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CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

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\$87,829,500 Provided by Legislature for Postwar Reemployment, Reconstruction and Readjustment

PLANNING for postwar highway construction by the Department of Public Works will be closely linked with the program of Governor Earl Warren's Reconstruction and Reemployment Commission. This is in accord with the expressed wishes of the Governor who believes that postwar prosperity of a State as large as California will depend upon a scientific system of highways and that such a system, in turn, will depend upon greater vision in planning future highways.

With a huge postwar public works program in the making, the Division of Highways and the California Highway Commission will coordinate their planning policies with those of the Reconstruction and Reemployment Commission and other State agencies to the end that road rehabilitation and new highway construction will go hand in hand with State building, expansion of industries, development of California's natural resources and the creation of future markets and new opportunities for capital with consequent benefits to labor and the forestalling of large scale unemployment.

PRELIMINARY ENGINEERING STARTED

Preliminary surveys and preparation of plans, specifications and estimates of costs for proposed highway projects to be built during the postwar period are rapidly becoming a major phase of the work of the Division of Highways.

During the months of July and August, advance engineering work amounting to \$281,500 was authorized and the preliminary engineering to be financed with these funds was started. The money for this advance engineering consists of Federal funds from appropriations under the National Defense Highway Act of 1941 matched equally with State highway moneys. The total apportionment of the Federal Advance Engineering funds to California was \$398,990.

At its first meeting on September 14th, the new Highway Commission

transferred into the State Highway Budget Fund \$12,000,000 appropriated by the Legislature for highway plans and surveys and the acquisition of rights-of-way for postwar construction. The commission allocated \$3,000,000 of the amount to engineering surveys and \$9,000,000 for right-of-way. This money is now available.

CONTRACT SIGNED WITH UNITED STATES

Endorsement of a proposal by Governor Warren that California enter into an agreement with the United

States Government to cooperate with the War Department in preparing plans and specifications for postwar development of the State Water Plan was voted by the California Water Project Authority on August 31st. The Central Valley Project, now approaching completion, is a unit of the State Water Plan. A contract signed by Director of Public Works C. H. Purcell has been sent to Washington.

Congressional approval of plans which the United States Engineers propose to assemble should result in the expenditure in California of many millions of dollars for postwar construction of flood control, water storage and irrigation projects by Federal agencies, according to Director Purcell.

The State Water Plan, representing 20 years of study by the Division of Water Resources, contemplates 24 major water storage reservoirs and major conveyance canals for the Sacramento and San Joaquin River basins and irrigation for 10,000,000 acres of Central Valley lands.

STATE ASSISTANCE REQUESTED

The United States Engineers requested State assistance from Governor Warren in preparing plans for postwar construction over a period of years. Director Purcell said that under the agreement between the Federal Government and the Department of Public Works, State Engineer Edward Hyatt, and the Division of Water Resources, of which he is the head, will cooperate to the fullest extent with the United States Engineers.

Governor Warren believes that the Government plans will fit into his own postwar planning program.

Coordination of highway construction planning and the aims and purposes of the Reconstruction and Reemployment Commission is imposed upon Mr. Purcell who has a triple responsibility in that he is Director of the Department of Public Works, chairman of the Highway Commission and chairman of the Reconstruction and Reemployment Commission.

Work Should Be Done By Private Contractors Says Paul G. Hoffman

TOO much unemployment for too long is a direct invitation to dictatorship. Perhaps what has not been recognized so clearly is that if government furnishes too much employment for too long, the result will be similar. Regimentation will replace free enterprise, and pressures created by either too much unemployment or too much government spells death to a free country.

There is, of course, an obvious need for a postwar public works program, and there is no conflict whatsoever between planning for such a program and postwar planning by private industry. But if a public works program is to make its maximum contribution toward postwar readjustment of the economy as a whole, it is vital that its implementation provide for the use of private contractors.

*Paul G. Hoffman,
President, the Studebaker
Corporation, and Chairman,
The Committee for
Economic Development*

Public works construction is a continuing function of government. In the opinion of Governor Warren and Purell, plan preparation also should be a continuing function of Federal, State and local governments to guard against wasteful expenditure of public funds in the postwar period.

LEGISLATURE PROVIDES FUNDS

To supplement the recovery efforts of private business it will be necessary to advance to the contract-letting stage thousands of Federal, State and local projects. This will be achieved in California thanks to the farsightedness of the Legislature which appropriated a total of \$14,750,000 to finance plans for State and county highway construction after the war and for preliminary work necessary for a program of reconstruction, rehabilitation and replacement of State-owned buildings, colleges and schools.

Legislative appropriations to aid postwar readjustments aggregate \$87,829,500. They are:

\$43,750,000 (estimated) to make up the "Postwar Employment Reserve" provided for by Chapter 572 and designed to meet the needs of the State for construction and rehabilitation of buildings and facilities and to provide postwar employment. Appropriates \$1,250,000 from this reserve for surveys, preparation of plans and specifications and other preliminary work necessary for a program of reconstruction, rehabilitation and replacement of State-owned buildings, colleges and schools.

\$12,000,000 appropriated by Chapter 564 to the Department of Public Works for the preparation of surveys, plans, and specifications and the acquisition of rights-of-way for State highway postwar construction projects.

\$1,500,000 appropriated by Chapter 565 to be allocated among the counties for the preparation of plans, surveys and specifications for postwar county highway construction projects.

\$30,000,000 bond issue (subject to approval by the voters in the next general election) provided for by Chapter 585 and which funds would be used for purchase of farms and homes for veterans of World War II. Pending the approval of this bond issue \$2,000,000 is appropriated for present use. This amount is to be returned to the State Treasury when bond money becomes available.

\$300,000 appropriated by Chapter 627 to the Veterans Welfare Board for educational assistance to veterans of World War II.

\$150,000 appropriated by Chapter 1058 to the Veterans Welfare Board to assist veterans to prosecute claims against the Government arising out of war service and to establish rights to privileges or compensation.

\$7,500 appropriated by H. R. 190 for use by the Assembly Interim Committee on Postwar Rehabilitation (Knight, T. Fenton, Chairman; Weber, Guthrie, Thompson, and Johnson) to make or cause to be made studies of agriculture, industry, natural resources, labor supply, population changes and other social factors for the purpose of formulating a program to absorb and assimilate into private enterprise men and women discharged from armed services or released from war industries.

\$15,000 appropriated by S. R. 125 for use by the Senate Interim Committee on Postwar Construction (Mayo, Luckey, Mixer, Swing, Engle, Keating, Brown, Breed, and Tenney) to investigate and determine a construc-

tion program which will provide employment following the war.

\$7,000 appropriated to the Joint Legislative Interim Fact-Finding Committee on Agricultural and Industrial Employment and Economic Planning (Hatfield, Chairman; Crittenden, Bashore, Hastain, and Lowrey) to study, analyze and report on a program for complete utilization of the agricultural and industrial capacities of the State and for efficient planning by labor, capital, and government for the war effort and for later peacetime adjustment.

\$100,000 appropriated by Chapter 631 for use of State Reconstruction and Reemployment Commission.

One of the principal objectives of the Reconstruction and Reemployment Commission is to prepare jobs for men and women returning from the armed forces and to reestablish in civil pursuits some 500,000 or more war workers who have come into California.

"Preparation for peace is as important as preparation for justifiable war," Governor Warren said in discussing the work of the commission. "The kinds of readjustment and development in California immediately after the war will vitally affect the State's future.

"In greater or less degree, the commission will deal with three types of problems—assisting the people of our State in making a satisfactory living; aiding and improving conditions for living through encouraging construction of more and better physical facilities and services; and fostering improvements in health, education, human welfare, and the attainment of a better life.

"Basic goals for economic readjustment are: One, maintaining a high level of employment. Two, maintaining as far as possible California's favorable income level for its larger population. Achieving these objectives requires expanding the State's peacetime production in agriculture, mining, forestry, fisheries and manufacturing, together with a concomitant increase in trade and services.

"We must determine as far as possible the probable magnitude and rate of discharge of war workers and demobilization of the armed forces and the number of peacetime jobs which will be required in various fields both for the State as a whole and for the major industrial areas. Such information will provide the basis for determining critical periods when public works, construction and other aids to reemployment would be most effective."

Gen. Fleming Advocates a National Plan for Public Works Program

MEASURED against the potential need, very little has been done in the way of actual preparation of plans and specifications and the securing of sites by governmental units for postwar construction.

Taking the Federal Government first, it is estimated that the amount of construction that could be put under way on short notice adds up to only about \$600,000,000.

When we turn to the States, the outlook isn't much more encouraging. Coming to the cities and other local units of government, we find the page almost blank.

What I personally hope to see is some kind of over-all National plan of public works construction which will be capable of management in such a way that it will best supplement the recovery efforts of private business. I think it should consist of Federal, State and local projects, the most urgently needed of which will be advanced to the contract-letting stage before the war ends. Unless we have such a National program, we run the risk of seeing any public works program surrendered to various group and community pressures.

*Maj. Gen. Philip B. Fleming,
Administrator, Federal Works
Agency, Washington, D. C.*

New Highway Commission Sworn Into Office; Holds First Meeting



State Highway Commission—Chester H. Warlow, Fresno; F. Walter Sandelin, Ukiah; Harrison R. Baker, Pasadena; Charles H. Purcell, Chairman; James A. Guthrie, San Bernardino; C. Arnholt Smith, San Diego; Homer P. Brown, Placerville

A NEW era in California highway building was inaugurated on September 14th when the members of Governor Warren's recently appointed highway commission were formally sworn into office, received their commissions and at their first official meeting heard Chairman C. H. Purcell state that California plans to embark upon a postwar highway construction program to total approximately one hundred million dollars.

The new appointees gathered in the Governor's council chamber at the Capitol at 10.30 a.m. and after drawing lots for long and short staggered terms of office were addressed by Governor Warren, who impressed upon them the wide and important scope of their new

duties, dwelling at some length upon the beneficial effect of an adequate highway program upon the economic welfare and prosperity of the State and all its citizens.

Governor Warren told the commissioners the postwar prosperity of a State as large and complex as California will depend upon a "scientific system of highways" and this, in turn, will depend upon greater vision than merely planning and building on the basis of local interests.

"I am proud of the personnel of this commission," said the Governor, "because I believe it will constitute a highway commission of the whole State in the truest sense of the word. In your chairman, State Public Works Director

Purcell, you have one of the greatest highway engineers in the country."

It is important, the Governor said, for the highway commission to tie in all its planning with that of other State agencies, devising policies for postwar building, expansion of industries, and development of natural resources.

"We are going into the planning business very seriously in California," said Governor Warren. "California has a tremendous job to do. There may be an upsurge in our State after the war outdoing the famous gold rush days. But if we don't plan intelligently we may lose a lot of new industry which has come to us in wartime, and we must remember more than 1,000,000 civilian workers have come

(Continued on page 6)

Members of the New California State Highway



JAMES A. GUTHRIE

JAMES A. GUTHRIE was born in San Bernardino in 1888 and has served for more than 35 years with the San Bernardino Daily Sun, of which he is editor and president.

Mr. Guthrie already is intimately acquainted with much of the highway development in southern California, and his newspaper had leadership in the original good roads program of San Bernardino County in advance of State highway construction. That program included important pioneer work on what are now highways U. S. 66, 91, 99, and the Rim of the World highway.

He is a member of advisory board, Automobile Club of Southern California, and a member of San Bernardino city traffic and safety commission.

He serves San Bernardino's community activity as a member of executive committees of war savings bond, war chest, USO and Red Cross. He is a member of board of directors of San Bernardino Chamber of Commerce and a member of mountain advisory board, San Bernardino County Chamber of Commerce. He is married and has two children, James K., of San Bernardino, and Kathleen, of Stanford University.



C. ARNHOLT SMITH

C. ARNHOLT SMITH of San Diego is one of the leading bankers of southern California and has been engaged in the banking business most of his life, having started as a bank messenger when a boy.

He is president of the Clearing House Association of San Diego, vice president and chairman of the board of the United States National Bank of San Diego, and president of the City Bank of Monrovia. He is also president of the National Iron Works of San Diego.

He was born in Oregon but moved to San Diego when still a youth. He lived in San Diego and attended the public schools in that city. He later lived in Los Angeles for several years. He is married and has two children, a boy and a girl.

He has always been interested in yachting and rowing. He has contested in many races, both crew and single shell contests. In 1920 at San Francisco he won the Pacific Coast single shell championship.

Commissioner Smith has always taken an active interest in highway



HOMER P. BROWN

HOMER P. BROWN of Placerville is general manager of the Diamond Springs Lime Company located at Diamond Springs, El Dorado County, near Placerville. He is an active member of the El Dorado Chamber of Commerce, of which he is a director, and chairman of the Industries Committee of the Sacramento Valley Council of the California State Chamber of Commerce. Mr. Brown is also a director of the Mother Lode Highway Association.

He is a member of the Sutter Club of Sacramento and of the Bohemian Club of San Francisco.

He was born in Butte County July 4, 1878, and was engaged in the sugar industry for 21 years.

He went to El Dorado County about 1927 and built the plant of the Diamond Springs Lime Company which he owns and operates. That plant has been almost exclusively engaged in providing war materials for the United States Government since Pearl Harbor.

matters and feels that he will be very happy in his new position as a highway commissioner.

Commission Appointed by Governor Earl Warren



CHESTER H. WARLOW

CHESTER H. WARLOW of Fresno is a lawyer, banker, and oil company executive. He was born June 30, 1889, in Virginia, Cass County, Illinois, and has lived in California since December, 1889. He was educated in the Fresno public schools and is a graduate of Kemper Military School of Boonville, Missouri, 1906; Stanford University, A.B., 1911, J.D., 1913; and Harvard Law School, Cambridge, Massachusetts, 1911-12.

He was admitted to the bar in California, June 1913, and practiced in the office of his father, George L. Warlow, until the latter's decease, when he entered private practice in 1930.

He is Fresno trust officer of the Security First National Bank of Los Angeles; chairman of the Fresno County Crime Commission, and has been vice president and president of the Fresno County Chamber of Commerce and is now a member of the Roads and Resorts Committee of that organization. He is also a member of the San Joaquin Council of the State Chamber of Commerce and member of the executive committee of the local council serving on its committee of roads and highways.

(Continued on page 18)



F. WALTER SANDELIN

F. WALTER SANDELIN of Ukiah is a hotel proprietor, being owner and manager of the Palace Hotel in that city. He was born in San Francisco in 1897 and in addition to being a native son, enjoys the proud distinction of being the father of three children, two boys and a girl, all of whom are in Coast Guard service. He has been actively engaged in the hotel business all his life. His father, the late Frank Sandelin, was a hotel man in San Francisco and later in Ukiah.

Commissioner Sandelin is a veteran of World War I, having enlisted in the Naval Reserve, and was mustered out of service in 1918 when the war ended. He is a past president of Ukiah Rotary Club, past commander, American Legion Post, and past president, Ukiah Chamber of Commerce. His children are F. W., Jr., 23 years old, serving with Coast Guard in Alaskan waters; Robert, 20, Government Island Coast Guard Base in Alameda; and Irene Marie, 21, who is a SPAR.

Commissioner Sandelin is chairman of the transportation committee of the Redwood Empire Association, also vice president and director.



HARRISON R. BAKER

HARRISON R. BAKER, who is one of the best known real estate men of Pasadena, has taken an outstanding part in the up-building of the community and has been active for years in numerous civic, social and business organizations. For fourteen years he has been a member of the Pasadena Planning Commission, serving as vice chairman for several terms, and was recently elected chairman. He is the oldest member of that body in point of service, although in years, he is one of Pasadena's younger business men.

He was born in Los Angeles in 1894, the son of Charles M. and Helen B. Baker. His father was an early real estate developer in Los Angeles, and later manager of the Pasadena office of the Los Angeles Gas and Electric Company.

The Baker family moved to Pasadena when the subject of this sketch was only nine years old and here he graduated from high school, where he won his letter in track, being a sprinter in those days. He later attended Occidental College, where he was a baseball player. He was valedictorian of the

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New Highway Commission Holds First Meeting

(Continued from page 3)

into California since the 1940 census.

"We must remember, too, our new steel, magnesium, aluminum and plastic industries because those are the things with which we will be working after the war is over. We have the natural resources and we can keep these industries if we prepare now for the future and don't let somebody beat us to the punch."

Governor Warren told the commission he believes the commission meetings should be held as a general rule in Sacramento where the headquarters of the Department of Public Works is located.

He asked Director Purcell about the status of highway conditions in California. Mr. Purcell replied that with 14,000 miles of State highways, more wartime tonnage in trucks is being carried in California than in any other State in the Nation. He added that if plans are mapped properly, California will be in position to start 50 per cent of her proposed new highway projects as soon as the war is over.

The new commissioners and the dates their terms will expire are:

Walter Sandelin, hotel man of Ukiah, Mendocino County; January 15, 1944.

Homer P. Brown, manufacturer of Placerville, El Dorado County; January 15, 1947.

Chester H. Warlow, banker and local highway organization leader of Fresno; January 15, 1945.

Harrison R. Baker, real estate man of Pasadena, Los Angeles County; January 15, 1946.

James Guthrie, newspaper publisher of San Bernardino; January 15, 1945.

C. Arnholt Smith, banker and manufacturer of San Diego; January 15, 1947.

After taking the oath of office administered by Deputy Secretary of State Hagerty and receiving their engrossed commissions signed in their presence by Governor Warren, the commissioners adjourned to the Department of Public Works building and were immediately called into session by Chairman Purcell and each presented with a large, bound compilation of maps and data.

On a rather lengthy agenda calling for votes on financial matters presented for their first consideration was a resolution to make available \$12,000,000

\$40 Per Capita Urged For Nation's Postwar Public Works Program

THERE is only one way we can guarantee that the proven principle of competitive bidding for public works programs, and the proven value of Federal-State highway financing, and the proven merit of civilian government operating civil public works, will be continued after the war. That way is to see that our cities and our States and our counties get together right away now to make advance preparations, in final detail, for a public works program involving \$40 per capita for one year.

And the way to do it is to encourage democratic planning right at the grass roots level. No central agency in Washington can do the job and do it right. But if we fail, in our home towns, to be ready for the end of the war, I can tell you that some central agency in Washington will step in and try to do the job—and our citizens will accept the federalization, because it will be the logical and inevitable result of our local failure to be ready with useful public works.

*G. Donald Kennedy,
Vice President, Automotive
Safety Foundation; Chair-
man, Postwar Construction
Committee, American
Society of Civil Engineers*

appropriated by the last Legislature for surveys and plans and right-of-way acquisition for postwar highway construction projects. The commission voted to place that sum in the State Highway Fund budget and allocated \$3,000,000 of the amount for surveys and plans and \$9,000,000 for right-of-way on postwar projects that receive the approval of the commission.

In this connection, Commissioner Warlow of Fresno asked Chairman Purcell what the proposed postwar highway program would cost. Mr. Purcell replied it would approximate \$100,000,000.

Other business on the agenda included highway maintenance and repair projects in various counties re-

quiring allocations of funds in various amounts for acquisition of right-of-way, bank protection, repairing and reconstruction of bridges. It was voted to transfer \$2,066,000 from the diesel-tax fund for posted bridges to the contingency reserve bridge reconstruction fund for financing the bridge projects.

Harrison R. Baker

(Continued from page 5)

Class of 1917, and holder of a Phi Beta Kappa key. From Occidental he went to Harvard University Law School.

When the United States entered World War No. I, Mr. Baker entered the Navy and was commissioned an Ensign, later being promoted to Lieutenant (j. g.). He served as signal officer on the troop ship "Agamemnon," and made nine transatlantic voyages with soldiers for the American Expeditionary Force.

Following the war, he became associated with an investment company and in 1921 with Richard D. Davis, Jr., organized the realty firm known as the Davis-Baker Company which has developed many subdivisions in southern California and laid out a total of about 2,000 lots in the Pasadena section alone.

Mr. Baker is president of both the Davis-Baker Company, and the Davis-Baker Insurance Agency, Inc. In 1927 he was president of the Pasadena Realty Board, and for fifteen years has served as chairman of the Land Developers and Home Builders division of the California Real Estate Association. He is also one of the foremost real estate valuation experts in southern California.

He was one of the first to promote the construction of the Pasadena Arroyo Seco Parkway, and is credited with being one of the four men most responsible for this major improvement. In numerous other ways Mr. Baker has been influential in furthering community interests.

Mr. Baker is a member of the Pasadena Presbyterian Church and many other organizations, including the American Legion, University Club of Pasadena, and Phi Gamma Delta college fraternity. In 1923 he married Miss Grace E. McCormick, who was born in Iowa and came to Pasadena when 10 years old. They have one son, Harrison R. Baker, Jr., who is a Naval Reserve Cadet assigned for training to St. Thomas College, Minnesota, for an officers' training program.

Annual Highway Traffic Study Count Shows 30 Per Cent Drop Since 1941

By GEO. T. McCOY, State Highway Engineer

THE annual state-wide traffic count taken on Sunday and Monday, July 11th and 12th, shows a decrease of 15.1 per cent under the 1942 count. In comparison with 1941, this year's count shows a decrease of 30.0 per cent. The regularly occupied monthly key stations show that the percentage decrease under 1942 has remained fairly constant since April.

The decreases are found in every main group of routes and on practically all the 80 individual routes which form the basis for these comparisons. A further analysis of the routes that show an increase reveals that in almost all cases the increase is primarily due to additional truck traffic.

SUNDAY DROP LARGEST

It will be noted that, with few exceptions, all routes show a substantially larger decrease on Sunday than on Monday. The largest decrease is recorded on Sunday for the recreational group. The routes that comprise this group serve recreational areas, but the traffic which they carry is only partially concerned with recreation.

No change was made from the regular procedure of previous years in the manner of taking the count. Actual recording covers the 16-hour period from 6 a.m. to 10 p.m. for both Sunday and Monday. Traffic was segregated by hourly periods into the following vehicle classifications: California passenger cars, out-of-State passenger cars, buses, light trucks, heavy trucks, trailers drawn by trucks, trailer coaches, and other passenger car trailers.

Each year some minor changes in the census become necessary, such as the relocation, addition, or discontinuance of individual stations; but in every instance these are excluded when determining comparisons with the previous year, only those stations that were identical during both years being taken into consideration.

These comparisons for the various route groups are as follows:

PER CENT GAIN OR LOSS FOR 1943 COUNT AS COMPARED WITH 1942

	Sunday	Monday
All Routes	— 23.24	— 13.81
Main North and South Routes	— 25.30	— 16.35
Interstate Connections	— 21.21	— 9.81
Laterals Between Inland and Coast	— 19.23	— 10.14
Recreational Routes	— 29.46	— 15.72

The gain or loss of traffic volume for State Highway Routes 1 to 80 inclusive, which constitute the basis for the foregoing summary, is shown in the following tabulation:

Route	Termini	1943			
		Per cent gain or loss		Monday	
		Sunday Gain	Sunday Loss	Monday Gain	Monday Loss
1.	Sausalito-Oregon Line	25.54		18.46	
2.	Mexico Line-San Francisco	22.63		17.37	
3.	Sacramento-Oregon Line	31.24		19.29	
4.	Los Angeles-Sacramento	22.40		11.90	
5.	Santa Cruz-Jc. Rt. 65 near Mokelumne Hill	27.13		13.63	
6.	Napa-Sacramento via Winters	30.30		19.90	
7.	Crockett-Red Bluff	33.49		27.35	
8.	Ignacio-Cordelia via Napa	34.65		26.90	
9.	Rt. 2 near Mentalvo-San Bernardino	15.16		6.68	
10.	Rt. 2 at San Lucas-Sequoia National Park	27.26		12.61	
11.	Rt. 75 near Antioch-Nevada Line via Placerville	34.88		21.52	
12.	San Diego-El Centro	25.99		20.32	
13.	Rt. 4 at Salida-Rt. 23 at Senora Jc.	34.60		21.23	
14.	Albany-Martinez	30.84		29.15	
15.	Rt. 1 near Colpella-Rt. 37 near Cisco	37.48		8.18	
16.	Hopland-Lakeport	22.00		2.89	
17.	Rt. 3 at Roseville-Rt. 15, Nevada City	26.81	11.00		
18.	Rt. 4 at Merced-Yosemite National Park	47.52		36.34	
19.	Rt. 2 at Fullerton-Rt. 26 at Beaumont	3.76		1.80	
20.	Rt. 1 near Arcata-Rt. 83 at Park Boundary	23.43		20.14	
21.	Rt. 3 near Richvale-Rt. 29 near Chico via Quincy	35.77		27.44	
22.	Rt. 56, Castroville-Rt. 29 via Hollister	27.32		9.83	
23.	Rt. 4 at Tunnel Sta.-Rt. 11, Alpine Jc.	36.01		19.15	
24.	Rt. 4 near Lodi-Nevada State Line	31.09		15.25	
25.	Rt. 37 at Colfax-Rt. 83 near Sattley	27.56		9.27	
26.	Los Angeles-Mexico via San Bernardino	8.22		1.80	
27.	El Centro-Yuma	3.31	14.11		
28.	Redding-Nevada Line via Alturas	35.33		7.99	
29.	Peanut-Nevada Line near Purdy's	37.12		37.45	
31.	Colton-Nevada State Line	16.90		14.94	
32.	Rt. 56, Watsonville-Rt. 4 near Califa	30.41		21.89	
33.	Rt. 56 near Cambria-Rt. 4 near Famoso	24.94		12.55	
34.	Rt. 4 at Galt-Rt. 23 at Pickett's Jc.	36.89		27.31	
35.	Rt. 1 at Altun-Rt. 20 at Douglas City	34.16		18.03	
37.	Auburn-Truckee	41.22		9.03	
38.	Rt. 11 at Mays-Nevada Line via Truckee River	60.74		50.99	
39.	Rt. 38 at Tahoe City-Nevada State Line	54.84		51.23	

Route	Termini	1943			
		Per cent gain or loss		Monday	
		Sunday Gain	Sunday Loss	Monday Gain	Monday Loss
40.	Rt. 13 near Montezuma-Rt. 76 at Benton	56.92		54.78	
41.	Rt. 5 near Tracy-Kings River Canyon via Fresno	11.41	2.47		
42.	Redwood Park-Los Gatos	26.43		12.40	
43.	Rt. 60 at Newport Beach-Rt. 31 near Victorville	19.26		6.43	
44.	Boulder Creek-Redwood Park	17.38		20.92	
45.	Rt. 7, Willows-Rt. 3 near Biggs	20.94	12.77		
46.	Rt. 1 near Klamath-Rt. 3 near Cray	22.31		13.04	
47.	Rt. 7, Orland-Rt. 29 near Morgan	23.17		6.26	
48.	Rt. 1 N. of Cloverdale-Rt. 56 near Albion	38.40		26.83	
49.	Napa-Rt. 15 near Sweet Hollow Summit	25.79		4.02	
50.	Sacramento-Rt. 15 near Willbur Springs	3.02	10.22		
51.	Rt. 8 at Schellville-Sebastopol	27.96		7.70	
52.	Alto-Tiburon	7.29		6.59	
53.	Rt. 7 at Fairfield-Rt. 4 near Lodi via Rio Vista	3.73	8.16		
54.	Rt. 11 at Perkins-Rt. 65 at Central House	6.33		17.81	
55.	Rt. 5 near Glenwood-San Francisco	37.87		28.91	
56.	Rt. 2 at Las Cruces-Rt. 1 near Fernbridge	23.24		10.30	
57.	Rt. 2 near Santa Maria-Rt. 23 near Freeman via Bakersfield	19.96		20.82	
58.	Rt. 2 near Santa Margarita-Arizona Line near Topock via Mojave and Barstow	3.54	12.60		
59.	Rt. 4 at German-Rt. 43 at Lake Arrowhead	22.99		10.80	
60.	Rt. 2 at Serra-Rt. 2 at El Rio	30.13		19.47	
61.	Rt. 4 S. of Glendale-Rt. 59 near Phelan	21.73		6.95	
62.	Rt. 171 at Northam-Rt. 61 near Crystal Lake	15.64	0.71		
63.	Big Pine-Nevada State Line	54.74		38.76	
64.	Rt. 2 at San Juan Capistrano-Blythe	3.46	1.84		
65.	Rt. 18 near Mariposa-Auburn	32.29		20.66	
66.	Rt. 5 near Mossdale-Rt. 13 near Oakdale	29.92		17.59	
67.	Pajaro River-Rt. 2 near San Benito River Bridge	15.37	7.13		
68.	San Jose-San Francisco	28.96	12.39		
69.	Rt. 5 at Warm Springs-Rt. 1, San Rafael	21.48	10.94		
70.	Ukiah-Talmage	19.53	1.90		
71.	Crescent City-Oregon Line	30.84	27.40		
72.	Weed-Oregon Line	29.88	19.44		
73.	Rt. 29 near Johnstonville-Oregon Line	28.41	35.95		
74.	Napa Wye-Cordelia via Vallojo and Benicia	24.79	27.21		
75.	Oakland-Jc. Rt. 65 at Altaville	25.62	16.19		
76.	Rt. 125 at Shaw Ave.-Nevada State Line near Benton	32.57	14.83		
77.	San Diego-Los Angeles via Pomona	19.87	10.09		
78.	Rt. 12 near Descanso-Rt. 19 near March Field	7.76	18.90		
79.	Rt. 2, Ventura-Rt. 4 at Castaic	13.94	6.86		
80.	Rt. 51, Rincon Creek-Rt. 2 near Zaca	14.91	4.69		

Mechanical Wizardry of Highway Shop Keeps Road Equipment Available

THE war is testing to the utmost the ingenuity and inventive genius of the mechanic craftsmen and the executive staff of the Headquarters Shop, Division of Highways, in Sacramento.

It is the major function of the Headquarters Shop as well as that of the district maintenance stations to keep road construction equipment and all motor vehicles of the Department of Public Works in operating condition.

Priorities controlled by the War Production Board have become the large-sized headache to Equipment Engineer R. H. Stalnaker and his crews at Headquarters Shop. Since purchase of new equipment is restricted to an almost negligible amount, the Division of Highways is compelled to make repairs to equipment that under normal conditions would not be even considered. What with limited manpower and the great difficulty in obtaining priorities for repair parts, the

men of the shops have been forced to rely upon their inventive abilities to keep road equipment rolling.

ADAPTED USED PARTS

For example, Headquarters Shop recently used heavy truck chassis, oil tanks, spray bars, pumps, piping and other pressure accessories, formerly parts of other units, and built up three 1,000-gallon insulated pressure road oil distributors that are comparable in detail with any of the later models of their capacity formerly on the market.

Confronted with the urgent need for additional equipment for road oil heating and with no such new equipment available, Headquarters Shop has undertaken the building of four portable units, two of which are mounted on old trailers. The other two units will be on steel skids.

The boilers, pumps, and fittings for the trailer-mounted units were purchased second-hand and will be recon-

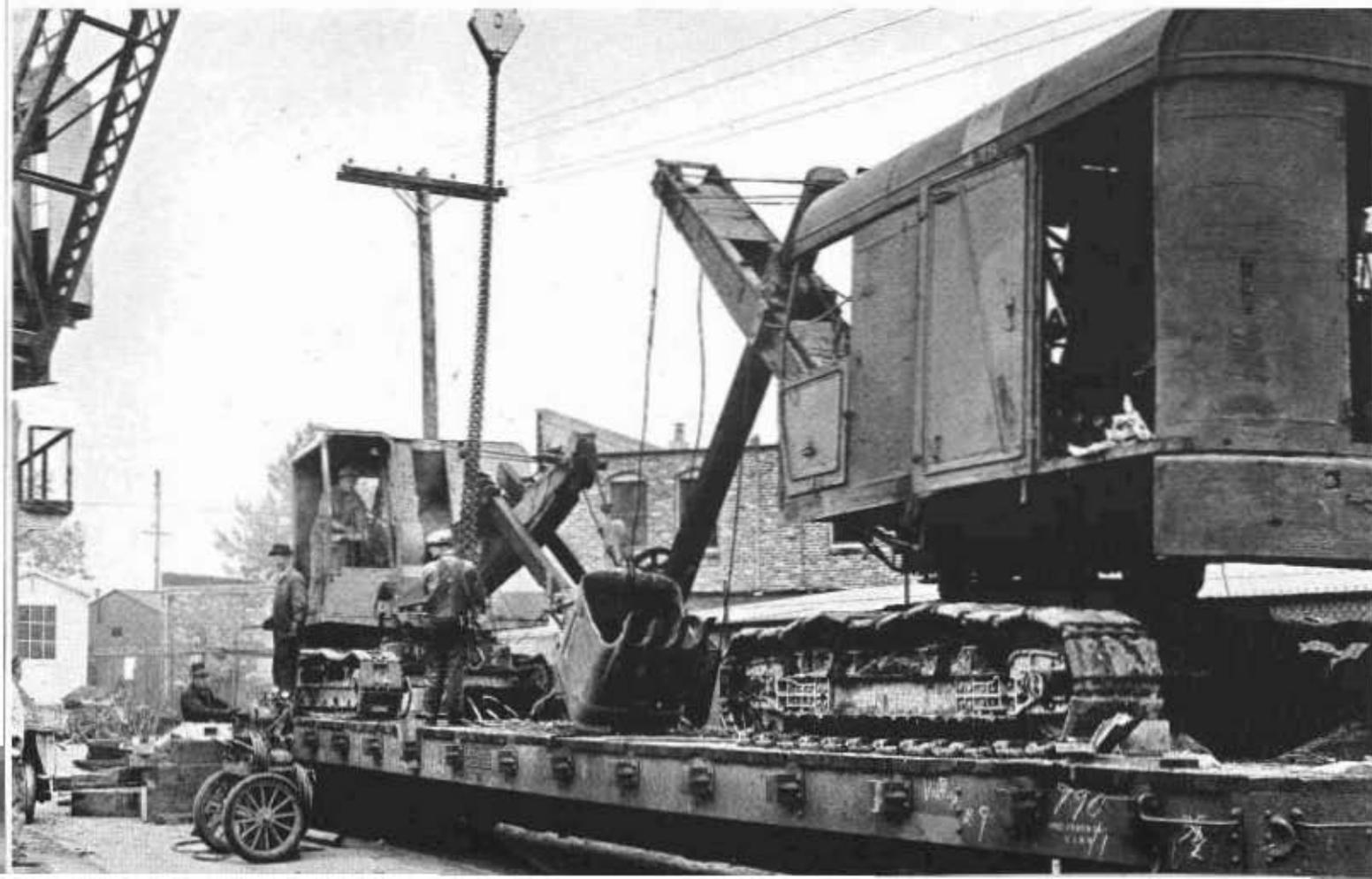
ditioned, assembled and mounted by the shop forces. The same procedure will govern the construction of the other units. In the assembling of both types, much salvaged material will be used, and the units will be built without the aid of priorities with the probable exception of two pressure oil burners.

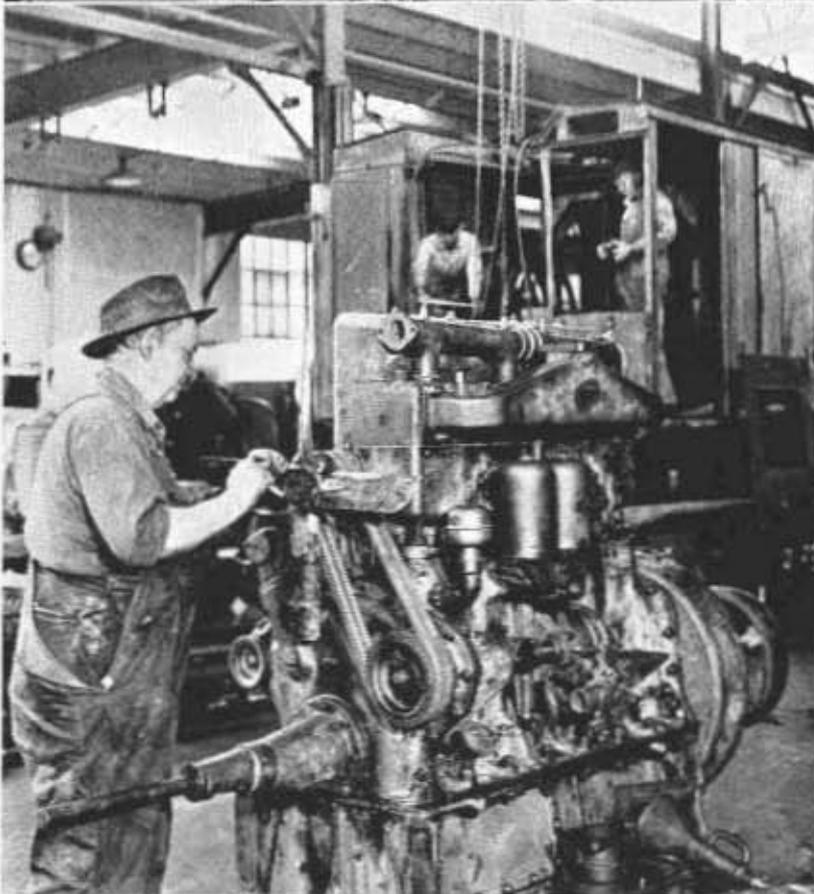
BUILT WHEELS FOR MOWERS

Also, the Shop has just completed an oil-pumping rig, powered by gasoline engine, mounted on a two-wheeled trailer, which was constructed of salvaged units without the necessity of priorities. Failing to get a priority for the small pneumatic tires needed for the sickle-bar ground wheel on highway mowers, the Shop constructed its own wheels and faced them with available composite material easily replaced when worn.

In order to further the conservation of steel and reduce time lost in securing parts for repair, the Shop installed a

Two big power shovels transported to Sacramento Highway Shops by freight car for extensive repairs, replacements and overhauling





Repair work at headquarters shop often involves making of new parts out of old ones that have seen service on other units. Top (left) adding new metal to worn crankshaft with metalizing machine. With this machine the worn part is built up sufficiently to be turned or ground back to its original size. Right—Sharpening scarifier discs by cutting new edges. Bottom (left) repairing heavy-duty Hesselman oil engine of power shovel on which men are working in background. Right—Forging steel bar with power hammer

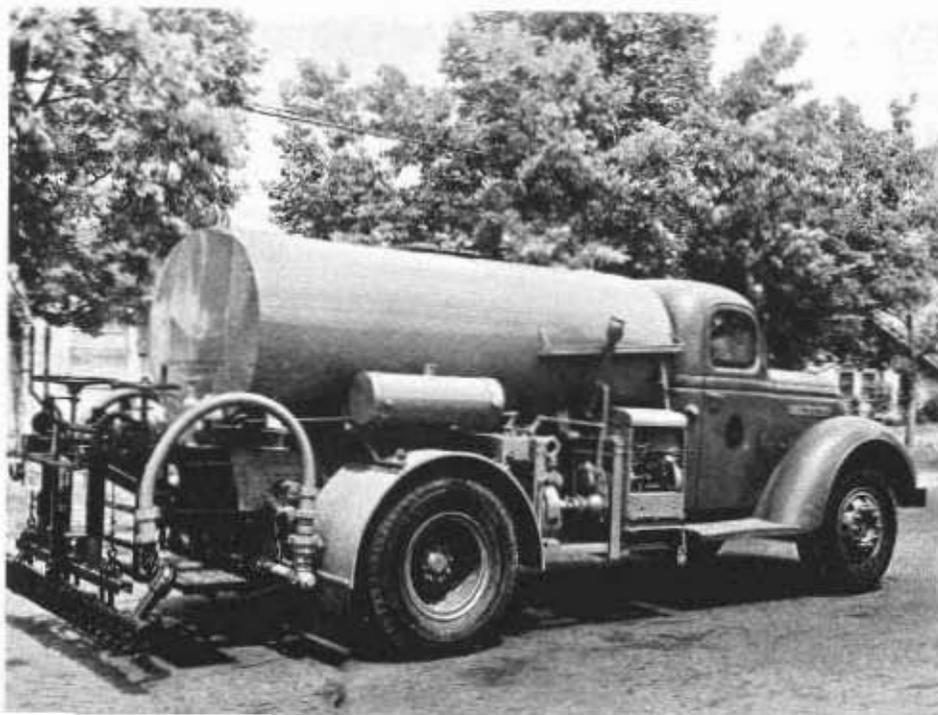
complete metallizing outfit with which worn shafting, pump-rods, crank and cam shafts, axles, drive shafts and numerous other parts can be built up sufficiently so that they can be turned or ground back to their original size and at a cost considerably less than for new ones. This installation is an expensive one but in times like the present is well worth the cost and will give ample returns on the investment.

IMPROVISED NEEDED PARTS

Repair parts, which the Division of Highways normally should have first, are seldom available for reasonably prompt delivery and are often the last to arrive; consequently, mechanics are continually changing over from job to job whenever parts are obtained that can be put in place, and the result is many valuable man-power hours are lost before the equipment is finally completed and back on the road working. As many as five pieces of major equipment have been in the shop for repairs, taken down one or more at a time, necessary parts requisitioned and then a tedious period of waiting endured before the work can be proceeded with.

Ordinary running repairs that have to be made on the road, often many miles from the Shop, are quite a problem. Prompt securing of parts is generally out of the question and Division of Highways mechanics are forced to patch or improvise to keep equipment going. How long a patching job will last is always problematical, but it has to be done. Improvisation gives results, but the cost is greater than that of replacement parts. There is a further loss of valuable man-power hours.

1100 gallon road oil distributor built with used parts from other units



Large oil heating retort on trailer constructed of salvaged materials

OLDER MECHANICS SUPERVISE

Maintenance shop mechanics for many years have relied on prompt delivery of parts and adjusted themselves to plan their work accordingly. Now that conditions have changed, the younger men need more supervision but due to the fact that many of the older mechanics are still in the State service, Equipment Engineer Stalaker feels that the Shop has gotten along creditably under the circumstances.

Because improvisation and ability to take short cuts were part of the early training of the older employees, much has been accomplished, chiefly in readaptations of various units by taking major parts from them and combining them into others badly

needed at present and not available under priority regulations.

Delay in obtaining repair parts has widely affected activities of the headquarters and district shops. One of the Division of Highways' largest district shops is crowded with units in various stages of repair with very little work being done on any of them due to lack of parts. In that same district about 40 other units that should now be in the shop, are working and in all probability some of these will be operated almost to the point of failure before the shop can get them.

Tractors, motor graders, dump trucks, and drag-line equipment when in for overhaul, present another difficulty. Floor space is limited at all shops and due to the fact that it usually takes at least 60 days, at times longer, to get complete delivery of parts requisitioned for a particular job, many manpower hours are wasted and repair costs increased.

As equipment gets older, repair periods are more frequent. In many cases it is difficult to get equipment away from job sites and into the shop because those in charge of its operation know that no reliable estimate can be made as to when it will return to service; consequently, some equipment is kept working too long.

All these factors create manpower losses and no relief can be expected until delivery of repair parts can be expedited and the obtaining of some new units made easier.

This situation probably will exist for the duration.

Critics—People who go places and boo things.

Funds Apportioned to Counties for Postwar Road Surveys and Plans

FUNDS appropriated by the Legislature to provide for plans, surveys and specifications for postwar county highway construction projects have been apportioned by Director of Public Works C. H. Purell.

The Legislature set up a fund of \$1,500,000 to be distributed to the counties on the basis of motor vehicle registration. This money became available when the act went into effect on August 4th.

Under the law, the counties must submit to the Department of Public Works for approval a list of proposed projects and a budget for the same.

McCoy Details Procedure

State Highway Engineer George T. McCoy has sent to all boards of supervisors copies of forms which must be filled out covering every project. His letter to the supervisors requested that budget proposals be forwarded to the Department of Public Works at the earliest possible date and gave important explanatory details.

In his letter of instruction Mr. McCoy said:

"This act has no connection with and is entirely separate from any Federal legislation.

Funds provided by the act are for surveying and the preparation of plans and specifications only and NOT for construction or right of way. If the county desires to include more projects than the apportionment will finance, the supervisors can appropriate county money for the additional work.

"The act provides that the expenditure of the money will be delegated to a county if the Department of Public Works is satisfied that the county is equipped to conduct the work in an efficient and economical manner.

Budget Must Be Approved

"Where the expenditure is so delegated, a warrant for the amount will be forwarded to the county for deposit in its special road improvement fund, upon approval of the budget by the department.

"The approved budget may be

amended or supplemented by submitting an amended or supplemental proposal on the specified form to the department for approval.

"In judging the necessity for, or order of importance of a proposed project the principal factor will be the general usefulness of the road; its place in the county highway system; and its social and economic service, such as connecting rural communities with town, markets, railroads, water transportation or the State Highway System, serving as mail routes or school bus routes, or providing access to community meeting places.

Maintenance Not Included

"For the purposes of the act, construction will be considered as the 'improvement' of county highways consistent with funds available to counties under the Streets and Highways Code. Improvement does not include maintenance, such as the preservation and keeping of rights of way and each type of roadway, structure and facility in a safe and usable condition to which it has been improved or constructed, but does include reconstruction or other new improvement.

"The act leaves the responsibility to the county to determine the standards of alignment, width, surfacing and structure design. Surveys and plans, specifications and estimates for all projects, however, shall correspond to the character of the work proposed and shall be in sufficient detail to show the quantities and kinds of work contemplated.

"It is suggested that plans be made on sheets of the size and standard required for Federal aid feeder roads, in case Federal funds are appropriated in the future for construction.

Projects in Cities

"It will be noted that the act includes county highways of major importance within cities. Projects within cities to be included in the budget will be determined by the county and agreed upon by the county and the respective cities within the county.

"The attached form of budget proposal was formulated for the purpose

of obtaining the minimum information required for intelligent and orderly review of the proposed post-war planning program of the county; and to determine the county's ability to perform the planning work in an efficient and economical manner, as contemplated by the act. The forms are to be completely filled in. Separate 'detail data of specific projects proposed' are to be made out for each individual project.

"The projects then are to be listed on the summary sheet in their order of importance, and the summary sheet and the detail data sheet attached to the cover sheet and signed by the authorized county officials. The complete budget, together with a certified copy of the resolution adopting the budget, is to be submitted in triplicate to the appropriate district engineer of the division of highways. The budget is to be accompanied by a map of the county, indicating the various projects proposed and numbered to correspond with the project number listed in the budget.

CAUTION: Do not make any surveys now. Prepare your list of projects to be surveyed and send them in to the State district engineer. After your program has been approved by the Director of Public Works, you can then start surveys and detail plans. No money can be paid for work done before the list of projects is approved by the Director of Public Works.

"You will note that Section 6 of the act provides that the county shall file a report with the department at the close of each fiscal year showing the expenditures made. Forms for filing the financial report will be furnished at a later date.

"It is recommended that the required budget proposal, as outlined herein, be prepared and submitted at the earliest date, so that the budget may be reviewed and approved and the funds made available in accordance with the act without delay. Every effort should be made to submit the full contemplated program at one time."

(Continued on page 18)

State Highway Maintenance Problems After Twenty Months of War

By T. H. DENNIS, Maintenance Engineer

THE maintenance forces of the Division of Highways' organization, although handicapped by lack of manpower, equipment, materials and supplies, have extended themselves since December, 1941, to provide normal service to the users of the highways. On the whole it is believed that the public has been well served, although in a few cases there have been protests due to limitations placed on snow removal, clearing of slides, etc., on roads which serve strictly recreational areas.

This generally favorable result has been made possible only through foresight in securing certain materials and supplies such as providing tanks for storage of bituminous materials and arranging for replacement of equipment even as far back as 1940 and early in 1941. The organization was thus in first-class shape at the start of the war from a working point of view.

CERTAIN WORK CURTAILED

It has been necessary, of course, to limit certain phases of the work, such as changing from the solid line traffic stripe to a broken line and reducing the mileage striped, reduction in the work of care of roadsides and roadside plantings, occasional patrol of light traffic routes, delaying the spring opening of mountain roads closed by winter snow, and similar items.

It must be realized, however, that as time passes the advantages obtained through early preparation are diminishing, and at the same time there is every prospect that demands will increase. Factors which must be considered are (1) traffic demands, (2) condition of the highway system on the one hand, and on the other (3) the status of finances, and (4) the working organization including such considerations as manpower, equipment, materials and supplies.

The total traffic volume at the present time is about 70 per cent of the corresponding 1941 volume. However, the truck and bus traffic volume is apparently about 94 per cent of the 1941 volume. Furthermore, heavier

loads are being hauled as a result of shortage of equipment and efforts of the Office of Defense Transportation to insure maximum efficiency.

The use of diesel oil for the first half of 1943 was some 8 per cent greater than for the corresponding period in 1942. From results of other studies it appears that the ton miles developed by commercial vehicles therefore is at least as great as in 1941. There is more hauling during the winter seasons than prior to 1941.

MAINTENANCE NEED INCREASED

As truck traffic is the portion of the traffic which most seriously damages road surfaces and structures it is evident that the need for adequate maintenance has not declined. It is to be expected that the highway system of the coast States will, in the near future, become even more important to the war effort. More and more units of the fleet will be based in the Pacific area accompanied by Army expeditions, and such shifting of emphasis can not fail to bring increased demands on the highways.

In the face of sustained demands on the facilities there has been a falling off of the total revenue available for highway purposes. It is not expected that amounts available for State Highway maintenance purposes will be materially reduced during the current biennial period, unless further restrictions are placed on the use of automobiles.

No new construction or even reconstruction projects are being placed under way except Federal access road projects. Such projects are restricted by Federal control to work essential to prosecution of the war.

COSTS OF WORK GREATER

Day by day the road surfaces and structures are getting older and with the postponement of the reconstruction program an increasing burden rests on the maintenance organization.

There is likewise a constant increase in the cost of performing work. Wages are increased as a result of statutory

increases and the wartime emergency increase. Delays result from breakdown of the equipment and deliveries of materials, and men are not available to fill in crews assigned to the major items of work.

This latter situation is especially serious as it requires transfer of men from one point to another which not only requires careful programming of the work, but causes unavoidable and expensive delays. There is also the additional expense involved in the transportation and support of the men while on temporary assignments.

LOSS OF MANPOWER

As a whole the organization is from 25 to 30 per cent below minimum requirements in numbers. Many of the men lost both to the Army and defense work were the younger men. Replacements have been made as far as possible, but these men are older and not so well trained or adaptable.

Women are being employed to some extent as flagmen and on other light work. While the organization is functioning well the strain is felt whenever an emergency develops which requires long hours and night work. Any State-wide or extended emergency period would cause a breakdown in the field service.

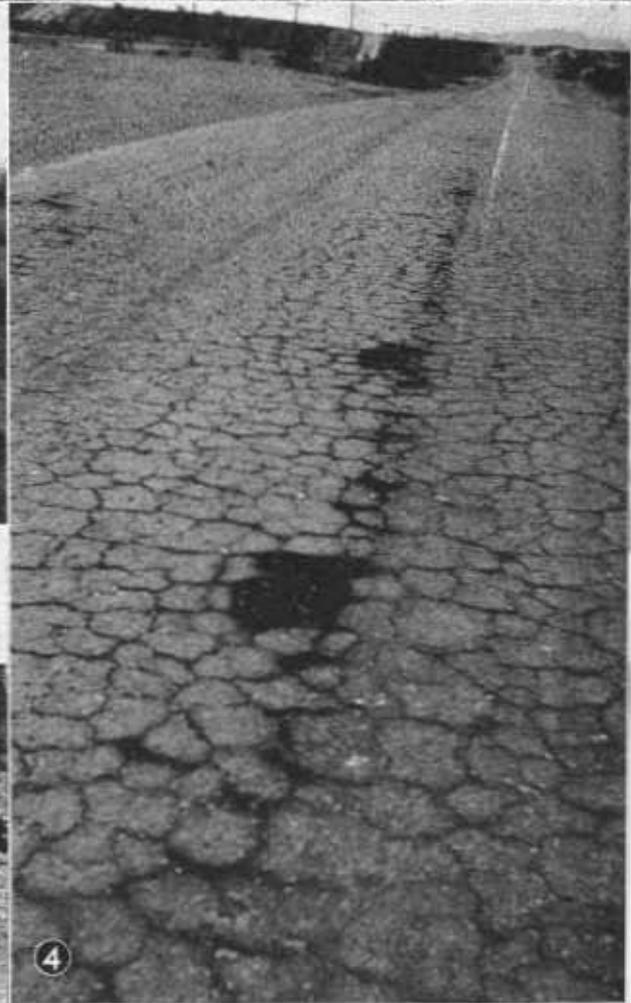
The matter of equipment is of particular concern. Only a few pieces of new equipment have been secured during the past two years and there have been no replacements. There are many units in service which would have been retired under normal conditions, for example:

SERIOUS EQUIPMENT SITUATION

- 22% of the trucks are 7 years old or older
- 20% of the power shovels are 7 years or older
- 21% of the motor graders are 7 years old or older
- 32% of the snow plows are 10 years old or older

Naturally as the equipment becomes older breakdowns are more frequent. Since an adequate stock of replacement parts can not be carried by the State,

(Continued on page 18)



Some maintenance jobs. (1) Section of State Highway surface in Santa Barbara County destroyed by military traffic. (2) Damage to surface of State Highway in Imperial County by hauling operations due to war emergency. (3) Damage to surface of State Highway in Merced County by contractors hauling to defense project. (4) Section of State Highway surface in San Bernardino County damaged during military maneuvers

Maintenance Considerations of Culvert Design and Practice

By C. F. WOODIN, Assistant Maintenance Engineer
G. A. TILTON, Jr. Assistant Construction Engineer

Foreword

This is the tenth and concluding article of a series of technical abstracts from a joint departmental review of culvert practice of the California Division of Highways by a committee composed of R. Robinson Rowe, Assistant Bridge Engineer, R. L. Thomas, Assistant Engineer Surveys and Plans, and the writers.

The series is concluded with a review of the nine preceding articles with particular reference to culvert maintenance.

THE predominant theme of the preceding articles is the concept of designing culverts to pass the 100-year flood without serious damage to the culvert or highway embankment and at no general appreciable increase in cost over the present practice of designing for the 10-year flood.

To accomplish this objective, and develop full economic value of the culvert, it should be designed, within safe limitations, to operate with sufficient head on the entrance to cause it to run full for the greater part of the length. A combination of these hydraulic considerations with properly proportioned appurtenances has been termed* "balanced design" by the committee.

Floods of unusually high intensity-frequency may be expected somewhere in California every year, either in scattered small areas, or in a few localized larger areas. In most cases serious damage results and it is the two-fold function of the maintenance forces (1) to make immediate minimum repairs to restore traffic and halt erosion, and (2) after study, to make permanent repairs to conform with recommended "balanced design."

Failure may not be due to hydraulic deficiencies alone. Inspection and analysis may reveal the cause of failure to be a combination of hydraulic inefficiencies and lack of adequate appurtenances.

CORRECTIVE MEASURES

Debris Barriers

Field inspections made immediately after storms, and consultation with field maintenance personnel, show debris congestion at culvert entrances to

be the greatest contributing cause of culvert failures.

It is not always possible for designers to anticipate the necessity for debris control measures. In a period of ten to twenty years natural conditions may be aggravated by changes in the culture of tributary basins from logging or clearing operations, farming operations, changes from rural cultivation to urban built-up areas and similar transitory conditions.

It is incumbent upon maintenance supervision to observe these changes from one phase to another and anticipate proper protective measures.

As outlined in the second article of this series, the committee found no consistent policy of debris control. As a result, debris devices were classified and adapted to varied conditions for the benefit of the maintenance engineer as well as the designer.

The problem of installing debris control appurtenances is simplified by their external location. Barriers should be placed so as to provide maximum efficiency in intercepting debris with minimum obstruction to flood waters. The ideal layout permits the deflection or collection of debris in a reservoir having sufficient capacity to store a full seasonal deposit.

Maintenance of debris racks and de-silting basins is one of the chief concerns of the maintenance personnel. Where debris and silt deposits have approached capacity stage, immediate removal may be imperative, although it is generally more economical to allow the deposits to become dried out before removal. Deposited material which interferes with the full use of drainage facilities may be viewed in the same light as slide material which completely obstructs the traveled way.

Culvert Location and Slope

The review of culvert practice indicated a general tendency of designers and field engineers to locate culverts on straight alignment and straight slopes away from channel beds for the exclusive purpose of shortening the length to reduce the cost over an installation in the channel proper.

The committee has made a strong recommendation for locations that follow the general alignment and slope of natural channels—on curves and properly broken slopes if necessary.

Culvert failures, caused by improper locations, which result in washouts, generally provide opportunities under maintenance to relocate them in their proper positions, or realign their outlets to insure safe discharge, particularly where they have been installed in "side-hill location" with entrances and outlets well above the channel bottom.

Culvert Entrances and Headwalls

Arbitrary selection of headwalls and lack of attention to entrance efficiency led the committee to classification of headwalls and recommended adaptations to various entry conditions. Likewise, types of entrance treatments were analyzed and classified.

Wherever the maintenance engineer is faced with the necessity of increasing the capacity of an existing culvert, improvement of the entrance should be the first condition to be analyzed.

Culvert Outlets and Endwalls

Recent design of large metal multi-plate culverts and large concrete arch and box sections without consideration of the damaging effect of high outlet velocities developed when operating at designed capacity, has tended to focus

* See page 13, July-August, 1943, issue of California Highways and Public Works.

attention on methods of preventing ensuing damage.

Recommendations of the committee limit outlet velocities to a designed maximum of twenty feet per second and the installation of energy-dissipators, if necessary, to prevent damage to the culvert, highway embankment or private property.

If improvement of property has taken place below the outlet of a large culvert and if discharge velocities prove damaging, methods of dissipating energy should be considered a maintenance problem, as outlined in the fifth article of this series.

Development of Siphonic Action*

As pointed out by the *committee, the development of siphonic action to increase the capacity of existing undersized culvert barrels can often be utilized to economic advantage. In many cases under high embankments where it is impractical to enlarge or install an additional culvert, increased capacity can be developed by siphonic action. Under roadways with little headroom, capacity can be increased in certain cases by use of the flared-siphon culvert, which is particularly adapted to widening operations.

Culvert Size

In the case of an existing culvert which has proved to be inadequate hydraulically, additional consideration should be given to improving capacity by use of rounded or throated entrances, warped wing walls, or lined training channels. If sufficient capacity can not be developed by any of the above methods, an additional culvert or culverts should be installed or the same culvert relocated where sufficient head can be utilized to develop the desired capacity to fulfill the requirements of "balanced design."

Historical Record

Historical data in regard to the more important culverts where debris, erosion, or other conditions have presented specific problems, are of inestimable value both in regard to conditions at their particular locations and to providing a basis for future design. The acquisition of information concerning actual performance of the culverts logically rests with maintenance field personnel, and should be readily accessible to the designing engineer. It is of particular value to record flood stage elevations while

identifying evidence is yet clearly discernible.

These data, for reasons of uniformity and ready reference, should follow some order as indicated by the following check list:

(DATE REPORT)

A. FLOOD STAGE

- a. Height above invert at entrance.
- b. Height above invert at outlet.

B. CONDITION OF CULVERT

- a. Metal—1. Extent of abrasion, 2. Pitting, 3. Rust, 4. Rivet and bolt condition.
- b. Concrete—1. Extent of spalls and abrasion, 2. Reinforcing exposed, 3. Cracks—location, extent, 4. Undermined side walls.
- c. Joints—1. Open—location, 2. Water entering or disappearing through joints.
- d. Drift and detritus (in barrel)—1. Kind and amount.

C. ENTRANCE (CHANNEL, HEADWALL, DEBRIS RACK)

- a. Scour (describe location and extent)
1. In channel, 2. Headwall, 3. Wingwalls, 4. Embankment slopes.
- b. Obstructing vegetation—1. Nature and extent.
- c. Drift and detritus deposit (describe nature and extent)—1. In channel, 2. At entrance, 3. On debris rack (if any), 4. In debris reservoir (if any).

D. OUTLET (CHANNEL, ENDWALL, VELOCITY, CHECK, ETC.)

- a. Scour (similar to entrance).
- b. Obstructing vegetation (similar to entrance).

E. ROADWAY PRISM

- a. Settlement over culvert—1. Amount of sag in grade, 2. Length of roadway affected.
- b. Probable cause of settlement—1. Saturation following blocking of inlet, 2. Saturation through culvert joints, 3. Other causes.

F. WORK DONE (give dates)

- a. Removal of debris, detritus
- b. Additional erosion protection
- c. Repaving invert, etc.
- d. Construct debris rack
- e. Other.

G. RECOMMENDATIONS

- a. Work needed beyond the scope of ordinary maintenance—1. Construct debris rack, 2. Lower footings, cutoff walls, etc., 3. Raise headwall to increase head at entrance, 4. Construct flared siphon outlet, 5. Place riprap, etc., 6. Other.

Brief Summary of Committee Recommendations

1. Culverts should be designed to meet the requirements of "balanced design" to pass the 100-year flood safely with sufficient head on the culvert entrance to make the culvert run full.
2. Debris control devices should be provided at culvert entrances

where required to prevent clogging.

3. Culverts should be located insofar as practical and economical in the approximate course and slope of natural channels.
4. Culvert entrances should be designed for hydraulic efficiency and headwalls should be proportioned with zero free board, to protect the embankment against the 100-year flood head on the entrance.
5. Excessive outlet velocities should be limited and controlled, if necessary, with energy-dissipator works or other means. Endwalls should not be arbitrarily selected but should be adequately designed to protect the embankment.
6. Development of siphonic action in culverts should be utilized where economic.
7. The basic principles of earth pressures transmitted to culverts and effect on various field conditions should be given greater consideration in design and field installation.
8. Waterway ratings should be considered for all large drainage culverts.
9. Selection of size and type of culvert should be based on sound hydraulic and engineering factors.
10. A systematic record of all troublesome culverts and all failures should be kept by maintenance personnel for future corrective measures or reconstruction.

LIST OF ARTICLES ALREADY PUBLISHED IN CALIFORNIA HIGHWAYS AND PUBLIC WORKS

- August, 1942—Preliminary Outline of Articles.
- September, 1942—Comparative Hydrology Pertinent to California Culvert Practice.
- October, 1942—Debris Control at Culvert Entrances on California State Highway System.
- November, 1942—Highway Culvert Location and Slope From a Review of California Practice.
- December, 1942—Culvert Entrances and Headwalls on California Highway System.
- January, 1943—Culvert Outlets and Endwalls on California Highway System.
- February, 1943—Utilization of Siphon Principles in California Culvert Practice.
- March-April, 1943—Earth Loading Factors Affecting Field Installations of Culverts.
- May-June, 1943—California Adopts Waterway Ratings for Large Drainage Culverts.
- July-August, 1943—Committee Recommendations for Selection of Culvert Size and Type.

* See February, 1943, California Highways and Public Works.

Road Reinventory Being Made With Portable Automatic Traffic Counters

By R. E. PIERCE, Principal Highway Engineer

DURING 1941 and 1942, the Highway Planning Survey started a field reinventory of all the roads in the State other than State highways.

This reinventory made at the request of the Public Roads Administration was planned with the object of completing about one-fifth of the road mileage each year so that at the end of five years the entire road system would be covered and new maps made. Then the process would be repeated, taking the counties in the same order as before. Thus, none of our maps or other data would ever be more than five years old.

During the original survey, traffic counts were made at about 2,500 stations located so as to give a thorough coverage of the State. These counts were made manually by persons located at each station, the number ranging from one to six individuals depending upon the density of the traffic and other conditions.

THREE TYPES TESTED

About the time the reinventory survey was started, tests were made of three portable automatic recorders of two makes. These will be identified as Make A No. 1, Make A No. 2, and Make B.

Both makes are operated by electric current from dry cell batteries, the counting mechanism being actuated by air impulses set up by the impact of the tires of vehicles crossing a rubber tube stretched across the roadway and connected to the instruments.

A series of tests were conducted on these counters during 1941 on various highways in the vicinity of Sacramento, having two, three and four lane sections. The results of these tests were tabulated, the portable recorder count being checked by a manual count in which the number of vehicles were determined in the same manner as our standard practice in traffic counting—that is trailers were counted as separate vehicles but tractors with semitrailers were counted as one vehicle.

TESTS SHOWED ERRORS

The Make A counters were tested for four days prior to the arrival of the Make B counter. The overall errors for the four days were 1.51 per cent for Make A No. 1 and 1.39 per cent for Make A No. 2. However, both counters showed errors for a single day in excess of 3 per cent.

Upon arrival of the Make B counter all these counters were tested for five days more. The average errors for these five days were found to be plus 1.57 per cent for Make A No. 1; plus 1.36 per cent for Make A No. 2 and minus 1.42 per cent for the Make B counter.

The results obtained from the Make A counters checked closely with those obtained in the first four days of testing. The overall error on the Make B counter is approximately equal to the Make A counters and furthermore its operation is more consistent, the errors for any one day being less than 2 per cent and always in the same direction, minus.

The Make A counters showed errors for individual days in this group of tests of 2.30 per cent and 4.60 per cent respectively. This is apparently due to the extreme sensitivity of the Make A counters. The errors are nearly always in the plus direction.

COUNTS EVERY AXLE

The Make A counter seldom fails to count every axle crossing the road tube. The Make B counters, on the other hand, tend to miss axles occasionally, particularly the second axle of vehicles with dual rear axles, which accounts for the very good accuracy obtained from this counter.

All three counters tested gave sufficiently accurate results to warrant their use in highway traffic counting. If traffic were measured in terms of axles passing a given point, the Make A counters would be definitely preferable as they count axles more accurately. However, with traffic counted in terms of vehicles it was believed the Make B counter produces slightly more accurate results and with pos-

sibly greater consistency, since it appeared to be less sensitive to slight changes in adjustment.

For these reasons, a total of 47 of the latter instruments were purchased, the specifications being as follows:

1. Size 6" long by 4 $\frac{1}{4}$ " wide by 4" high. Weight, 9 pounds. The aluminum casting is moisture and dust proof and has a window in the top for the reading of counter figures. The cost including tubing and clamps was approximately \$30 per unit.

2. The counter mechanism consists of a special wound solenoid coil and a Veeder Root counter. The counter is actuated when contact is made by an air-electric relay switch. The contact points are silver and are so arranged that it is not necessary to disconnect the battery to adjust the points.

BATTERY SPECIALLY BUILT

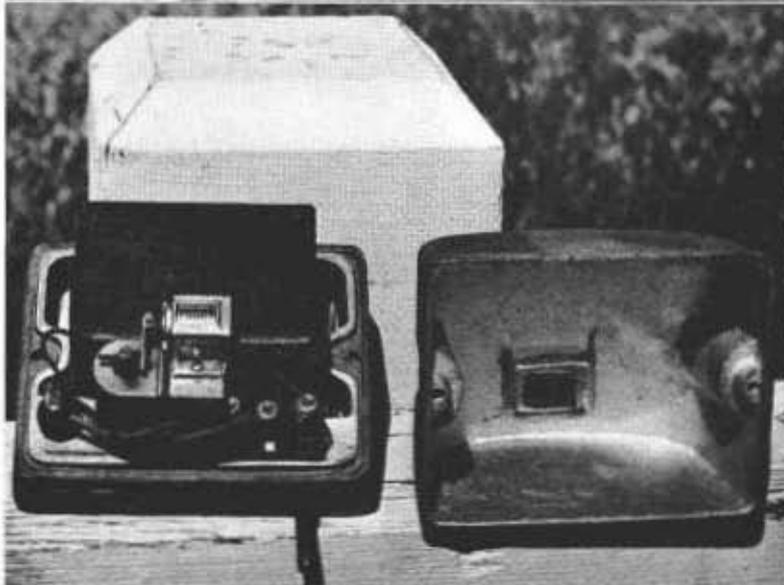
3. The dry battery is a specially built high amperage type, size 2 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " x 4", approximate life is 200,000 contacts. Replacement cost \$1.50.

4. The detector tube used is size $\frac{9}{16}$ " outside by $\frac{3}{16}$ " inside diameter. The counters will operate satisfactorily with detector tubes up to 60 feet in length. One end of the detector tube connects to the recorder, the free end being plugged. The detector tube is made fast on both sides of the highway by clamps placed around the tube and nailed into the highway shoulder. The recorder itself is chained and locked to any upright post or tree on the right-of-way.

These 47 Make B and the two Make A counters were used in making counts in 10 of the 11 counties selected for the first reinventory.

TWENTY-FOUR HOUR COUNTS

The plan was for the fieldman to set out the counters at points previously determined on the road maps. Each count was for a 24-hour period. This permitted the field men to place the instruments and take initial readings at such times as were convenient during normal working hours and arrange to take final readings and pick



Top photo shows typical installation of automatic traffic counter on highway. Black line on pavement in foreground is 9/16 inch rubber tubing that actuates counting machine. Lower pictures show recording mechanism in box which is secured to post by lock and chain

up instruments in the same sequence 24 hours later. Since the instruments were generally spread over a distance not exceeding 20 miles for a specific area the slight time offset between successive counters did not introduce any material error in results and also largely eliminated overtime for the field men.

The tabulation shows the cost of this operation by county. The cost per counter per day varies from a low of \$1.34 to a high of \$4.39 with an average of \$1.71. The variation in cost is primarily due to the variation in distance from Sacramento of the field of operations and to the relative

density of the road grid in the several counties. With a dense road grid a larger number of counts can be obtained per day due to shorter mileage between stations.

LACK TRAFFIC CLASSIFICATION

The principal disadvantage of automatic counting is the lack of any segregation of the traffic into various classifications such as trucks, buses, foreign cars, etc. This was overcome to some extent by having the field men make four-hour manual classification counts at representative automatic counter stations in spare time available after setting out the counters.

A total of 56 such manual counts were obtained during the course of the automatic counting program. On the basis of data so obtained it was possible to compute the distribution of the various vehicle types in terms of percentage of total traffic at the specific locations where manual counts were made. By combining the results of all such counts in a county or other geographic area, average distribution factors were obtained by means of which calculations of vehicle type distributions at other counter locations could be obtained with a fair degree of accuracy.

Accidents Decrease on Rural State Highways

THE trend of traffic accidents on the rural State Highway System for the first six months of 1943 as compared with a similar period for 1942, is considerably more favorable than on city streets and county roads, according to Director of Public Works C. H. Purcell.

For the periods under consideration, Director Purcell said, there was a 41 per cent decrease in reported traffic accidents as compared with a 22 per cent decrease in traffic on the rural State Highway System. Considering the State as a whole, there was a decrease of 17 per cent in reported accidents as compared with a 21 per cent decrease in traffic. On the same basis of comparison, total gasoline consumption shows a decrease of 18 per cent.

"It must be pointed out, however," Director Purcell said, "that during the first six months of 1943 there were 817 more pedestrians injured and 53 more killed than during a like period in 1942, and that pedestrian accidents influence the accident record on city streets to a major extent. This record admittedly is for a short period of time and is thus a meager sample upon which to base fixed conclusions."

Chester H. Warlow

(Continued from page 5)

He is a director of the Sierra National Parks Highway Association, being one of the founders of that organization and chairman of the San Joaquin Valley State-wide Water Committee from 1930-1940; member of the Fresno Rotary Club; American Legion Post No. 4 and Sequoia Sunnyside Club. He was the leader of the community effort that resulted in the construction of Kings Canyon Highway, Fresno-Yosemite Highway, and the Generals Highway.

He entered the oil business in 1898 by purchase of stock of the Blue Goose Oil Company in the Coalinga oil fields and is president and principal owner of the Ward Oil Company and Seneca Oil Company, both producing companies in the Coalinga area. He is also director and member of the executive committee, Independent Oil Producers Agency of California.

Mr. Warlow enlisted in the regular Army Signal Corps in August 1917, was commissioned second lieutenant, December 1917, and assigned com-

County Postwar Road Funds Apportioned

(Continued from page 11)

Following is the apportionment as announced by Director C. H. Purcell:

County	Registered vehicles	Amount
Alameda	204,803	\$92,720.28
Alpine	112	5,047.97
Amador	2,747	6,176.58
Butte	17,600	12,538.35
Calaveras	2,854	6,222.41
Colusa	4,343	6,860.17
Contra Costa	63,251	32,091.38
Del Norte	1,627	5,696.87
El Dorado	4,231	6,855.03
Fresno	72,711	36,143.24
Glenn	5,565	7,383.58
Humboldt	17,114	12,330.19
Imperial	19,107	13,183.82
Inyo	3,306	6,416.01
Kern	54,661	28,412.15
Kings	14,943	11,400.32
Lake	3,868	6,656.72
Lassen	5,561	7,381.86
Los Angeles	1,156,981	500,552.78
Madera	9,449	9,047.15
Marin	20,029	13,578.73
Mariposa	1,455	5,623.20
Mendocino	8,714	8,732.34
Merced	19,523	13,362.00
Modoc	3,155	6,351.34
Mono	567	5,242.86
Monterey	30,850	18,213.53
Napa	13,728	10,879.91
Nevada	4,808	7,059.34
Orange	63,233	32,083.67
Placer	10,164	9,353.40
Plumas	3,590	6,537.65
Riverside	43,014	23,423.56
Sacramento	73,338	36,411.79
San Benito	5,086	7,178.41
San Bernardino	66,617	33,533.09
San Diego	139,834	64,893.06
San Francisco	184,015	83,816.46
San Joaquin	55,739	28,873.87
San Luis Obispo	16,213	11,944.28
San Mateo	48,688	25,853.82
Santa Barbara	28,256	17,102.48
Santa Clara	74,073	36,726.61
Santa Cruz	17,590	12,534.07
Shasta	11,652	9,960.73
Sierra	743	5,318.24
Siskiyou	10,269	9,398.37
Solano	32,280	18,826.02
Sonoma	31,676	18,567.32
Stanislaus	34,347	19,711.35
Sutter	7,929	8,396.11
Tehama	5,871	7,514.64
Trinity	906	5,388.05
Tulare	42,105	23,034.22
Tuolumne	3,514	6,505.10
Ventura	26,590	16,388.91
Yolo	12,518	10,361.65
Yuba	7,408	8,172.96
Totals	2,825,021	\$1,500,000.00

manding officer of Flying Cadets, Cadet Wing, Kelly Field; adjutant of Cadet Wing in charge of Ground School Sections; commissioned First Lieutenant June 15, 1918; and recommended for commission as Major in Air Service, October 1918.

He is married and has no children.

Maintenance Problems After 20 Months of War

(Continued from page 12)

and in fact is not available on the coast, the breakdown of equipment in certain circumstances may become a serious matter.

Some difficulty has been experienced in securing plant-mix and other material required for maintenance work due to the demands as a result of extensive construction for airports and other military establishments. This has been overcome largely by stockpiling plant-mix and aggregates in considerable quantities in the off season, and by seeing to it that all available tank storage is kept filled with bituminous materials.

The main concern at the present time is the possibility that further restrictions may be placed on the manufacture of liquid asphalts. In that event, changes in maintenance methods and equipment would be necessary. Such changes in many cases would require time as well as securing new equipment which is on the critical list.

BLANKET TREATMENT LIMITED

As time passes the maintenance of the highway system will become more difficult due to the very limited construction and reconstruction program. Construction funds have been inadequate over a long period to fully develop the highway system. As a result the reconstruction of surfacing has been sacrificed in order to secure proper location with the thought that this deficiency could be corrected later.

In 1940 it was estimated that reworking or reconstruction of the surfacing on the rural State highway at a rate of 10 per cent, or over 1200 miles per year, was required to care for traffic needs. This deficiency is being made up to some extent by a program of blanket treatments.

Funds limit this program, however, to about 400 miles per year. War Production Board restrictions limit such work to a minimum design so that benefit from such work can be expected for only a three to five year period when further reinforcement or reworking must be provided. It is evident then that if the war continues even two years longer, the State highways will have deteriorated in very considerable degree.

Telephone operator to new girl she is breaking in: "No, honey, you say 'just a moment, please,' not 'Hang on to your shirt, mister.'"

Highway Bids and Awards for August and September 1943

ALAMEDA COUNTY—Between Toll Plaza and Distribution Structure about 1.3 miles, imported borrow to be furnished and placed, plant mixed material to be placed as base and surfacing, asphalt concrete pavement to be constructed and seal coat to be applied to plant mixed surfacing and imported borrow on parking areas and shoulders. District IV, Routes 5, 69. Chas. L. Harney, San Francisco, \$97,475; Gallagher & Burk, Oakland, \$109,662. Contract awarded to Lee J. Immel, Berkeley, \$91,925.

ALAMEDA COUNTY—Between Dublin and Castro Hill, portions only, about 3.9 miles, to be repaired with asphalt concrete. District IV, Route 5, Section B. Lee J. Immel, Berkeley, \$97,953; A. Teichert & Company, Sacramento, \$97,964. Contract awarded to Louis Biasotti & Son, Stockton, \$94,314.

CONTRA COSTA COUNTY—Near Pittsburg and near Brentwood, about 2.9 miles to be repaired with plant mixed material on crusher run base and applying a seal coat. District IV, Route 75, Sections C,D. Lee J. Immel, Berkeley, \$50,184; E. A. Forde, San Anselmo, \$51,139; Louis Biasotti & Son, Stockton, \$52,244. Contract awarded to Claude C. Wood, Lodi, \$48,052.

DEL NORTE COUNTY—Between Crescent City and Smith River Bridge, portions only, about 4.7 miles, to be repaired with imported base material and armor coat. District I, Route 71, Section A. Mercer-Fraser Co., Eureka, \$50,030. Contract awarded to Marshall S. Hanrahan, Redwood City, \$49,652.

EL DORADO AND AMADOR COUNTIES—Across the Cosumnes River about 10 miles south of El Dorado, the existing timber truss span to be repaired. District X, Route 65, Sections C,A. M. E. Whitney, Bakersfield, \$14,420; James H. McFarland, San Francisco, \$14,784; F. Kaus, Stockton, \$15,595. Contract awarded to M. A. Jenkins, Sacramento, \$13,914.

FRESNO AND MERCED COUNTIES—Between Eagle Field and Russell Avenue, about 1.2 miles to be graded and bituminous surface treatment applied; and between South Dos Palos and Dos Palos, about 2.0 miles to be surfaced with road mixed surfacing. District VI, Eagle Field. M. W. Stanfield Company, Los Angeles, \$36,096; J. E. Haddock, Ltd., Pasadena, \$41,849. Contract awarded to Brown, Doko and Baun, Pismo Beach, \$35,948.

LOS ANGELES AND VENTURA COUNTIES—Ventura Boulevard, between Calabasas and Newbury Park, portions only, about 4.4 miles, to be repaired with plant mixed material. District VII, Route 2, Sections C,A. Southwest Paving Co., Roscoe, \$33,010. Contract awarded to Schroeder & Co., Inc., Roscoe, \$31,372.

LOS ANGELES AND ORANGE COUNTIES—On Firestone Blvd., between Marquardt Street and Coyote Creek, and on Imperial Highway between Route 62 and Puente Road, about 3.8 miles, to be repaired with plant mixed material and bituminous surface treatment. District VII, Routes 174 and 176, Sections B,A. Oswald Bros., Los Angeles, \$19,922; Vido Kovacevitch, South Gate, \$21,405; Pacific Rock & Gravel Co., Los Angeles, \$22,910. Contract awarded to Griffith Co., Los Angeles, \$19,639.

MARIN COUNTY—Reed Road and Tiburon Boulevard, between State Highway Route 52 and 4 miles easterly, about 3.9 miles to be graded, crusher run base to be constructed and armor coat to be placed. District IV, Lee J. Immel, Berkeley, \$160,407; Macco Construction Co., Oakland, \$168,207; Fredrickson & Watson Construction, Oakland, \$170,880; A. G. Raisch, San Francisco, \$222,464. Contract awarded to Heafey-Moore Co., Oakland, \$121,939.

MENDOCINO COUNTY—Between Dimmick Memorial Park and Mendocino, about 3.2 miles, to be repaired with imported base material and a seal coat. District I, Routes 48, 56, Sections C,D. Elmer J. Warner, Stockton, \$34,877; Fred J. Maurer & Son, San Francisco, \$44,920. Contract awarded to Ted Watkins, Linden, \$32,762.

MERCED COUNTY—Between 2.5 miles north of southerly Merced County line and Lingard, about 6.1 miles, to be repaired by the road mixed method on untreated rock base. District X, Route 4, Section A. Claude C. Wood, Lodi, \$73,470; Brown, Doko & Baun, Pismo Beach, \$77,670; Granite Construction Company, Watsonville, \$79,635; Louis Biasotti & Son, Stockton, \$80,630; J. E. Haddock, Ltd., Pasadena, \$104,395; M. W. Stanfield Co., Los Angeles, \$104,920. Contract awarded to Phoenix Construction Co., Bakersfield, \$61,131.

MONTEREY AND SAN BENITO COUNTIES—Portions between Santa Rita and San Benito River, about 3.0 miles, to be repaired with plant mixed material. District V, Route 2, Sections J,B. M. J. Ruddy & Son, Modesto, \$21,830. Contract awarded to Granite Construction Co., Watsonville, \$15,240.

VARIOUS COUNTIES IN DISTRICT III—Painting maintenance station buildings at Tahoe City, Mays, Nevada City, Roseville, Williams, Chico, Marysville, Truckee, Donner Summit, Yuba Gap, Colfax and Sierraville. Hastings & Wilson, Yuba City, \$8,845; Deemer & Deemer, San Francisco, \$6,790. Contract awarded to Acme Painting Service, Sacramento, \$5,568.

RIVERSIDE COUNTY—Between San Diego County line and Corona and between Elsinore and Route 19, about 41.4 miles, por-

tions to be repaired with plant mixed material and a seal coat and other portions to be repaired with a seal coat. District VIII, Routes 77 and 78, Sections A,B,C,D,Esu, C,D. George Herz & Co., San Bernardino, \$54,153; Oswald Bros., Los Angeles, \$59,405. Contract awarded to E. L. Yeager, Riverside, \$52,395.

RIVERSIDE COUNTY—Between Camp Haan and Alessandro Trailer Project, a new cross-over to be graded and surfaced with plant mixed surfacing and an existing cross-over to be removed. Contract awarded to George Herz & Co., San Bernardino, \$2,814.

SAN DIEGO COUNTY—Between Palm Avenue and The Silver Strand, about 2.4 miles to be graded, paved with portland cement concrete and plant mixed surfacing on portland cement concrete base. District XI, Route 199, Section A. Calowell Construction Co., Long Beach, \$269,967; V. R. Dennis Construction Co., San Diego, \$287,449; Rhoades Bros. & Shofner, Los Angeles, \$305,397. Contract awarded to Griffith Co., Los Angeles, \$208,486.

SHASTA COUNTY—At Burney, Four bridges across Burney Creek to be repaired. District II, Route 28, Section D. Jack Gilmore, Redding, \$18,268; M. A. Jenkins & A. R. McEwen, Sacramento, \$19,219; M. E. Whitney, Bakersfield, \$20,880. Contract awarded to J. P. Brennan, Redding, \$16,042.

SAN LUIS OBISPO COUNTY—In Paso Robles, about 2.7 miles to be repaired with plant mixed material and a seal coat. District V, Route 2, Brown, Doko and Baun, Pismo Beach, \$34,037. Contract awarded to Granite Construction Co., Watsonville, \$29,460.

SAN JOAQUIN COUNTY—On Willow Street, Carlton Avenue, North Drive and Occidental Avenue between Buena Vista Avenue and Pollock Shipyard, about 1.5 miles to be graded and surfaced with plant mixed surfacing. District X. M. J. B. Construction Co., Stockton, \$43,772; E. A. Forde, San Anselmo, \$49,860; A. Teichert & Co., Sacramento, \$51,510. Contract awarded to Louis Biasotti & Son, Stockton, \$41,238.

SOLANO COUNTY—About 7 miles south of Dixon, a reinforced concrete slab bridge across Ulatis Creek to be constructed. District X, Route 101, Section B. G. M. Carr, Santa Rosa, \$23,818; James H. McFarland, San Francisco, \$24,143; M. A. Jenkins & A. R. McEwen, Sacramento, \$24,586; Dan Caputo, San Jose, \$27,179; M. E. Whitney, Bakersfield, \$27,183. Contract awarded to Holdener Construction Company, Sacramento, \$23,112.

SOLANO AND NAPA COUNTIES—Between north city limits of Vallejo and Suscol Creek, about 8.9 miles to be graded and paved with portland cement concrete. District X, Routes 74, 8; Sections A, B. Lee J. Immel, Berkeley, \$663,168; Louis Biasotti & Son, Stockton, \$670,839; Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, \$671,444; Heafey-Moore Co., Oakland, \$709,152; A. Teichert & Company, Sacramento, \$735,598; Macco Construction Co., Oakland, \$748,709; Parish Bros., Sacramento, \$793,161; Chas. L. Harney, San Francisco, \$885,319. Contract awarded to J. A. Casson & N. M. Ball Sons, Berkeley, \$641,894.

SUTTER COUNTY—Between Yuba City and Butte County line, about 5.2 miles to be repaired with plant mixed material. District III, Route 3, Section A. Louis Biasotti & Son, Stockton, \$36,035. Contract awarded to Hemstreet & Bell, Marysville, \$33,525.

TRINITY COUNTY—Portions between one mile east of Weaverville and Fawn Lodge, about 5.7 miles to be repaired with plant mixed material. District II, Route 20, Sections A, B. Contract awarded to Clements & Co., Hayward, \$21,750.

Congratulations From Truck Industry Editor

Motor Transportation
Los Angeles, California

August 27, 1943

Editor
California Highways and
Public Works
P. O. Box 1499
Sacramento, Calif.

Dear Sir:

Heartiest congratulations to you and your publication on the article in the July-August issue dealing with truck traffic on the California Highway System.

Glad to see your magazine give this recognition to the importance of motor transport and I am sure the industry will benefit as the result of your presentation.

Kind personal regards,

Sincerely yours,

(Signed) Roy H. Compton
Editorial Director

ALAMEDA COUNTY—In the city of Oakland on Twenty-second Street between Peralta Street and Wood Street, about 0.25 mile to be graded and paved with portland cement concrete and asphalt concrete. District IV, Gallagher & Burk, Oakland, \$21,690; Lee J. Immel, Berkeley, \$24,643. Contract awarded to Louis Angelus Co., Oakland, \$21,135.

CONTRA COSTA COUNTY—Between Danville and one mile north, a portion of the state highway to be repaired. District IV, Route 107, Section A. Lee J. Immel, Berkeley, \$14,458; E. A. Forde, San Anselmo, \$17,512; Louis Angelus Co., Oakland, \$17,959. Contract awarded to Union Paving Co., San Francisco, \$13,826.

CALAVERAS COUNTY—Between San Andreas and Angels Camp, about 6.8 miles to be repaired by the road mixed method. District X, Route 65, Section B. Harms Bros., Sacramento, \$28,950; Phoenix Construction Co., Bakersfield, \$30,145; A. A. Tieslau Son, Berkeley, \$32,080; R. A. Westbrook, Sacramento, \$32,200. Contract awarded to A. Teichert & Co., Sacramento, \$24,580.

DEL NORTE COUNTY—In Crescent City, a reinforced concrete box culvert at Elk Creek to be constructed. District I, Route 1, Section Cr. C. E. E. Smith, Hill, \$22,845; C. C. Gildersleeve, Colusa, \$22,994; Mercer Fraser Co., Eureka, \$25,020. Contract awarded to Flotation Systems, Inc., Los Angeles, \$18,934.

IMPERIAL COUNTY—At points between Indio and Brawley, 11 timber bridges to be repaired. District XI, Route 26, Section E. Fred D. Kyle, Los Angeles, \$20,616; Contracting Engineers Co., Los Angeles, \$24,449; Byerts & Dunn, Los Angeles, \$29,766; Walter H. Barber, San Diego, \$29,914; Ralph A. Bell, San Marino, \$32,520. Contract awarded to C. B. Tuttle, Wilmington, \$19,187.

LASSEN COUNTY—Near Honey Lake, an area to be graded and portions to be surfaced with plant-mixed surfacing and with portland cement concrete pavement. District II. R. A. Westbrook, Sacramento, \$767,786; E. B. Bishop, Orland, \$582,125; A. Teichert & Co., Sacramento, \$592,333; Parish Bros. & A. S. Vinnell Co., Sacramento, \$611,201; Bressi & Bevanda Constructors, Inc., Los Angeles, \$914,870. Contract awarded to Radich & Brown, San Leandro, \$521,900.

LOS ANGELES COUNTY—On Fries Avenue, La Paloma Avenue and Falcon Street from Anacapa Street to San Clemente Avenue, about 0.5 mile to be graded, portland cement concrete pavement to be constructed and bituminous surface treatment to be applied to shoulders. District VII, Morman Island. Contract awarded to Griffith Co., Los Angeles, \$25,458.

LOS ANGELES COUNTY—On Pearl Street, between Sepulveda Boulevard and Centinela Avenue in the city of Los Angeles, about one mile to be surfaced with plant mixed surfacing. District VII, Pearl Street. Vido Kovacevich, South Gate, \$19,410; Griffith Co., Los Angeles, \$20,745; Oswald Bros., Los Angeles, \$20,940. Contract awarded to C. O. Sparks & Mundo Engineering Co., Los Angeles, \$17,555.

LOS ANGELES COUNTY—East Broadway between Crenshaw Blvd. and Doty Avenue, about 0.7 mile to be graded and surfaced with plant mixed surfacing. District VII, Vido Kovacevich, South Gate, \$38,959; R. R. Hensler, Glendale, \$39,628; Griffith Co., Los Angeles, \$43,008. Contract awarded to Oswald Bros., Los Angeles, \$32,377.

NAPA COUNTY—Between Third Street in Napa and Suscol Creek, about 4.3 miles to be graded and paved with portland cement concrete. District X, Route 8, Section Nap., B. Lee J. Immel, Berkeley, \$420,002; Chas. L. Harney, San Francisco, \$481,561. Contract awarded to J. A. Casson Co. & N. M. Ball Sons, Hayward, \$410,196.

NAPA COUNTY—Between Napa and Solano County line, portions about 7.6 miles in length, to be repaired by placing plant-mixed material over the existing bituminous surface. District IV, Routes 8,74, Sections B.A. Parish Bros., Sacramento, \$68,860; Lee J. Immel, Berkeley, \$69,750; Chas. L. Harney, San Francisco, \$71,100; E. A. Forde, San Anselmo, \$71,209; Louis Biasotti & Son, Stockton, \$73,322; Heafey-Moore Co., Oakland, \$74,804; A. Teichert & Co., Sacramento, \$80,925. Contract awarded to A. G. Raisch, San Francisco, \$63,571.

RIVERSIDE AND SAN BERNARDINO COUNTIES—On Etiwanda Avenue between Mission Boulevard and Valley Boulevard about 3.3 miles to be graded and surfaced with plant mixed surfacing. District VIII, George Herz & Co., San Bernardino, \$72,505.50; Bonadiman-McCain, Inc., Los Angeles, \$81,601; Griffith Co., Los Angeles, \$82,334; Oswald Bros., Los Angeles, \$84,562; Harvey Adair Construction Co., El Monte, \$98,470. Contract awarded to Match Bros., Elsinore, \$72,505.

RIVERSIDE COUNTY—At points between Indio and Blythe, 33 timber bridges to be repaired. District XI, Route 64, Sections B.C. John Strona, Pomona, \$51,380; C. B. Tuttle, Wilmington, \$58,057; Dan Caputo, San Jose, \$69,068; Ralph A. Bell, San Marino, \$69,955; Oberg Bros., Inglewood, \$75,200; Carlo Bongiovanni, Hollywood, \$75,973; Contracting Engineers Co., Los Angeles, \$78,955; Walter H. Barber, San Diego, \$82,927; Fred D. Kyle, Los Angeles, \$89,276; Flotation Systems, Inc., Los Angeles, \$99,917; H. B. Nicholson, Los Angeles, \$107,076; A. S. Vinnell Co., Alhambra, \$136,332. Contract awarded to F. E. Stearman, Glendale, \$42,924.

RIVERSIDE COUNTY—Between 4 miles west of Shavers Summit and 2.9 miles west of Blythe, portions, about 15 miles in length, to be repaired by road mixed method. District XI, Route 64, Sections I,B,C,D,E. Phoenix Construction Co., Bakersfield, \$54,009. A. S. Vinnell Co., Alhambra, \$58,202; Harvey Adair Construction Co., El Monte, \$76,737; Warren Southwest Inc., Los Angeles, \$87,232. Contract awarded to Arthur A. Johnson, Laguna Beach, \$49,995.

SAN LUIS OBISPO COUNTY—Between San Luis Obispo and 0.8 mile west of Pennington Creek, about 6.5 miles, shoulders and median strip to be graded and bituminous surface treatment applied. District V, Route 56, Section SLO.D. Arthur A. Johnson, Laguna Beach, \$41,055; Brown, Doko and Baum, Pismo Beach, \$45,778; Granite Construction Co., Watsonville, \$52,796. Contract awarded to M. W. Stanfield Co., Los Angeles, \$36,317.

SANTA BARBARA COUNTY—Between Surf and Lynden School, about 3.5 miles, imported borrow and plant mixed surfacing to be placed. District V, Route 149, Section A. L. A. Brisco, Arroyo Grande, \$48,893. Contract awarded to Brown, Doko and Baum, Pismo Beach, \$35,469.

SHASTA COUNTY—Twelve miles east of Redding, a through girder bridge to be constructed across Oak Run Creek. District II, Route 20, Section C. James B. Allen, San Carlos, \$10,536; M. A. Jenkins, Sacramento, \$11,132; O'Connor Bros., Red Bluff, \$11,240; C. C. Gildersleeve, Colusa, \$13,810; Louis Angelus Co., Oakland, \$14,485; J. Phillip Murphy Corp., San Francisco, \$15,637. Contract awarded to Jack Gilmore, Redding, \$10,326.

VENTURA COUNTY—On Harvard Street between west city limits of Santa Paula and Main Street, about 2.3 miles to be repaired with plant mixed material. District VII, Route 79. Brown, Doko and Baum, Pismo Beach, \$17,435; Vido Kovacevich, South Gate, \$17,990; Oswald Bros., Los Angeles, \$18,874. Contract awarded to G. W. Ellis, North Hollywood, \$16,105.

In Memoriam Chester A. Potter

On September 17, 1943, Chester A. Potter, Associate Highway Engineer in headquarters office at Sacramento, died suddenly of heart trouble. He was 56 years of age.

"Cap" Potter was one of the old-time construction engineers of the Division of Highways. He joined the State Highway organization as an instrumentman on location in June, 1917, and, with the exception of some eight months' service in the Army during World War I, he continued with the department until his death.

From the start of his employment, "Cap" proved his ability as a highway engineer. His earlier work was all in District I and included both location and construction on the Redwood Highway and the Klamath River Road north of Crescent City. In 1919 he was made Assistant Resident Engineer on prison labor construction in Lake County and two years later became the Resident. In 1926 he was transferred to District X as Resident Engineer on construction in Stanislaus County. A year later he moved to the District III organization, where he remained for over eight years. He served in the capacity of Resident on a variety of construction contracts and from 1931 to 1935 was Maintenance Superintendent in both Marysville and Placerville. He went back to construction and represented the State on numerous highway contracts in District II, including portions of the famous Feather River Highway.

In 1942 his heart began to give him trouble. In November of that year he was forced to give up the active life of a Resident Engineer on construction and was transferred to headquarters office where he worked for the Office Engineer on the securing of priorities and the maze of Federal wartime regulations and restrictions governing highway construction.

"Cap" was one of the Division's most valued Resident Engineers. His experience was wide and varied, covering the supervision of all types of road construction from heavy grading to high type paving. Many of the rising engineers in the Division received the training that put them on their way under the guidance of "Cap" Potter. His discipline of the men who worked under his supervision was firm but kindly. He inspired in them confidence and lasting friendship.

He was born in Greenville, Ohio, and received his education in Anderson, Indiana, and at Earlham College. He leaves a sister, Mrs. Mable Van Hook of Anderson, and two nieces, one in Anderson and the other in Louisville.

State of California

EARL WARREN, Governor

Department of Public Works

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

CHARLES H. PURCELL, Director of Public Works

A. H. HENDERSON, Assistant Director

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HARRISON BAKER, Pasadena
HOMER P. BROWN, Placerville
JAMES GUTHRIE, San Bernardino
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FRED J. GRUMM, Assistant State Highway Engineer
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RICHARD H. WILSON, Office Engineer
T. E. STANTON, Materials and Research Engineer
R. M. GILLIS, Construction Engineer
T. H. DENNIS, Maintenance Engineer
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L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
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E. R. HIGGINS, Comptroller
FRANK C. BALFOUR, Chief Right of Way Agent

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F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
JNO. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
E. T. SCOTT, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
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W. H. ROCKINGHAM, Principal Mechanical and Electrical Engineer
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