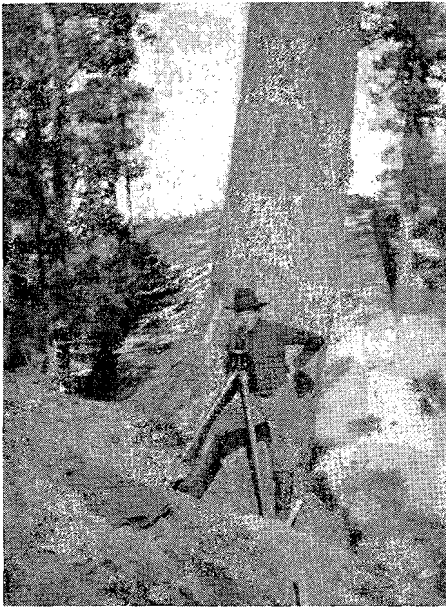
Fred Haselwood was born at Milford, Nebraska, in May, 1880, and moved to Kansas 11 years later. After graduating from Kansas State Agricultural College in 1901, he took graduate work in civil engineering with special emphasis on hydraulics at Stanford University until 1903.



F. W. HASELWOOD 1912

Began Career in 1903

He began his active engineering career in 1903 when he went to work for the Western Pacific Railroad. He was a stake artist on a location survey party along the Middle Fork of the Feather River east of Spring Garden Tunnel. Progressing to transitman in a few short months, he located 70 miles of railroad in Nevada. Mr. Haselwood states that E. S. Arnold, the locating engineer in charge, was the highest qualified man employed by the Western Pacific Railroad and was an excellent instructor. The principles of location, learned during this early stage of his career, were to later leave their



Mr. Haselwood on survey of Western Pacific Railroad entering Delaney Canyon on the Middle Fork of the Feather River

mark on many miles of highways in Districts I, II, and III.

In the summer of 1904 he worked for Theodore Hoover at Standard Consolidated Mine at Bodie, California. At this mine mules hauled the cars filled with ore over a level track to the foot of an incline at the stamp mill. Haselwood took over where the mules left off and all he had to do was haul the loaded cars up a 200-foot incline to the upper story of the mill and dump them. Having developed his muscles during this light summer outing, and proving he had the strength of at least one mule, he decided to take up football upon his return to Stanford University. He states that in his first game he inadvertently ran into a brick wall in the form of an opposing Olympic Club player and broke his collarbone. The damage was not permanent and he was back on the playing field after three weeks of idleness.

Varied Experience

Earlier in 1904 he engaged in several odd jobs, among which was one estimating construction costs for the Santa Fe Railroad at Eureka. It was here that he began an association with R. L. "Bob" Thomas, a recently retired fellow highway engineer, that has lasted with frequent contacts for 45 years.

From 1905 to 1909, inclusive, Mr.

Haselwood again worked for the Western Pacific Railroad. He ran transit on 225 miles of final location and later was resident engineer on 30 miles of grading and bridges near Altamont and on construction of terminals in Oakland and Stockton.

During 1910 and 1911 he engaged in private practice in San Francisco. In September, 1911, he began work for Nathan Ellery, State Engineer, investigating water rights in Shasta and Tehama Counties.

Upon returning from a trip to Kansas early in 1912 he answered a call from F. G. Somner, then Division Engineer of District I at Willits, and began his career with the Division of Highways.

His early experiences during the pioneering days in District I are best told in his own words, and we quote him:

"In 1912 conditions for travel were not very promising in Division I. Mr. Somner was furnished a Franklin car and his chief worry was where to use it. With the road conditions that prevailed, it was one jump ahead of walking. There were only two other cars in Willits in those days.

"Early in the history of Division I it became necessary for reconnaissance work and surveys to be undertaken in Humboldt County. The railroad frontier was a short distance north of Willits and the track to Eureka was not constructed until 1914. The short cut to Eureka was by train to San Francisco and thence by boat to Eureka. When Somner went to Eureka we usually didn't see anything of him for over a week.

No Soft Job

"Inspection of construction projects was not as rapid as it is today. To get to Contract No. 2 it was necessary to take the train to Hopland and hire a horse and buggy for the rest of the trip.

"In 1915 the first convict camp on the highway system was established at Leggett Valley on the South Fork of the Eel River. There were no roads along the river and the only access to Leggett Valley, other than by trail, was a so-called road from the coast. All supplies for the camp were shipped by boat to Union Landing and hauled

over this road by truck in the dry season.

"Inspection trips were hard and tedious. One on which I accompanied Mr. Somner required five days. We took the train from Willits to Alder Point, missed the stage and walked to Garberville. The distance may have been less than 30 miles but we tried a short cut, got lost and wandered far out of direction so it seemed a hundred. Three days over rough trail were required to get from Garberville to Cummings.

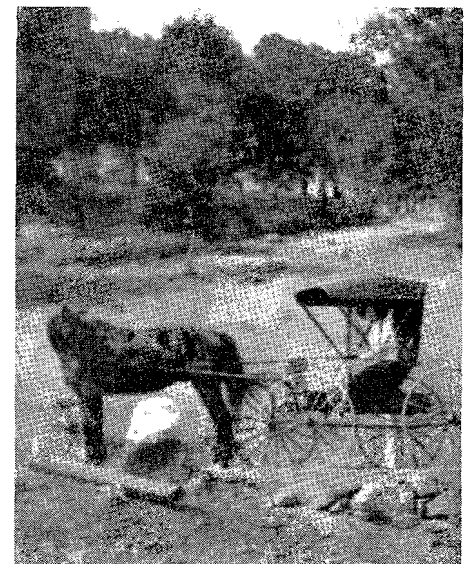
Early Bridge Construction

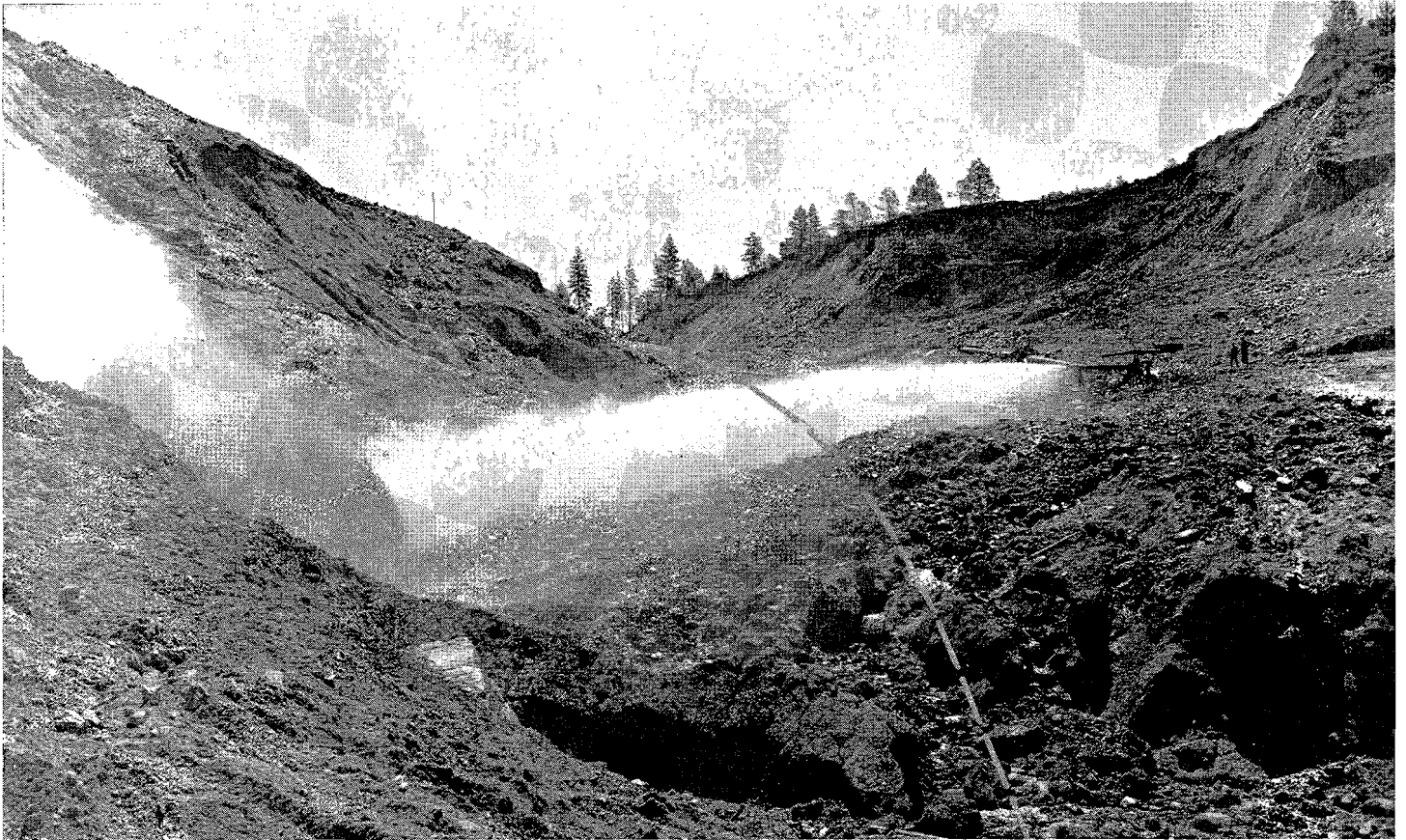
"Soon a second camp was established and this was a busy area. The major qualification required of a district engineer was resourcefulness and had not Mr. Somner possessed this quality to a high degree, the road would never have been built.

"There were several deep, narrow gulches to be crossed and bridges were required. The redwood timber on a 40-acre tract was acquired and a sawmill set up to produce lumber for the bridges. Designs were made in the division office. The most unique of these designs, and my particular pet, was the Rock Creek Arch. Having a span of 150 feet and with the roadbed 150 feet above the stream, this three-hinged timber arch, probably the first

... Continued on page 63

Inspection of State Highway Contract No. 2 in Mendocino County in 1912 was made by train, Willits to Hopland, and by horse and buggy from Hopland on





In constructing a highway between Weaverville and Junction City over Oregon Hill in Trinity County, Mr. Haselwood resorted to hydraulicking to level the obstacle. Over 10,000,000 yards of earth were removed in five years by this method

Congestion Relief

Two-lane Section Between Los Angeles and Palm Springs Doomed

By J. M. COWGILL, District Planning Engineer

CONSTRUCTION now in progress on U. S. 70-99 will eliminate the only remaining section of two-lane highway between Los Angeles and the Palm Springs junction, a distance of 90 miles. This improvement will be effected under a contract awarded November 17, 1949, to Fredericksen and Kasler, Sacramento. The contract provides for widening the existing highway to provide a four-lane expressway between 2.3 miles east of Redlands and Beaumont. The length of the project is 9.6 miles.

Figure 1 shows the location of the project in San Bernardino and Riverside counties. The City of Beaumont, at the east end of the construction, is an agricultural center. The orchards and rolling grain fields which surround

the city are characteristic of the terrain through which the highway passes.

Part of National System

This section of U. S. 70-99 is a part of the National System of Interstate Highways, the limited-mileage basic network of trunk routes established by Congress to connect the nation's principal cities and to serve the national defense.

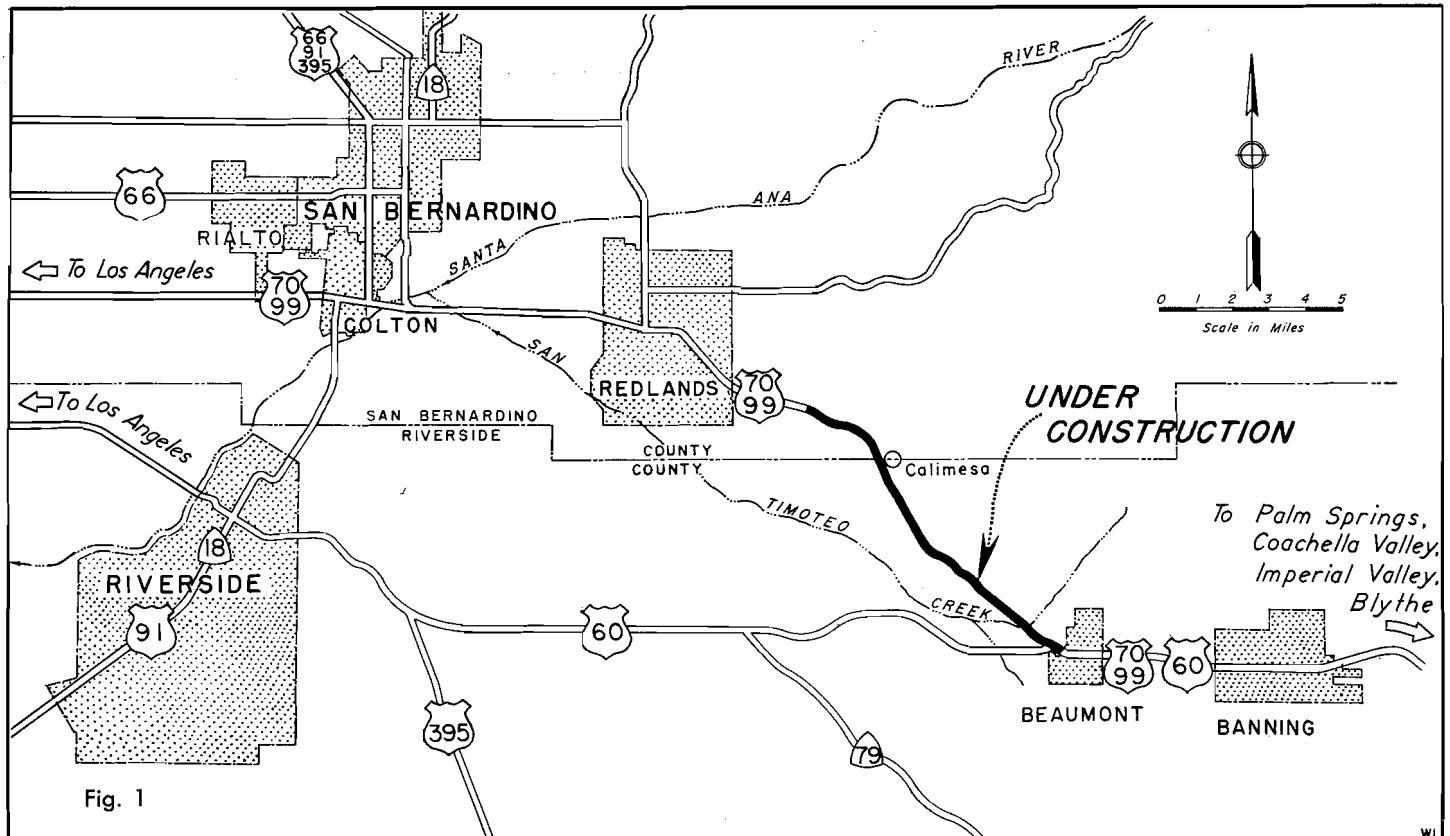
A large proportion of the interstate traffic entering California at its eastern boundary proceeds westerly over this road to the Los Angeles metropolitan area. In addition to the interstate traffic and the local traffic, there are two segments of intrastate traffic that contribute to the high vehicle count. These are the farm-to-market traffic with the

Imperial and Coachella Valleys and the recreational traffic with Palm Springs and other desert resort points. The first named traffic is heavy with trucks. Passenger cars are predominant in the Palm Springs traffic. Both of these traffic movements have their other terminus in Los Angeles or neighboring cities to the west of the present project.

Relief of Traffic Congestion

Although this traffic load is shared with U. S. 60 west from Beaumont, the proportion which uses U. S. 70-99 is in excess of the capacity of the existing two-lane highway. Delay and congestion prevail when traffic is held behind slow-moving vehicles which cannot be passed because of the numbers of oncoming cars or because there is not

This map shows the general location of the project between Redlands and Beaumont on U. S. Routes 70-99 and the relationship to other state highways in the area





Aerial view at Calimesa. Business section along existing highway in upper center of photograph will be undisturbed by construction. New location of U. S. 70-99 is indicated at right

sufficient sight-distance for safe passing. Drivers frequently get impatient under such conditions and accidents follow.

This deficiency will be corrected by constructing an additional two-lane roadway adjacent to the existing roadway, as depicted in the typical cross-

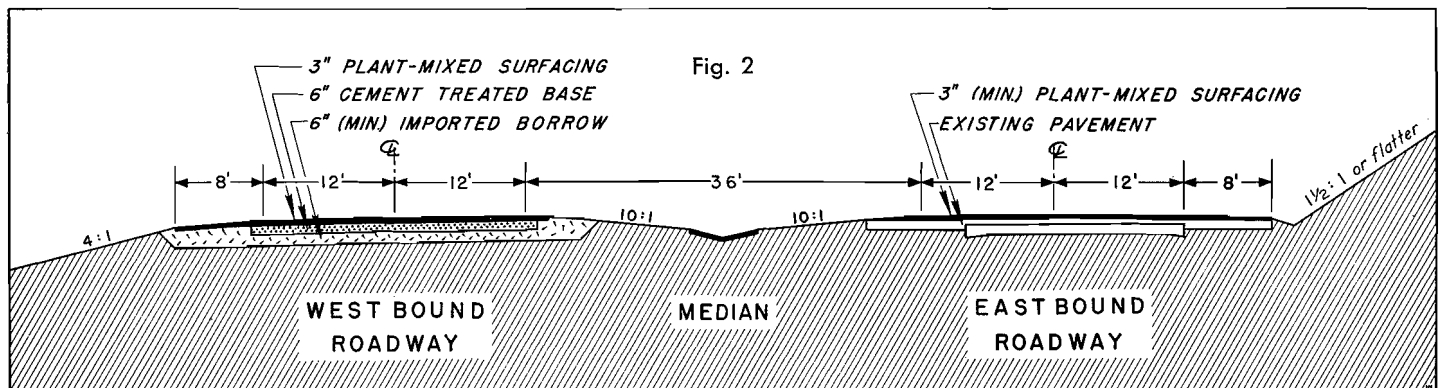
section shown in *Figure 2*. The added roadway will be made up of two 12-foot traffic lanes, an 8-foot shoulder on the outside, and a 5-foot shoulder adjacent to the median. The median will provide a width of 36 feet between pavement edges of the separate roadways. This width will constitute a zone

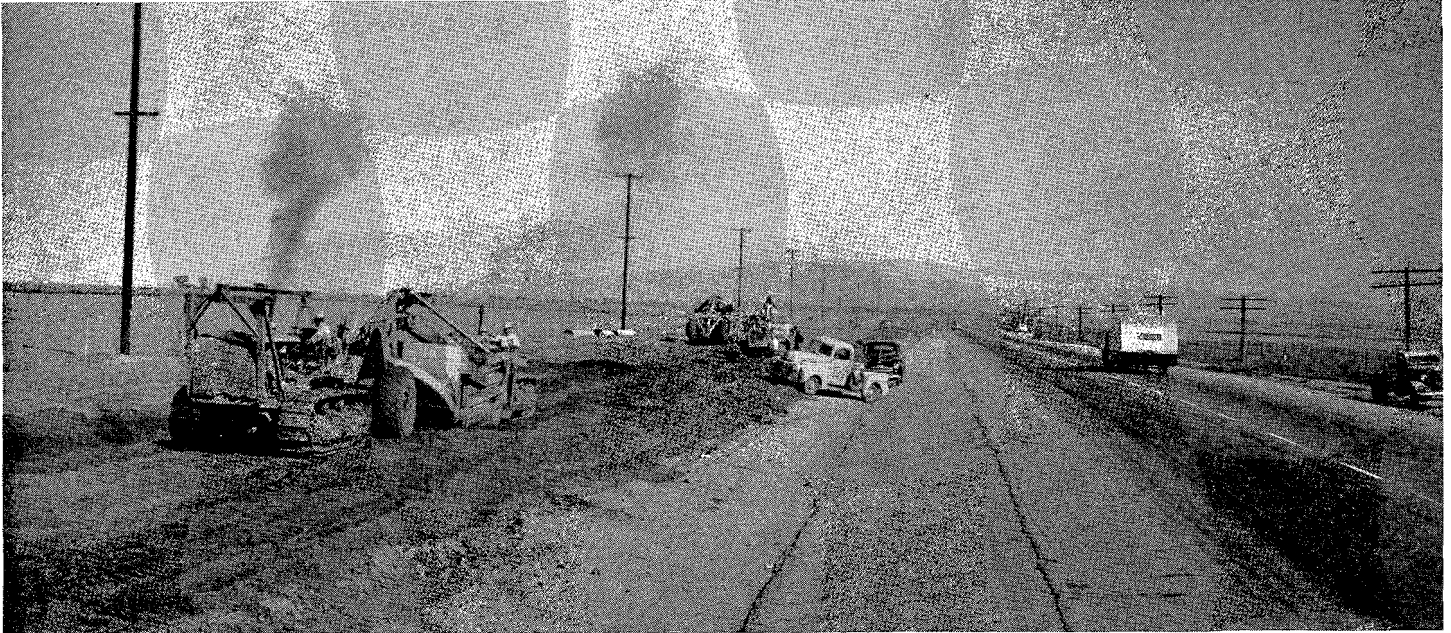
of safety to prevent head-on collisions and to relieve headlight glare.

Design of Pavement

The traffic lanes and shoulder will be surfaced with plant-mixed surfacing, three inches thick. The plant-mixed surfacing of the traffic lanes will

Typical cross-section of the highway. Where the roadways are on different levels, steeper cross slopes (up to 2:1) will be used in the median and guard railing will be constructed





Grading operations in progress three miles northwest of Beaumont. Existing pavement at right will be resurfaced and will form southbound lanes of expressway

be placed upon a cement treated base, six inches thick. The base consists of mineral aggregate which is mixed with Portland cement and water at a central mixing plant.

Tests have determined that the bearing capacity of the local soil is inadequate to directly support the base, so the plans call for a subbase of imported borrow, which will be excavated by the contractor from sources outside the highway right of way. The imported borrow subbase will be placed in thicknesses varying from six inches to 15 inches, depending on the bearing capacity of the local soil.

The pavement of the existing two-lane roadway will be reinforced by re-

surfacing with plant-mixed surfacing. This will also have the desirable effect of giving uniformity of appearance to the two roadways.

A seal coat of asphaltic emulsion will be applied to the completed surfacing. On the traffic lanes the seal coat will be covered with fine screenings ($\frac{1}{4}$ -inch x No. 10).

Erosion Control

To provide erosion control and a better appearance of the roadsides, slopes are being seeded with a mixture of barley, rye grass and alfalfa seed. The work calls for cultivation of the cut slopes and incorporation of straw to provide protection during germina-

tion and until the growth of grasses becomes established. The slopes that were first completed are now displaying a fine stand of grass.

At Calimesa, a community of small farms, the present highway passes through the business section. There is a resulting mutual hindrance between through traffic and patrons of the business district. To eliminate this conflict and accomplish the highway widening without disturbing the business buildings, the expressway is being constructed on a location which skirts the west side of Calimesa. This realignment, which is indicated on the accompanying photograph, also provides a saving in distance and eliminates from

Just west of Beaumont U. S. 70-99 joins U. S. 60. This sketch shows the layout of connecting roadways that will be constructed to provide interchange between the two highways. The separation structure will permit free flow of opposing streams of traffic

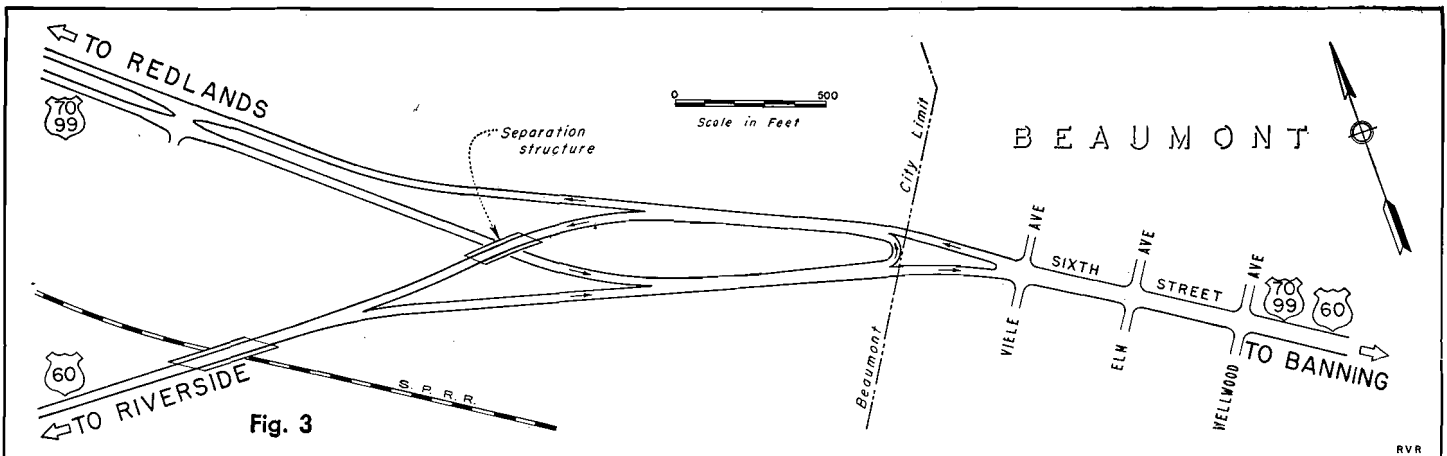


Fig. 3

the path of through traffic a sequence of curves whose lack of sight distance has been the cause of annoying delay and hazard.

Intersection Problem

The junction with U. S. 60, one-fourth mile west of Beaumont, posed a major intersection problem. To provide for the uninterrupted flow of the crossing and merging streams of traffic, the project plans call for the construction of a separation structure and a system of roadways on high standards of curvature. The essential features are sketched in *Figure 3*.

All the roadways provide a width for two lanes of traffic. The separation bridge will have a width of 28 feet between curbs to carry the westbound roadway of U. S. 60 across the eastbound roadway of U. S. 70-99. It will be a reinforced concrete box girder type of bridge, consisting of a main span 72 feet long, two side spans each 49 feet long and two cantilever spans each 4 feet 6 inches long. The bridge will be supported on reinforced concrete bents and abutments on timber treated piles.

The middle fork of San Timoteo Creek will be crossed by a reinforced concrete slab type of bridge consisting of three spans each 22 feet long and two spans each 18 feet long, supported on concrete pile bents and reinforced concrete abutments on concrete piles. The bridge will provide a width of 28 feet between curbs to carry the westbound roadway of U. S. 70-99.

Thirteen Culverts

In addition to the two bridges, the project includes thirteen reinforced concrete box culverts to be constructed or extended. The culvert work has been completed by the contractor. The major items of work involved in the bridge and culvert construction include approximately 11,700 cubic yards structure excavation and backfill, 3,100 cubic yards Class "A" Portland cement concrete, and 475,000 pounds bar reinforcing steel.

Roadway excavation and related grading operations have been substantially completed by the contractor. This work has included approximately 630,000 cubic yards of roadway excavation

PHONE CABLE IS PROTECTED DURING ROAD CONSTRUCTION

Among the utility facilities which occupy the highway right of way on U. S. 70-99 between Redlands and Beaumont is a coaxial cable of the Pacific Telephone and Telegraph Company. An interesting preliminary to the highway construction was the work performed by the company in connection with the cable.

In order to protect this costly and vital facility from possible damage by construction operations, the company constructed a concrete slab over the cable at all places where the cable was not deeper than five feet below the roadway grade. At locations where existing manholes were within the proposed traveled way, the manholes were closed and an access tunnel leading to the manhole from the side of the roadway was constructed. Construction of these access tunnels reflects the desire of the Pacific Telephone and Telegraph Company to cooperate in the movement for public safety. Elimination of manholes from the pavement area will make it unnecessary for the company employees to open manholes or do any work on the highway pavement. Thus, elimination of hazard for both motorists and company personnel is accomplished.

and 9,900,000 station yards over-haul. Major equipment employed by the contractor on the grading work has included 12 D-8 tractors, six carrying scrapers of 14-22 cubic yard capacity, four double units of 60-inch diameter sheepsfoot rollers, two heavy duty motor graders, a 1 3/4 cubic yard power shovel, and six 10-wheel dump trucks. The imported borrow subbase, which is expected to total 130,000 cubic yards, is now being excavated and placed.

Paving Plants Established

The contractor has established his paving plants on Singleton Road at a point about one mile east of the center of the project, where he has determined that deposits of suitable mineral aggregate are available. Separate mixing plants have been erected for

cement treated base and for plant-mixed surfacing with batch capacities of 6,000 pounds and 4,000 pounds respectively.

The base and surfacing for the project will require approximate quantities as follows:

- 65,000 tons mineral aggregate for cement treated base
- 67,000 tons mineral aggregate for plant-mixed surfacing
- 17,500 barrels Portland cement
- 3,350 tons paving asphalt

The estimated total cost of contract items is \$1,143,000. The contract provides for the completion of the work in June, 1951. Mr. C. E. Kasler, partner in Fredericksen and Kasler, who is supervising the firm's work, has said that he is scheduling his operations to accomplish completion of the construction well in advance of the required time.

Control of Access

The completed highway's status as an expressway will derive not only from the advanced design of the facility, but also from the control of access. Through negotiation with owners of abutting property, ingress and egress to the roadway has been permanently limited to a minimum number of specific openings. The access openings have been located at points where the safest possible conditions may be obtained for vehicles entering and leaving the highway. In order to avoid the hazards of private driveways entering into the roadways of the intersection with U. S. 60, frontage roads will be constructed to provide service to the properties which front on the intersection.

The service of the expressway will be made available to the surrounding area by means of connections to county highways.

Thirteen Intersections

There will be thirteen intersections in the 9.6 miles length of the project. The two intersections which provide entrance to Calimesa and the intersection at Woodland Avenue are expected to handle the largest volumes of traffic from the local area. This traffic requirement has been recognized by providing channelization of the intersections. The scheme for connecting county highways to the expressway

... Continued on page 26

NEW UNIT OF BAYSHORE FREEWAY

THE MUCH discussed Metropolitan System of Freeways in San Francisco is now under way; the first unit covers a distance of one and a third miles between Augusta Street on the south where it conforms with the Bayshore Boulevard and terminates at Twenty-fifth Street on the north about three blocks east of Potrero Avenue. Both of these termini points make temporary connections to the existing highway.

The contract for this first unit was awarded to Guy F. Atkinson Company and Charles L. Harney, Inc., of South San Francisco and San Francisco, respectively, as a joint venture for \$2,819,378.90 on May 11, 1949. The right of way cost of this section was approximately \$3,000,000, making a total cost of about \$6,000,000 for one and a third miles. The project is financed from state gas tax, federal aid and the San Francisco City and County apportionment of gas tax funds.

In planning this job, much study was made relative to the serious traffic problems, the number of going business establishments that would be affected by construction and the surface and underground utility obstruc-

tions. The work of removing factories and other buildings began more than two years before the advertisement of the contract and many of the utilities were relocated during this period.

The average week day automobile and truck traffic on this section of the Bayshore Boulevard is approximately 60,000 vehicles per day.

The traffic situation was made much more difficult by the bridge construction by the City of San Francisco at Islais Creek and Third Street, which closed one of the other main arteries for through traffic between San Francisco and the peninsula area, thereby greatly increasing the amount of traffic which had to be handled through construction.

Two Major Interchanges

There are two major interchanges included in the contract; one at the intersection of Alemany Boulevard and the Bayshore Highway and the other at the junction of Army Street and the Bayshore Highway. When this project is completed, the main line traffic will be carried above both of these interchanges, with local city street traffic

Aerial photo of Bayshore Freeway project under construction and centerline projection through adjacent area. Solid line area now under contract; broken line area future location

passing underneath. The main freeway will be an eight-lane divided highway. Alemany Boulevard is located on an area that at one time was part of the meandering Islais Creek and, as industries became established in this area, more and more of the delta land was filled up with refuse and at a later date a shallow crust of poor fill material was placed. It was necessary to remove large quantities of this unsatisfactory material prior to beginning construction of the various roadways for the planned rotary and piling to support the structures were driven to depths up to 100 feet. The rotary approach roadways will be paved with plant-mixed material on a cement treated base. The main line of the freeway will be paved with Portland cement concrete on a cement treated subgrade.

This contract is expected to be completed by the latter part of December, 1950. This work is all under the direction of Jno. H. Skeggs, Assistant State Highway Engineer, with headquarters in San Francisco. H. A. Simard is the Resident Engineer, and G. W. Thompson the Bridge Department representative.



Heavy grading operations on Redlands-Beaumont highway project

was worked out with the Counties of Riverside and San Bernardino and embodied in an agreement with the Riverside County Board of Supervisors, signed by Chairman Floyd E. Gilmore, and an agreement with the San Ber-

nardino County Board of Supervisors, signed by Chairman Frank H. Mogle.

This highway is on the U. S. Federal Aid System and the current construction will be financed in part by federal aid. Mr. E. C. Brown, District Engineer

of the Bureau of Public Roads, administers federal aid in California.

For the Division of Highways, E. A. Bannister is Resident Engineer and F. M. Morrill is Bridge Department Representative on the project.



San Fernando

New Highway Construction in Southern City Is Under Way

By F. E. STURGEON, Resident Engineer

A SERIOUS traffic situation will be eliminated upon completion of a Division of Highways construction program through the City of San Fernando in Los Angeles County. U. S. Highway 99, the State's most important north-south artery, is the principal business street through the city. This street, known as San Fernando Road, is paved 56 feet wide between curbs, with abutting property presenting a solid frontage of business houses. Local business and the very heavy through traffic along with curb side parking and the usual cross street pedestrian movement in this shopping and business area cause a great deal of confusion, interference and delay to local traffic and loss of time to through traffic.

Unusual Divided Highway

To alleviate the congestion and confusion on San Fernando Road, the Division of Highways now has a contract under way on State Highway Route 213 for the construction of 1.6 miles of 64-foot width roadway

through the City of San Fernando. This new roadway will parallel San Fernando Road on the northeasterly side and bypass the business area.

Upon completion the new highway and existing San Fernando Road will essentially be a divided highway with a block of business houses occupying the area between. The new construction will provide a one-way roadway for northbound traffic, while existing San Fernando Road will be converted to a one-way roadway for southbound traffic. Traffic islands at the junction of the roads at both ends will facilitate safe handling of moving traffic. The new highway will not be classed as a freeway and business houses may be established on it, while business houses fronting on existing San Fernando Road may open entrances on the new road through the rear of their existing buildings.

Typical Section

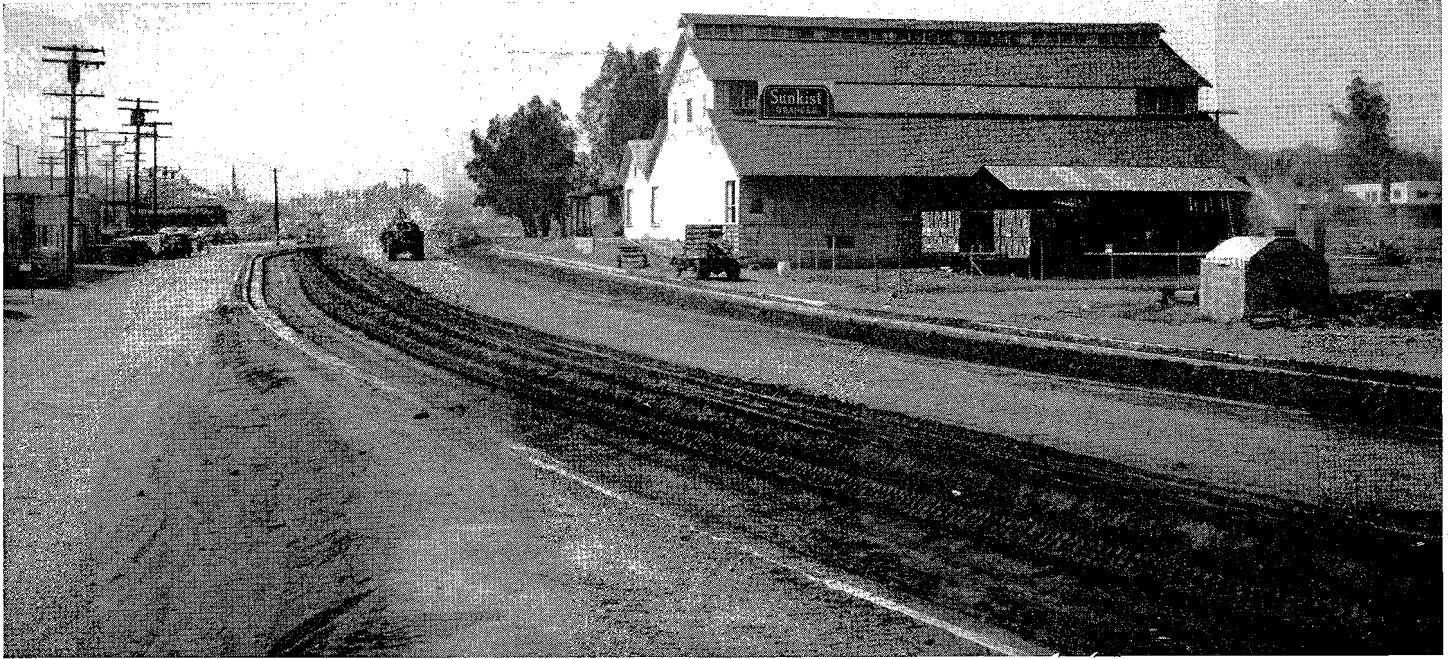
The improvement consists of placing an asphalt concrete pavement 60 feet wide and 6 inches thick on an 8-

inch cement treated base. Outer curb and 2-foot gutter will provide an overall width of 64 feet between curbs. Drainage will be handled by the installation and construction of various concrete pipe storm drains, catch basins and reinforced concrete boxes. Flasher and signal installations are being installed under separate contract.

Due to low relative compaction of the original ground, the roadway was excavated to a depth of two feet below profile grade and the exposed surface rolled to secure a minimum 90 percent relative compaction in the upper 6 inches of the material being compacted. The trench was then backfilled with material previously excavated and re-compacted to a minimum 90 percent relative compaction. A few small details involved in bringing the roadbed to grade consisted of installing sanitary sewer house connections and filling existing cesspools, removing approximately 4,000 cubic yards of unsuitable materials, and breaking up and removing massive reinforced concrete machinery foundations. The founda-

Congested traffic conditions on existing San Fernando Road at Maclay Avenue to be relieved when new construction is completed. This street will be for one-way southbound traffic and the new construction will be for northbound traffic





Shaping roadbed on Route 213 through the industrial area of the City of San Fernando

tions were cracked with hydraulic jacks operating in holes previously drilled by jack hammers, then broken up with a D-8 dozer.

Artesian Wells Uncovered

Exploratory work to determine the cause of a seepage area at the north end of the job resulted in uncovering two flowing artesian wells located a few feet off center line of construction. These wells formerly were a source of water supply for the Southern Pacific Railroad. They were abandoned some years ago and the area in which they were located, being a small draw, was used as a disposal area for miscellaneous debris, combustible material and broken concrete. As the years went

by the dump increased in height over the wells and the water found its way underground to a nearby stream bed. After removing the unsuitable material the well casings were exposed. Rather than plug them, with the possibility that they might break out at some unexpected place, the casings were cut off at a depth of 8 feet below profile grade and the water conducted through drain tile in a filter material filled ditch to a newly constructed double 7-foot x 8-foot reinforced concrete box culvert.

The only large drainage structure involved in the contract is the double box culvert referred to above. It carries storm water across the right of way by extending an existing double 7-foot x 8-foot reinforced concrete

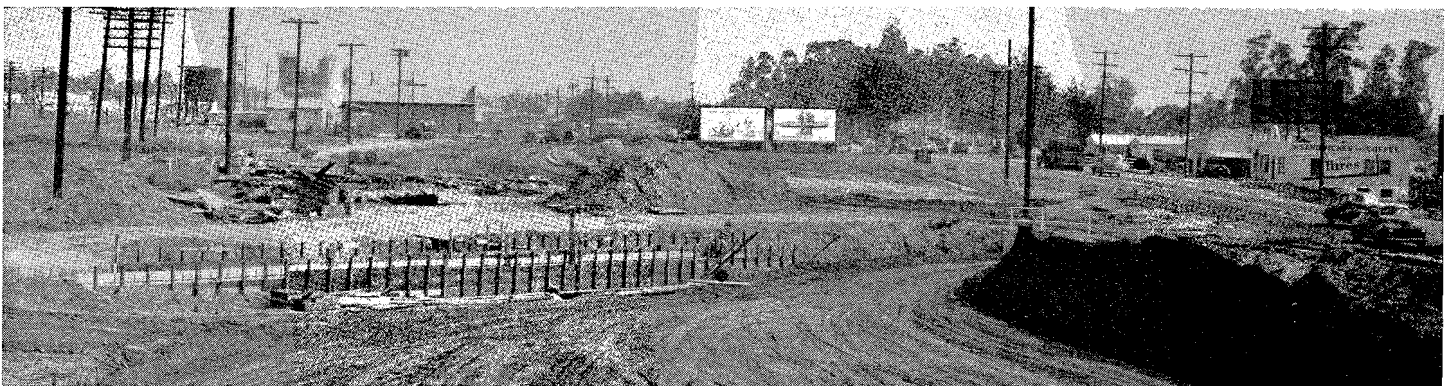
box culvert under San Fernando Road on the west to join the wing walls of a small railroad bridge on the east.

Status of Construction Contract

At this writing the earthwork has been completed, curbs and gutters are 90 percent complete, concrete pipe storm drains and drainage structures are 75 percent complete. Cement treated base was started last month. Vido Kovacevich Company is the contractor and R. A. Engle is the superintendent for the contractor.

The contract allotment is \$251,300, and by the time this is published construction work will be better than 50 percent complete. The estimated date of completion is September 1, 1950.

Construction operations near northerly end of contract showing form construction for double 7-inch by 8-inch reinforced concrete box culvert



Ramona Freeway

*Another Unit of This Project
Now Under Construction*

By ROY COOLEY and H. R. LENDECKE, Resident Engineers

THE EARLY MONTHS of 1951 will see the completion of another unit of the Ramona Freeway now under construction. A bottleneck for traffic on the three U. S. Routes 60, 70 and 99 that follow along this portion of Ramona Boulevard just east of the Los Angeles city limits will be eliminated and an extension of 1.8 miles will be added to the present freeway. Work began on this project in September, 1949, at an estimated cost of approximately \$1,300,000, and is expected to be completed in early 1951, with the date for completion set at March 13, 1951.

Traffic Bottleneck

The traffic bottleneck which occurs in the City Terrace area just outside the Los Angeles city limits is very congested as a result of small business houses adjacent to the highway and the presence of local bus traffic on the existing street. The new Ramona Freeway will by-pass this area on an alignment adjacent to the Pacific Electric Railway, thereby eliminating several hazardous intersections and in general

relieving the congested traffic conditions now existing.

The construction joins the existing Ramona Freeway at Indiana Street, which is the east city limits of Los Angeles. The present construction is on new right of way which follows the southerly side of the Pacific Electric Railway right of way from Indiana Street to Bonnie Beach Place, with the existing roadway acting as an outer highway, and on a widened existing right of way from Bonnie Beach Place to the end of the project, 0.2 mile east of Helen Drive. An outer highway will be built for local traffic between Herbert Avenue and Helen Drive.

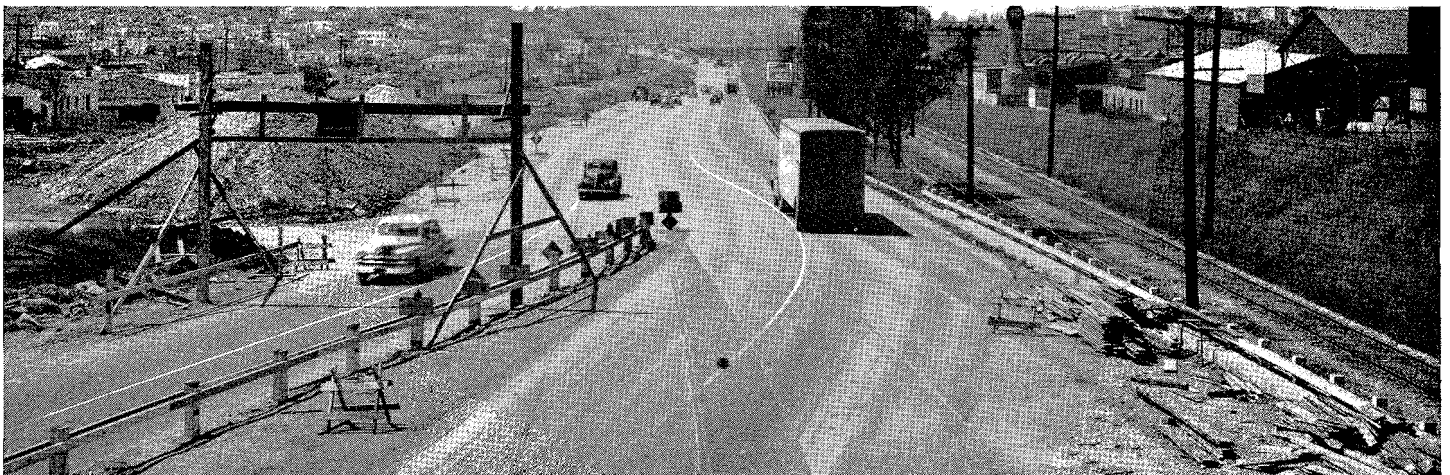
Roadways 36 Feet Wide

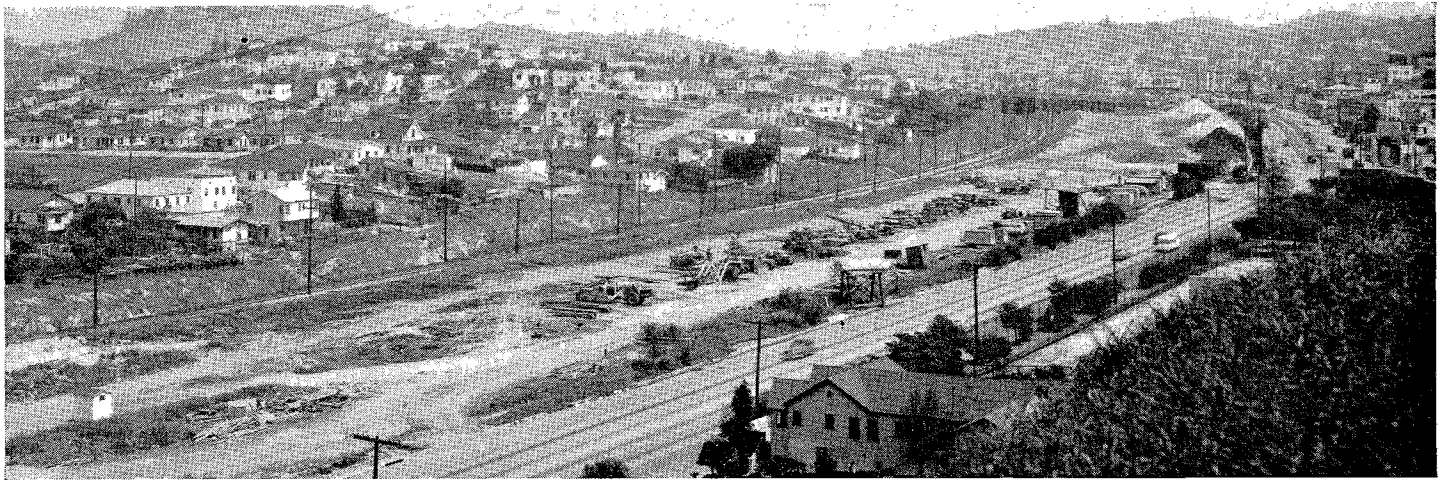
The construction consists of grading and paving two separate Portland cement concrete roadways 36 feet wide, separated by a 12-foot division strip. The Portland cement concrete pavement, eight inches in thickness, is to be placed on 16 inches of selected base material of which the top four inches is to be stabilized by cement treatment.

Inlet and outlet ramp connections, acceleration and deceleration lanes, interchange roadways, outer highways and a temporary connection are to be graded and surfaced with plant-mixed surfacing. The plant-mixed surfacing is to be placed on a subgrade of five to eight inches of untreated rock base.

The Herbert Avenue and the Eastern Avenue overcrossings are both of the reinforced concrete box girder type and both are nearing completion. The Herbert Avenue overcrossing replaces a timber bent bridge which was removed at the beginning of construction. It consists of four spans totaling 249 feet. The roadway is 48 feet wide with two 3-foot 9-inch sidewalks. The Eastern Avenue overcrossing is to partly replace a reinforced concrete bridge that spanned the Pacific Electric Railway and Ramona Boulevard. The portion that spanned Ramona Boulevard was removed and reconstructed to fit the freeway cross section, while the existing portion that spanned the railway remained in place. The new structure conformed to the existing

Looking west from Eastern Avenue Overcrossing





View of new freeway location looking east from beginning of job with City Terrace area on right

structure, which had a roadway of 60 feet with two 8-foot sidewalks.

Access for Westbound Traffic

The Marengo Street ramp provides access for the westbound traffic into Los Angeles from the community of City Terrace. It is of the reinforced concrete box girder type with six spans for a total of 480 feet and a roadway width of 20 feet.

The two existing pedestrian undercrossings under the Pacific Electric

Railway at City Terrace and Miller Avenue were extended to provide for public pedestrian traffic beneath the freeway.

This project will add another unit to the Ramona Freeway which connects with the Santa Ana Freeway at the Aliso Street Bridge, which in turn is to connect with the Harbor, Hollywood and Arroyo Seco Freeways at the four-level grade separation structure in the heart of Los Angeles, and will provide freeway facilities easterly from the Los

Angeles Civic Center. The work is being done under the direction of Frank B. Cressy, District Construction Engineer, and his field assistant, B. N. Frykland. J. E. Haddock, Ltd. of Pasadena is the contractor, with Neal E. Saul as superintendent.

The authors of this article are resident engineers on construction, with Roy Cooley responsible for highway construction details, and Bob Lendecke responsible for bridge construction.

Freeway Program

Continued from page 8 . . .

being a party to this type of freeway agreement, to that extent the local governing body is performing an integral planning function with respect to the State Highway System and is performing a vital function, the influence of which may extend far beyond the boundaries of the local community and vitally affect the State Highway System as a whole.

It is important that the members of local governing bodies realize this responsibility and take a broad viewpoint which will bear in mind not only the needs and requirements of the local community but will also take into consideration the requirements of adjacent communities and of the over-all State Highway System into which the local community fits as an integral part. This will take breadth of vision, unselfish-

ness and an understanding of the entire problem presented for a solution.

Continuing Support Needed

Third, there is a continuing need for the *support of the freeway program* by all those who are familiar with the need for this program and the desirability of seeing it carried through to completion. It is not enough for this support to be indicated spasmodically when some legislative program is presented. There is need for a continuing and intelligent support for the development and unfolding of the freeway program by individuals, officials of local communities and interested civic bodies and groups. It is apparent in public hearings held throughout the State by the California Highway Commission in regard to freeway locations that too often only those opposed to certain phases of the plans presented for consideration appear and present their views which are based upon some

particular aspect of the problem in which they are interested. It is important that the viewpoint of the necessity for a state-wide freeway program, and the desirability of its construction to solve a pressing problem, should be properly presented in order to have a balanced presentation at this type of hearing. Also, in the development of public opinion and in the formulation of policies of local governmental units and civic organizations it is important that those who are interested in the successful development of the freeway program see that local officials and the public are kept intelligently informed.

There is an enormous task to be done in the modernization of the California highway system and the construction of an adequate freeway system. Its successful accomplishment will take the cooperation and intelligent assistance of all of those sincerely interested in the successful carrying out of this program.

Santa Ana Freeway

Another Major Unit Is
Opened to Public Travel

By J. W. GREEN, Southern Representative, Bridge Department

ON APRIL TWELFTH another major unit of the Santa Ana Freeway was opened to public traffic. Without ceremony or formalities the barricades were removed and the public was permitted to move over this completed section of the Santa Ana Freeway between La Verne Avenue and Eastland Avenue, a distance of one mile. While the actual distance is relatively short, the fact that this completed construction separates the Atlantic Boulevard heavy traffic from the Anaheim-Telegraph Road heavy traffic has alleviated a bad traffic bottleneck for those motorists who regularly use either one of these two important state highways.

The Santa Ana Freeway, when completed, will become one of the most important connections of the Los Angeles area with Orange and San Diego Counties. This is one of the major freeways that have been established to serve Southern California areas. It extends from the Los Angeles Civic Center in a general southeasterly direction through Los Angeles County and Orange County to the City of Santa Ana.

Outer Highways

The work done under this recently completed contract consisted, in general, of constructing one mile of freeway, with outer highways, intersecting and connecting roadways, placing Portland cement concrete pavement on a cement treated subgrade and plant-mixed surfacing on untreated rock base, a railroad underpass, two highway grade separations, a pump-house, storm drains, sanitary sewers, and other necessary work.

The freeway construction consisted of grading and paving three 12-foot lanes for traffic in each direction, separated by a 12-foot median strip. Portland cement concrete pavement, eight inches thick, was used for the surfacing of the freeway, Atlantic Boulevard and Industrial Avenue. Imported subgrade material, 1.83 feet in thickness, was placed under the pavement and the upper four inches of which was cement treated.

The Atlantic Boulevard Overcrossing structure is a reinforced concrete bridge of continuous box-girder construction, including reinforced con-

crete abutments and a four-column center bent, all with spread footings. The bridge consists of two spans, one 62 feet and one 68 feet, designed for six 12-foot traffic lanes and a 6-foot dividing strip, two 5-foot sidewalks, and steel handrails.

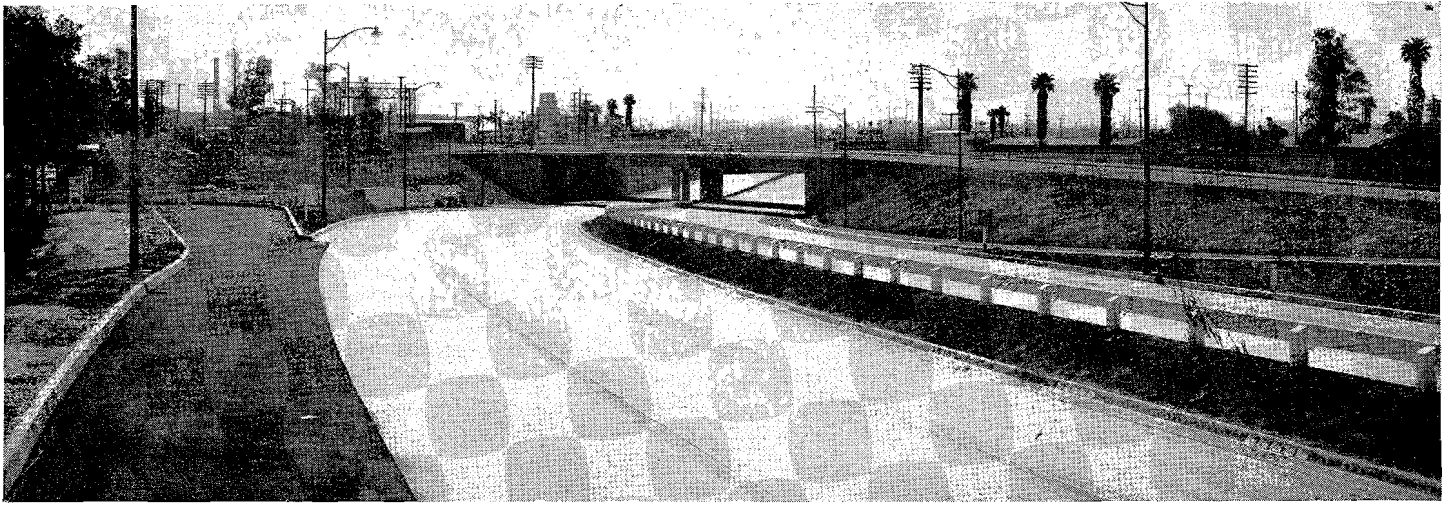
Grade Separations

The Goodrich Avenue Overcrossing is a reinforced concrete bridge similar in design to the Atlantic Boulevard separation except the roadway is 26 feet wide, with one 6-foot sidewalk. It is constructed on a 351-foot radius curve, with standard retaining walls to support the approach fills.

The East Los Angeles Station railroad grade separation is a two-span plate girder bridge, designed with a E-75 railroad loading to carry three tracks of the Union Pacific Railroad. Each span has fifteen 71-foot-6-inch x 7-foot-1 1/2-inch plate girders at 3-foot-2 3/16-inch center to center. Girders are supported on reinforced concrete abutments and center pier, all on spread footings. Track and ballast are carried on a 7-inch concrete deck,

Looking northwesterly showing Atlantic Boulevard Bridge in foreground, with Union Pacific Railroad grade separation in background





View looking northeasterly, showing completed Santa Ana Freeway, taken just before opening to public traffic, with Goodrich Avenue Bridge in foreground

49 feet-9 inches wide. Approach fills are retained by specially designed cantilever retaining walls.

In addition to the customary reflectorized warning and directional signals, large special signs were installed at the turn-off locations. These signs are placed high above the driver's eye so as to be visible from a considerable distance. For ease in reading these directional signs at night, a special type of fluorescent lighting has been provided. At all on and off interchange roadway connections, adequate safety lighting

has been provided. The steel lighting standards place the luminaires 30 feet above the pavement.

At the intersections of Atlantic Boulevard with Industrial Avenue, Anaheim-Telegraph Road and Goodrich Avenue, systems of fully actuated traffic signals were installed.

Construction operations on this contract were described in a previous joint article by Resident Engineers G. L. Laird and B. N. Frykland in the May-June 1949 issue of the *California Highways and Public Works* magazine.

Bridge construction was under the general supervision of F. W. Panhorst, Assistant State Highway Engineer, and the highway work under the supervision of P. O. Harding, Assistant State Highway Engineer in charge of District VII. The contract was administered by the Bridge Department of the Division of Highways. The Griffith Company of Los Angeles was the contractor. The total value of the contract work for this unit of the freeway was \$1,383,908.96.

FLUORESCENT HIGHWAY INTERSECTION LIGHTING

By F. M. CARTER, Senior Highway Engineer, and
ROY W. MATTHEWS, Associate Electrical Engineer

RURAL INTERSECTION LIGHTING has always been a problem to illuminating engineers because the ordinary street lighting luminaires, which are not objectionable in cities where there is an abundance of other lights, become an annoying glare source against the black sky background at rural intersections on our high speed highways.

The addition of glare shields to present-day street lighting luminaires has been of much benefit, but with the conventional light sources the discomfort has not been entirely removed.

For many years it has been thought that fluorescent lamps should be used

in highway lighting, but the ordinary fluorescent lamps had several disadvantages which made their use impractical for street or highway lighting.

Fluorescent Lamp Development

In recent years, however, there has been considerable activity in the development of fluorescent lamps.

One recent development has been the introduction of the slimline types of fluorescent lamps which are now available in a variety of sizes and colors. These lamps are instant starting (require no starter as do ordinary fluorescent lamps), and have a high light

output as well as an extremely long life.

The California Division of Highways has been using these lamps to illuminate overhead signs on the freeways for a year or more, and the results have been very satisfactory.

One of the latest lamps announced is 1½ inches in diameter, eight feet long, and can produce a light output of 5,800 lumens at an operating current of 600 milliamperes. Four of these lamps when placed in one luminaire would produce a total of 23,200 lumen, or slightly more than the amount produced by one 21,000 lumen mercury

... Continued on page 50

Erosion Control

Methods Used on California
State Highways Discussed

By H. DANA BOWERS, Supervising Landscape Architect

California, a wrinkled ribbon of land more than 800 miles long lying between the high Sierras and the Pacific Ocean, stretches from the humid forested zone characteristic of the Pacific Northwest to arid northern Mexico, and ranges in elevation from below sea level to more than 14,000 feet. Climatic variations are extreme, as might be expected, and erosion control problems vary correspondingly. Many different types of control have, therefore, been found to be necessary.

The purpose of this series of articles is to discuss the variable factors associated with erosion which affect California roadsides, review the development of erosion control methods by the State Division of Highways, and describe erosion control processes now being employed with reasonable success to stabilize slopes on California state highways. This is the fourth installment.

It is felt that at least a few of the methods which have proved effective in California may be modified to suit conditions in other regions. Consequently, descriptions have been made as complete and are illustrated as fully as possible in order to permit duplication of these methods by nontechnical personnel.

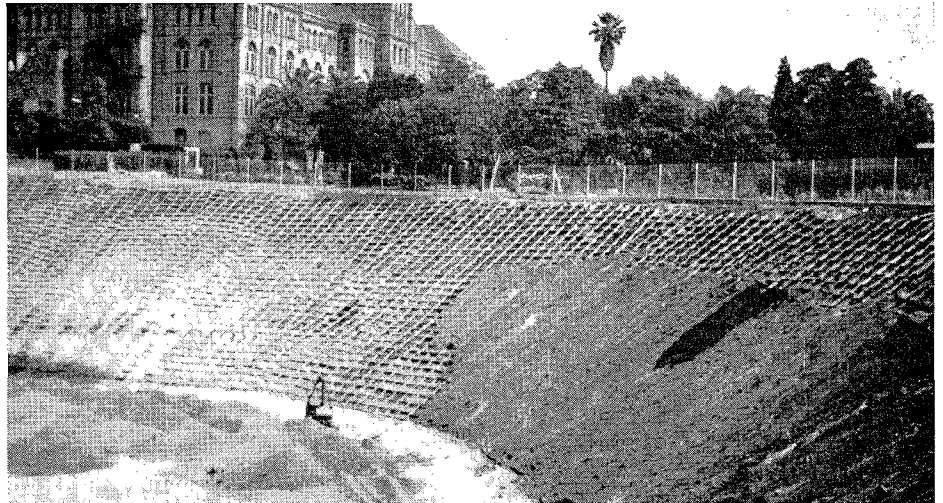
The erosion problem on agricultural lands is another matter entirely. Since this phase of the subject is adequately treated in publications of the Soil Conservation Service we will consider here only erosion as it directly affects roadsides.

STABILIZATION

AN ELABORATE method for stabilizing steep slopes was developed to suit special conditions sometimes found on our metropolitan freeways. (See *Slope Stabilization Detail Sheet*.) In highly developed urban areas the cost of purchasing a wider right of way to allow for the construction of flatter slopes may be excessive. In this event, the expense involved in installing this type of stabilization treatment, though high, is justified in that a considerable net saving in expenditure of highway funds is possible.

Some concern has been expressed regarding the permanency of the wooden grid, since no preservative treatment is given the frame members. This method has been in use since 1939 on the Arroyo Seco Parkway in Los Angeles, and no failures due to rotting or weakening of the grid have taken place. It is probable that ground cover plant roots have by this time so permeated the soil that the supporting effect of the wooden frames is no longer required.

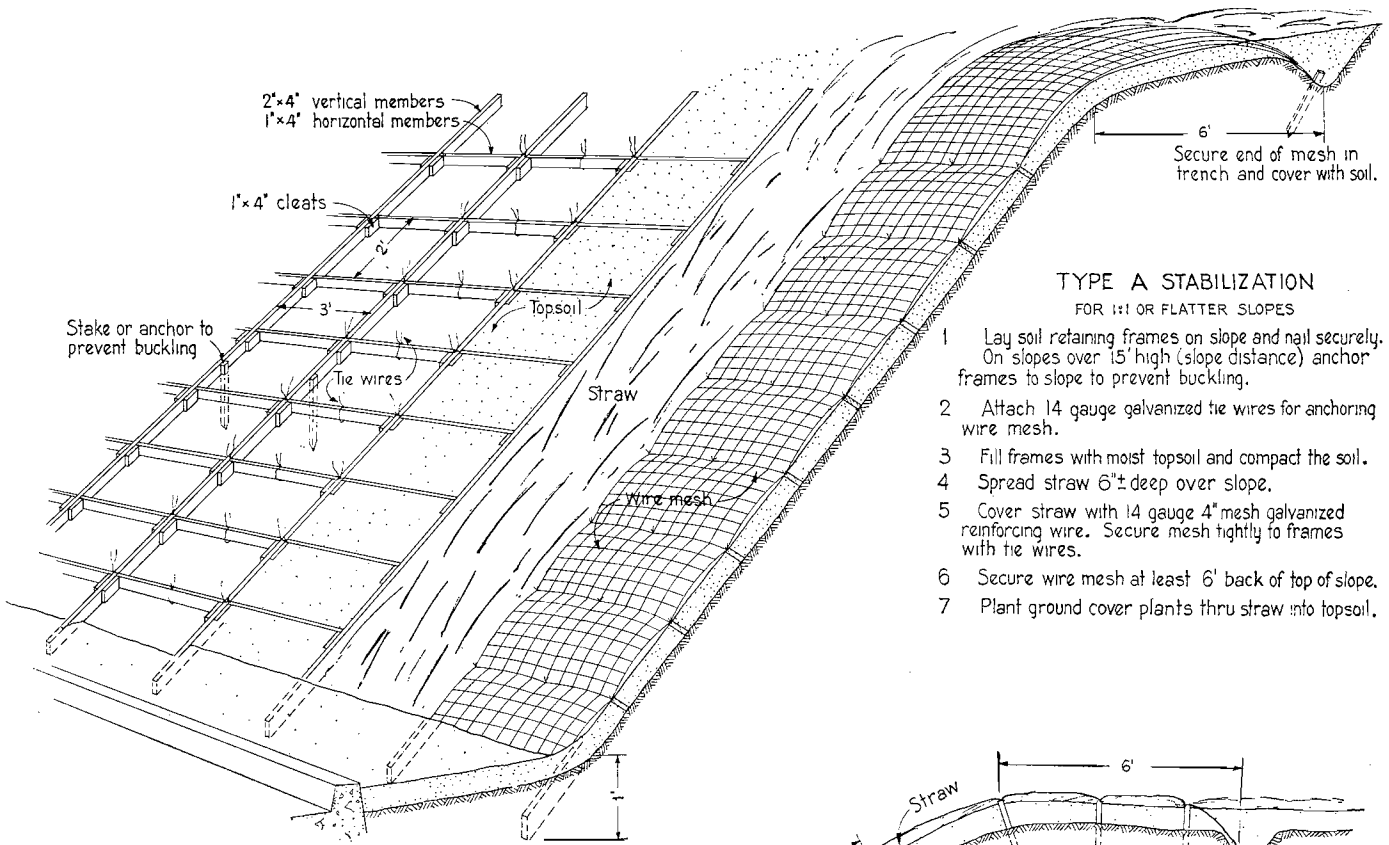
Since the areas given Type A Stabilization treatment are invariably covered by a sprinkler system, a rapid and lush growth of ground cover plants takes place soon after installation. Periodic applications of commercial fertilizer are made in order to keep the plants growing well, and an occasional



UPPER—Type A stabilization during construction. Topsoil is cast on by dragline. (Seventh Street Interchange, Santa Ana Freeway, Los Angeles.) LOWER—Established ground cover planting on Type A Stabilized 1:1 cut slopes. (Arroyo Seco Parkway, Los Angeles to Pasadena)

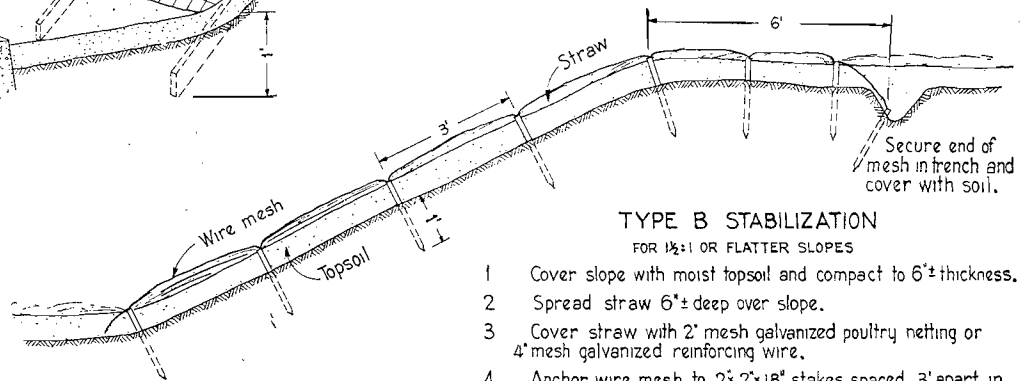


SLOPE STABILIZATION



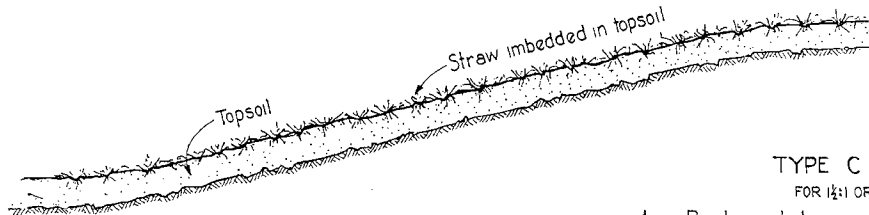
TYPE A STABILIZATION FOR 1:1 OR FLATTER SLOPES

- 1 Lay soil retaining frames on slope and nail securely. On slopes over 15' high (slope distance) anchor frames to slope to prevent buckling.
- 2 Attach 14 gauge galvanized tie wires for anchoring wire mesh.
- 3 Fill frames with moist topsoil and compact the soil.
- 4 Spread straw 6"± deep over slope.
- 5 Cover straw with 14 gauge 4" mesh galvanized reinforcing wire. Secure mesh tightly to frames with tie wires.
- 6 Secure wire mesh at least 6' back of top of slope.
- 7 Plant ground cover plants thru straw into topsoil.



TYPE B STABILIZATION FOR 1½:1 OR FLATTER SLOPES

- 1 Cover slope with moist topsoil and compact to 6"± thickness.
- 2 Spread straw 6"± deep over slope.
- 3 Cover straw with 2' mesh galvanized poultry netting or 4' mesh galvanized reinforcing wire.
- 4 Anchor wire mesh to 2x2x18" stakes spaced 3' apart in staggered rows with tie wires. Tying preferred to nailing to stakes.
- 5 Plant ground cover thru straw into topsoil.
- 6 If slope is to be seeded sow seed before placing straw.



TYPE C STABILIZATION FOR 1½:1 OR FLATTER SLOPES

- 1 Roughen cut slopes on a rough contour with a scarifier or cultivator type implement in a series of longitudinal grooves or corrugations.
- 2 Cover cut slopes with 3"± to 6"± of topsoil. If topsoil is not available cultivate slope 4" to 6" deep and apply fertilizer. Fill slopes will not ordinarily require topsoil or cultivation unless very sterile or compacted.
- 3 Cover slope with straw at rate of 4± tons per acre. Imbed straw into loose soil with a sheepsfoot roller.
- 4 Plant ground cover thru straw into topsoil.
- 5 If slope is to be seeded sow seed before placing straw.

PREPARED BY
LANDSCAPE SECTION OF THE DESIGN DEPT.
CALIFORNIA DIVISION OF HIGHWAYS

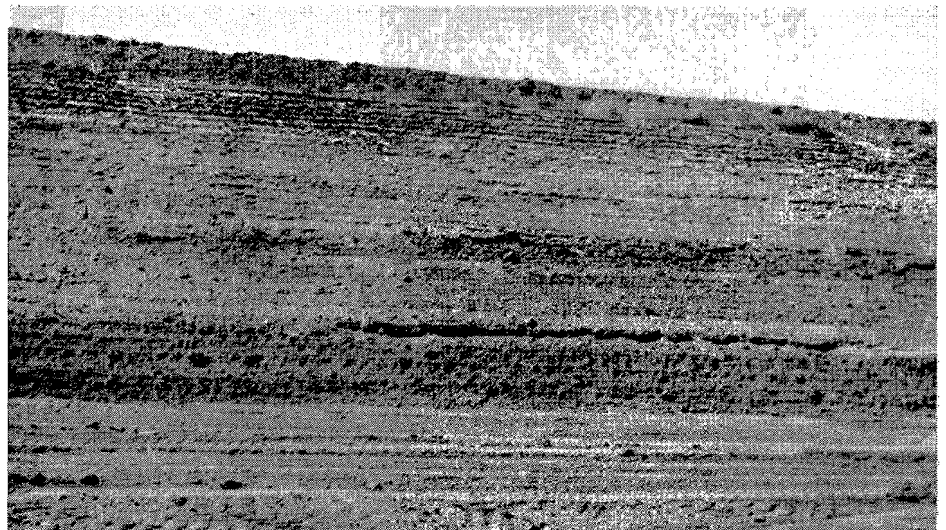


Type B stabilization treatment ready for ground cover planting

clipping or mowing to remove excess or old growth has been found to be necessary.

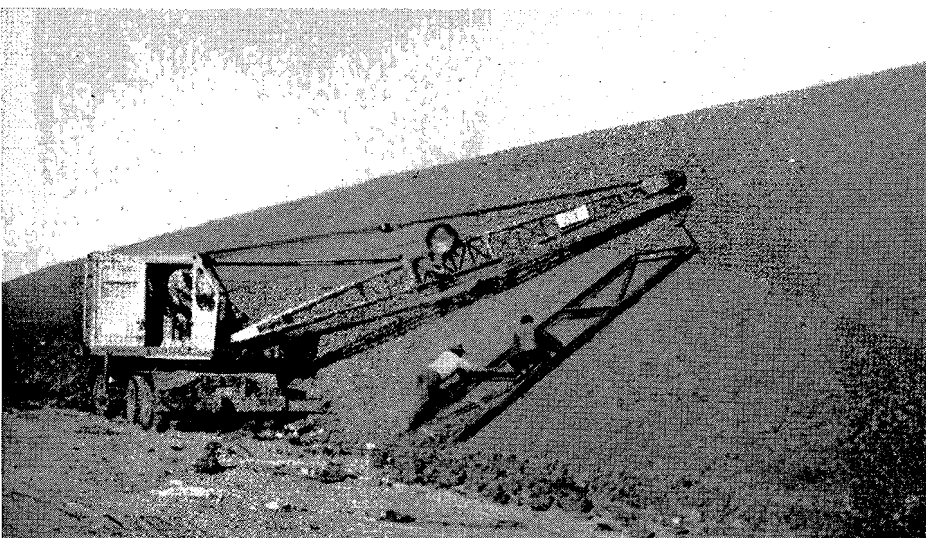
The only failures experienced on the Arroyo Seco Parkway installations of Type A Stabilization resulted from uncontrolled and concentrated drainage water from areas above, which caused narrow and confined washouts. Also, at bridge abutments where the backfill was not thoroughly compacted, loss occurred when that particular area was overwatered immediately following installation of stabilization.

The cost of installing Type A Stabilization, based on bids received in February, 1948, is about \$1.45 per square yard. This figure also includes



Well roughened cut slope ready to be topsoiled

Spreading and smoothing topsoil on a roughened slope



the cost of furnishing and placing topsoil in the frames. Ground cover plants will add about \$0.05 per plant, or if planted 12 inches apart, \$0.45 per square yard to the above cost.

TYPE B STABILIZATION

This method for stabilizing 1½:1 or flatter slopes was developed for use on urban freeways in locations where any soil loss whatever could result in a traffic hazard. (See *Slope Stabilization Detail Sheet*.) A slope which is constructed at the top of a retaining wall or which is close to adjacent improved property must be positively controlled, since damage claims or danger to the traveling public could result if any portion of the slope failed. A thick

layer of straw held firmly in place by anchored strips of wire mesh effectively prevents the two types of soil movement—surface loss and slippage. After vegetation has become established; permanent stabilization is a reality.

This procedure, while extremely effective, is too costly for general use on rural highway roadsides where the consequences of soil loss are not generally immediately serious. The cost, based on bid prices received in February, 1948, is about \$0.90 per square yard. This figure includes the furnishing and placing of topsoil, but does not include the cost of seed or ground cover plants.

TYPE C STABILIZATION FOR SLOPES

This is the method most commonly used for stabilizing highway cut and fill slopes. (See *Slope Stabilization Detail Sheet.*)

Cut slope roughening, to be most effective, should be done with a scarifier or cultivator type implement as excavation progresses and before the newly exposed subsoil dries out. The roughened slope should show corrugations on a rough contour. When the soil becomes saturated, these corrugations tend to break up the smooth slippage plane which forms between the layer of topsoil and the relatively impermeable subsoil.

Maximum compaction of the surface layer of soil by rolling with a



Spreading straw on newly topsoiled slope



Brush layers and wire reinforced brush mats installed in a fill during construction. These mats have been allowed to protrude too far. Note rock protection at toe of slope. (City Creek Road, San Bernardino County)

sheepsfoot roller can only be obtained when the soil contains the optimum amount of moisture, as determined by soil compaction tests. Normally only one round trip of the roller is required, though additional rolling may be done if it appears that a greater degree of compaction would be desirable. In this event, the rate of application of straw must be increased, since each pass of the roller presses a small amount of straw beneath the surface of the soil, and it is essential that enough straw remain unburied to afford surface protection.

Experience has revealed that on 1½:1 cut slopes, there are apt to be fewer failures during the first heavy rains if the topsoil blanket is restricted

to approximately two inches to three inches in thickness. Thicker coverage tends to saturate, become heavy, and slip. As the degree of slope lessens, the depth of the layer of topsoil can be increased if desired.

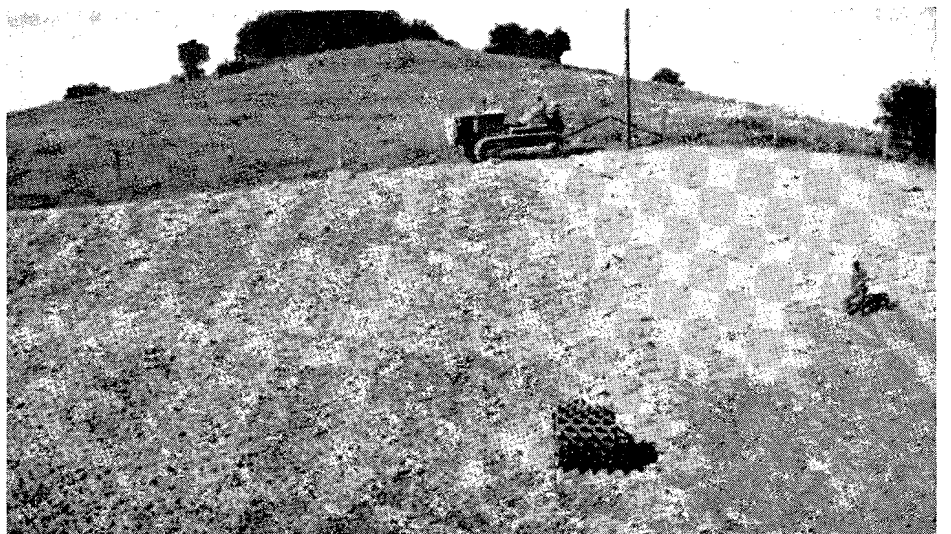
The cost of Type C Stabilization, based on a number of 1948 and 1949 bids, averages as follows:

Slope preparation or roughening	..... \$0.08 per sq. yd.	\$387.20 per A.
Straw at 4 tons per acre	..... 55.00 per ton	220.00 per A.
Total	.....	\$607.00 per A.

Add the cost of seed or ground cover plants.

The price paid per ton for straw includes the cost of furnishing, spreading and rolling. The cost of handling and spreading topsoil does not appear,

Spreading straw and rolling 1½:1 cut slope with cable-controller sheepsfoot roller. (Vicinity of Salinas)



since this item is included in Roadway Excavation quantities, and is paid for as such.

Commercial fertilizer, to be applied at the rate of 30 pounds to 40 pounds per 1,000 square feet averages about \$85 per ton. A complete fertilizer having an analysis of 6-9-6 or 6-10-4 is usually specified.

BRUSH LAYER METHOD FOR STABILIZATION OF EXTREMELY ERODIBLE FILL SLOPES

This method was developed for use during construction in stabilizing fill slopes composed of erosive soils in regions where rainfall intensities are high. The function of the brush layer is to minimize formation of gullies, in the event the surface protection fails, by discharging the stream and reducing the velocity of the runoff water.

In order to simplify the detail sheet, the term, "Brush Layer," has been used throughout the specification, though actually other materials have, at times, been used for this purpose. These variations are discussed below.

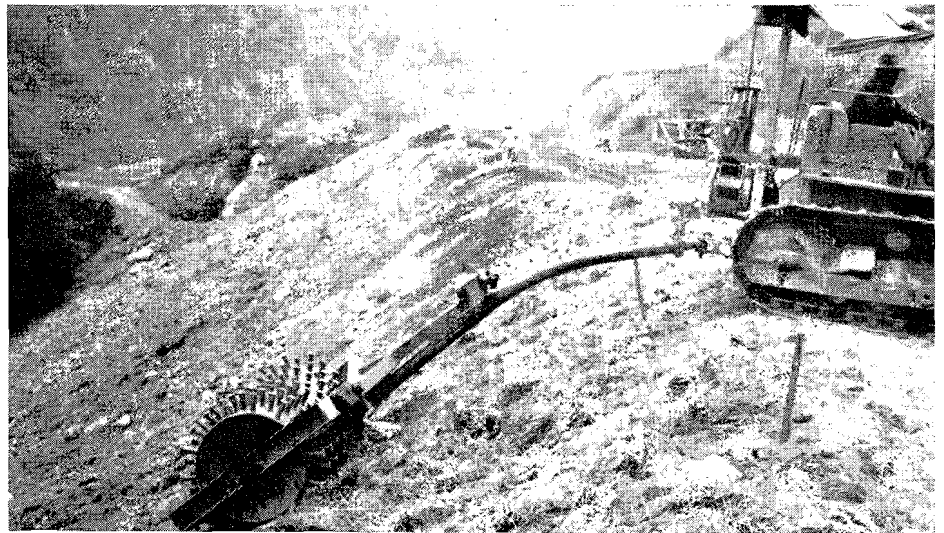
In addition to the installation of brush layers or mats, this method differs from Type C Stabilization procedure in that a heavier application of straw and additional rolling with a sheepsfoot roller are specified. Excellent compaction is obtained below the outer 2 inches by thoroughly rolling each portion of the slope, and the comparatively uncompacted outer two inches are so mixed with straw that the tendency to wash is minimized.

Our specifications require that the complete stabilization treatment be given fill slopes at stages during fill construction in order that no extensive area of unprotected slope shall be exposed to damage from unseasonal cloudbursts which sometimes occur in the mountains of Southern California.

Two Alternatives

When brush is not readily available, at least two alternatives are possible:

1. *Straw Mat.* Lay 1-inch-mesh galvanized netting or fencing on the prepared fill bench surface. The mesh should extend into the fill about five feet. Spread straw on the mesh to such depth that after compaction the finished mat will be approximately 4 inches thick. Proceed as for "Brush Layer."



Rolling 10-foot strip of fill slope after application of straw. (City Creek Road, San Bernardino County)

2. *Wire Mesh Mat.* Lay 60-inch-wide, 4-inch-mesh, galvanized fencing on the prepared fill bench surface. On top of this, lay several courses of War Surplus Camouflage Netting (green-painted steel wool fastened to poultry netting), or small-mesh poultry netting. Proceed as for "Brush Layer."

A more elaborate, denser, and presumably structurally stronger form of the Brush Layer has been used in Southern California:

Wire Reinforced Brush Mat. Lay 60-inch-wide, two-inch to four-inch-mesh galvanized fencing on the prepared fill bench surface. Place brush on wire, leafy ends outward, to such depth that after compaction the finished mat will be from four inches to six inches thick. Lay wire mesh

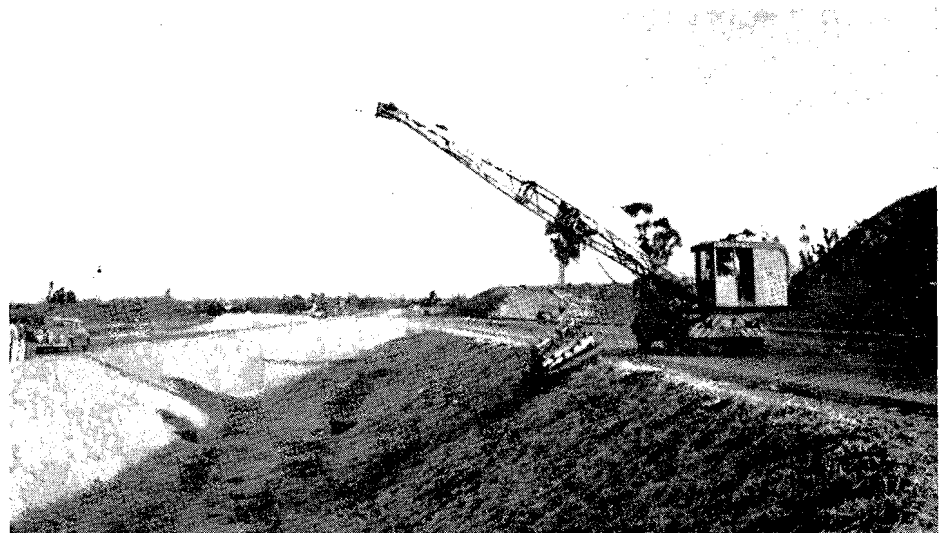
on top of brush and tie edges together at one-foot intervals with 16-gauge galvanized wire. Tie along center and at quarter points at three-foot intervals. Stake sufficiently to prevent slipping under additional fill. Proceed as for "Brush Layer."

This type of mat may be used in conjunction with brush layers in locations where conditions are extreme.

Reinforced Brush Mat

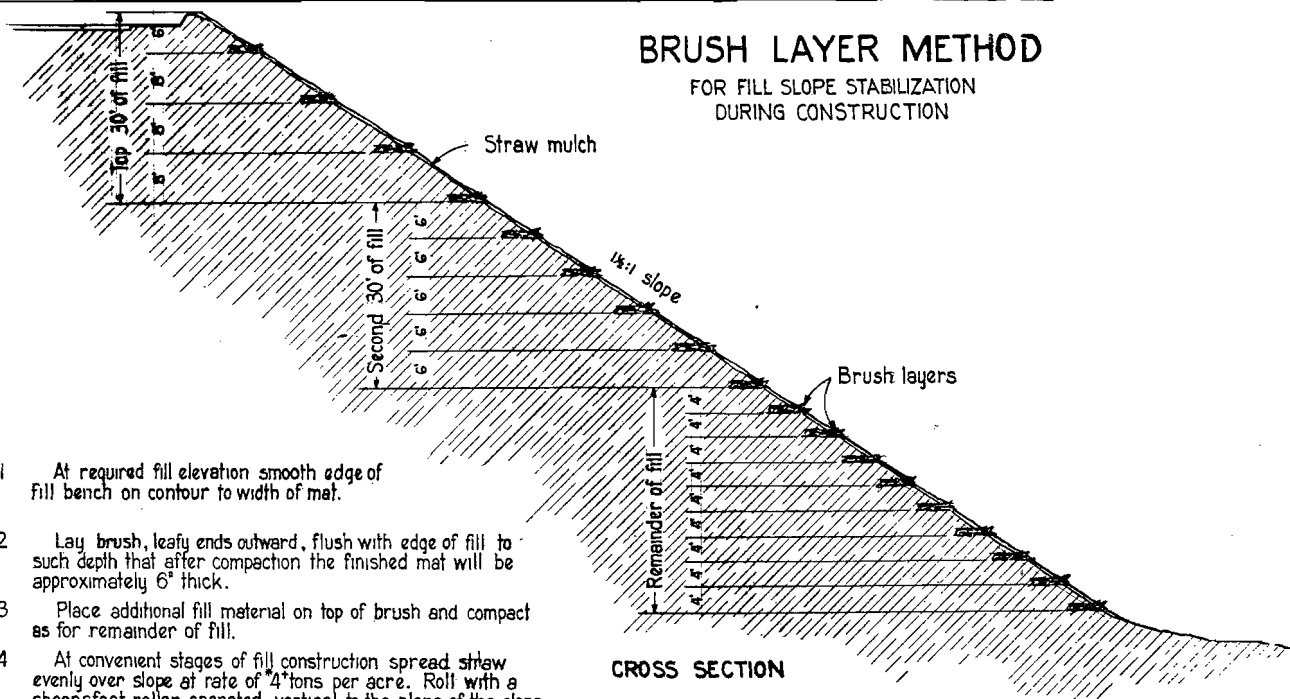
On low embankments and the upper portions of high slopes, every fourth brush layer is replaced by a wire reinforced brush mat, and as the distance from the top of the fill becomes greater, this interval is reduced until

Rolling low fill slope after completion of roadway. Roller is towed by the boom cable and held in position by a second cable attached to the uphill side of the yoke. (In this case, straw was applied to protect sand slopes from wind erosion.) (Near Colton, San Bernardino County)



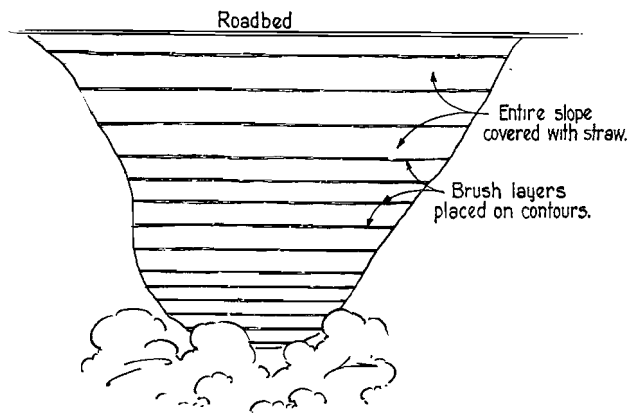
BRUSH LAYER METHOD

FOR FILL SLOPE STABILIZATION
DURING CONSTRUCTION

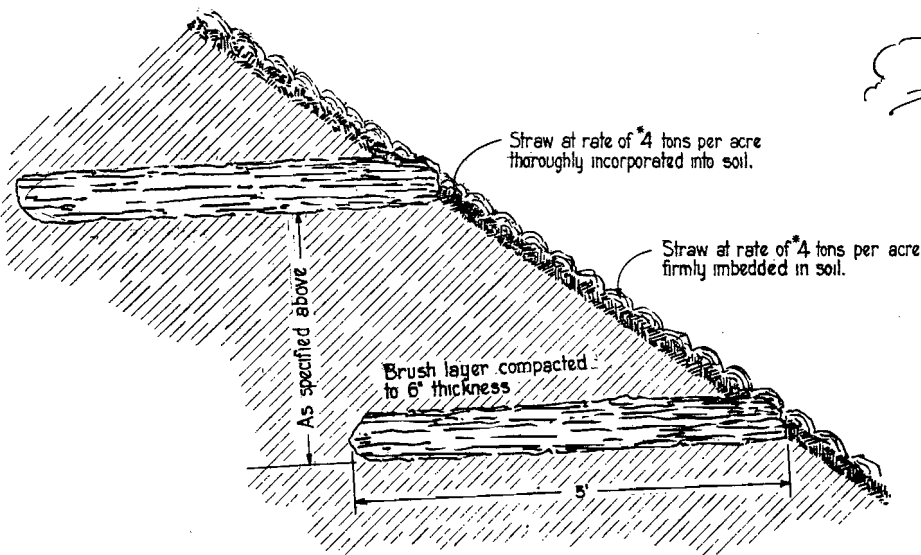


- 1 At required fill elevation smooth edge of fill bench on contour to width of mat.
- 2 Lay brush, leafy ends outward, flush with edge of fill to such depth that after compaction the finished mat will be approximately 6" thick.
- 3 Place additional fill material on top of brush and compact as for remainder of fill.
- 4 At convenient stages of fill construction spread straw evenly over slope at rate of 4 tons per acre. Roll with a sheepfoot roller operated vertical to the plane of the slope until straw is thoroughly incorporated into the soil. At least 4 round trips of the roller will be required.
- 5 Sow evenly over the slope a mixture of 50% Barley, 45% Rye grain and 5% Alfalfa seed by weight at rate of 200 lbs. per acre.
- 6 Spread second application of straw at rate of 4 tons per acre. Repeat rolling operation until straw is firmly imbedded in soil.
- 7 Plant live cuttings of Baccharis and Willow, or cuttings and seed of hardy varieties of plants indigenous to the locality, between mats for permanent vegetative protection.

CROSS SECTION



SIDE ELEVATION



DETAIL SECTION

* The total quantity of straw applied per acre will vary according to the character of the fill material. Loose, granular, disintegrated granite soil usually requires more straw per acre for an adequate cover (6 to 10 tons per acre) than does soil of a loamy character (4 to 8 tons per acre).

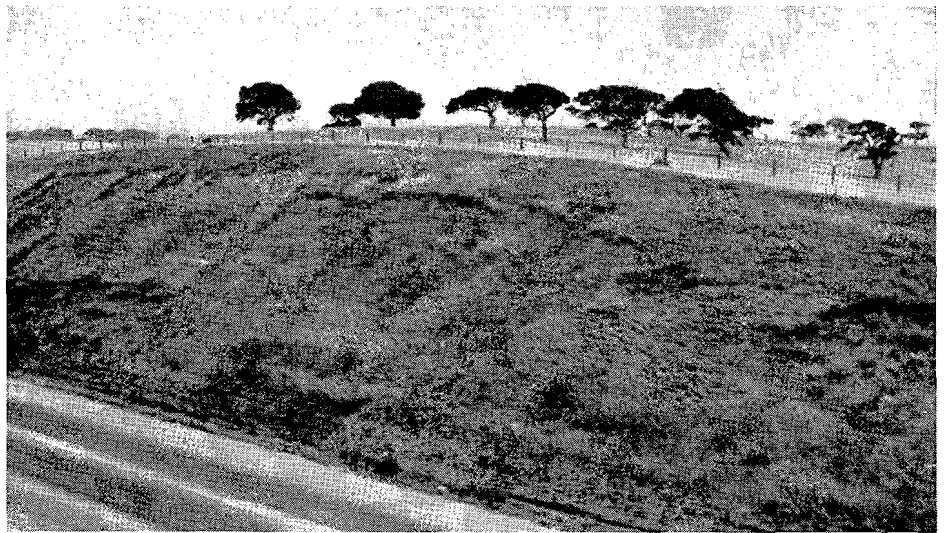


Surface slippage due to saturation caused by a 6-inch rainfall in 24 hours. (Vicinity of Salinas)

every third and, finally, every second layer consists of a reinforced mat.

In sections where brush is scarce, wire reinforced brush mats or wire mesh mats have recently been installed at 15-foot vertical intervals in low embankments and the upper portions of high embankments, and at 10-foot vertical intervals in the lower portions of the high slopes. No intermediate brush layers were used in these sections.

When wire mesh or fencing is used, the outer edge should be laid far enough inside the ultimate slope line that it will not be damaged during the rolling operation. Lengths of fencing should be overlapped and fastened together in order to take advantage of



Sections from which topsoil has slipped were repaired with fertilizer, seed and straw and are now successfully stabilized. (Near Castroville, Monterey County)

Gullies on a 1½:1 topsoil cut slope caused by runoff from adjacent property. An intercepting ditch and down drain are needed here. (Balboa Freeway, San Diego)



any structural strength and resistance to slumping which the wire may offer. The wire mat may then extend continuously for the full length of the fill, plus a short distance beyond the intersection of the embankment slope and original ground where it should be secured.

Standard Practice

The interval between brush layers or mats as shown on the detail sheet is not critical, and may be increased or decreased to suit variable soil and climatic conditions.

It has now become standard practice to supplement this elaborate type of slope protection treatment with a

planting project which is carried on concurrently with the construction contract. During the season when enough moisture is present in the soil to support plant growth, state forces plant cuttings of *Baccharis* or willow and seed and plants of suitable shrubs and trees on fill slopes as soon as the slope treatment is completed. This procedure has proved much more satisfactory than inclusion of the planting as a contract item in the construction contract, since the day labor work order under which the work is financed can be extended beyond the contract completion date, and the work may, therefore, be suspended if planting conditions are not favorable.

... Continued on page 64

Prison Labor

Story of Highway Road Camps
in the State of California

By G. A. TILTON, JR., Supervising Highway Engineer

This is the seventh and concluding article of a series appearing in *California Highways and Public Works*, recording the history, legislation and continuous administration of state highway prison road camps in California since 1915. The six previous articles include:

(1) History and Legislation.....	March-April, 1949
(2) Organization	May-June, 1949
(3) Camp Layouts	July-August, 1949
(4) Feeding and Nutritional Accounting.....	September-October, 1949
(5) Custody, Care and Welfare.....	November-December, 1949
(6) Accounting of Inmate Wages.....	January-February, 1950

The following article covers construction features involved in the employment of prison labor on highway projects.

WITH CALIFORNIA'S growing population and continued development of the State Highway System in all areas of the State, it is becoming more and more difficult to find locations in remote sections that are adaptable to the employment of prison labor on highway construction.

PRISON ROAD CAMP ACTIVITIES ON DECLINE

Due to the scarcity of suitable projects, road camp activities have been

steadily declining during the past 20 years with the prisoner population in the camps progressively decreasing from a peak of 700 men in seven camps during 1929-1930 to the present camp population of 200 men in three camps.*

Concurrent with the reduced employment of prisoners in the highway road camps and the increase in population of the prisons, the Department of Corrections has been faced with the acute problem of developing work pro-

* As of March, 1950.

grams for inmates that will eliminate objectionable idleness in the institutions.

PRISONER REHABILITATION BENEFIT TO SOCIETY

At the present time, out of an adult inmate population of over 11,000 men, about 3,000 prisoners are being released to society each year at the rate of approximately 250 per month, and as pointed out by correction authorities, it cannot be expected that these men

Prison Road Camp No. 38 on State Route No. 77 in San Diego County





Los Angeles Crest Highway in Los Angeles County. This is typical rugged terrain adaptable to prison labor

will go from prison cell to unfamiliar employment after many years of confinement and immediately make good workmen without the benefit of some conditioning process such as that offered by the road camps.

To this end, prison administrators are convinced that there should be some employment for these men other than the work that can be done within prison confines. Outdoor activities away from prison atmosphere give these men an opportunity to work the "kinks out of their backs and minds" and adjust themselves physically and psychologically before return to a different and often unfriendly society.

ECONOMIC BENEFITS TO STATE OF SECONDARY IMPORTANCE

The present quota of 200 inmates in the state highway road camps is relatively small in comparison to the total prison population of over 11,000 men. Although road camp inmates are self-supporting and the prison system is relieved of the cost of their upkeep in prison, the accruing economic saving to the prisons is considered to be of secondary importance when compared to the potential benefits of returning men to society with a better chance of "making good" under adverse circumstances.

CONSTRUCTION ORGANIZATION AND PROCEDURE

Consistent with the intent of legislative provisions controlling the operation of prison road camps, construction organizations for specific projects are designed to utilize inmates for common labor, and free men for supervisory positions and skilled jobs. For the average camp as presently organized, 45 free men are employed for every 100 prisoners assigned to the camps, including 10 percent utilized for camp maintenance. Construction operations are mechanized in line with efficient contract practices, and include modern power shovels, tractors, trucks, compactors, power graders, carryall scrapers and similar power equipment required for specific types of heavy construction work.

COSTS BY PRISON LABOR COMPARABLE TO CONTRACT COSTS

Analysis of the cost of past and current highway projects employing prison labor under the California road camp pay-system bears out the fact that the cost, including all overhead costs and camp write-off, is approximately the same as that of comparable work done by the contract method.

With the cost of construction by prison labor approximating the cost by contract methods, justification for building highways with prison labor must be found primarily in benefits accruing to society and the State Prison System.

EXPENDITURES AT UNIFORM RATE

Unlike contract work, where large expenditures are made in relatively short periods, funds for prison labor projects must be allotted and expended at a uniform rate over a longer period of time to insure continuity of construction operations. The magnitude of work proposed for prison labor projects must be sufficient to satisfy both expenditure and time requirements as well as to justify the construction of an adequate camp. Projects selected for construction have, as a matter of policy, been located in remote mountainous areas whenever possible and where there is little or no competition with a free labor market.

Experience indicates that a minimum expenditure of \$1,000,000 over not less than four years time is necessary to meet both economic and financing needs. Camp quotas of less than 50 prisoners have been found to be impractical under the pay-system where it is incumbent that inmates be self-supporting. If the camp quota is too small the overhead is unavoidably disproportionate to income from inmate wages.

Following is a typical breakdown of current camp expenditures:

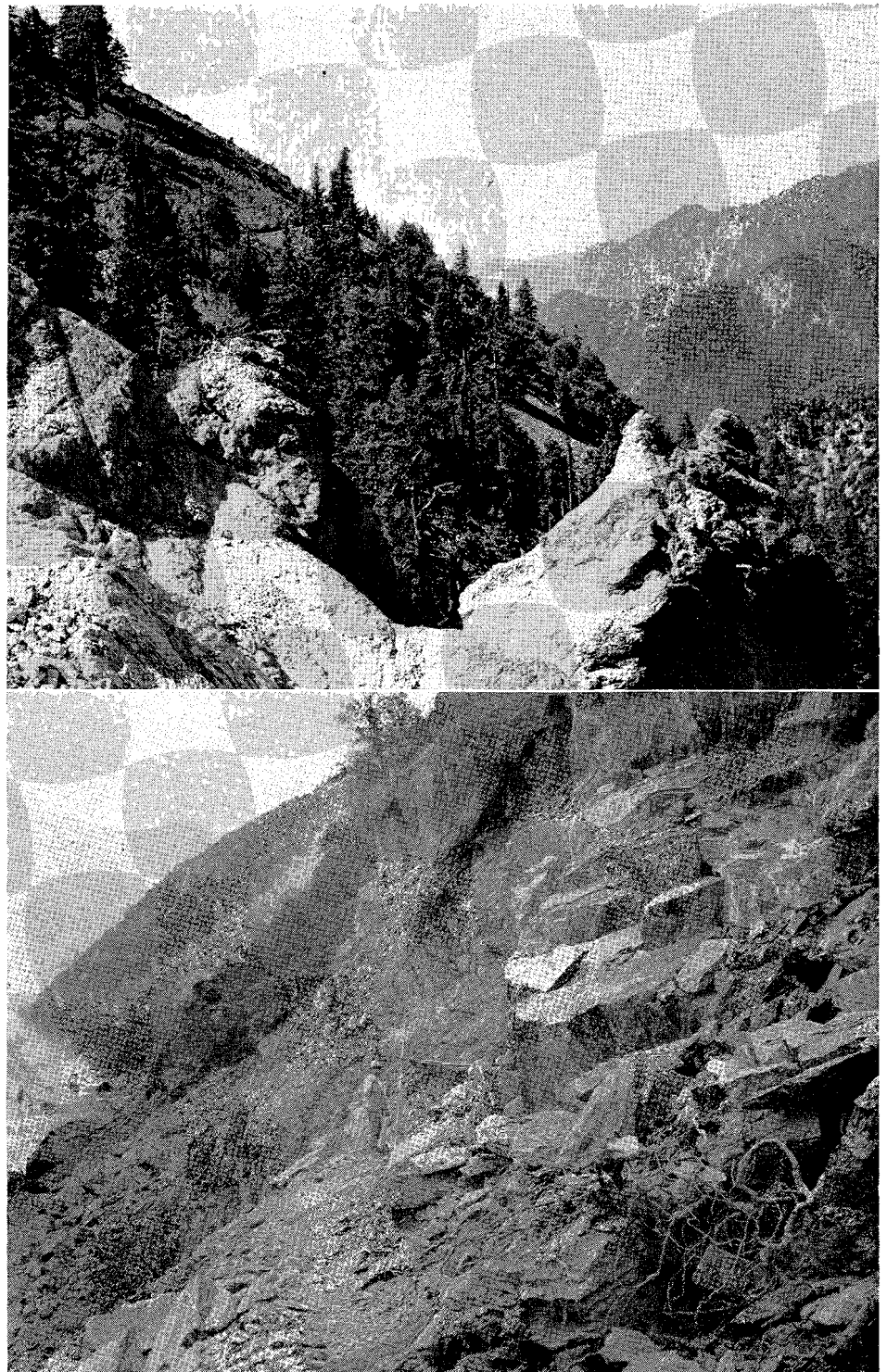
Free labor	35%
Equipment rental	31%
Explosives	8%
Construction materials	5%
Gas, oil, miscellaneous.....	6%
Inmate labor	15%
<hr/>	
Total	100%

EQUIPMENT

Equipment required for construction operations over long periods of time is owned by the State and obtained upon requisition from the Division of Highways Equipment Department at established rental rates—the rental rates in-

cluding repairs and depreciation but not the operating cost such as gas, oil and operator which is borne by the job allotment.

Equipment needed for short periods or in emergencies is rented from outside vendors after advertising for bids



UPPER—Islip Summit on Angeles Crest Highway in Los Angeles County. LOWER—Merced Canyon on Sign Route 140 to Yosemite Valley

as required by law and is rented fully operated, including the operator.

For the purpose of repairing and maintaining state-owned equipment, a modern equipment shop is built in each camp and maintained under supervision of the Equipment Department.

FREE PERSONNEL

All skilled free labor and supervisory personnel for the camps are furnished from civil service eligible lists selected through competitive examinations.

Typical free-labor job classifications employed on construction in the road camps include:

- Construction Superintendent
- Highway Foreman
- Truck Driver
- Power Shovel Operator
- Stonemason
- Powderman
- Carpenter
- Tractor Operator
- Power Shovel Oiler
- Blacksmith
- Heavy Equipment Mechanic
- Commissary Clerk
- Timekeeper-Clerk

Skilled labor required for emergencies and short-time jobs, such as plumbers, electricians, etc., is generally procurable from the nearest local community.

ENGINEERING INSPECTION

A resident engineer is assigned to each road camp project in charge of all engineering aspects of the job. He is responsible to the district engineer and bears the same relation to the camp construction superintendent as the resident engineer on a contract bears to the contractor.

It is the duty of the resident engineer to enforce compliance with specifications and conformance with approved plans for the project as well as determination of construction quantities.

MONTHLY PROGRESS REPORT

Efficient administration of road camp construction activities requires a current record of costs and progress. To provide this information, job expenditures are accounted for and assembled in a monthly progress report along with construction quantities, unit costs, and pertinent job data.

The progress report of project activities is compiled from job accounting records and from construction

OF INTEREST IN GERMANY

OFFICE OF THE UNITED STATES HIGH
COMMISSIONER FOR GERMANY
Nutrition Mission for the Office
of the Surgeon General
APO 807

February 20, 1950

Mr. G. A. Tilton, Jr.,
Department of Public Works
State of California
Sacramento, California

My Dear Mr. Tilton: Your letter of January 8, 1950, has been received. You tell of sending six copies of the September-October 1949 issue of *California Highways and Public Works* at Miss Sedgwick's request. Your kindness in sending the publications is appreciated.*

The article on Feeding and Nutritional Accounting in your series of articles on prison labor camps in California is excellent, and the best on what can be accomplished by suitable control and nutritional accounting that has been published. It contains the factual evidence necessary to be convincing. As Miss Sedgwick probably told you, I wanted the chart to give to the Germans along with the article which I had copied from the manuscript. The original paper with the inventory of stores and quarterly requisition as well as the chart on cost will be appreciated by the Germans more than the copy.

With kindest regards.

Sincerely yours,

(Signed) PAUL E. HOWE
Chief, Nutrition Mission

* Food administrator, California Youth Authority.

quantities measured by the resident engineer. Unit costs of construction items are determined from this information for comparison with the preliminary estimate of cost and for judging the efficiency and rate of progress of construction operations.

Each monthly report is completed as soon as possible after the first and before the tenth of each month and includes complete information on the following subjects:

- (a) General Camp Data
- (b) Status of Allotted Funds
- (c) Narrative Report
- (d) Inmate Records

- (e) Free Personnel
- (f) Analysis of Expenditures to Date
- (g) Inventory of Construction Materials
- (h) Explosive Inventory
- (i) Camp Cost and Write-off to Construction Items
- (j) General Expense
- (k) Extra Work
- (l) Monthly Analysis of Unit Costs
- (m) Equipment Rentals
- (n) State-owned Equipment Rentals and Outside-owned Equipment
- (o) Over-all Comparison of Actual Costs to Date With Preliminary Estimate of Cost

MODERN CONSTRUCTION PRACTICES EMPLOYED

The efficiency of construction superintendents in charge of road camps is judged primarily by the quality, progress and cost of the work under their supervision as compared to preliminary estimates of cost for each project and comparable contract work.

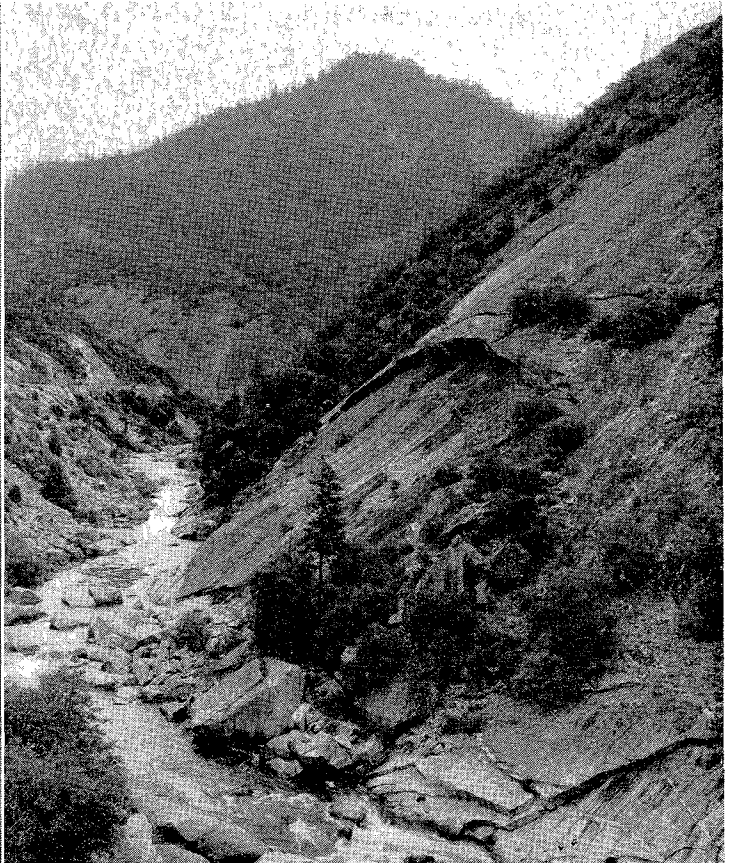
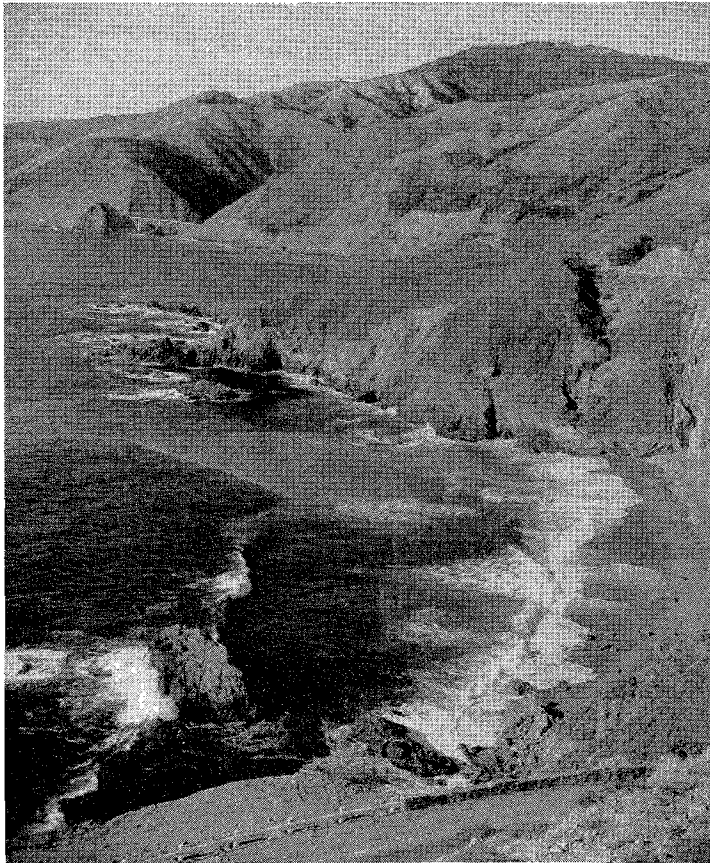
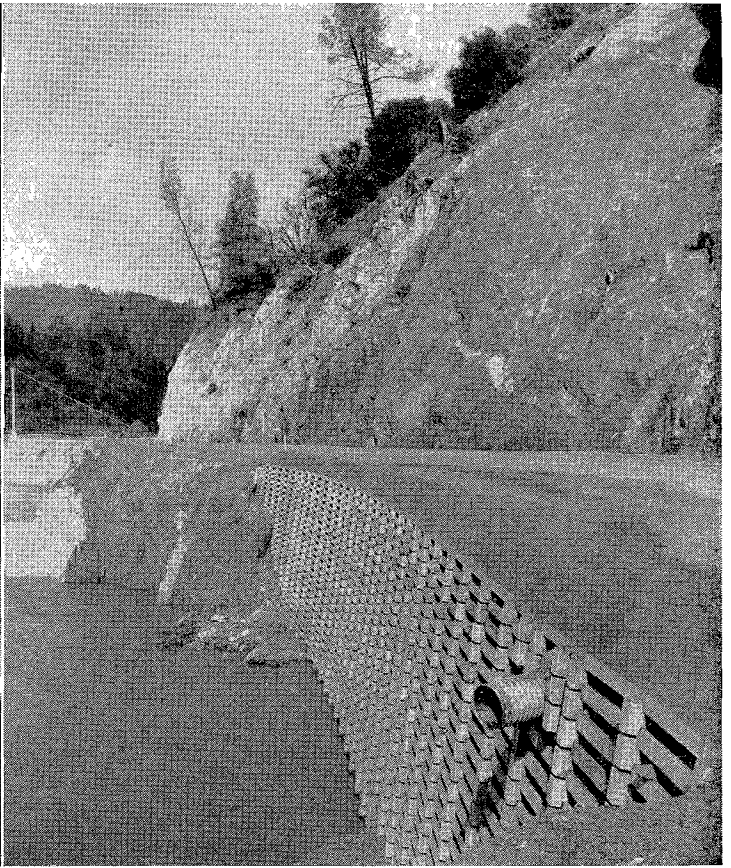
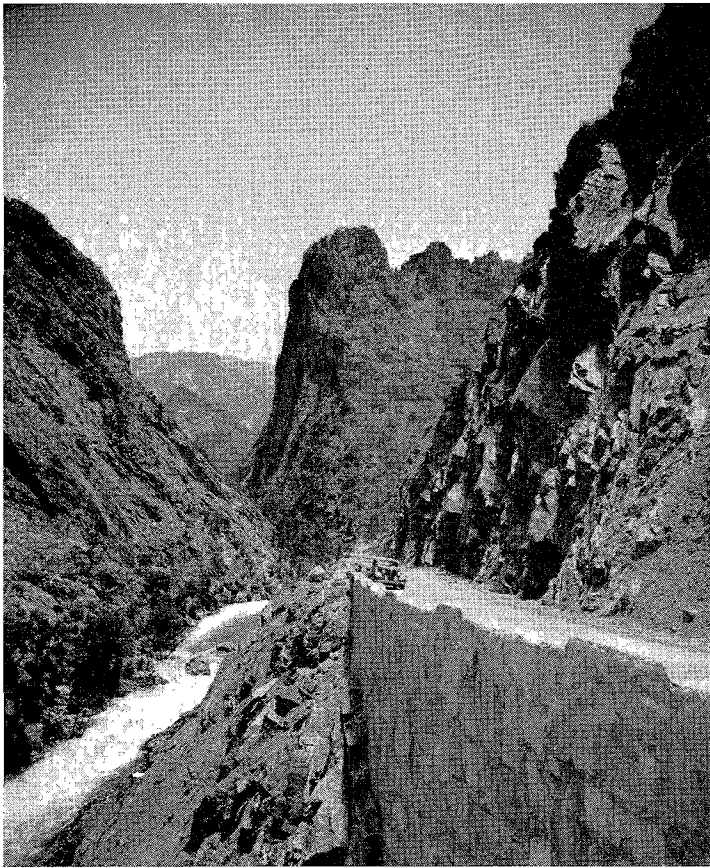
Superintendents are required to keep abreast modern construction practices and are encouraged in the development of new methods, use of improved products, and experimental investigation of specialized equipment. Likewise improvement of current construction procedures on all phases of the work is fostered. To this end, extensive time studies of power shovels and truck operations are undertaken at intervals and production records and costs compared between the various camps.

In recent experiments with newly marketed detachable alloy steel rock bits, one camp has been able to consistently more than double the drill hole footage per shift over conventional carbon steel detachable bits. Similarly, experiments with different types of explosives and loading methods have resulted in uniformly good blasting technique in the camps. Such improved methods tested in one camp are then adopted in other camps where applicable.

RELATIVE PRODUCTION OF INMATE LABOR

Contrary to popular conception, analysis of the productive labor output of prisoners under the California road camp pay-system indicates that it com-

... Continued on page 64



Typical rugged terrain adaptable to prison labor. UPPER LEFT—Kings River Canyon Highway, Sign Route 180 in Fresno County. LOWER LEFT—San Simeon-Carmel Highway, Sign Route 1 in Monterey County. UPPER RIGHT—Trinity Lateral, U. S. 299, in Trinity County. LOWER RIGHT—Arch Rock on Feather River Highway, Sign Route 24, in Butte and Plumas Counties

Here's Tip

*New Cement-Treated Base Road-Mixed Method
Used Between Sherwood Road and Sapp Creek*

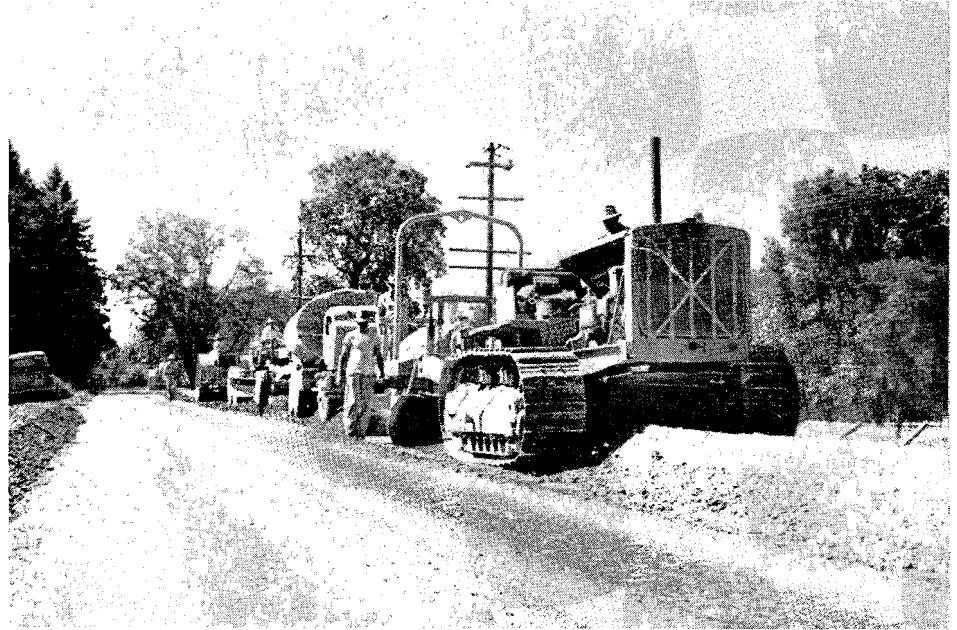
By H. W. BENEDICT, Assistant Highway Engineer

DURING the construction season of 1949 a resurfacing contract for some 8.3 miles of the Redwood Highway, U. S. 101 (State Route 1), was completed between Sherwood Road and Sapp Creek near the town of Laytonville in Mendocino County. The contract consisted of the cement treatment of existing and imported base material by road-mixed methods, surfaced with three inches of plant-mixed surfacing. This construction provided stabilization of a section of highway which was badly broken up, and which had been a serious maintenance problem for several years.

While all phases of the work were completed in a commendable manner by the contractor, that of road-mixed cement-treated base is especially worthy of comment; both for the efficient way in which the work was handled and for the final appearance of the work, which was excellent. Following is a brief resume of the methods used by the contractor to accomplish these results.

Scarifying of the existing and imported base material consisted of breaking, to the size of the largest particle in the aggregate, all that material to be cement treated. Existing material ranged from armor coat to exceedingly hard road-mixed surfacing, to which was added varying quantities of imported base, placed under the same contract. This latter consisted of crushed river gravel. At several locations the imported base material comprised the entire thickness to be cement treated. Generally, however, it was combined with portions of the existing base to make the total thickness.

The prime tool for scarifying was built by the contractor after several years of experimentation. It consisted of the frame, wheels, etc., of a LeTourneau ripper to which were welded eleven shanks from a Caterpillar No. 12 motor patrol ripper. These shanks were



This photo shows the contractor's equipment in operation

fitted with standard scarifier teeth. The unit was towed by a D8 Caterpillar, and proved very effective in ripping up the hardest bituminous pavement encountered on this contract. To further pulverize the larger pieces of ripped-up oil cake, a bare Caterpillar was walked over the scarified base utilizing the grinding action of the growlers with good success. A motor grader was also used in this operation to turn the scarified material for the above equipment and to reshape and re-lay the material after scarifying. This grader was also used to prepare the windrow ahead of the road-mixer.

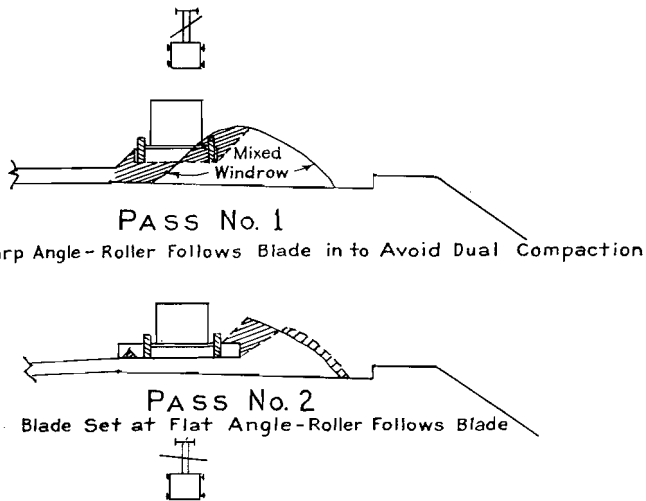
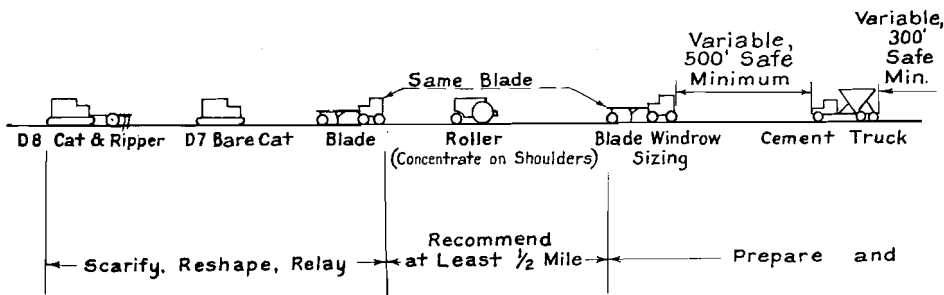
The contractor made one miscalculation in that he did not begin his scarifying operations further in advance of mixing operations. Consequently, he was forced to work the scarifying equipment overtime to keep ahead of the mixer. In this connection, it is also believed the State is better served when the operations are well spread out, since it provides two short areas of controlled traffic rather than one long traffic control with the

resultant longer delays for traffic.

Four percent of cement was added to the material to be road-mixed directly ahead of the mixer by means of a gondola truck built by the contractor. This cement spreader consisted of a three-axle drive truck on which was mounted a metal bin in the shape of an inverted pyramid. This bin held two cans (10 tons) of cement, and was loaded at a central storage area by a dragline which also served to unload the cement cans from transport trucks.

Cement was distributed on the windrow by an ingenious rotary valve mounted at the outlet of the cement bin. Quantities of cement could be very closely controlled by means of simple gear changes on the chain drive of the rotary gear. This proved to be an economical and highly satisfactory method of adding cement.

Mixing of the prepared base was done with a Woods 54-inch road-mixer, towed by a D8 Caterpillar tractor equipped with a special transmission and power take-off so integrated as to provide a forward move-



This diagrammatic sketch and the one on the page following show types of equipment, arrangement, and spacing, and method of laying out road-mixed cement treated base

ment of about 20 feet a minute with the mixer fully loaded.

The machine mixed one traffic lane at a time, in this case a section 12 feet wide. In some cases the compacted depth was five inches and in others it was six inches. It readily mixed the heaviest windrow which consisted of approximately 7.2 cubic feet of uncompacted aggregate per lineal foot. The machine was stalled on only two locations where the windrow had been poorly sized and contained approximately nine cubic feet of uncompacted material.

Water Distribution

Water was furnished the mixer by means of a water truck towed directly behind the mixer by a quickly detachable tow bar. The water was pumped from the truck through a meter to spray bars within the mixing drum. The quantity of water added to the mixer was controlled by tables prepared by the engineer integrating the rate of flow with the speed of the machine, the size of the windrow, and the moisture content thereof. After

some experience with the machine, moisture content could be determined very closely by feel and touch. Laboratory tests showed this method to be very reliable; it being the first job in the writer's experience when it was not necessary to remove over-watered "quakey" spots in the finished base.

After poor results were obtained in an attempt to use a home-made self-propelled spreading device to lay out the mixed base material, the contractor elected to use a Caterpillar No. 12 motor grader to spread the windrowed cement treated base. This method proved economical and produced a true section under the conditions encountered on this contract. It was immediately obvious that the entire progress of the work depended upon the skill and ability of the individual operating this grader since the travel of the Woods mixer could not exceed the spreading of the processed material. The contractor was fortunate in having an extremely capable operator who managed to handle the material as fast as it was mixed and yet

complete the process in a manner acceptable to the inspectors.

To facilitate the above, the superintendent and engineer realized that an orderly method of spreading should be devised. Accordingly, a method was developed which both satisfied the specifications and allowed for the rapid completion of the operation. This method of laying out the material is best described by diagrams which are attached to this report.

Compaction was obtained with two 12-ton three-wheeled rollers. The first worked in close conjunction with the spreading grader; the second completed the initial rolling. The material was then trimmed by another motor grader, after which the base was given the final rolling with a contractor-constructed rubber-tired roller, conforming to specifications for this type machine.

Sealing of the completed base was accomplished in the usual manner, the contractor using a 1,300-gallon boot truck to spread the asphaltic emulsion, and a Buckeye spreader to distribute the sand.

However, this operation differed in some respects from the usual in that the contractor stockpiled sand for the curing seal at various locations on the job. This procedure obviated the usual costly delay while the sand truck was returning to the plant for sand.

As a result of the above well-planned and well-coordinated operations, and the selection of adequate machines and skilled operators, the contractor was able to complete the cement treated base and related items of work in a length of time far shorter than that previously experienced in this district.

... Continued on page 48

OCEANSIDE-CARLSBAD FREEWAY IS APPROVED

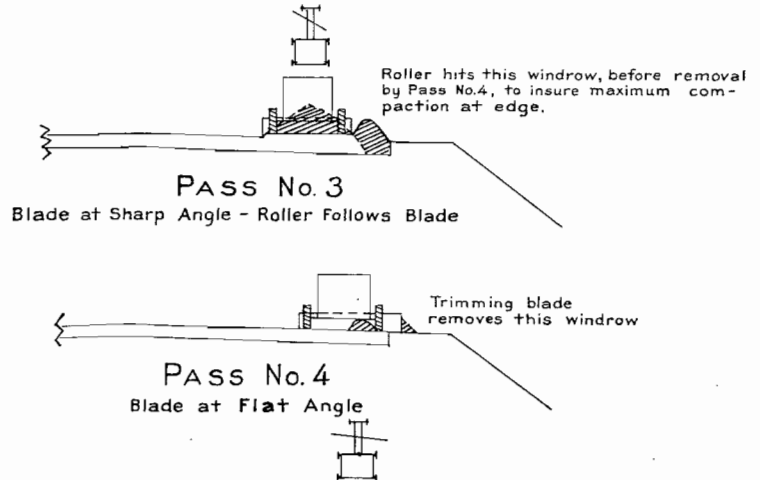
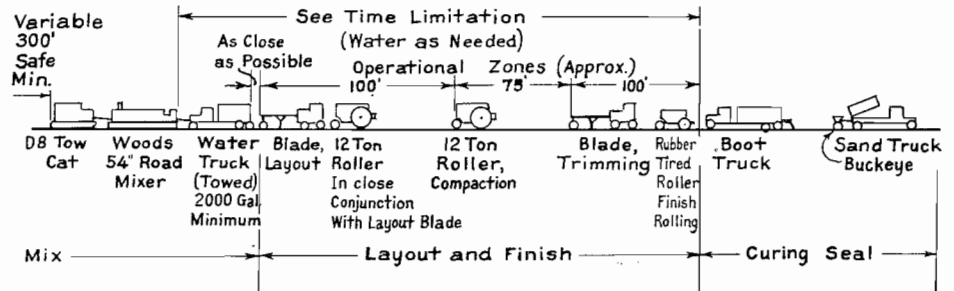
The California Highway Commission at its meeting in Los Angeles on May 19th unanimously authorized the construction of the \$6,000,000 freeway on U. S. 101, through Oceanside, South Oceanside and Carlsbad, from the San Luis Rey River to a point one mile south of Carlsbad. The adopted route has been referred to as the "Red Line." The Highway Commission estimates that the route may be placed in service approximately three years subsequent to the initiation of the project and is prepared to budget funds to begin construction as soon as freeway agreements may be made with local governing bodies.

Project Statistics

Following, in outline form, are the more important statistics on this phase of the contract:

Total square yards CTB mixed	118,316 sq. yds.
Equivalent tons CTB mixed (at 140 lbs./cu. ft.)	32,120 tons
Working days to complete CTB	12.5 days
Working hours to complete CTB	102 hours
Average tons CTB mixed per day	2,570 tons
Average tons CTB mixed per hour	315 tons
Maximum tons CTB mixed per day (approximate)	3,100 tons
Rate of travel of Woods mixer, average	18.7 ft./min.
Rate of travel of Woods mixer, maximum	20.0 ft./min.
7-day test specimens—	
High	1,400 lbs./sq. in.
Low	680 lbs./sq. in.
Average	1,054 lbs./sq. in.
28-day test specimens—	
High	1,770 lbs./sq. in.
Low	745 lbs./sq. in.
Average	1,211 lbs./sq. in.

Contractor Clements & Company was represented on the contract by Superintendent J. R. Paselk; the State by Resident Engineer H. W. Benedict, assisted by R. J. Datel on tests and Jack R. Rowe, Street Inspector.



In Memoriam

ROBERT MELLOUS HAVERSTICK

Friends of Robert Mellous Haverstick were shocked and saddened to learn of his sudden death on Saturday, May 13, 1950. He was on the job as survey party chief for District VII, State Division of Highways, the early part of that week, becoming ill Wednesday evening and losing consciousness the following morning. He was then taken to the Queen of Angels Hospital in Los Angeles where he remained in a coma until his death.

Everybody knew him as "Bob" Haverstick. He was one of the most colorful and beloved personalities in the District VII engineering staff. He was born in Los Angeles, July 25, 1890. He was a descendant of the old pioneer Mellous family, which helped make early Southern California history.

Bob's association with District VII dates back even before the begin-

ning. The nucleus for District VII appears to have existed in the personnel of the Los Angeles County Road Commission's 1909 organization. At that time the county road commission had three survey parties, for one of which the chief was Spencer V. Cortelyou, the head man of District VII for so many years. In Cortelyou's party one of the chainmen was Bob Haverstick. On March 15, 1912, Bob joined the Division VII (as it was then designated) organization, again working under Mr. Cortelyou, and he remained in the district organization continuously except for military service during World War I.

Very quickly Bob rose to be Chief of Survey Party and in that capacity he has had responsibility for the surveying work on some of the largest and most important state highway projects. Notably among these was

the intricate and complex layout engineering on the \$14,000,000 Terminal Island Freeway, built by the State for the Navy to serve facilities on Terminal Island in the Los Angeles Harbor area. With the advent of the huge postwar freeway program, Bob proved himself an enthusiastic supporter of the new methods that had to be introduced to meet the new conditions. Bob's great success with the Division of Highways can be accounted for not only because of his technical ability as an engineer but also because of his cheerful friendliness and his helpful and cooperative attitude toward everyone.

He is survived by his widow, Helen Gridley Haverstick; his son, Richard G. Haverstick; his daughter, Jean H. Coldewey; and his grandson, Jack David Haverstick. The sincere sympathy of the entire department is extended to his family.

AN ENGLISHMAN WRITES ON FEDERAL AID

By REES JEFFREYS, London *

THE TWO interesting and important articles on federal aid in the last two issues of *California Highways and Public Works*, one by Mr. C. H. Purcell and the other by Mr. R. F. Reynolds move me to write a short note which may be of interest to your readers.

My first visit to the United States was in 1912. As the Secretary of the British Road Board, I had been appointed Hon. Secretary of the Third International Road Congress to be held in London in 1913. I was authorized by the British Government to visit the United States to interest the highway authorities in the London congress and, incidentally, to study the highway system of the U. S. A.

I was the guest in Washington of Mr. Logan Waller Page, then Secretary of the Highways Department of the Ministry of Agriculture. That department had very few powers and little money to spend. It occupied itself mainly in trying to inspire and instruct the state and city highway authorities in road construction. Among other activities it ran a "Good Roads" train equipped with men and appliances to instruct the authorities how to make roads. At that time a system of designed and metaled highways connecting the towns did not exist. A highway connecting New York and San Francisco was regarded as a visionary's dream.

Early Federal Aid

The question of federal aid had then been raised in Congress and at the request of Mr. Page I attended a meeting of a committee of the Senate under the chairmanship of Senator Burnham on June 13, 1912, and was invited by them to give any information about our experiences in Great Britain which might be useful. I did my best to encourage the committee to proceed with the scheme of federal aid. It was only too apparent that no great progress would be made in the United States until the Federal Government came to the assistance of the state authorities with federal aid under a properly designed

scheme which would secure that roads were constructed and improved on a national plan and that the states would then be responsible to maintain them in good condition.

It was not until 1916 that the first Federal Aid Road Act became law. Its weakness was that it made all post roads eligible for grants, and it was not until 1921 that experience put the federal aid scheme on a sound basis. In the interval Mr. Thos. H. MacDonald had been made Chief of the Bureau of Public Roads. Followed the miraculous development of highways in the U. S. A. which I have ventured to class as one of the modern miracles of our time.

International Road Congress

In 1930 I attended the International Road Congress held in Washington and at the final banquet in responding to the toast proposed by Mr. Arthur M. Hyde, Secretary of Agriculture, I said:

"In 1912 you were behind Western Europe in your road systems—now you are in front. In 1912 you could teach us little—now we come to the United States from all parts of the world to learn the best methods of road construction, to examine the most up-to-date machinery."

I remember making contact over 30 years ago with Mr. A. B. Fletcher (a predecessor of Mr. Purcell), who, after leaving California, was sent to England in 1924 by the U. S. Bureau of Public Roads to make an intensive study of highway and transport conditions. I was glad to be of some assistance to Mr. Fletcher during that visit.

In 1931 by the courtesy of Mr. Purcell I made a study of the California Highway System which I traveled from the Mexican border via San Diego, Pasadena and Merced to Sacramento and thence to San Francisco. Among the district engineers I particularly recall for their courtesies are Messrs. Skeggs, Wallace and Cortelyou.

Mr. Purcell showed me the plans for the new bridge from San Francisco to Oakland, a marvelous scheme so efficiently and quickly carried out. In contrast, I have been associated with efforts to put a bridge across the Lower Severn to connect

Out of the Mail Bag

FOREST SERVICE LETTER

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

MR. KENNETH C. ADAMS, *Editor*
California Highways and Public Works
Sacramento, California

DEAR MR. ADAMS: I want to compliment you on your magazine, its factual articles, and its fine photographs. Our staff members, especially those concerned with the problems of watershed management, look forward to the receipt of *California Highways and Public Works*, and frequently comment on the excellent presentation of your subject matter.

Very sincerely yours,
STEPHEN N. WYCKOFF, Director

APPRECIATES INDEX

PORTLAND CEMENT ASSOCIATION
Chicago 10, Ill.

KENNETH C. ADAMS, *Editor*
California Highways and Public Works
Sacramento, California

DEAR MR. ADAMS: You will never realize how very much surprised I was to find an index for *California Highways and Public Works* for 1949 placed in the back of the January-February, 1950, issue. You will never know what a big help this is to those of us in specialized library work who use your magazine daily for reference and research work.

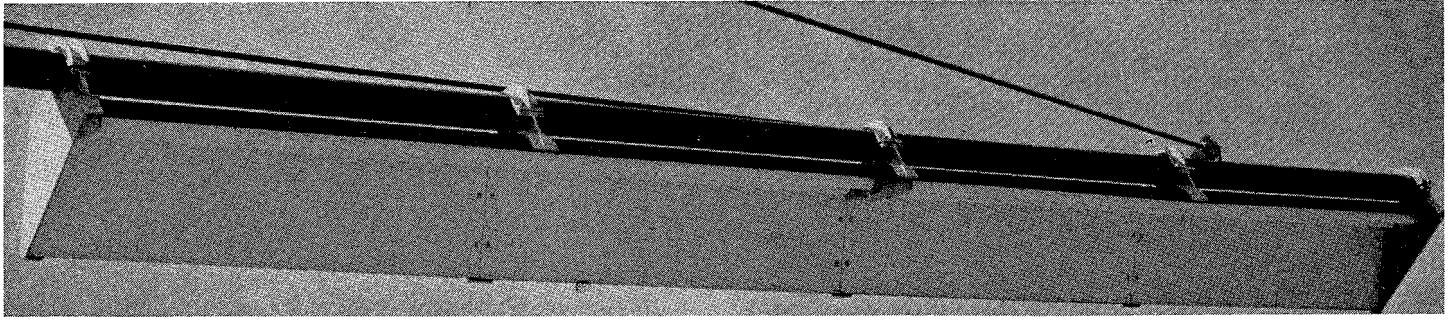
During the past several years I have had to index this periodical myself in order to keep track of the various activities on the West Coast, especially in the State of California. I do not know, of course, how many libraries receive *California Highways and Public Works*, but I do feel that you have given the library profession a great help in supplying an index for your publication. I, for one, am very grateful and wish to say "thank you" to you.

Yours very truly,
P. B. SHEFFIELD, Librarian

England with Wales, which after 30 years is still unbuilt.

It is the imaginative realization of what traffic requires, skill in planning and speed in execution, which has given to California, in my experience, the outstanding highway administration of the world.

* Author of "The King's Highway."



Fluorescent luminaire showing details of reflector

Intersection Lighting

Continued from page 33 . . .

vapor lamp as used in present-day luminaires.

Intersection Illumination

Personnel of the Traffic Control Section of the Traffic Department of the California Division of Highways recently designed and had manufactured a lighting unit specifically for highway intersection illumination. This luminaire uses four of the new lamps and is designed to direct the light in one direction only. In accordance with the American Standard Practice, the location for an intersection light is on the far right corner as one approaches the intersection. This produces a bright area on the pavement in the intersection and enables the approaching driver to see objects in the intersection both by direct illumination and by silhouette.

The ordinary street lighting luminaire is designed for continuous lighting of the street and consequently directs the light equally in both directions. When it is mounted on the far right corner of the intersection the light which is directed into the intersection appears as a bright pattern on the pavement for the approaching motorist. The light which is directed away from the intersection is reflected away from the approaching motorist and is of little value in building up pavement brightness.

It seems reasonable, therefore, that for intersection lighting a luminaire which directs the main portion of its light into the intersection would be more efficient.

Major Advantage

Another major advantage of the 16-foot long fluorescent luminaire is that the wide brightness pattern on the pavement is not affected by a wet pavement surface and there are no excessively bright streaks on the pavement as is so often the case with ordinary street lights on a rainy night.

The luminaire, Type 100, was manufactured for the Division of Highways by Smoot-Holman and Company of Los Angeles. The unit as designed is approximately 16 feet long, and the reflector is a paracyl shape with white porcelain enameled facets to reflect the light rays. Four eight-foot fluorescent lamps are used. The unit is supported at right angles to the traveled

way and approximately 28 feet above the pavement by a 20-foot, 3-inch horizontal mast arm.

The new luminaire is installed at the intersection of Fruitridge Road and Stockton Boulevard, on U. S. 99 in Sacramento County.

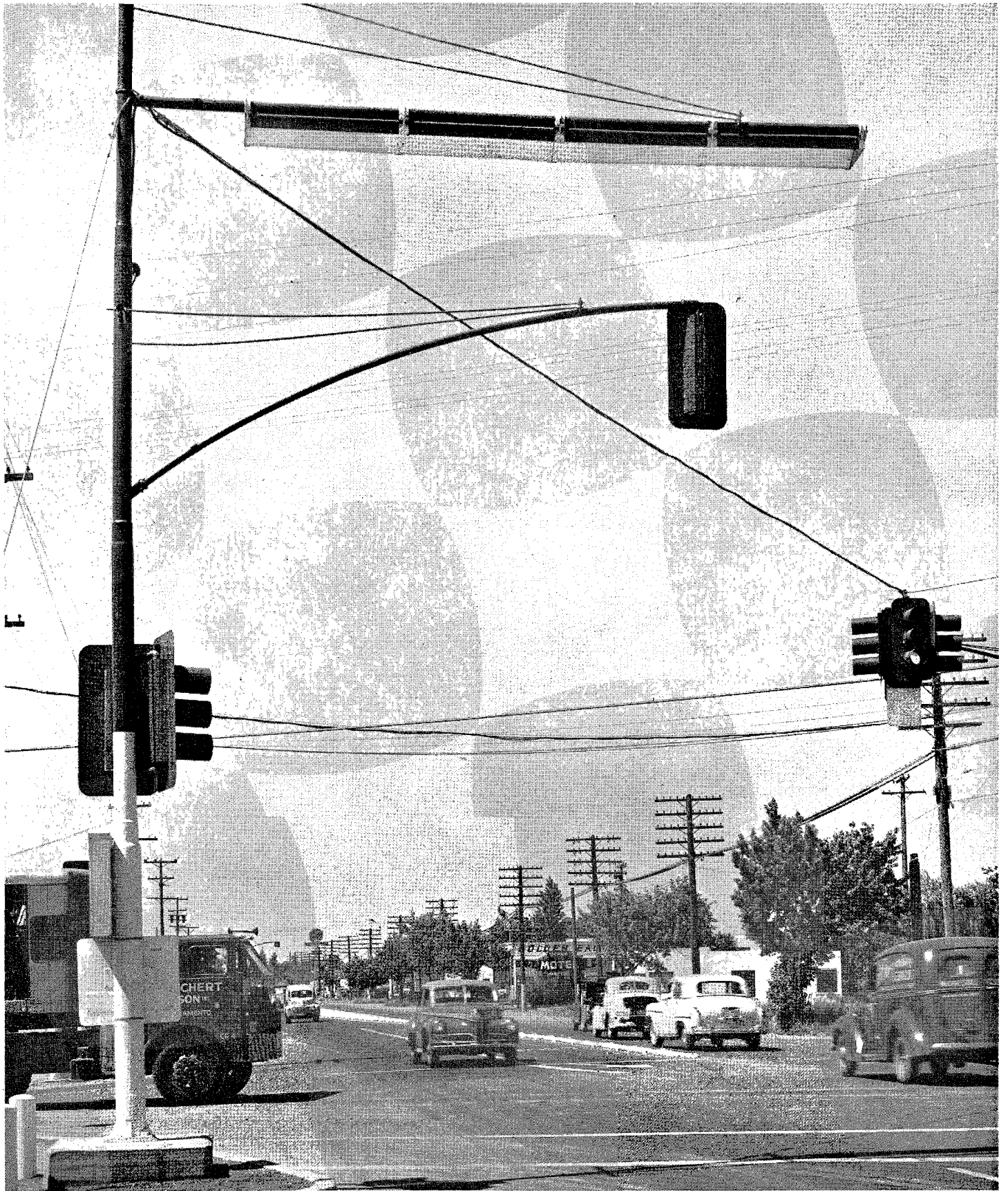
The new traffic signal at this intersection is of the latest type and employs an electronic dispatcher. This dispatcher is traffic actuated and automatically adjusts itself to and takes fullest advantage of the variations in traffic volumes and densities on all of the approaches to the intersection.

A count is taken of every vehicle approaching the intersection, whether it be on the green period or the red

. . . Continued on page 63

Stockton Boulevard and Fruitridge Road, showing nonglare appearance when illuminated





View of fluorescent luminaire as seen by northbound motorists at Stockton Boulevard and Fruitridge Road in Sacramento County

THE CALIFORNIA HIGHWAY HAND SHOVEL

By H. L. FERRON, Assistant Stores Engineer

THE CALIFORNIA Division of Highways uses about 4,000 shovels per year. During the war years good shovels were difficult to obtain which caused the maintenance personnel to become "shovel conscious." A preliminary investigation indicated that the hand shovel presented a fertile field for investigation and improvement. This is particularly true, since the advent of power equipment relegated the hand shovel primarily to clean-up work and has eliminated to a large extent spading or earth-moving operations by hand.

Modern highway construction equipment for moving dirt and rock is usually visualized by the layman as huge power shovels, tractors and carryalls, trucks, bulldozers and other large and powerful machines. This equipment, which fascinates the "sidewalk superintendent," is designed and constructed to move large quantities of material in a relatively short time. Part of the work, particularly some of the finishing and cleaning up, must be done with hand tools. One of the most important of these tools is the No. 2 hand shovel. This lowly "muck stick" becomes even more important and indispensable after the road is completed and turned over to the maintenance men.

One of Earliest Tools

History tells us that a hand shovel or scoop of some kind was one of the earliest tools used by mankind. Archaeologists have discovered and preserved for posterity digging tools of, some description from practically every age of civilization they have had the opportunity to study. As civilization advanced and declined, the digging tools advanced and declined along with the other forms of culture. It is human nature to believe that our present culture is the zenith of all recorded time, we naturally believe that our tools are the finest in history.

Hand shovels are being produced at present by numerous manufacturers,

all of which make high quality shovels and also make "competitive" grades. The "competitive" grade is the low cost shovel ordinarily available to the buying public at retail stores. Because of their lower cost, competitive grade shovels have been purchased in the past for the California Division of Highways.

Study of Shovels

One of the principal functions of the Stores Department is to determine which tools, supplies and materials are the most satisfactory for highway purposes. Surveys and tests are being made continuously to improve the quality and adaptability of many items which the users have called to the attention of the department.

The Stores Department coordinators found that one of the tools most frequently mentioned as being unsatisfactory was the hand shovel. As the shovel is one of the most generally used hand tools, an investigation was launched about two years ago to determine why they were not satisfactory. After questioning maintenance men skilled in the use of shovels, it was apparent that their complaints were justified, and they were unanimously of the same opinion as to what correction was needed. It was soon discovered that merely knowing what was wrong was not sufficient information to write a shovel specification with physical characteristics satisfactory to the workmen.

Men Express Preference

A field investigation was decided upon to obtain the answer. Several dozen shovels were procured which appeared to be closest to what the men desired. These were purchased from various hardware firms and were the products of practically all of the leading manufacturers. Each shovel was given an identifying number and the manufacturers' name obliterated to avoid any personal prejudice for trade

names. The shovels were distributed at random throughout the State to various maintenance men who reported on a questionnaire after about three months use, indicating their preference on several features which were found to be controversial in the preliminary questioning. Numerous comments and suggestions were made which were helpful in the study and analysis.

After completion of the field tests, the shovels were thoroughly examined for wear and fatigue. The type of work on which each shovel had been used was of primary importance in developing a satisfactory design.

High Lift Shovel Favored

It was especially interesting to find that the major portion of highway maintenance work being done with hand shovels consisted of "mucking" or scooping loose material from ditches, shoulders, road approaches and subways; trimming around sign and guard rail posts; and loading trucks from stockpiles of premixed surfacing material, sand and rock. With one exception, very little time is spent in using the shovel as a spade. The exception is the gardeners, upon whose shoulders rest the burden of keeping the landscaped freeways, subways, and other beautified spots on the highway system pleasing to the traveling public. Their work of planting and cultivating shrubs, trees and other plants necessarily calls for a spading shovel for which the following specifications are not adaptable.

The survey and analysis indicated that a shovel with a high lift is the most desirable for almost all maintenance work. A high lift eliminates unnecessary back bending, reduces fatigue, results in more work done and a more satisfied employee.

Comparison of Shovels

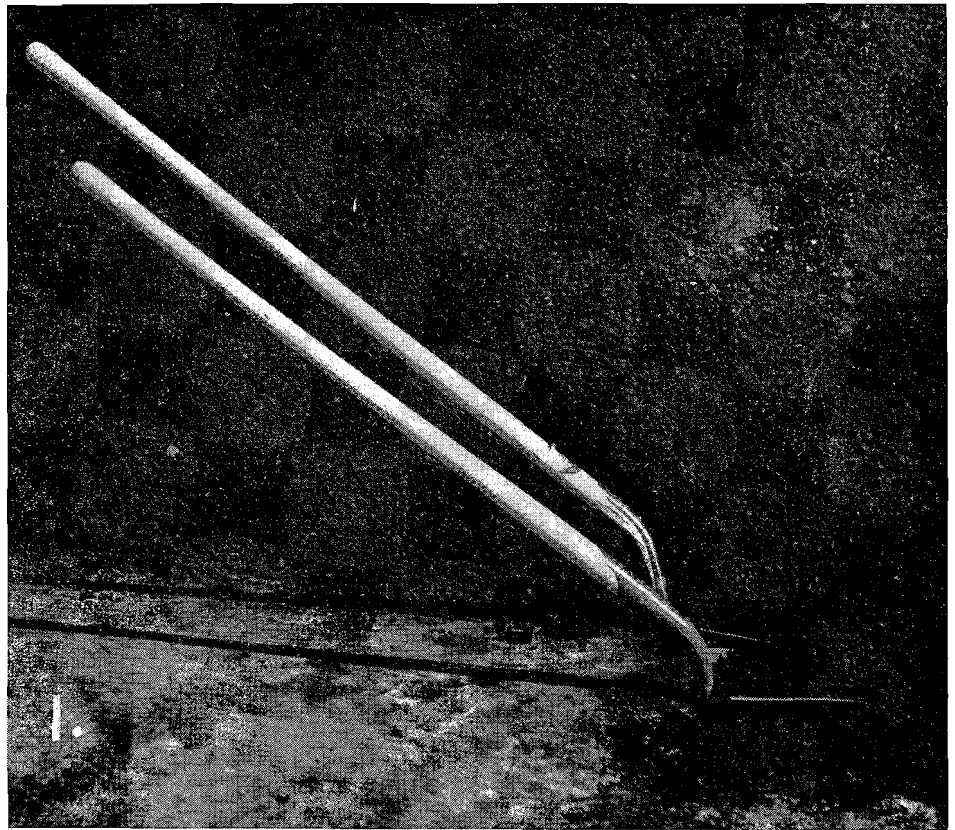
In *Figure 1*, the shovel in the foreground came closest to the preferred

type and except for the lift and length of handle would be satisfactory.

Figure 2 shows the same two shovels. For comparative purposes the same man was used in the illustrations. Note that the hand is higher in the left photograph requiring a lesser amount of stooping. The left hand is in a better position to force the shovel into the stockpile. Mechanical principles of the human body are the same as any other machine. Decreasing the number of movements tends to increase the life of the machine, as well as increase the efficiency.

The lift is measured by placing the blade of the shovel on a flat surface and observing the vertical distance to the tip of the handle. The shovel in the background was fabricated to our specifications. It is obvious that the bend at the shank is similar and the additional lift is accomplished with the longer handle. The natural angle of repose of the handles is identical.

The questionnaire indicated the following major objections to the test shovels: 1. Too heavy. 2. Handle too short. 3. Handle too large in diameter. 4. Insufficient lift. 5. Poor balance. With these objections in mind, and by



Commercial shovel in foreground and California highway shovel in background, showing difference in lift and length

making physical measurements of the shovel parts which the men considered

satisfactory, a composite of the desirable features indicated the final design.

Same shovels as illustrated in Figure 1. Note the much better posture of the man with the highway shovel in the left picture



Paragraph (a) *General* of our specifications cover this composite.

Shape of Handle

Table I of the specifications covers the shape of the handle. It was first determined by inquiry whether it was practical to commercially manufacture a handle to the tolerances indicated. It was quite obvious from the questionnaire which handles had an acceptable shape and such handles were calipered and plotted graphically. A mean line was drawn for the group and the maximum deviation from the mean was accepted as the allowable tolerance. The diameter in inches, as shown in the table, is a composite of 15 different shovels of various grades made by several different manufacturers. It was noted that a well shaped handle often made an inferior quality shovel more acceptable to the user than one of better quality with a clumsy or cumbersome handle.

After a thorough examination of the test shovels, it was definitely apparent that there would be no economy in procuring a shovel produced from anything but the best materials. Handles made of inferior grades of wood were broken along the slash grain, splintered and badly checked while those of first grade ash were still in excellent condition. The steel of the lower grade shovels showed two definite weaknesses. Some were extremely hard and fairly abrasive resistant but did not have sufficient ductility to stand the constant bending and failed by cracking. Some of the steel was so soft that it was only a short time before they were so badly worn they were no longer usable.

Best Grade of Ash

Manufacturers were consulted and they were all of the opinion that in our type of work, it was false economy to use anything but the best grade of ash obtainable for the handles and an alloy steel for the blades. They agreed that the steel should be both abrasive resistant and relatively ductile when properly heat treated.

It was interesting to note the workmanship in the lower grade shovels which were tested. A heavy coat of paint over rivets, welds and other joints

Robert M. Shillito Named Assistant To Public Works Chief

DIRECTOR of Public Works C. H. Purcell has appointed as his special assistant Robert M. Shillito, of San Francisco, who resigned as Director of the Highways and Transportation Department of the California State Chamber of Commerce to accept the job, which is exempt from civil service.

Purcell said that the position of Deputy Director of Public Works, which previously had been the exempt appointment in the department, has been reestablished as a civil service post and that with the approval of the State Personnel Board he has named Frank B. Durkee to the permanent position of Deputy Director. Durkee has been holding that office exempt from civil service since May, 1948.

Shillito is a graduate of the University of California at Los Angeles. During the war served in the South Pacific and Pacific Theaters as aircraft maintenance engineering officer with the 403 Troop Carrier Group of the 13th Air Force. In 1946, he was employed as Director of Public Relations for the Southern California Council of the California State Chamber of Commerce, with headquarters in Los Angeles. Subsequently he was Assistant Manager of the Southern California Council until 1948 when he became Director of the State Chamber's Transportation and Highway Department in San Francisco.

Shillito is married to the former Elizabeth Despard Kinne of Los Angeles. He will make his home in Sacramento.

greatly enhanced the tools' appearance. This "camouflage" was soon obvious after the shovels were put to work—without exception the ones which were painted the prettiest were the ones relegated to the junk pile first. Our specifications were written to eliminate as much "camouflage" as possible.

In addition to the test requirements of the present specifications, we will soon be able to include a fatigue test. The Division of Highways Materials

and Research Department is working with the Stores Department on a laboratory test designed to simulate field conditions. The test will specify the number of flexures a shovel must withstand under fixed conditions without any apparent failure. Failures occurring in the handle or blade will be classed as material failures. Failures occurring at welds or riveted joints will be classed as fabrication failures. Present indications are that a test may be devised which will simulate field conditions in the laboratory and give a fast check on both materials and quality of workmanship.

Results indicate that when repeated stresses are applied, failure will occur in a definite pattern depending upon the quality of the shovel. Shovels of comparable grades fail at approximately the same number of cycles. From these observations, it is believed that the severity of the test can be made such that any shovel can be graded by the number of cycles necessary to accomplish failure. Our specifications will be based on the number of cycles necessary to cause failure of the best grade of chromium molybdenum shovels available commercially.

To our knowledge there is no commercial stock shovel available which will meet all provisions of our specification. Apparently shovel manufacturers have spent a great deal of time designing shovels for general use, and many special uses. However, they have never considered specifically the type of work being done by highway maintenance forces. From all reports, the shovels manufactured under the following specifications are proving to be far more satisfactory to the users than any stock shovels we have been able to procure in the past.

The highway workers who actually use these shovels wrote the specifications by telling the Stores Department engineers what they wanted. As a result of this cooperation the Stores Department has been able to procure shovels which will give much more wear for each dollar of cost. Being a lighter and better balanced tool, it will increase the efficiency of the men employed on highway maintenance work by requiring less energy to accomplish their shoveling tasks.

**CALIFORNIA DIVISION OF HIGHWAYS
SPECIFICATIONS FOR LONG-
HANDLED SHOVELS**

(a) *General.*—Shovels supplied under these specifications shall be of the type known to the industry as “smooth, plain back.”

The weight of round point shovels shall not exceed fifty-two (52) pounds per dozen and the weight of square point shovels shall not exceed fifty-four (54) pounds per dozen.

The length from tip of blade to the end of the handle shall be not less than 59½ inches nor more than 60½ inches.

The blades of the round point shovels shall be not less than 8¾ inches wide and not more than 9 inches wide, and the length shall be not less than 11½ inches and not more than 12 inches. The width of the blades of the square point shovel shall be not less than 9¼ inches and not more than 9½ inches, and the length shall be not less than 11½ inches and not more than 12 inches.

The shape of the handle shall conform to the dimensions shown on Table I, which table is hereby referred to and made a part of these specifications.

The finish of the blade shall be black or natural and shall be coated with a suitable material to prevent rust while in storage. The strap shall be polished and coated with a suitable material to prevent rust while in storage. The handle shall be sanded and waxed only. No painting or other finish on the handle will be acceptable.

The lift of the shovels shall be not less than 35 inches nor more than 37 inches at the end of the handle. The lift will be measured by clamping the center of the blade to a plane surface at a point two inches from the leading edge of the blade. The vertical distance from that plane surface to the center of the end of the handle shall be the lift. The lift will be based on a shovel measuring 60 inches from the tip of the blade to the end of the handle. The center axis of the blade shall be flat for at least seven inches from the point.

Either plain step or rolled step shovels shall be furnished under these specifications as called for on the purchase order.

(b) *Materials.*—The blade shall be fabricated from 16 gauge sheets of suitable alloy steel. A suitable alloy steel shall be considered as one which has physical characteristics similar to chromium molybdenum steel (A. I. S. I. 4140) or nickel-molybdenum steel properly heat treated to meet the hardness and flexure requirements as set forth in Article (c) Tests, herein. Bidders shall submit chemical analysis of proposed alloy steel to be used. The State reserves the right to reject any bids of alloy steels they feel are not comparable to those listed above.

The handle shall be seasoned ash, Grade SA, as specified in the National Bureau of Standards, Simplified Practice Recommendations R 76-40.

(c) *Tests.*—The Rockwell Number indicating the hardness of the blade shall be not less than 45C nor more than 50C.

With the lower two inches of the blade of a round point shovel held firmly gripped in a vise, with the face out and up, and the blade bent by forcing the handle to move in

Division of Highways Bowling Team Again Is Championship Winner

“Winner, and still champion” for the second successive year, of the State Employees Bowling League is the Division of Highways team.

Last year the team got off to a slow start but climbed steadily all season to win. This year it was in the first division at all times, but still did not clinch the championship until the final match.

Charlie Nassi of the Highway Division is captain of the winning team.

Other members are: Larry Kime, Division of Highways, Al Strubinger and Stan Havlik, Division of Architecture, and Warren Marsden, Division of Contracts and Rights of Way.

a forward and downward direction through an arc of seventy-five degrees (75°) three successive times; the blade shall show no signs of cracking or permanent deformation. The steel used in square point shovels shall be of the same heat or chemical analysis, and shall be heat treated in the same manner as the round point.

(d) *Construction.*—All welds shall be polished to the approximate plane of the blade plate.

The cutting edges shall be sharpened or beveled in accordance with commercial practice. The cutting edges of round point shovels shall be considered as the bottom half of the blade. All exposed metal edges, except the cutting edges of the blade shall be smooth. Rough or raw edges will not be tolerated.

Shank straps shall be flush with the handle and polished.

Rivets shall be countersunk, smoothly finished and polished.

The abbreviation “CAL. DIV. HWYS.” shall be branded on the side of the handle between the straps in letters one-quarter inch high. No markings within 34 inches of the end of the handle or on the top or bottom of the shank of the handle will be permitted. This provision does not prohibit the placing of gummed labels on the shanks.

Table 1—Shape of Handle

(Referred to in Article (a) General.)

Distance in inches from end of handle	Diameter in inches	Tolerance
2.....	1-9/32	± 1/32
4.....	1-1/8	
6.....	1-1/32	
12.....	1-1/32	
16.....	1-1/16	± 1/16
20.....	1-5/32	
24.....	1-1/4	
30.....	1-3/8	
34.....	1-7/16	
Shank.....	1-7/16	

Out of the Mail Bag

FINDS MAGAZINE VALUABLE

SAN MATEO, CALIFORNIA

*California Highways and Public Works
Sacramento, California*

GENTLEMEN: Please send me if possible a copy of *California Highways and Public Works*—the issue of November-December, 1949.

I will appreciate it greatly if you will send me this issue as it is the only one missing from my more than five years' collection.

I have learned more from your magazine and its contributors than I have learned in 35 years of paving experience.

Mail it COD or any other way and I will be very glad to pay for it.

A lawyer borrowed the missing copy to peruse the subject of contracts, decisions, etc., and lost it.

Yours very truly,

U. A. BROWN

PRAISE FOR AL SHIRA

MOORPARK CHAMBER OF COMMERCE

P. O. Box 462

Moorpark, California

MR. CHARLES H. PURCELL

*Director of Public Works
Sacramento, California*

DEAR MR. PURCELL: We have had numerous problems here in the Simi Valley which have been handled effectively by the division foreman in this area, and we of the Moorpark Chamber of Commerce agree unanimously that the improvements made on the Santa Susana Grade is a good example of one of these problems solved.

It has been our observation that your division foreman, Al Shira, did a worthy job in managing both men and equipment with a maximum of efficiency.

I'm sure the people here in the Simi Valley as well as anyone driving the Santa Susana Grade does so with a greater sense of security that was missing prior to the work just completed.

The members of the Moorpark Chamber of Commerce sincerely appreciate your local organization and its men.

Very truly yours,

MELBA BILLINGSLEY, *Secretary*

Moorpark Chamber of Commerce

Highway Bids and Awards for January, February, March, and April, 1950

January, 1950

ALAMEDA COUNTY—Furnishing and installing traffic signals and highway lighting at the intersection of MacArthur Boulevard with Foothill Boulevard and 73d Avenue in the City of Oakland. District IV, Route 5. Scott-Buttner Electric Co., Inc., Oakland, \$14,535. Spott Electrical Co., Oakland, \$14,650; Abbett Electric Corp., Emeryville, \$15,237; Del Monte Electric Co., Oakland, \$15,316. Contract awarded to L. H. Leonardi Electrical Construction Co., San Rafael, \$13,169.

ALAMEDA COUNTY—Across San Leandro Creek and the tracks of the Southern Pacific Company at the south city limits of Oakland, a steel girder bridge to be constructed. District IV, Route 69. Fredrickson Bros., Emeryville, \$697,790; Carl N. Swenson Co., Inc., San Jose, \$705,610; Erickson, Phillips & Weisberg, Oakland, \$706,917; Bates & Rogers Construction Corp., San Francisco, \$707,626; Frederickson & Watson Construction Co., Oakland, \$707,778; J. H. Pomeroy & Co., Inc., San Francisco, \$709,695; Underground Construction Co., Oakland, \$710,534; H. W. Ruby, Sacramento, \$713,394; Charles MacClosky Co., San Francisco, \$716,843; Granite Construction Co., Watsonville, \$716,863; Johnson, Drake & Piper, Inc., Oakland, \$718,491; A. Soda & Son, Oakland, \$723,595; Dan Caputo and Edward Keeble, San Jose, \$732,419; Stolte, Inc., and The Duncanson-Harrelson Co., Oakland, \$736,852; Guy F. Atkinson Co., South San Francisco, \$739,907; Lew Jones Construction Co., Inc., and Brighton Sand & Gravel Co., San Jose, \$748,039; Healy, Tibbitts Construction Co., San Francisco, \$773,682; S. J. Amoroso Construction Co., San Francisco, \$781,152. Contract awarded to C. B. Tuttle Co., Long Beach, \$680,741.

IMPERIAL COUNTY—Across Rockwood Canal, about 2.5 miles south of Brawley, a reinforced concrete slab bridge to be constructed and about 0.4 mile to be graded and surfaced with road-mixed surfacing on imported base material. District XI, Route 201, Section B. Hubbs Equipment Co., Colton, \$28,960; Roland T. Reynolds and Thomas Construction Co., Burbank, \$30,067; E. C. Young & Co., San Fernando, \$30,727. Contract awarded to Arthur A. Johnson, Laguna Beach, \$24,443.

LOS ANGELES COUNTY—On Santa Ana Parkway, between Rosecrans Avenue and Orange county line, about 3.5 miles, a new two-lane roadway parallel to the existing roadway to be graded and paved with asphalt concrete on cement treated base and outer highways to be graded and surfaced with plant-mixed surfacing on untreated rock base, to provide a four-lane divided highway with outer highways on each side. The existing bridge over Coyote Creek is to be extended and three new reinforced concrete slab bridges are to be constructed parallel to the existing bridge. District VII, Route 174, Section B. Griffith Co., Los Angeles, \$695,911; Basich Bros. Construction Co. and Basich Bros., San Gabriel, \$719,829; Sully-Miller Contracting Co., Long Beach, \$730,649; Spencer Webb Co., Los Angeles, \$736,531; Chas. MacClosky Co. and Clyde W. Wood, Inc., North Hollywood, \$760,378; Cox Bros. Construction Co. and J. E. Haddock, Ltd., Pasadena, \$786,551; N. M. Ball Sons, Berkeley, \$791,293; Dimmitt & Taylor and K. B. Nicholas, Monrovia, \$806,677; C. O. Sparks, Inc., and Mundo Engineering Co., Los Angeles, \$832,956; Tomei Construction Co., Van Nuys, \$845,765. Contract awarded to Peter Kiewit Sons Co., Arcadia, \$677,249.

LOS ANGELES COUNTY—On Firestone Boulevard from Rosecrans Avenue to Valley View Avenue, furnish and install highway lighting at two intersections, furnish and install full traffic actuated signal systems and highway lighting at two intersections. District VII, Route 174, Section B. Electric & Machinery Service, Inc., South Gate, \$23,962; Westates Electrical Construction Co., Los Angeles, \$24,018; Clinton Electrical Corp., Los Angeles, \$25,432. Contract awarded to C. D. Draucker, Inc., Los Angeles, \$23,746.

MARIN COUNTY—Constructing two-car garage at bridge tenders' residences at Black Point. District

IV, Route 8, Section A. R. Taylor Willis, Santa Rosa, \$2,932; Parish Bros., Benicia, \$3,199; G. O. Millie Construction Co., San Rafael, \$3,740; W. J. Kubon, San Rafael, \$3,944; Jensen and Pitts, San Rafael, \$5,240. Contract awarded to Herman Krusi, Berkeley, \$2,795.

NAPA COUNTY—Between Foster Road and Union Station about 3.1 miles to be graded and surfaced with plant-mixed surfacing on crusher-run base. District IV, Routes 8, 49, Sections A, D, Nap, B. Rice Bros., Marysville, \$239,917; C. M. Syar, Vallejo, \$240,056; Parish Bros., Benicia, \$257,448; Granite Construction Co., Watsonville, \$258,822; Munn & Perkins, Modesto, \$265,038; A. G. Raisch Co., San Rafael, \$267,852; Eugene G. Alves, Pittsburg, \$268,372; Lee J. Immel, San Pablo, \$274,347; J. R. Armstrong, El Cerrito, \$276,242; Harms Bros., Sacramento, \$283,150; Chittenden & Chittenden, Auburn, \$283,683; Brown-Ely Co. Contractors and E. A. Forde, Corte Madera, \$287,007; Oilfields Trucking Co. and Phoenix Construction Co., Inc., Bakersfield, \$288,779; A. Teichert & Son, Inc., Sacramento, \$288,798; J. Henry Harris, Berkeley, \$297,522; McGillivray Construction Co., Sacramento, \$315,968. Contract awarded to Fredrickson Bros., Emeryville, \$239,505.

SANTA CRUZ COUNTY—Furnishing and installing traffic signal system at the intersection of Santa Cruz-Watsonville Freeway with Morrissey Avenue-Pacheco Avenue in the City of Santa Cruz. District IV, Route 56. Granite Construction Co., Watsonville, \$11,097. Contract awarded to L. H. Leonardi Electrical Construction Co., San Rafael, \$8,935.

SAN MATEO COUNTY—On El Camino Real, between Whipple Avenue and Woodside Road in Redwood City, furnishing and installing traffic signal systems and highway lighting. District IV, Route 2. Manning & Whitaker, Inc., San Francisco, \$35,642; Spott Electrical Co., Oakland, \$39,949; Abbett Electric Corp., San Francisco, \$44,484; Granite Construction Co., Watsonville, \$46,145; H. S. Tuttle Co., San Francisco, \$47,827. Contract awarded to L. H. Leonardi Electrical Construction Co., San Rafael, \$29,999.

SAN MATEO COUNTY—Between Frenchman's Creek and 1.0 mile northerly, about 1.0 mile to be graded and surfaced with plant-mixed surfacing on imported base material. District IV, Route 56, Section C. A. Teichert & Son, Inc., Sacramento, \$97,323; Louis Biasotti & Son, Stockton, \$99,004; Nevada Constructors, Inc., Reno, \$109,240; Granite Construction Co., Watsonville, \$111,025; Elmer J. Warner, Stockton, \$114,754; L. C. Smith, San Mateo, \$133,826; Peter Sorensen, Redwood City, \$137,852. Contract awarded to Eugene G. Alves, Pittsburg, \$82,916.

VENTURA COUNTY—On Oxnard Boulevard, between north city limits and south city limits of Oxnard, about 1.9 miles to be graded and paved with asphalt concrete on cement treated base and existing pavement. District VII, Route 60. J. E. Haddock, Ltd., Pasadena, \$259,536; Granite Construction Co., Watsonville, \$263,439; Griffith Co., Los Angeles, \$263,746; Clyde W. Wood, Inc., North Hollywood, \$264,508; Hensler Construction Corp., Glendale, \$268,263; Frank T. Hickey, Inc., Los Angeles, \$280,865. Contract awarded to Baker & Pollock, Ventura, \$259,445.

VENTURA COUNTY—At the foot of Fir Street in the City of Ventura, the existing Ventura Pier to be repaired. Ventura Beach State Park, District VII. E. G. Perham, Los Angeles, \$26,543; Pugh Construction Corp., San Pedro, \$27,051; E. L. Thorsten, Santa Monica, \$28,166; C. J. B. Construction Co., Oxnard, \$30,377; Macco Corp., Paramount, \$33,475; Shannahan, Inc., Los Angeles, \$43,640; N. M. Saliba Co., Los Angeles, \$63,801. Contract awarded to C. B. Tuttle Co., Long Beach, \$23,753.

F. A. S. County Projects

MONO COUNTY—Between 4.2 miles and 0.4 mile west of U. S. Route 395, about six miles north

of Coleville, about 3.6 miles to be graded. District IX, Route 959. Huntington Bros., San Anselmo, \$91,128; M. W. Brown, Redding, \$107,861; Arthur A. Johnson, Laguna Beach, \$107,977; George Pollock Co., Sacramento, \$110,225; Mathews Construction Co., Alhambra, \$110,574; Clyde W. Wood, Inc., North Hollywood, \$119,133; Bishop Engineering and Construction Co., Bishop, \$127,319; Anderson Company, Visalia, \$139,774; Oilfields Trucking Co. and Phoenix Construction Co., Inc., Bakersfield, \$165,734; Chittenden & Chittenden, Auburn, \$227,628. Contract awarded to Westbrook & Pope, Sacramento, \$88,051.

LOS ANGELES COUNTY—Across San Gabriel River on Florence Avenue, a reinforced concrete girder bridge to be constructed. District VII, Route 838. Lars Oberg, Los Angeles, \$219,751; E. G. Perham, Los Angeles, \$226,223; Byerts & Sons, Los Angeles, \$227,591; Griffith Company, Los Angeles, \$229,515; K. B. Nicholas, Ontario, \$232,200; Gardner & McCall, Long Beach, \$234,035; Charles MacClosky Co., San Francisco, \$238,829; Sharp & Fellows Contracting Co., Los Angeles, \$239,475; C. B. Tuttle Co., Long Beach, \$239,820; Granite Construction Co., Watsonville, \$241,227; W. J. Disteli, Los Angeles, \$243,597; J. E. Haddock, Ltd., Pasadena, \$243,722; Guy F. Atkinson Co., Long Beach, \$243,893; N. M. Saliba Co., Los Angeles, \$249,004; Anderson Company, Visalia, \$259,758; Ralph A. Bell, Monrovia, \$262,983; Spencer Webb Co., Los Angeles, \$265,336; Carlo Bongiovanni Construction Co., Hollywood, \$278,494. Contract awarded to Davies, Keusder & Brown, Los Angeles, \$214,916.

February, 1950

KINGS COUNTY—At junction of Routes 10 and 135 at the east city limits of Hanford, furnish and install traffic signal and lighting system. District VI, Routes 10 and 135. Section, Han, A. A. Clinton Electric Corp., Los Angeles, \$9,565; L. H. Leonardi Electric Construction Co., San Rafael, \$10,281; R. O. Ferguson Company, Visalia, \$10,919. Contract awarded to Westates Electrical Construction Co., Los Angeles, \$8,578.

LOS ANGELES COUNTY—Over Hollywood Freeway and outlet ramp, at Hill Street in the City of Los Angeles, a reinforced concrete box girder bridge for an overcrossing to be constructed. District VII, Route 2. Guy F. Atkinson Co., Long Beach, \$396,208; Chas. MacClosky Co., San Francisco, \$410,843; Erickson, Phillips & Weisberg, Oakland, \$412,838; Chas. J. Rounds & Lars Oberg Contractor, Los Angeles, \$422,799; C. B. Tuttle Co., Long Beach, \$422,805; W. J. Disteli & R. J. Daum Construction Co., Los Angeles, \$427,912; J. E. Haddock, Ltd., Pasadena, \$437,750; Frank T. Hickey, Inc. & Byerts & Sons, Los Angeles, \$447,266; Griffith Co., Los Angeles, \$460,861; Oberg Bros. Construction Co., Inglewood, \$471,802; Carlo Bongiovanni Construction Co., Hollywood, \$476,769; Norman I. Fadel, North Hollywood, \$524,936. Contract awarded to Spencer Webb Co., Los Angeles, \$377,131.

LOS ANGELES COUNTY—Between 0.4 miles south of Castaic Creek and 0.4 mile north of Palomas Wash, about 5.1 miles to be graded and surfaced with plant-mixed surfacing on cement treated base, and two reinforced concrete bridges to be constructed. District VII, Route 4, Section A, G. Parish Bros., Benicia, \$793,607; Fredrickson Bros., Emeryville, \$799,560; N. M. Ball Sons, Berkeley, \$843,435; Hensler Construction Corp., Glendale, \$856,016; Claude Fisher Co., Ltd., Los Angeles, \$857,906; Griffith Co., Los Angeles, \$868,579; Yount Constructors Inc. & Winston Bros. Co., Azusa, \$872,669; Rand Construction Co. Inc., Bakersfield, \$879,497; L. A. & R. S. Crow, El Monte, \$888,194; Clyde W. Wood, Inc., North Hollywood, \$891,266; Oilfields Trucking Co. & Phoenix Construction Co. Inc., Bakersfield, \$897,392; Peter Kiewit Sons Co., Arcadia, \$903,986; Cox Bros. Construction Co. & J. E. Haddock, Ltd., Pasadena, \$920,639; A. Teichert & Son, Inc., Sacramento, \$928,228; Granite Construction Co., Watsonville, \$928,632; Dimmitt & Taylor & K. B. Nicholas, Monrovia, \$939,643; Ralph A. Bell, Mon-

rovia, \$966,804; M. J. B. Construction Co., Stockton, \$970,453; Silva & Hill Construction Co., & G. W. Ellis Construction Co., Los Angeles, \$982,504. Contract awarded to Basich Bros. & Basich Bros. Construction Co. & W. C. Lefever & D. Gerald Bing, San Gabriel, \$793,305.80.

ORANGE COUNTY—Between south city limits of Newport Beach and Myrtle Avenue in Laguna Beach, about 5.5 miles to be widened and surfaced with plant-mixed surfacing on untreated rock base and on the existing pavement. District VII, Route 60, Section B, Lgn B. Sully-Miller Contracting Co., Long Beach, \$362,705; Griffith Co., Los Angeles, \$368,226; John J. Swigart Co., Torrance, \$368,716; Cox Bros. Construction Co., Stanton, \$377,790; Arthur A. Johnson, Laguna Beach, \$384,362; Match Bros., Colton, \$401,020. Contract awarded to Hensler Construction Corp., Glendale, \$345,505.

LOS ANGELES COUNTY—On Ramona Freeway between Macy Street and Helen Drive, highway lighting and illuminated sign systems to be furnished and installed. District VII, Route 26, Section L.A.D. Ets-Hokin & Galvan, Wilmington, \$35,881; Newberry Electric Corp., Los Angeles, \$36,465. Contract awarded to Electric & Machinery Service, Inc., South Gate, \$35,664.

SAN DIEGO COUNTY—Metal guide posts and culvert markers. District XI, Route 2. R. E. Hazard Contracting Co., San Diego, \$16,391; Griffith Co., Los Angeles, \$16,659. Contract awarded to V. R. Dennis Construction Co., San Diego, \$14,953.25.

SAN BERNARDINO COUNTY—One-half mile west of the Ontario city limit at the intersection of Holt Avenue and Central Avenue, furnish and install full traffic actuated signal and highway intersection lighting system. District VIII, Route 26, Section C. Paul R. Gardner, Ontario, \$8,613; Westates Electrical Construction Co., Los Angeles, \$8,904; C. D. Draucker Inc., Los Angeles, \$8,732. Contract awarded to Clinton Electric Corp., Los Angeles, \$8,463.

SAN BERNARDINO COUNTY—At Wheaton Wash Maintenance Station, about 36 miles east of Baker, a metal fence to be constructed. District VIII, Route 31, Section P. Los Angeles Fencing Co. Inc., Los Angeles, \$3,255; Alcorn Fence Co., Los Angeles, \$3,394. Contract awarded to American Steel & Wire Co. of New Jersey (Cyclone Fence Div.), Glendale, \$3,177.

VENTURA COUNTY—In the City of Oxnard at the intersection of Oxnard Boulevard with Saviers Road-Wooley Road, traffic signal system and intersection lighting to be furnished and installed. District VII, Route 60. Electric & Machinery Service, Inc., South Gate, \$11,992; C. D. Draucker, Inc., Los Angeles, \$12,718; Paul R. Gardner, Ontario, \$12,953; C.J.D. Construction Co., Oxnard, \$13,766. Contract awarded to Westates Electrical Construction Co., Los Angeles, \$11,937.

YOLO COUNTY—On the Yolo Causeway, furnish and install highway lighting system. District III, Route 6, Section B. Del Monte Electric Co., Oakland, \$31,942; Manning & Whitaker, Inc., San Francisco, \$32,266; Collins Electrical Co., Stockton, \$32,666; Wismer & Becker, Sacramento, \$32,790; Reliable Elevator Works, Sacramento, \$35,054; Abbott Electric Corp., Emeryville, \$35,378; R. Goold & Son, Stockton, \$36,720; Luppen & Hawley, Inc., Sacramento, \$37,116; Karl F. Stoltzing, Santa Rosa, \$37,185; Spott Electrical Co., Oakland, \$41,456; Scott-Butner Electric Co. Inc., Oakland, \$47,985; Underground Electric Construction Co., Oakland, \$52,335; L. H. Leonardi Electric Construction Co., San Rafael, \$53,449. Contract awarded to Grason Electric Co., Sacramento, \$29,749.

F. A. S. County Projects

KERN COUNTY—Brundage Lane, between Union Avenue and Fairfax Road, about four miles to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VI, Route 575. Griffith Company, Los Angeles, \$132,222; Rand Construction Co. Inc., Bakersfield, \$133,949; Rice Brothers, Marysville, \$179,884; Contract awarded to Oilfields Trucking Co. & Phoenix Construction Co. Inc., Bakersfield, \$130,254.

TULARE COUNTY—On Lovers Lane, between State Route 134 and six miles north, about 6.0 miles to be graded and surfaced with road-mixed surfacing on cement treated imported base material. District

VI, Route 1137. P. J. Moore & Son, North Sacramento, \$132,104; Anderson Company, Visalia, \$137,932; Oilfields Trucking Co. & Phoenix Construction Co. Inc., Bakersfield, \$138,251; K & H Company, Colton, \$141,534; Rice Bros., Inc., Marysville, \$143,869; Rand Construction Co. Inc., Bakersfield, \$144,115; Nevada Constructors, Inc., Reno, \$146,534; Munn & Perkins, Modesto, \$147,141; Gene Richards, Inc., Fresno, \$148,000; Frank T. Hickey, Inc., Los Angeles, \$151,993; Louis Biasotti & Son, Stockton, \$153,361; Valley Paving & Construction Co., Inc., Pismo Beach, \$159,316; Volpa Brothers, Fresno, \$159,395; Griffith Company, Los Angeles, \$163,328; George Pollock Co., Sacramento, \$173,766; Covina Construction Co., Covina, \$178,181; Halloran & Gill, Bakersfield, \$179,909; Clyde W. Wood & Sons, Inc., North Hollywood, \$182,442; Elmer J. Warner, Stockton, \$185,985; Madonna Construction Co., San Luis Obispo, \$199,852; Dicco, Inc. & Dix-Syl Construction Co. Inc., Bakersfield, \$200,116. Contract awarded to George E. France, Inc., Visalia, \$123,805.

GLENN COUNTY—Across Willow Creek about four miles west of State Route 45, an existing reinforced concrete bridge to be widened. District III, Route 1121. H. H. Anderson, San Leandro, \$9,710; James H. McFarland, San Francisco, \$10,758; Lord & Bishop, Sacramento, \$10,993; O'Connor Bros., Red Bluff, \$11,098; Gordon C. Weems, Willows, \$11,470; Chittenden & Chittenden, Auburn, \$11,868; Ted Schwartz, Smartville, \$11,976; H. Earl Parker Inc., Marysville, \$12,392; Louis Bormolini & Son, Novato, \$12,728; J. P. Brennan, Redding, \$12,780; C. O. Bodenhamer, Redwood City, \$12,889; B. S. McElderry, Berkeley, \$13,682. Contract awarded to Bos Construction Co., Oakland, \$9,532.

March, 1950

ALAMEDA COUNTY—Across Vallecitos Creek about 9 miles southwest of Livermore, a bridge to be repaired. District IV, Route 108, Section A. Earl W. Heple, San Jose, \$3,628; Bos Construction Co., Oakland, \$3,761; Jas. H. McFarland, San Francisco, \$3,886; O. C. Jones & Sons, Berkeley, \$3,964; Dan Caputo, San Jose, \$4,414; Herbert H. Anderson, San Leandro, \$4,482; J. Henry Harris, Berkeley, \$4,793; B. S. McElderry, Berkeley, \$5,982. Contract awarded to Lew Jones Construction Co., San Jose, \$3,409.

CONTRA COSTA COUNTY—Between Port Chicago Road and Pittsburg, about 4.5 miles to be graded and surfaced with plant-mixed surfacing on existing pavement and on cement treated base, a curbed central dividing strip and two reinforced concrete bridges to be constructed to provide a four-lane divided highway. District IV, Route 75, Section F. United Concrete Pipe Corp., Baldwin Park, \$853,223.95; Fredrickson Bros., Emeryville, \$871,123; Fredrickson & Watson Construction Co., Oakland, \$880,806; Dan Caputo & Edward Keeble, San Jose, \$912,457; Guy F. Atkinson Co., South San Francisco, \$923,923; H. Earl Parker Inc. & N. M. Ball Sons, Berkeley, \$965,564; Lord & Bishop & M. J. B. Construction Co., Sacramento, \$992,865; Harms Bros., Sacramento, \$1,036,426; Charles L. Harney, Inc., San Francisco, \$1,244,866. Contract awarded to Parish Bros., Benicia, \$815,811.25.

IMPERIAL COUNTY—In the City of Brawley at the intersections of Main Street with First Street and with Sixth Street, traffic signal systems and intersection lighting to be furnished and installed. District XI, Routes 26, 187. Ed Seymour, Long Beach, \$11,828; Ets Hokin & Galvan, San Diego, \$12,098. Contract awarded to Westates Electrical Construction Co., Los Angeles, \$11,432.

IMPERIAL COUNTY—Between two miles northwest of Niland and Riverside county line, about 21.8 miles to be graded and surfaced with road-mixed surfacing on imported base material. District XI, Route 187, Sections F, G. Dimmitt & Taylor, Monrovia, \$420,783; Arthur A. Johnson, Laguna Beach, \$421,116; Peter Kiewit Sons Co., Arcadia, \$439,157; E. L. Yeager Co., Riverside, \$449,697; Anderson Co., Visalia, \$454,356; Cox Bros. Construction Co., Stanton, \$454,549; Claude Fisher Co., Ltd., Los Angeles, \$455,359; R. P. Shea Construction Co., Indio, \$469,701; Clyde W. Wood & Sons, Inc., North Hollywood, \$470,250; Basich Bros. Construction Co. & Basich Bros., San Gabriel, \$475,578; R. T. Reynolds & Thomas Construction Co., Bur-

bank, \$501,930. Contract awarded to Hensler Construction Corp., Glendale, \$388,296.

IMPERIAL COUNTY—Between Ash Canal and South Alamo Canal, a distance of about 0.6 mile to be graded and surfaced with road-mixed surfacing on imported base material. District XI, Route 202, Section C. E. S. & N. S. Johnson, Fullerton, \$28,772; E. C. Young & Co., Bakersfield, \$29,828; Mathews Construction Co., Alhambra, \$31,076; Claude Fisher Co., Ltd., Los Angeles, \$35,722; Anderson Co., Visalia, \$36,350; James L. Miller & Sons, Los Angeles, \$38,282; Foster & McHarg, Riverside, \$46,410. Contract awarded to Hubbs Equipment Co., Colton, \$22,399.

LOS ANGELES COUNTY—At the intersection of Sierra Highway with 10th Street, furnish and install semi-traffic actuated signal system. District VII, Route 23, Section F. Westates Electrical Construction Co., Los Angeles, \$5,180; Clinton Electric Corp., Los Angeles, \$5,638; Paul R. Gardner, Ontario, \$5,788; C. D. Draucker, Inc., Los Angeles, \$5,964. Contract awarded to Electric & Machinery Service, Inc., South Gate, \$4,980.

LOS ANGELES COUNTY—At the intersection of Valley Boulevard with Mountain View Road, furnish and install fixed time traffic signal system. District VII, Route 77, Section A. Westates Electrical Construction Co., Los Angeles, \$2,097; Paul R. Gardner, Ontario, \$2,256; C. D. Draucker, Inc., Los Angeles, \$2,385. Contract awarded to Electric & Machinery Service, Inc., South Gate, \$2,042.

ORANGE COUNTY—In the City of Tustin, at the intersection of D Street with Main Street, furnish and install full traffic actuated signal system and intersection lighting. District VII, Route 2. Westates Electrical Construction Co., Los Angeles, \$8,496; Clinton Electric Corp., Los Angeles, \$8,993; Paul R. Gardner, Ontario, \$9,411; C. D. Draucker, Inc., Los Angeles, \$9,643. Contract awarded to Electric & Machinery Service, Inc., South Gate, \$8,305.

SAN BERNARDINO COUNTY—California Institution for Men at Chino, about 1.2 miles, roads within the institution grounds to be graded and surfaced with plant-mixed surfacing on imported base material. District VIII. R. A. Erwin, Colton, \$20,228; Ralph J. Laird, La Verne, \$20,267; Hubbs Equipment Co., Colton, \$20,863; A. A. Edmondson, Glendale, \$21,757; American Asphalt Paving Co., Monrovia, \$21,869; George Herz & Co., San Bernardino, \$22,235; Parker Engineering Co., Claremont, \$23,800; John J. Swigart, Torrance, \$23,975; Cox Bros. Construction Co., Stanton, \$25,092; A. Teicher & Son, Inc., Sacramento, \$25,130; Bonadiman-McCain, Inc., Los Angeles, \$25,540; Boulder Construction Co., Van Nuys, \$26,154; Dimmitt & Taylor, Monrovia, \$26,593; Griffith Co., Los Angeles, \$28,608. Contract awarded to Match Bros., Colton, \$18,714.

SAN JOAQUIN COUNTY—Between Mariposa Road and Calaveras River and at D Street, furnishing and installing highway lighting at seven intersections and two interchange areas. District X, Routes 4, 5, Sections E, Stkn. C, Stkn. R. O. Ferguson Co., Visalia, \$21,487; Curtis Electric Co., Stockton, \$22,178; Collins Electric Co., Stockton, \$22,888; L. H. Leonardi Electric Construction Co., San Rafael, \$22,987; Ets-Hokin & Galvan, Stockton, \$25,479. Contract awarded to R. Goold & Son, Stockton, \$20,985.

ORANGE COUNTY—On Santa Ana Freeway between 0.2 mile southeast of Euclid Avenue and State Highway Route 2 at Miraflores, about 2.9 miles, a new two-lane roadway parallel to portions of the existing roadway to be graded and paved with asphalt concrete on cement treated base, the portion through Anaheim to be widened on both sides and paved with asphalt concrete on existing pavement and new cement treated base and outer highways to be graded and surfaced with plant-mixed surfacing on untreated rock base, to provide a four-lane divided highway with outer highways. District VII, Route 174. John J. Swigart Co., Torrance, \$312,200; Sully-Miller Contracting Co., Long Beach, \$315,116; J. E. Haddock, Ltd., Pasadena, \$332,772; Peter Kiewit Sons Co., Arcadia, \$345,565; Basich Bros. Construction Co. & Basich Bros., San Gabriel, \$358,555. Contract awarded to Griffith Co., Los Angeles, \$308,228.

ORANGE COUNTY—On Santa Ana Freeway, between Los Angeles county line and 0.2 mile southeasterly of Euclid Avenue, about five miles in length, a new two-lane roadway to be graded and surfaced with asphalt concrete on cement treated

base; portions of the existing pavement to be resurfaced with asphalt concrete; shoulders to be constructed of untreated rock surfacing and bituminous surface treatment applied thereto; and other highways to be constructed to provide a four-lane divided highway. District VII, Route 174, Section A. Griffith Co., Los Angeles, \$488,040; Peter Kiewit Sons Co., Arcadia, \$514,167; Cox Bros. Construction Co. & J. E. Haddock, Ltd., Pasadena, \$516,891; Basich Bros. Construction Co. & Basich Bros., San Gabriel, \$578,498. Contract awarded to Sully-Miller Contracting Co., Long Beach, \$466,258.

SAN BERNARDINO COUNTY—At Wheaton Wash Maintenance Station, three cottages to be constructed. District VIII, Route 31, Section P. Contract awarded to The Mahoney-Morrison Co., Sunland, \$25,000.

SAN BERNARDINO COUNTY—City of San Bernardino, between E Street and east city limits, about 1.8 miles in length, existing roadbed to be widened and resurfaced with plant-mixed surfacing. District VIII, Route 190. Matich Bros., Colton, \$126,116; R. A. Erwin, Colton, \$138,646; E. L. Yeager Co., Riverside, \$147,510. Contract awarded to George Herz & Co., San Bernardino, \$121,545.

SAN LUIS OBISPO COUNTY—Between Route 125 and Kern county line, about 4.2 miles, plant-mixed surfacing to be placed over cement treated imported borrow and existing pavement. District V, Route 33, Section C. Valley Paving and Construction Co., Inc., Pismo Beach, \$103,493; N. M. Ball Sons, Berkeley, \$112,012; Rand Construction Co., Bakersfield, \$112,049; Madonna Construction Co., San Luis Obispo, \$121,876. Contract awarded to Granite Construction Co., Watsonville, \$98,457.

SANTA CLARA COUNTY—On Bayshore Highway at North First Street, a full traffic actuated signal system and highway lighting to be furnished and installed and channelization to be constructed. District IV, Route 68, Section B, SJs. J. C. Bateman, Inc., San Jose, \$28,047; A. J. Raisch Paving Co., San Jose, \$30,601; Granite Construction Co., Watsonville, \$31,251; Leo F. Piazza, San Jose, \$33,345. Contract awarded to Dan Caputo, San Jose, \$27,590.

SOLANO COUNTY—At Fairfield Maintenance Station about three-fourths mile west of Fairfield, a prefabricated metal truck shed to be constructed. District X, Route 7, Section B. Da Roza-Ribal, Inc., Monterey, \$13,978; E. & G. Construction Co., Rio Vista, \$14,600; J. A. Waterbury Construction Co., Inc., Sacramento, \$16,190; O'Connor Bros., Red Bluff, \$16,995; J. A. Bryant, Vallejo, \$19,052; Cannon Construction Co., Stockton, \$21,679. Contract awarded to E. J. Solomon, San Andreas, \$13,075.

TULARE COUNTY—Between Visalia and Venida Substation, about 8.1 miles to be surfaced with plant-mixed surfacing and seal coat applied. District VI, Route 10, Section Vis., C. G. W. Ellis Construction Co., North Hollywood, \$103,700; Valley Paving and Construction Co., Inc., Pismo Beach, \$104,825; Gene Richards, Inc., Fresno, \$107,326; N. M. Ball Sons, Berkeley, \$110,161; Rand Construction Co., Bakersfield, \$107,305; Guy F. Atkinson Co., South San Francisco, \$112,036; Peter Kiewit Sons' Co., Arcadia, \$113,412; M. J. Ruddy & Son, Modesto, \$123,440; Rice Bros., Inc., Marysville, \$124,987. Contract awarded to Griffith Co., Los Angeles, \$97,530.

April, 1950

AMADOR COUNTY—Between the north city limits and the south city limits of Plymouth, about 0.9 mile in length, existing shoulders to be excavated and imported base material to be placed over shoulders and existing surfacing and surfaced with road-mixed surfacing. District X, Route 65. Claude C. Wood Co., Lodi, \$18,411; Beerman & Jones, Sonora, \$20,188; Browne & Krull, Hayward, \$20,448; Louis Biasotti & Son, Stockton, \$20,990; Miles & Bailey, Madera, \$21,679; Paul E. Woof, Fresno, \$22,230; Eugene G. Alves, Pittsburg, \$22,769; C. M. Syar, Vallejo, \$22,993; A. Teichert & Son, Inc., Sacramento, \$23,687; O'Connor Bros., Red Bluff, \$24,247; J. Henry Harris, Berkeley, \$26,804; Harms Bros., Sacramento, \$27,017; Tyson & Watters, Inc., Sacramento, \$29,339; Brighton Sand & Gravel Co., Sacramento, \$38,930. Contract awarded to P. S. Moore & Son, North Sacramento, \$16,396.

BUTTE COUNTY—Between Chico and Tehama county line, portions, existing structures to be ex-

tended and roadbed to be widened. District III, Route 3, Section D. Wm. E. Thomas Construction Co., Sacramento, \$30,967; C. O. Bodenhamer, Redwood City, \$33,084; O'Connor Bros., Red Bluff, \$37,631; Baker Trucking Co. & Gordon C. Weems, Hamilton City, \$38,900; Liston Ehorn, Red Bluff, \$39,752; Louis Bormolini & Son, Novato, \$41,610; Robert Taylor, Oroville, \$42,148; J. P. Brennan, Redding, \$55,382. Contract awarded to Minton & Kubon, San Francisco, \$27,361.

CONTRA COSTA COUNTY—In the City of Richmond, at Rust Drain, a reinforced concrete culvert to be constructed and a detour to be graded and surfaced and later obliterated. District IV, Route 69. J. R. Armstrong, El Cerrito, \$30,496; J. Henry Harris, Berkeley, \$32,913; Minton & Kubon, San Francisco, \$32,991; B. S. McElderry, Berkeley, \$41,632. Contract awarded to Lee & Immel, San Pablo, \$28,817.

DEL NORTE COUNTY—Between Klamath River Bridge and Wilson Creek, about 6.7 miles to be surfaced with plant-mixed surfacing on cement treated base. District I, Route 1, Section A. Clements Co., Hayward, \$252,600; N. M. Ball Sons, Berkeley, \$255,348. Contract awarded to Harms Bros & C. M. Syar, Sacramento, \$247,230.

DEL NORTE COUNTY—Between Smith River Bridge and one-fourth mile north of Winton Corners, about 4.7 miles to be graded and a two-span steel girder bridge with reinforced concrete deck to be constructed across Rowdy Creek. District I, Route 71, Sections A.B. Piombo Construction Co., San Francisco, \$404,414; John Burman & Sons & G. M. Carr, Bati Rocca, Eureka, \$415,248; Mercer Fraser Co., Inc., Mercer, Fraser Gas Co., Inc., J. L. Conner, Jr., Eureka, \$419,920; Johnson Drake & Piper, Inc., Oakland, \$489,887. Contract awarded to N. M. Ball Sons, Berkeley, \$393,374.

GLENN AND BUTTE COUNTIES—At Big Butte Creek, about 6.50 miles east of Butte City, a bridge and approaches to be constructed. District III, Route 45, Sections C.A. M. A. Jenkins, Sacramento, \$79,447; Fredrickson Bros., Emeryville, \$80,351; Lew Jones Construction Co., San Jose, \$81,007; Underground Construction Co., Oakland, \$81,255; H. Earl Parker, Inc., Marysville, \$82,543; R. G. Clifford, South San Francisco, \$82,679; C. B. Tuttle Co., Long Beach, \$83,068; Elmer J. Warner, Stockton, \$85,184; E. H. Peterson & Son, Richmond, \$85,391; E. G. Perham, Los Angeles, \$87,175; Chittenden & Chittenden, Auburn, \$89,031; O'Connor Bros., Red Bluff, \$96,807; J. P. Brennan, Redding, \$101,746. Contract awarded to Transocean Engineering Corp., San Lorenzo, \$73,575.

HUMBOLDT COUNTY—Between one mile south of Orick and two miles south of Del Norte county line, about 5.2 miles to be surfaced with plant-mixed surfacing on cement treated base. District I, Route 1, Section K. Harms Bros. C. M. Syar, Sacramento, \$202,812; N. M. Ball Sons, Berkeley, \$211,502; Clements & Co., Hayward, \$230,325; A. Teichert & Son, Inc., Sacramento, \$232,030; Piombo Construction Co., San Francisco, \$272,119. Contract awarded to Mercer, Fraser Co. & Mercer Fraser Gas Co., Inc., Eureka, \$199,803.

IMPERIAL COUNTY—Across San Felipe Creek and overflow, about 2.5 miles east of San Diego county line, a reinforced concrete slab bridge to be constructed and about 0.5 mile of approaches and dip to be graded and bituminous surface treatment applied thereto, and drainage channels to be improved. District XI, Route 198, Section A. E. C. Young & Co., San Fernando, \$103,255; Arthur A. Johnson, Laguna Beach, \$105,341; Norman I. Fadel, North Hollywood, \$107,580; Thomas Construction Co. & Roland T. Reynolds, Burbank, \$107,787; E. G. Perham, Los Angeles, \$107,963; Mathews Construction Co., Alhambra, \$109,166; Bent Construction Co., Los Angeles, \$109,870; C. B. Tuttle Co., Long Beach, \$115,842; Walter H. Barber & H. R. Breeden, La Mesa, \$117,266; Oberg & Cook, Gardena, \$119,430; Claude Fisher Co., Ltd., Los Angeles, \$121,038; E. S. & N. S. Johnson, Fullerton, \$121,455; Foster & McHarg, Riverside, \$122,637; Dimmitt & Taylor, Monrovia, \$124,348; A. A. Edmondson, Glendale, \$124,522; Byerts & Sons, Los Angeles, \$135,069; Ralph A. Bell, Monrovia, \$145,689. Contract awarded to Anderson Company, Visalia, \$96,791.

KERN COUNTY—Between six miles west and two miles west of San Emidio Road, about 4 miles to be surfaced with road-mixed surfacing. District VI,

Route 57, Section B. Griffith Co., Los Angeles, \$37,738; Oilfields Trucking Co. & Phoenix Construction Co., Inc., Bakersfield, \$39,091; Halloran & Gill, Bakersfield, \$40,078; California Fresno Asphalt Co., Fresno, \$42,850; Louis Biasotti & Son, Stockton, \$43,809; Browne & Krull, Hayward, \$44,350; Rexroth & Rexroth, Bakersfield, \$46,345; Valley Paving & Construction Co., Inc., Pismo Beach, \$46,485; E. S. & N. S. Johnson, Fullerton, \$48,625; Dicco, Inc., Bakersfield, \$55,214; Covina Construction Co., Covina, \$55,720. Contract awarded to Rand Construction Co., Inc., Bakersfield, \$32,445.

KINGS COUNTY—Between 0.2 mile and 5.2 miles north of Kettleman City, about 5 miles in length, constructing a graded roadbed, placing imported borrow and imported base material and applying bituminous surface treatment and seal coats. District VI, Route 125, Section C. Anderson Co., Visalia, \$108,141; P. J. Moore & Son, North Sacramento, \$110,773; Volpa Bros., Fresno, \$124,859; Munn & Perkins, Modesto, \$125,049; Oilfield Trucking Co. & Phoenix Construction Co., Inc., Bakersfield, \$125,448; Ted F. Baun, Fresno, \$126,457; Rand Construction Co., Inc., Bakersfield, \$130,457; Valley Paving & Construction Co., Inc., Pismo Beach, \$133,280; Rice Bros., Inc., Marysville, \$134,558; McGilivray Construction Co., Sacramento, \$134,806; Griffith Co., Los Angeles, \$136,084; Gene Richards, Inc., Fresno, \$139,477; T. M. Page, Monrovia, \$141,349; Claude Fisher Co., Inc., Los Angeles, \$144,266; Roland T. Reynolds & Thomas Construction Co., Burbank, \$145,264; N. M. Ball Sons, Berkeley, \$167,968. Contract awarded to Westbrook & Pope, Sacramento, \$98,468.

LAKE COUNTY—Between 0.4 mile west and 0.7 mile east of Tulelake, about 1.4 miles to be graded, road-mixed surfacing to be constructed on cement treated imported base material and seal coats to be applied. District I, Route 15, Section A. Eugene G. Alves, Pittsburg, \$196,719; Piombo Construction Co., San Francisco, \$196,804; John Burman & Sons, Eureka, \$202,060; Fredrickson & Watson Construction Co., Oakland, \$202,157; Arthur B. Siri, Inc., & Harold Smith, Santa Rosa, \$211,218; F. E. Young & J. R. Armstrong, El Cerrito, \$212,817; Harms Bros., Sacramento, \$215,336; O'Connor Bros., Red Bluff, \$222,759; Tyson & Watters, Inc., Sacramento, \$231,406; Chittenden & Chittenden, Auburn, \$233,945; Westbrook & Pope, Sacramento, \$237,183; N. M. Ball Sons, Berkeley, \$243,325. Contract awarded to M. W. Brown, Redding, \$191,432.

LOS ANGELES COUNTY—On Sepulveda Boulevard, between Ohio Avenue and Bolas Street (portions) about 1.3 miles, to be graded, existing pavement to be widened with untreated rock base, and plant-mixed surfacing to be placed. District VII, Route 158, Sections A.L.A. Schroeder & Co., Sun Valley, \$40,287; Griffith Company, Los Angeles, \$42,170; M. S. Mecham & Sons, South Gate, \$43,662; Oswald Bros. Co., Los Angeles, \$45,479; Vernon Paving Co., Inc., Los Angeles, \$46,639; A. A. Edmondson, Glendale, \$51,687; Tomei Construction Co., Van Nuys, \$53,055. Contract awarded to Jesse S. Smith, Glendale, \$40,242.

LOS ANGELES COUNTY—Between Imperial Highway and Century Boulevard, about 1.1 miles, plant-mixed surfacing to be placed over existing pavement. District VII, Route 164, Section A. C. O. Sparks, Inc., & Mundo Engineering Co., Los Angeles, \$40,333; Jesse S. Smith, Glendale, \$42,458; M. S. Mecham & Sons, South Gate, \$42,623; Griffith Co., Los Angeles, \$44,013; Warren Southwest, Inc., Torrance, \$45,022; Vido Kovacevich Co., South Gate, \$45,175; Vernon Paving Co., Inc., Los Angeles, \$45,690; Hensler Construction Corp., Glendale, \$46,917. Contract awarded to Oswald Bros. Co., Los Angeles, \$38,779.

LOS ANGELES COUNTY—On North Figueroa Street in the City of Los Angeles, between Marmion Way and Avenue 50 about 1.1 miles, existing pavement to be surfaced with plant-mixed surfacing. District VII, Route 165. Schroeder & Co., Sun Valley, \$16,480; Jesse S. Smith, Glendale, \$18,328; Southwest Paving Co., Sun Valley, \$19,066; Warren-Southwest, Inc., Torrance, \$19,256; Vernon Paving Co., Inc., Los Angeles, \$19,370; Griffith Co., Los Angeles, \$16,260. Contract awarded to C. O. Sparks & Mundo Engineering Co., Los Angeles, \$16,260. Successful bidder determined by lot.

LOS ANGELES COUNTY—Firestone Boulevard between Central Avenue and Ivy Street, about 1.3 miles to be surfaced with plant-mixed surfacing. Dis-

tract VII, Route 174, Section B. M. S. Mecham & Sons, South Gate, \$32,574; Vido Kovacevich Co., South Gate, \$33,255; Jesse S. Smith, Glendale, \$34,052; Warren Southwest, Inc., Torrance, \$34,172; Griffith Co., Los Angeles, \$34,516; Vernon Paving Co., Inc., Los Angeles, \$35,128. Contract awarded to C. O. Sparks, Inc., & Mundo Engineering Co., Los Angeles, \$32,395.

MENDOCINO COUNTY—Between Bacon Gulch and one-third mile north of Signal Port Creek, about 0.8 mile to be graded and surfaced with road-mixed surfacing on imported base material. District I, Route 56, Section A. Harold Smith, St. Helena, \$98,981; O'Connor Bros., Red Bluff, \$101,256; C. M. Syar, Vallejo, \$101,674; Eugene G. Alves, Pittsburg, \$104,700; Louis Biasotti & Son, Stockton, \$106,457; John Burman & Sons, Eureka, \$109,920; R. B. Guerin & Co., South San Francisco, \$113,608; Chittenden & Chittenden, Auburn, \$114,143; Fredrickson & Watson Construction Co., Oakland, \$129,262; Miles & Bailey, Madera, \$158,892. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, \$97,905.

MENDOCINO COUNTY—At Salmon Creek about 20 miles south of Fort Bragg, about one mile to be graded, road-mixed surfacing to be constructed on cement treated imported base material and seal coats applied. District I, Route 56, Section D. Harold Smith, St. Helena, \$106,045; Close Building Supply, Hayward, \$107,648; Harms Bros & C. M. Syar, Sacramento, \$109,603; Chittenden & Chittenden, Auburn, \$112,498; O'Connor Bros., Red Bluff, \$115,314; John Burman & Sons, Eureka, \$116,390; Eugene G. Alves, Pittsburg, \$121,786; R. B. Guerin & Co., South San Francisco, \$126,446; Fredrickson & Watson Construction Co., Oakland, \$129,878. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, \$104,198.50.

MERCED COUNTY—Between 10.4 miles east of Los Banos and San Joaquin River, about 5.3 miles to be surfaced with plant-mixed surfacing on untreated rock base. District X, Route 32, Section C. P. J. Moore & Son, North Sacramento, \$154,245; M. J. Ruddy & Son, Modesto, \$155,586; Granite Construction Co., Watsonville, \$156,823; Frank B. Marks, Jr., Newman, \$167,990; J. R. Armstrong, El Cerrito, \$174,277; Volpa Bros., Fresno, \$175,220; Fredrickson Bros., Emeryville, \$177,192; Rand Construction Co., Inc., Bakersfield, \$180,538; Fredrickson-Watson Construction Co., Oakland, \$189,173. Contract awarded to Valley Paving & Construction Co., Inc., Pismo Beach, \$153,595.

MERCED COUNTY—Across San Joaquin River about 6 miles east of Gustine, a reinforced concrete slab bridge to be constructed and about 0.6 mile of roadway to be graded and surfaced with plant-mixed surfacing. District X, Route 122, Section A. J. R. Tout Co., Inc., Fresno, \$103,605; C. B. Tuttle Co., Long Beach, \$104,574; Thomas Construction Co., Burbank, \$105,274; Chas MacClosky Co., San Francisco, \$109,719; Fredrickson & Watson Construction Co., Oakland, \$110,939; E. G. Perham, Los Angeles, \$112,396; Dan Caputo & Edw. Keeble, San Jose, \$112,417; Lew Jones Construction Co., San Jose, \$114,895; M. A. Jenkins, Sacramento, \$114,904; Erickson, Phillips & Weisbert, Oakland, \$115,830; Granite Construction Co., Watsonville, \$120,100; F. W. Case Co., Van Nuys, \$126,356. Contract awarded to H. W. Ruby, Sacramento, \$102,496.

MODOC COUNTY—Between Toms Creek and Cedarville, about 8.9 miles to be graded and surfaced with plant-mixed surfacing on cement treated base. District II, Route 28, Section C. Harms Bros., Sacramento, \$331,183; A. Teichert & Son, Inc., Sacramento, \$337,051; Clements & Co., Hayward, \$337,619; McGillivray Construction Co., Sacramento, \$338,738; Fredrickson & Watson Construction Co., Oakland, \$370,807. Contract awarded to Rand Construction Co., Inc., Bakersfield, \$303,851.

MONTEREY COUNTY—Between Spence Underpass and two miles south of Salinas, about 2.4 miles to be graded and surfaced with plant-mixed surfacing on cement treated base. District V, Route 2, Section B. Rice Bros., Inc., Marysville, \$209,289; Ted F. Baun, Fresno, \$212,442; Fredrickson & Watson Construction Co., Oakland, \$239,574; Madonna Construction Co., San Luis Obispo, \$239,644. Contract awarded to Granite Construction Co., Watsonville, \$191,842.

MONTEREY COUNTY—Between Gonzales and Chualar, about 4.9 miles to be surfaced with plant-mixed surfacing and seal coats applied. District V,

Route 2, Section C. Granite Construction Co., Watsonville, \$89,193; Valley Paving and Construction Co., Inc., Pismo Beach, \$89,548; G. W. Ellis Construction Co., North Hollywood, \$89,705; Ted F. Baun, Fresno, \$103,065; J. R. Armstrong, El Cerrito, \$106,842; Harms Bros., Sacramento, \$114,495; Brown-Ely Co. Contr. & E. A. Forde, Corte Madera, \$115,841; Rand Construction Co., Inc., Bakersfield, \$121,213; J. Henry Harris, Berkeley, \$122,877; Madonna Construction Co., San Luis Obispo, \$124,800. Contract awarded to Rice Bros., Inc., Marysville, \$84,865.

ORANGE COUNTY—In the City of San Clemente, between mile 1.77 at Avenida Valencia and mile 3.89, about 2.1 miles to be surfaced with plant-mixed surfacing. District VII, Route 2. Griffith Co., Los Angeles, \$46,183; John J. Swigart Company, Torrance, \$46,208; Cox Bros. Construction Co., Stanton, \$54,331; R. P. Shea Co., Indio, \$57,279; Peter Kiewit Sons' Co., Arcadia, \$57,690. Contract awarded to Sully-Miller Contracting Co., Long Beach, \$39,603.

ORANGE COUNTY—On Huntington Beach Boulevard, between Garfield Avenue and 23d Street, about 5.4 miles to be graded and surfaced with plant-mixed surfacing. District VII, Route 171, Section A. M. S. Mecham & Sons, South Gate, \$138,824; Cox Bros. Construction Co., Stanton, \$139,550. John J. Swigart Co., Torrance, \$139,991; Peter Kiewit Sons' Co., Arcadia, \$153,882; Griffith Co., Los Angeles, \$154,176; Basich Bros. Construction Co. & Basich Bros., San Gabriel, \$158,503. Contract awarded to Sully-Miller Contracting Co., Long Beach, \$131,538.

SAN BERNARDINO COUNTY—Between San Antonio Avenue and Corona Street in the City of Ontario, about 2.7 miles, existing pavement to be resurfaced with plant-mixed surfacing. District VIII, Route 26. R. A. Erwin, Colton, \$39,910; Griffith Co., Los Angeles, \$41,133; Match Bros., Colton, \$41,200; Vido Kovacevich Co., South Gate, \$42,525; American Asphalt Paving Co., Monrovia, \$46,970; Cox Bros. Construction Co., Stanton, \$47,448; Peter Kiewit Sons' Co., Arcadia, \$48,436; Warren Southwest, Inc., Torrance, \$48,719. Contract awarded to George Herz & Co., San Bernardino, \$39,234.

SAN BERNARDINO COUNTY—Highland Avenue between 0.1 mile west of Riverside Avenue and 0.1 mile west of Cajon Creek, about 1.0 mile to be graded and surfaced with plant-mixed surfacing. District VIII, Route 190, Section B. George Herz & Co., San Bernardino, \$39,995; E. L. Yeager Co., Riverside, \$40,428; Match Bros., Colton, \$41,178; K & H Co., Colton, \$42,459. Contract awarded to R. A. Erwin, Colton, \$36,583.

SAN DIEGO COUNTY—Between Del Mar and San Onofre, portions about 11.2 miles in length to be surfaced with plant-mixed surfacing and seal coats applied. District XI, Route 2, Sections A,B, Cn,D. R. P. Shea Construction Co., Indio, \$199,305; Peter Kiewit Sons' Co., Arcadia, \$208,914; G. W. Ellis Construction Co., North Hollywood, \$222,572; R. E. Hazard Contracting Co., San Diego, \$254,677. Contract awarded to Griffith Co., Los Angeles, \$172,724.

EL DORADO COUNTY—Between one-half mile west and one-half mile east of South Fork American River near Lutus, about one mile of roadway to be graded and bituminous surface treatment applied thereto and a structural steel girder bridge with reinforced concrete deck to be constructed. District III, Route 65, Section B. Fredrickson Bros., Emeryville, \$189,590; Al Erickson & Co. and Hunington Bros., Napa, \$192,584; H. W. Ruby, Sacramento, \$193,631; M. A. Jenkins & R. E. Hortal, Sacramento, \$197,754; Chittenden & Chittenden & B. S. McElderry, Auburn, \$201,917; Fredrickson & Watson Construction Co., Oakland, \$208,000; Granite Construction Co., Watsonville, \$208,032; Lord & Bishop, Sacramento, \$215,045; Piombo Construction Co., San Francisco, \$204,962; G. M. Carr & Bati Rocca, Santa Rosa, \$220,856; Elmer J. Warner, Stockton, \$225,539; O'Connor Bros., Red Bluff, \$230,780; Charles MacClosky, San Francisco, \$234,732. Contract awarded to Thomas Construction Co., Burbank, \$188,891.50.

HUMBOLDT COUNTY—Between 0.5 mile south of Stone Lagoon Summit and one mile south of Orick, about 3.8 miles to be surfaced with plant-mixed surfacing on cement treated base. District I, Route 1, Section J. N. M. Ball Sons, Berkeley, \$211,432; Harms Bros. & C. M. Syar, Sacramento, \$213,805; Piombo Construction Co., San Francisco, \$242,

603. Contract awarded to Mercer Fraser Co. & Mercer Fraser Gas Co., Inc., Eureka, \$203,177.

INYO COUNTY—Between Little Lake and 3 miles north, about 2.4 miles to be graded and surfaced with road-mixed surfacing on imported base material. District IX, Route 23, Section G. Browne & Krull, Hayward, \$21,568; Westbrook & Pope, Sacramento, \$21,613; Arthur A. Johnson, Laguna Beach, \$22,973; R. A. Erwin, Colton, \$23,772; Oilfields Trucking Co. & Phoenix Construction Co., Inc., Bakersfield, \$24,751; E. S. & N. S. Johnson, Fullerton, \$26,888; Roland T. Reynolds, Anaheim, \$27,367; Bishop Engineering & Construction Co., Bishop, \$30,001; The Boulden Construction Co., Van Nuys, \$30,066; Rand Construction Co., Inc., Bakersfield, \$32,257; Dix-Syl Construction Co., Inc., Bakersfield, \$34,861. Contract awarded to Halloran & Gill, Bakersfield, \$20,919.

IMPERIAL COUNTY—Between Holtville and Calipatria, portions about 7.4 miles to be surfaced with road-mixed surfacing on imported base material. District XI, Route 187, Sections B,C,D. Bent Construction Co., Los Angeles, \$74,300; A. A. Edmondson, Glendale, \$74,832; E. C. Young & Co., San Fernando, \$75,780; Roland T. Reynolds, Anaheim, \$76,869; Dimmitt & Taylor, Monrovia, \$84,440; Covina Construction Co., Covina, \$89,908. Contract awarded to Arthur A. Johnson, Laguna Beach, \$71,770.

IMPERIAL COUNTY—Between Midway Wells and the Colorado River, portions about 9.7 miles in length to be surfaced with road-mixed surfacing. District XI, Route 27, Sections A,B. Arthur A. Johnson, Laguna Beach, \$63,120; Dimmitt & Taylor, Monrovia, \$72,685; E. C. Young & Co., San Fernando, \$75,360; Covina Construction Co., Covina, \$78,729; Clyde W. Wood & Sons, Inc., North Hollywood, \$79,210. Contract awarded to E. S. & N. S. Johnson, Fullerton, \$57,166.

LOS ANGELES COUNTY—On Olympic Boulevard, between Lemon Street and Boyle Avenue in Los Angeles, about 0.7 mile, existing pavement to be surfaced with plant-mixed surfacing. District VII, Route 173. C. O. Sparks, Inc., & Mundo Engineering Co., Los Angeles, \$17,069; Vido Kovacevich Co., South Gate, \$17,734; M. S. Mecham & Sons, South Gate, \$17,823; Warren Southwest, Inc., Torrance, \$18,338. Contract awarded to Griffith Co., Los Angeles, \$16,491.70.

LOS ANGELES COUNTY—Across Rio Hondo Channel, on Anaheim-Telegraph Road, a structural steel beam bridge on concrete and treated timber pile bents and approaches between Gage Avenue and Tweedy Lane to be constructed. District VII, Route 166, Section A. Oberg Bros. Construction Co., Inglewood, \$244,629; E. G. Perham, Los Angeles, \$244,997; J. E. Haddock, Ltd., Pasadena, \$247,786; C. B. Tuttle Co., Long Beach, \$250,798; Griffith Co., Los Angeles, \$254,153; K. B. Nicholas, Ontario, \$257,112; W. J. Disteli, Los Angeles, \$257,629; Byerts & Sons & Geo. K. Thatcher, Los Angeles, \$259,014; Chas. MacClosky Co., San Francisco, \$259,878; Ralph A. Bell, Monrovia, \$262,350; Guy F. Atkinson Co., Long Beach, \$264,524; Carlo Bongiovanni Construction Co., Los Angeles, \$270,763. Contract awarded to Macco Corp., Paramount, \$242,593.

LOS ANGELES COUNTY—At the intersection of Carson Street with Clark Avenue, furnish and install traffic signal system and highway lighting. District VII, Route 178, Section A. Electric & Machinery Service, Inc., South Gate, \$8,193; Ed Seymour, Long Beach, \$8,495; Clinton Electric Corp., Los Angeles, \$8,578. Contract awarded to Westates Electrical Construction Co., Los Angeles, \$8,096.

MONO COUNTY—Between one mile north of Grant Lake and junction with Route 23, about 1.5 miles to be graded and surfaced with road-mixed surfacing. District IX, Route 111, Section A. Ken Lowe, San Bernardino, \$25,278; Steele & Easton, Sacramento, \$26,730; Browne and Krull, Hayward, \$28,847; Halloran & Gill, Bakersfield, \$29,758; Dix-Syl Construction Co., Inc., Bakersfield, \$31,526; Bishop Engineering & Construction Co., Bishop, \$32,957; Downer & Eckley, Reno, \$38,846. Contract awarded to Westbrook & Pope, Sacramento, \$24,471.

ORANGE COUNTY—In the City of South Laguna, at the intersection of Pacific Coast Highway with Third Avenue, traffic signal system and intersection lighting to be furnished and installed.

... Continued on page 62

DOES A LONG-TIME PLANNING PROGRAM PAY DIVIDENDS?

This paper was presented by J. C. Womack, Planning Engineer, Division of Highways, at the Second California Institute on Street and Highway Problems held in Los Angeles.

THE QUESTION before us almost answers itself. Long-time programs are essential to the operation of any successful business. A successful street or highway program likewise requires a long-time plan and we in the California Division of Highways agree that a long-time highway planning program pays dividends.

There are three major considerations that make long-range planning not only desirable but absolutely essential in our work:

1. The magnitude of the job of bringing our state highways to acceptable modern standards;
2. The complex and extensive detail that is required to prepare modern highway projects for contract; and
3. The limitations of law which require that our funds be distributed among the several counties of the State in compliance with the formula established by the so-called Mayo amendment to the Collier-Burns Highway Act of 1947.

Critical Deficiencies

In preparing for the legislation which resulted in the Collier-Burns Highway Act of 1947 a list of critical deficiencies existing on our state highways was compiled by the Division of Highways. A program based on the elimination of these deficiencies is the core of our long-range planning. To meet and accomplish this long-range plan in an orderly manner advance planning sections have been established in our headquarters office in Sacramento and in the 11 district offices whose function it is to conduct each individual project from its inception up to a point where it can be turned over to the design section for detailed designing.

Five-year Program

Under our procedure the first step in setting up an actual program of projects to be considered for construction or for the purchase of rights of way is the preparation by the advance planning sections in the district offices, of a five-year planning program. These programs are a continuing process and are prepared each year for the subsequent five-year period. The first year of each of these periods is our tentative list of projects to be considered for inclusion in our current budget recommendation to the California Highway Commission.

An estimate of the probable total revenue that will be available for construction and the purchase of right of way for each of the succeeding years of the five-year period is furnished each of the districts, and upon the basis of these figures a list of projects is prepared.

Costs Distributed

Each project is located specifically between named termini within a county and is carefully estimated as to cost for the purchase of rights of way and for actual construction. These costs are then distributed with respect to fiscal years on the basis of the work that is contemplated for those fiscal years. On major projects the funds necessary for the purchase of rights of way may be spread over one or more years preceding the start of construction; also the cost for actual construction may be spread over more than one year, depending on the type and size of the project.

Headquarters Approval

These five-year planning programs, when completed by the districts, are forwarded to Sacramento for preliminary review by the headquarters planning section. During January of each year a conference is held in Sacramento with representatives of each district to discuss the program that they have submitted. The agreements and understandings reached at these meetings are presented to the State Highway Engineer for his consideration and approval.

The approved planning program sets up the list of projects for which the districts are authorized to develop detailed design.

Project Reports

Projects included in approved five-year planning programs are now ready for the preparation of what we call our "project reports." These project reports which are prepared by the districts, are actually a thorough reconnaissance report of a proposed improvement carried out to consistent conclusions and recommendations.

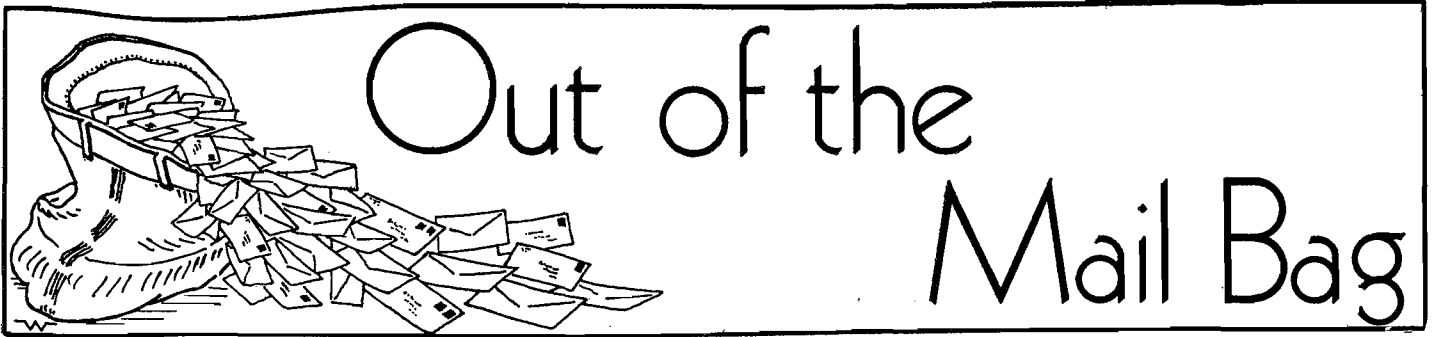
An outline for a typical project report is as follows:

1. General description;
2. Origin of project;
3. Justification and benefits;
 - A. Traffic warrants;
 - B. Economic benefits;
 - C. Structural warrants;
4. Right of way;
5. Conclusion;
6. Recommended action;
7. Data to accompany report;
 - A. Estimate of cost;
 - B. Soils and material data;
 - C. Over-all map of project;
 - D. Typical section;
 - E. Schematic drawings including tentative intersection treatment;
 - F. Traffic charts and accident data;
 - G. Photographs.

Long-time Plan Pays

Each project report that is submitted to headquarters is subject to review and comments from the various interested departments and to the final approval of the State Highway Engineer. This orderly analysis of all proposed highway undertakings insures a full presentation of the objectives sought, a proper determination on location and standards, a reliable estimate of cost and a definite understanding as to the procedure. Moreover, it results in establishing consistent standards and policies for all routes and, of considerable importance, it builds up a record which in time will constitute a coverage of all routes and present the background for ascribing correct priorities for future financing.

Experience is conclusive, to us, that long-time plans pay dividends.



WE LIKE THIS

Surrey Hills
MELBOURNE, AUSTRALIA

California Highways and Public Works
Sacramento, California

DEAR SIR: I am grateful for my continued reception of your journal, and hope that I may remain on your mailing list.

Your courageous progress is an inspiration to us here. My co-readers and self congratulate you on it.

We look forward to the receipt of each journal, and take pride in your achievements.

Yours sincerely,
ARTHUR O. GYLES

ROAD CONSCIOUS

CAMP AND TRAIL CLUB
OAKLAND, CALIFORNIA

KENNETH C. ADAMS, *Editor*
California Highways and Public Works
Sacramento, California

SIR: The members have asked me to write and thank you for the *California Highways and Public Works* magazine that you have been sending to us. We want you to know that we enjoy this magazine and that we are now "road conscious," which we never were before we received it.

After I am sure that every member has read the magazine, I mail it to a cousin in Northern Ireland. He works on the roads there and is always glad to receive the magazine.

So we hope that you will keep us on your mailing list.

Thanking you, I remain,
WILLIAM F. NEVIN
Secretary, Camp and Trail Club
Chapter No. 3

DOING GOOD WORK

F. H. BENHARD
Public Relations Manager
Nevada U. S. 40 Highway Assn.

COLFAX, CALIFORNIA
MR. KENNETH C. ADAMS, *Editor*
California Highways and Public Works
Sacramento, California

DEAR MR. ADAMS: I am enclosing postcard asking to be retained on your mailing list, and am taking this occasion to express to you our association's great appreciation and admiration for your very interesting and comprehensively informative publication.

You are probably familiar with the fact that the Nevada U. S. 40 Highway Association not only concerns itself with all highways leading to Utah, Nevada and Northern California, but also with other surface transportation systems which bring business and tourist trade to the area between the Rockies and the Sacramento Valley.

Thank you for your numerous courtesies.

Very truly yours,
F. H. BENHARD

APPRECIATION

91 Browett Road
COUNDON, COVENTRY, ENGLAND
California Highways and Public Works
Sacramento, California

DEAR SIR: Thank you very much indeed for putting my name on your mailing list for your magazine. I have received two copies so far and have found them interesting in every way, especially as I am an architectural student here in Coventry, England.

Yours sincerely,
LESLIE A. COCKERILL

HAVANA UNIVERSITY

HAVANA, CUBA
CALIFORNIA HIGHWAYS AND
PUBLIC WORKS
Sacramento, California

GENTLEMEN: Again I have pleasure in thanking you for mailing me your valuable magazine *California Highways and Public Works*, which I always look over carefully and from which I take many clippings.

Yours very truly,
JOSE R. SUST
Assistant Professor of Streets
and Highways, School of
Engineering, University
of Havana

OLD SUBSCRIBER

1210 Diana Road
SANTA BARBARA
California Highways and Public Works
Sacramento, California

GENTLEMEN: This past year was the tenth year I have received *California Highways and Public Works*. Ten years ago I was a student in school when I ran across a copy in the school library. At that time I was majoring in civil engineering. A lot has happened since then.

There was a war; then after I came back I switched my major to business. Now I am a traveling salesman; therefore I am still very much interested in our highways.

I probably have the distinction of being one of your youngest subscribers. I am now 24, which would make me just 14 when I received the first copy of the magazine.

There will be many more 10 years for me; hope there will be for you.

Sincerely,
BILL EVERETT.

Auburn Study

Continued from page 6 . . .

The sections labeled *A* and *B* on the map are the centers of business activities in the City of Auburn and here exist the highest property values. Section *B* is along the route of the former highway, while Section *A* is just off the main through lanes of travel. It is in the first block along Section *A* (Lincoln Way) that the 100 percent locations exist.

New Buildings

It is interesting to note that the very best business locations were not fronting on the highway, but rather slightly removed therefrom. Apparently the heavy traffic along the highway had hampered business growth along High Street (Section *B*) so that it was not until after freeway construction began and the prospect of through traffic removal became a certainty that new retail business building began. The new Livingston Building, housing complete modern shopping facilities, pictured herein was built during this period along the former highway.

Section *C* of the map is the historic original section of Auburn existing today much as it did during the mining days before 1900. Some of the old buildings built in this early era, still business-occupied, are pictured in these pages. The narrow, crooked street shown is the westerly entrance to Auburn and formerly carried all U. S. Highway 40 traffic headed eastward or westward. Properties in this section have not changed hands for many years. Businesses here, most of them cafes and bars, showed benefits resulting from the freeway installation. Rental rates have remained unchanged.

Values Remain Equal

The section of former highway northeasterly of the main business district from the railroad underpass, which forms the upper limit to the business district, to its connection with the new freeway, is abutted by property formerly, and still, classified as having either a commercial or residential highest and best use. Values for either use have remained about equal, being approximately \$1,000 to \$2,000

per building "site." (See Section *D* of Map.)

The existence of miles of undeveloped property of this type along the highway had apparently held down the value of the property for a potential commercial use, much as is true along the highways throughout the State. It is evident that all of the highway frontage available can not be profitably developed into commercial property in the foreseeable future. The very remoteness of this potentiality has reasonably held down the values.

Residential Development

Considered for residential development, this section of superseded highway has shown a marked improvement in desirability, if not any substantial increase in value. Probably this is due to the removal of 78 percent of the traffic from this section of the roadway and removal of almost all of the heavy though truck traffic.

Most traffic from the highway entering the City of Auburn now uses one of the approaches near the business district.

Having discovered that the retail sales in Auburn are up well above the logical expectancy since opening the freeway, that parking meter returns have increased, and that the drop in traffic along the city's main street has corresponded almost exactly with the traffic drop along the highway, and assuming the obvious—that all highway traffic does not now pass through the city—our inevitable conclusion is that shoppers from the surrounding areas who had formerly traded elsewhere are now patronizing Auburn merchants.

The fact that over-all retail sales displayed such a marked increase also indicates that highway travelers who formerly stopped en route to their destinations are still turning off the freeway into the historic little city for leisurely dining, service and shopping.

In summarizing the apparent effect of the Auburn freeway on business and property values, with consideration of the effects on traffic along the different sections of the highway in the old section of Auburn, in the modern business section of the city, and along the only partially developed section northeast of the city to its connection with the freeway, we are able to state that the analysis of all factors indicates definite benefits and no harmful effects to any type of property or retail business class.

Bids and Awards

Continued from page 59 . . .

District VII, Route 60, Section C. Westates Electrical Construction Co., Los Angeles, \$3,884; Electric & Machinery Service, Inc., South Gate, \$4,151. Contract awarded to Clinton Electric Corp., Los Angeles, \$3,845.

ORANGE & RIVERSIDE COUNTIES—Between 1.7 miles west of Orange County line and Corona, about 4.9 miles to be graded and surfaced with plant-mixed surfacing on cement treated base and existing surfacing. District VIII, Route 43, Sections B,A. Griffith Co., Los Angeles, \$446,879; R. A. Erwin, Colton, \$450,497; R. P. Shea Construction Co., Indio, \$465,108; E. L. Yeager Co., Riverside, \$466,125; A. Teichert & Son, Inc., Sacramento, \$478,665; Basich Bros. Construction Co. & Basich Bros., San Gabriel, \$486,013; Cox Bros. Construction Co. & J. E. Haddock, Ltd., Pasadena, \$497,142; N. M. Ball Sons, Berkeley, \$579,536. Contract awarded to Peter Kiewit Sons' Co., Arcadia, \$444,857.10.

SAN FRANCISCO COUNTY—In the City and County of San Francisco at State Highway building, parking areas and service area, including sidewalks, curbs, fences, drainage facilities and lighting, to be constructed and installed. District IV. O. C. Jones & Sons Co., Berkeley, \$19,373; The Lowrie Paving Co., Inc., San Francisco, \$19,413; Eaton & Smith, San Francisco, \$22,839; J. Henry Harris, Berkeley, \$27,020; Minton & Kubon, San Francisco, \$27,438; The Fay Improvement Co., San Francisco, \$27,499; Contract awarded to Chas. L. Harney, Inc., San Francisco, \$19,326.20.

SAN BERNARDINO COUNTY—In the City of Redlands, between north city limits and Route 26, and between Orange Street and east city limits, about 4.4 miles to be surfaced with plant-mixed surfacing. District VIII, Route 190. Matich Bros., Colton, \$28,825; R. A. Erwin, Colton, \$29,457. Contract awarded to George Herz & Co., San Bernardino, \$27,325.50.

SAN DIEGO COUNTY—Between Miramar and Lake Hodges, about 11.8 miles to be surfaced with plant-mixed surfacing and seal coats applied. District XI, Route 77, Sections A,B. Griffith Co., Los Angeles, \$215,884; Cox Bros. Construction Co., Stanton, \$236,993; Clyde W. Wood & Sons, Inc., North Hollywood, \$238,403; R. P. Shea Construction Co., Indio, \$261,403. Contract awarded to Peter Kiewit Sons Co., Arcadia, \$207,943.

SAN JOAQUIN COUNTY—Four miles east of Terminous, about 0.3 mile to be graded and surfaced with plant-mixed surfacing. District X, Route 53, Section C. M.J.B. Construction Co., Stockton, \$24,235; A. Teichert & Son, Inc., Sacramento, \$27,042; Eugene G. Alves, Pittsburg, \$27,065; Louis Biasotti & Son, Stockton, \$28,027; Tyson & Watters, Inc., Sacramento, \$32,073. Contract awarded to Claude C. Wood Co., Lodi, \$23,777.10.

SANTA CLARA COUNTY—At various locations between 3.3 miles south of San Jose and Madrone, about 5.8 miles to be resurfaced with plant-mixed surfacing. District IV, Route 2, Section B. A. J. Raisch Paving Co., San Jose, \$103,400; Granite Construction Co., Watsonville, \$111,168; Rand Construction Co., Inc., Bakersfield, \$105,868; Frank B. Marks, Jr., Newman, \$113,410; Harms Bros., Sacramento, \$118,225. Contract awarded to Leo F. Piazza, San Jose, \$100,406.25.

STANISLAUS COUNTY—Between junction with Route 109 and one mile east of Oakdale, about 11.2 miles to be surfaced with plant-mixed surfacing on untreated rock base. District X, Route 13, Sections A,Rvbk,A,Okdle,B. Granite Construction Co., Watsonville, \$199,865; M. J. Ruddy & Son, Modesto, \$204,765; Rand Construction Co. Inc., Bakersfield, \$212,142; N. M. Ball Sons, Berkeley, \$214,553; M.J.B. Construction Co., Stockton, \$217,187; Harms Bros., Sacramento, \$225,707; Fredrickson Bros., Emeryville, \$228,239; United Concrete Pipe Corp., Baldwin Park, \$232,870; Rice Bros. Inc., Marysville, \$239,897; Fredrickson & Watson Construction Co., Oakland, \$244,009; McGillivray Construction Co., Sacramento, \$247,260; A. Teichert & Son, Inc., Sacramento, \$246,315. Contract awarded to Munn & Perkins, Modesto, \$197,800.

Adieu

Continued from page 20 . . .

of its type ever built, was expected to serve for 20 years. The particular feature of this bridge that gives it strength and adds to its life is that all members are in compression. The bridge is 220 feet long and cost \$7,800."

During these early years in District I, Mr. Haselwood must have acquired some of the qualities of resourcefulness that he praises in Mr. Somner. Shortly after he took over as district engineer in District II, he was assigned just about as tough a problem in location and construction that ever confronted a highway engineer: the location and construction of a highway between Weaver-ville and Junction City over Oregon Hill in Trinity County.

Oregon Hill is a mass of gold-bearing gravel that once was part of an ancient stream bed left high above the present river by earth movements millions of years ago. It was the site of the LaGrange Hydraulic Mine, one of the largest in the world, which was actively operated from 1862 until 1918.

Oregon Hill offered very little support for a highway location, except at right angles to the direction it should go, and a direct ascent over the hill involved a 200-foot cut through the mountain as well as through an immense slide of several million cubic yards' extent on the rim of the old mine. Moving this much material was, of course, impossible by ordinary methods of road building.

However, Mr. Haselwood once stated that unusual problems call for unique solutions, and when mountains get in the way of highways they must be moved. And move one he did.

A portion of the water system that supplied the mining operations was still in existence, and a study of the situation proved that it would be feasible to remove the slide and cut through the mountain by the hydraulic mining method. Soon the largest hydraulic operation ever undertaken on highway work was under way with two 8-inch giant monitors slicing down over 5,000 cubic yards of earth an hour. Over 10,000,000 yards were removed in five years by this method, and traffic now travels through Oregon Hill very near the bed of a river millions of years old.

One of the outstanding highway achievements completed under the guidance of Mr. Haselwood was the construction of the Oroville-Quincy or Feather River Highway. He made a complete reconnaissance of this route in 1927 while in District III. This section had become a part of District II by the time he transferred to Redding in 1932, and he directed the completion of surveys and plans and construction of a good many miles of this route. The location follows the Feather River and its tributaries for 70 miles, and the many precipitous areas through rugged canyons with steep and bare granite walls presented some formidable problems in design and construction. For 10 miles between Pulga and Rock Creek the road is cut in the solid walls of the canyon, and three tunnels pierce precipitous points in the Arch Rock, Grizzly Dome, and Elephant Butte areas.

This \$8,000,000 dollar highway was opened to public traffic in 1937 after nine years of intensive construction work by two prison road camps and several contracts. For the engineers, this was the completion of a task, the magnitude and complexity of which is rarely encountered. For the people of Plumas County it was the culmination of a 70-year-old dream, and for the people of the State of California this highway has become a facility of steadily increasing service.

Many other notable highway projects, too numerous to detail here, have been guided to a successful completion by Mr. Haselwood in recent years. Included in these are the relocation of the highway around Shasta Reservoir north of Shasta Dam, and many miles of modern freeways on U. S. 99 in District II.

Other than a trip into Canada this summer, his plans for the future are unformulated, so that he will be free at any time to travel and see and do the things he has never taken time out for in the past. All members of the organization wish him well and sincerely hope that in whatever he undertakes he will derive the pleasure and benefits that are most certainly due him.

He can retire with the satisfaction of a job well done and can well be proud

Intersection Lighting

Continued from page 50 . . .

period, and all of the timing intervals of the dispatcher are affected and modified accordingly. The dispatcher is so designed that it automatically balances the car seconds of delay on the street having the red light against the car seconds of delay which would result were the traffic stopped on the street having the green light. Because of the processes of automatic and continuous balance, it is possible not only to eliminate all unnecessary delay, but materially reduce the total delay at the intersection.

Vehicle detectors have been installed in each approach to the intersection. Allocation of the green light is made on the basis of maximum demand, thereby assuring that the greatest possible traffic volumes will always move through the intersection.

The greatest time saving feature of the traffic actuated signal is that if there are no cars on an approach to the intersection, the signal dispatcher will not give a green light to that street. The green light will remain on the street which had the last car go through the intersection, and the green light will remain until the detectors on the other approaches to the intersection are actuated. This system is quite different from the electric motor operated timers on the city streets which change the green light from one street to the other regardless of the traffic.

A left turn lane is provided for the southbound traffic desiring to turn left into Fruitridge Road. When a vehicle enters the left turn lane it actuates the detector which lets the dispatcher know that the vehicle desires to make a left turn, and at the earliest possible moment a left turn green arrow will appear on the separate signal which is provided over the intersection for the left turn traffic.

of the important role he has played in the pioneering and expansion of our highway system. Many miles of our modern highways will remain as constant reminders of his service to the people of this State, not only as an engineer, but also as an individual vitally interested in progress.

Prison Labor

Continued from page 44 . . .

pares favorably with that of average free labor on similar work.

To become eligible for the camps, inmates must not only have good behavior records in prison but they must volunteer for the assignment, and in order to remain in a camp and retain the privilege of earning a wage, they must work diligently and produce satisfactory work or be returned to the institution.*

Through proper selection and encouragement of the good workers, efficient inmate labor crews are built up that are surprisingly productive.

An excerpt from the First Biennial Report of the California Highway Commission, dated December 31, 1918, describing a Northern California camp, indicates that the same relative efficiency prevailed in the early days of the camp:

"We are building a road 12 feet wide in excavation and 14 feet wide in embankment and all in rough, rugged mountainous country, where transportation of men and supplies is expensive in summer and almost out of the question in winter. Enough supplies must be stored in camp by the middle of November to last until the middle of April."

"Just now the convict camp is very efficient. Comparing it with free labor, the convict will do more work than the average free laborer available at the present time."

CONCLUSIONS

As indicated heretofore, the purpose of this series of articles on prison road camps in California is to record the history, legislation, organization, and administrative procedures developed over 34 years of continuous operation of the camps since 1915.

Experience over this period indicates that there is comparatively no advantage over the contract method in the employment of prisoners for building highways insofar as the economics of highway construction are concerned.

The employment of prisoners in the road camps however, results in advantages to the State aside from the important benefits to the prison system.

By agreement with the Department of Corrections, State Department of Natural Resources, and the U. S. Forest Service, road camp inmates are advantageously utilized for the suppression of forest fires and are of par-

* See article on "Organization" in the May-June, 1949, issue of *California Highways and Public Works*.

ticular value for emergency use in the early stages of a fire within a reasonable distance from the camp.

Through the employment of prison labor, construction has been advanced several years on many of the State's highways in remote mountainous areas that could not have otherwise been financed.

It is the policy of the department, where required to operate prison road camps under directive legislation, to operate them as efficiently as possible with due consideration for prison requirements and maximum return on the highway dollar.

Administrative road camp personnel is tuned to this policy.

AUTHOR'S NOTE:

The author wishes to acknowledge the helpful suggestions of Mr. P. R. Watson, Jr., Assistant Construction Engineer, who has been in charge of general supervision of the road camps since September, 1947, and also Mr. C. J. Tyack, Accountant in charge of prison road camp accounting for the Division of Highways.

The author also wishes to express his appreciation of the considerate cooperation given by Mr. John H. Klinger, Deputy Director of the Department of Corrections, in reviewing the original copy of each of these articles.

EDITOR'S NOTE:

This article concludes the series of seven articles on prison road camps.

Erosion Control

Continued from page 40 . . .

It should be emphasized here that the establishment of an adequate growth of permanent trees and shrubs to reinforce the relatively short-lived Baccharis and willow planting is highly desirable in localities where soil type and rainfall intensity justify these elaborate control measures. Tree and shrub roots, penetrating the fill material, consolidate and bind it to a degree obtainable by no other means, and by the time brush layers rot or wire rusts away these roots are capable of holding the soil firmly in place. Thus, truly permanent control can be established.

Average Costs

The average cost of these various methods, based on 1947, 1948, and 1949 bids is as follows:

	Per lineal foot
Brush layers	\$0.17
Wire reinforced brush mats.....	\$0.50

(One contractor stated his actual cost was over \$1 per lineal foot.)

In Memoriam

WILLIAM J. LENTZ

William J. Lentz, Associate Chemical Testing Engineer with the Materials and Research Department, passed away suddenly March 31, 1950. Mr. Lentz was stricken with a heart attack.

A veteran of two wars, Mr. Lentz had served the Materials and Research Department for 28 years. Born October 19, 1893, in Truckee, California, he came to Sacramento at an early age and was graduated from Sacramento High School.

His first employment with the State of California was for a short period with the State Purchasing Division prior to World War I. After his return from France, where he served with the Chemical Warfare Service, he accepted a position as Chemist with the Southern Pacific Company.

He joined the staff of the Materials and Research Department in 1922, and remained there until his death, with the exception of two years with the Chemical Warfare Service during World War II, during which time he was stationed at Edgewood Arsenal with the rank of Captain.

He was a member of the American Chemical Society and was well-known in paint and varnish circles due to his work in formulating specifications for protective coatings for highway use.

He resided at 530 46th Street, Sacramento, and is survived by his widow, Mrs. Aileen Lentz.

Wire mesh mats (camouflage netting) \$0.55 to \$0.75

(The State furnished war surplus camouflage netting at no cost to the contractor for these mats.)

Wire mesh mats (poultry netting) \$1.15
Straw mat: No costs available.

Straw, furnished and spread on the slopes in two applications at the total rate of six tons per acre, averaged about \$64 per ton, or \$384 per acre. The cost of rolling or compacting slopes, which was set up as a separate item on these contracts, ranged from \$0.08 to \$0.12 per square yard, or \$387.20 to \$580 per acre.

... to be continued

EARL WARREN
Governor of California

CHARLES H. PURCELL
Director of Public Works

FRANK B. DURKEE
Deputy Director

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J. C. WOMACK Planning Engineer
I. O. JAHLSTROM Principal Bridge Engineer
STEWART MITCHELL Principal Bridge Engineer
E. R. HIGGINS Comptroller

Right of Way Department

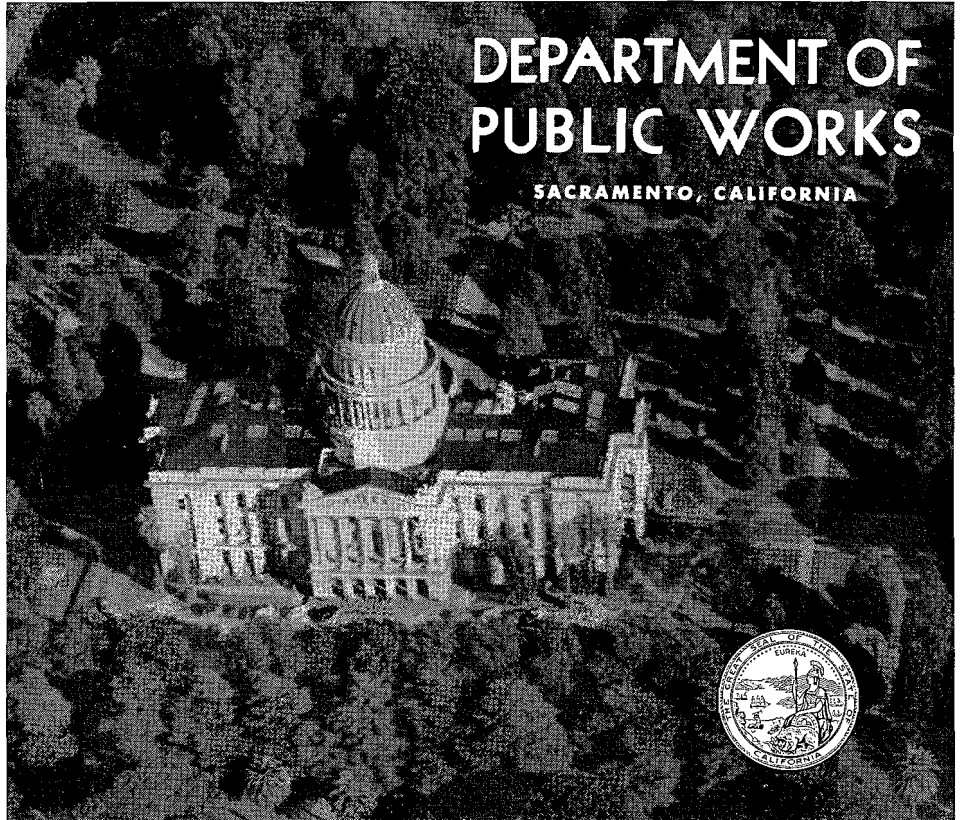
FRANK C. BALFOUR Chief Right of Way Agent
E. F. WAGNER Deputy Chief Right of Way Agent
GEORGE S. PINGRY Assistant Chief
R. S. J. PIANEZZI Assistant Chief
E. M. MacDONALD Assistant Chief

District IV

JNO. H. SKEGGS Assistant State Highway Engineer

District VII

P. O. HARDING Assistant State Highway Engineer



**DEPARTMENT OF
PUBLIC WORKS**
SACRAMENTO, CALIFORNIA

DIVISION OF HIGHWAYS

District Engineers

A. M. NASH District I, Eureka
F. W. HASELWOOD District II, Redding
CHARLES H. WHITMORE District III, Marysville
B. W. BOOKER District IV, San Francisco
L. A. WEYMOUTH District IV, San Francisco
E. J. L. PETERSON District V, San Luis Obispo
E. T. SCOTT District VI, Fresno
W. L. FAHEY District VII, Los Angeles
M. E. CESSNA District VII, Los Angeles
E. Q. SULLIVAN District VIII, San Bernardino
S. W. LOWDEN District IX, Bishop
JOHN G. MEYER District X, Stockton
E. E. WALLACE District XI, San Diego
HOWARD C. WOOD Bridge Engineer, San Francisco-Oakland Bay Bridge and Carquinez Bridge

**DIVISION OF CONTRACTS AND
RIGHTS OF WAY**

Legal

ROBERT E. REED Chief
GEORGE C. HADLEY Attorney
HOLLOWAY JONES Attorney

**DIVISION OF SAN FRANCISCO BAY
TOLL CROSSINGS**

RALPH A. TUDOR Chief Engineer

DIVISION OF WATER RESOURCES

A. D. EDMONSTON State Engineer, Chief of Division
P. H. VAN ETEN Assistant State Engineer
W. H. HOLMES
Principal Engineer, Design and Construction of Dams
G. H. JONES Principal Hydraulic Engineer, Sacramento River Flood Control Project
T. R. SIMPSON
Principal Hydraulic Engineer, State-wide Water Plan
T. B. WADDELL
Principal Hydraulic Engineer, Central Valley Project
GORDON ZANDER
Principal Hydraulic Engineer, Water Rights
GEORGE B. GLEASON
Supervising Hydraulic Engineer, Los Angeles Office
HENRY HOLSINGER Principal Attorney
T. R. MERRYWEATHER Administrative Assistant

DIVISION OF ARCHITECTURE

ANSON BOYD State Architect
W. K. DANIELS Assistant State Architect (Administrative)
P. T. POAGE Assistant State Architect (Design and Planning)
D. C. WILLETT Chief Construction Engineer

Headquarters

A. F. DUDMAN Principal Architectural Designer
C. L. IVERSON Supervising Architectural Draftsman
CARLETON PIERSON Supervising Specification Writer
FRANK A. JOHNSON Principal Structural Engineer
C. A. HENDERLONG
Principal Mechanical and Electrical Engineer
WADE HALSTEAD Supervising Estimator

Schools

W. H. PETERSEN Principal Structural Engineer, Sacramento
H. W. BOLIN . Principal Structural Engineer, Los Angeles

