

CALIFORNIA HIGHWAYS and PUBLIC WORKS

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One of the
Natural Water Resources
in Kings River Canyon

Official Journal of
THE DEPARTMENT
OF PUBLIC WORKS
State of California

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First Four Months of 1932 Show Marked Progress of Ten Year Plan

Forty-five Per Cent of Annual Construction Program Under Way
by May 1 With \$10,250,000 Released for New Work--
A Record of Activity Equal to Last Year

By COLONEL WALTER E. GARRISON, Director of Public Works

ORDERLY progress under the ten-year plan for highway construction in California continues with gratifying results.

Charged by the Legislature and the people with responsibility for the development of a great road system, the Department of Public Works is keeping the work fully abreast of the approved schedule.

The first quarter's (1932) record discloses activities by the Highway Division equal to those of the similar period of 1931.

Against a new construction program that totals \$23,000,000 for the year, there will have been released during the first four months more than \$10,250,000 for new construction. This means that 45 per cent of the year's schedule is under way the first third of the year.

Work orders issued since January 1 total \$6,085,300, and the projects awaiting the opening of bids (April 12) reach \$2,811,000. The total becomes \$8,896,300. By the end of April, approximately \$3,000,000 more will be placed by contract. Of this latter amount, \$1,620,000 is already under advertised call, leaving \$1,380,000 more to go out, before May 1. The several amounts, when combined with the

work orders issued and projects advertised, will give an aggregate of \$10,276,300 in construction put under way by the first of May.

WORK IN HAND

In going activities, work to the amount of \$10,718,000 was carried over from last year. Without allowance for completions, the record of the Highway Division for the first four months of the year shows construction work in hand to the amount of \$20,994,900.

Nevertheless, California is not leading all her sister states in highway development. California is not spending more or building more than any other. Our State's position on the list of comparatives does not bear out the careless statement that we are overly ambitious in highway construction. The situation should be understood in order to refute erroneous statements tending to create a

division of sentiment as to the wisdom of maintaining our present progress.

On January 1 the position of California in highway building was as follows:

Sixth among the states in population.

Second in area.

Second in motor registrations.



COLONEL WALTER E. GARRISON

Groyne System Adopted in Widening State's Most Congested Coast Link

By S. V. CORTELYOU, District Engineer

OUTSTANDING in two ways is that section of the State Highway system known officially as VII-Los Angeles-60-B and generally called "Roosevelt Highway" or "Coast Boulevard," which extends from Santa Monica northwesterly along the coast to the point where Beverly Boulevard comes down to the sea. It has the highest traffic count of any portion of the State highway system and it is immediately adjacent to the most intensively used beach areas in southern California.

On Sunday, July 14, 1929, in a 16-hour period from 6 a.m. to 10 p.m., 53,303 vehicles passed over the highway west of Santa Monica Canyon, which means an average of 56 vehicles per minute throughout the whole 16-hour period.

This strip of coast line affords the most convenient series of beaches for that large metropolitan area extending along the foothills, including Santa Monica, Beverly Hills, Hollywood, Glendale, Pasadena, the northerly portion of Los Angeles, etc. During the summer months the use of the beach seems to be limited only by area available for parking of autos of those who drive down for beach bathing and picnicking. While there is a considerable volume of "through" traffic using this coast highway, the largest percentage of the traffic is due to the recreational use of the adjacent beaches.

CONTRACTS AWARDED

With a view of relieving the congested traffic and providing easier access to these beach areas, the State has recently awarded two contracts for very important and much needed improvements between Santa Monica Canyon and Beverly Boulevard. One contract includes the grading of a roadway 80 feet wide, of which 40 feet will be paved with asphalt concrete and 20-foot earth shoulders on each side will be oiled so that the full width of 80 feet will be used by traffic. Under a second contract the State will construct five groynes of steel sheet piling for shore protection.

A considerable portion of this section passes along beach frontage which has been set aside for State and county park purposes. In order to make these beach areas available, it is neces-

sary to provide highway shoulders wide enough to permit the parking of cars and at the same time not interfere seriously with traffic along the highway. Along the county and State beaches an additional 15- to 20-foot strip will be graded for the parking of autos outside of the 80-foot roadway.

PUBLIC BENEFACTORS

The property along the beach road is extremely valuable, and great credit is due the following owners of the property who have donated not only the 80-foot right of way but also have given the State the right to extend excavation and embankment slopes outside of this strip as required for an 80-foot width of roadbed: Alphonso Bell and the Los Angeles Mountain Park Company, R. C. Gillis and the Pacific Land Corporation; the Harold F. McCormack Company; The Huntington Palisades Property Owners' Association and Will and Betty Rogers. The deed from the famous American humorist was obtained immediately after his return from the Japanese-Chinese war front, and the League of Nations Peace Meeting in Europe.

The contract for widening this highway presents no unusual construction difficulties except for the shore protection and the large volume of traffic to be handled over the road during construction. The roadbed section along nearly the entire length of the project will be widened on the landward side by cutting into the adjacent cliffs with power shovels. This excavated material will be hauled in trucks and used to build up the embankment slopes on the ocean side of the highway.

ALONG PARK LANDS

Under present shore conditions, the embankment slopes of the widened highway along about 2400 feet of the ocean frontage, in the park lands of the State of California and the county of Los Angeles, would be subjected to severe erosion by the ocean. It would be impossible to maintain these embankment slopes without some kind of shore protection.

On account of the great value of and the demand for the sand beach area for recreational purposes, it became evident immedi-



GREATEST TRAFFIC DENSITY in the State is recorded for this section of the Coast Highway west of Santa Monica Canyon where 53,303 vehicles passed in a 16-hour period. The roadway will be graded to a width of 80 feet.



CONQUEST OF THE WAVES, soon to be ended, is depicted in this scene. Battering seas have wiped away the beach and are gouging out the highway slopes on this section of the Coast Boulevard northwest of Santa Monica.



HARNESSING OLD OCEAN, compelling it to work in building up beach by use of groynes or bulkheads, this view shows results obtained on Santa Monica coast. Note tops of groynes nearly submerged by newly deposited sand.

Maricopa-Ventura Highway Largest Joint District Cooperation in State

A HIGHWAY now under construction between southern San Joaquin Valley and the Santa Barbara coast and officially designated as "Joint Highway District No. 6" is unique in its history and interesting as the most outstanding example of cooperative highway building under the Joint District plan provided by law.

Among the first in the State to receive official recognition as an ultimately desirable highway route, this project was forced by

Pine Mountain into Sespe River, thence down Sespe River through the Sespe Gorge to Cold Springs, thence over the Topatopa Mountain range and down the north fork of Matilija River through Wheeler Gorge and Wheeler Hot Springs to the Ojai Valley, thence down the Ventura River to the city of Buena Ventura on the Coast Highway. The total distance is about 70 miles of which all but 11 miles will be new construction.

Under an act of the Legislature, adopted in



circumstances to wait nearly fifteen years before reaching the construction stage. Now being built through the cooperation of Uncle Sam, the State of California, and the counties of Santa Barbara, Ventura and Kern—it has achieved the distinction of being the largest cooperative project in the State in point of cost, length of project and number of cooperatives.

With the Coast Route 40 miles to the west, the Ridge Route 30 miles to the east, and no other intervening roads, this new highway makes a great saving in mileage between valley and coast and crosses one of the most rugged sections of the Coast Range of mountains.

The new highway leaves the Maricopa-Santa Maria State Highway at its entrance to the Cuyama Valley and follows up the Cuyama Valley to Ozena 20 miles, thence crosses over

1913, this road will become a State highway when fully completed. When the work now under way is finished there will remain a gap of only 17.4 miles to be built. This section lies between the two mountain ranges along the Sespe River.

The route makes two mountain ranges accessible to recreational traffic. San Joaquin Valley people can now reach Pine Mountain and people from the coast will soon be able to reach the Topatopa range. While through traffic will not be able to use this route until it is finished, local recreational traffic from each end can get into the mountains.

The Sespe, a virgin country inaccessible in the past except to pack outfits, is rugged and

(Continued on page 17)



THREE-IN-ONE SHOT is the unique bit of photography shown in picture No. 1 of a section of Maricopa-Ventura Highway where two short tunnels connected by a bridge are necessary to carry the road through a mountain spur and across Wheeler Gorge. The camera sees the three construction units as a black hole with a decorative entrance. No. 2 is taken from the interior of one tunnel looking across the bridge through the second bore. No. 3 shows finished portion of highway and No. 4 a view of Wheeler Gorge. Tunnel photos by Ben Blow, National Automobile Club.

How 240 Tons of Explosives Were Used Excavating Gorge Highway

The proper use of explosives in highway work is a fundamentally important item, and the following article describes the drilling, loading and blasting methods used on a contract of the Division of Highways that called for the excavation of some 700,000 cubic yards of material, most of which required heavy blasting and the use of over 480,000 pounds of explosives. The data for this article and the accompanying sketches were provided by Paul F. Green, Assistant Resident Engineer.

By C. S. POPE, Construction Engineer

THE SCENE of the blasting operations herewith described was on the relocated U. S. Highway Route 99 traversing the rocky sides of Shasta Canyon in northern California, beginning at a point about three miles north of the town of Yreka and extending to the Klamath River.

The canyon walls are steep and generally rocky, much broken up by dykes and rock masses, and the alignment at many places breaks through spurs and ridges which required cuts of considerable magnitude. However, a large part of the work was sidehill cut.

The rock formations were considerably broken and variable in structure as well as in hardness which required great care in drilling, method of placing powder pockets, and loading shots to avoid excessive overbreak.

The rock encountered was of igneous origin of unstratified, metamorphic, and eruptive types, varying in hardness from sound diorite to comparatively soft and shattered stone.

MINIMUM OF WASTING

Grade and alignment were worked out to secure as close a balance of cut and fill as possible, and, of necessity, blasting of rock overside, or wasting, was held to a minimum. The deep cuts through spurs or saddles required breaking the ground in place and hauling to fill sections.

The type of blasting chamber used in the different locations will be more easily understood if they are described by their local names, some of which are as follows:

COYOTE HOLES—A coyote hole is a drift to a powder chamber similar to a mining tunnel, except that the drift is made smaller and the rounds of shots are less in number of drilled holes. The arrangement of the holes, however, is the same, they having the back holes, the breast holes, the cut holes,

and the lifters, and the shooting system of delays is executed in the same way.

The cut holes are shot first, because they are drilled with the object in view of breaking out a wedge and forming a cavity for the balance of the holes to break to. They are two in number and are started usually one foot each side and a foot above the center of the face, and driven downward at an angle of 30° and outward so they meet a line parallel with the side of the drift at completion.

The two breast holes are drilled just above the cut holes but more to the sides and are driven in slightly downward from horizontal. They are shot second in rotation and placed to break out the center section of the drift.

The back holes are drilled as close to the ceiling as it is possible to work, and upward at an angle to give the required height, and outward to give the required breadth to the ceiling. They are shot third in rotation.

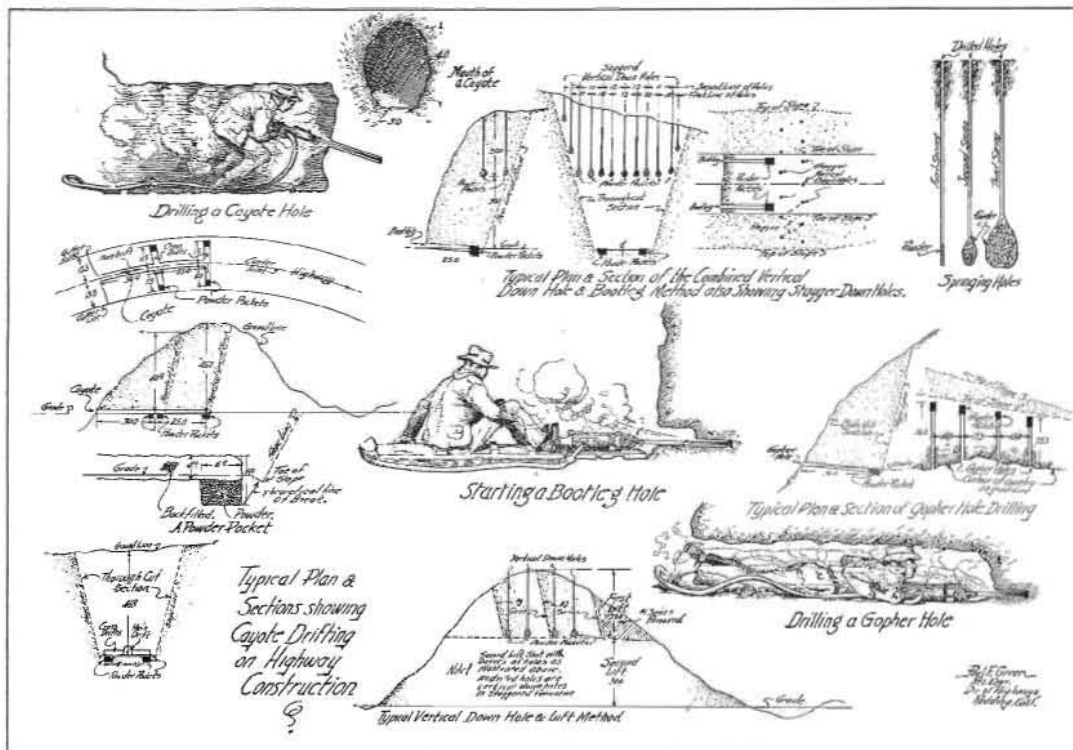
The lifters are drilled so as to break the bottom thoroughly and to lift the refuse, deposited by the other shots, back from the new face, so that a round can be started while the refuse is being mucked out.

COMPRISED A ROUND

All of these holes together are considered a round, and the depth of a round is the distance from the face of the drilling to a vertical plane passing through the bottom of the drilled holes. In most cases these rounds are 5 feet in depth.

In drilling the main drift, one driller and helper constituted a crew, but when cross drifts were run in conjunction, another driller and helper were used.

The drifts were constructed oval in shape and were not all of a uniform size, but were in general from 3.5 to 4.5 feet in height and from 3.0 to 4.0 feet in width.



BOOTLEG METHODS have been adopted in drilling operations, at least in the vernacular of the engineers, as shown in the above sketch illustrating various types of holes prepared for explosives used to excavate a highway out of the rock walls of Shasta Canyon. Other types of holes are suggestively named gopher and coyote.

The length of the main drifts varied, depending upon the amount of ground to be broken above the drill. Where cross drifts were necessary and run, the first was placed 25 to 30 feet from the face, and thereafter at 20-foot intervals.

CROSS DRIFTS

Cross drifts are usually used at 20- to 30-foot intervals, extending in each direction to within one to three feet of the slope line of the cut where powder pockets are blasted to a depth of above five feet below grade and large enough to accommodate the amount of explosive needed.

BOOTLEG HOLES—The bootlegs are constructed by drilling and shooting a successive series of short holes ordinarily from 1 to 15 feet in depth, depending upon the character of the rock. These holes are so loaded as to break back to the previous face but not so heavily as to form pockets.

The broken rock is removed from the holes by hand scrapers, and another short hole is then drilled and shot and the process repeated until the desired depth of hole is attained or the limiting length of drill steel reached.

As these holes are only about 10 inches in diameter and must be drilled entirely from the outside, they could be drilled only as deep as is possible to handle the drill and steel from that position; ordinarily they were not over 25 feet in depth. They were driven in on a slight downward angle in order to place the powder pocket below grade at their termination.

As they neared completion, the driller drilled as low as possible, and used heavier charges of powder in

shooting his round than he had ordinarily used, in order to create a large powder pocket in which the main blasting charge was to be placed.

The placing of the main charge of powder in these powder pockets was generally accomplished by the use of a small box attached to a long pole, which was filled with powder and pushed into the hole and emptied into the powder pocket by simply turning it over.

GOPHER HOLES—The gopher hole is from 18 to 24 inches in diameter and is built with the idea that it will admit a man's body in a crawling position. It is dug by drilling, seam shooting and barring out loose material from seams by hand.

Often solid and hard obstructions are encountered, and it is necessary to drill and blast to clear the way. This is accomplished sometimes by use of a drilling machine and long steel from the outside. In other cases where the hole is too far advanced for the steel to reach, or where the obstruction is in such a position that it can not be drilled from the outside, it becomes necessary to crawl inside with the drilling machine and drill the rock in a lying down position.

FORMED POWDER POCKETS

The enlarging of the bottom and sides of this hole at its termination formed the powder pocket for the main charge, these being dug as deep as 35 feet into the hillside and in position the same as the bootleg.

DOWN HOLES—Staggered vertical down holes were drilled vertically down and in series of rows, one set behind the other. Each hole on the back row was so placed that it was between two holes

Great Variety of Explosives Needed

(Continued from preceding page)

ahead of it, the theory being that it broke the section between these two holes ahead.

These holes were all sprung to form powder pockets at their base to receive the main blast charge. The distance apart and the amount of springing necessary to obtain good breaks was determined by the powdermen's observations in making a trial shot in the same type and character of ground, being generally about 10 to 15 feet apart.

MADE DEEP BREAKS

A combination with vertical down holes above a series of bootlegs was used in the breaking of deep lifts. Clean breaks were made as deep as 65 feet in porphyry.

Down holes and lifts were drilled in series of two rows each and staggered. They were drilled to a level plane, sprung and shot, and during the removal of the broken material, a second series of two rows of holes was drilled to the same level plane, sprung, and when the debris was removed from in front, they were shot and the program repeated until this lift had been removed.

Oftentimes the drilling would precede the shooting for considerable distances and sometimes a series of four rows of holes would be shot at one time. In general, however, only two rows of holes would be shot at once, as by so doing better breakage and more effective use of powder was secured. Another series of holes was then drilled from this now cleaned off level plane and the process repeated. The depth of these lifts was in most cases 25 to 30 feet.

The location of all powder pockets was accurately determined in relation to the grade line and slopes, and the powder charge was figured from the volume of rock to be broken as determined by the area of the cross-sections influenced by the explosive.

EXPLOSIVES USED

A great variety of explosives was used on this project. Black powder, 5% granular and 20% dynamite in bags, 20 to 60% dynamite in $\frac{7}{8}$ " and $1\frac{1}{8}$ " cartridges were all used in considerable quantities.

In general, No. 6 electric blasting caps were used for detonators and they were fired by a 50-hole push down electromagnet type blasting machine.

Delay electric blasting caps were used to advantage. The shooting successively of the various charges relieved the blast ahead and better results are secured with smaller charges. Their use was of especial advantage in holes near the slopes as the prior relief of part of the load permitted breaking outward rather than into the slope, thereby aiding to some extent in preventing overbreak.

Timed powder fuse was used only in "bulldozing" or in the shooting of short plug holes.

DRILLS AND COMPRESSORS

Drilling was all done by means of jackhammers, two makes similar in size and design to the B. R. C. 430 being used. These machines were operated at air pressures ranging from 90 to 110 pounds at the compressor and it is stated that pressure at the drills was seldom below 80 pounds.

Air for the drills was produced by both stationary

and portable compressors in accordance with the location of the drilling.

The heavier drilling was handled by three stationary compressors rated at 540 cubic feet capacity. Portable compressors furnished air to drills used for short holes and plugging. These compressors ranged in capacity from 120 to 360 cubic feet of air per minute.

Drilling was successfully accomplished to a depth of 25 to 35 feet in hard rock. Drill steel was of $\frac{7}{8}$ " octagonal type pierced to permit either air or water to be blown through it in cleaning out rock dust or other wastes.

DRILL BIT TYPES

Bits of both the cross-bit and chisel type were used with cross bits predominating because of the seamy nature of the rock. Drill bits varied in size according to the character of the rock, and the usual starting size varied from 1 $\frac{1}{2}$ " to 2 $\frac{1}{4}$ " in diameter. Drill bits were decreased in size usually one-eighth inch for each two-foot depth of hole, and great care was exercised to preserve the fluting of the bit to insure proper cleaning.

One crew on the work sharpened their steel by hand while another crew used machine sharpener, the results generally showing a margin in favor of the machine. The bits were sharpened with heavy shoulders, due to the irregular quality and formation of the rock to be drilled.

Swedish and American steel was used, both with varying success. Tempering the bits in oil and in water was practiced, one method showing no apparent benefit over the other. Good results were gained only where the blacksmith proved his skill in obtaining the proper heat color, and in the timing of the dip.

Following is powder data on six of the major through cuts:

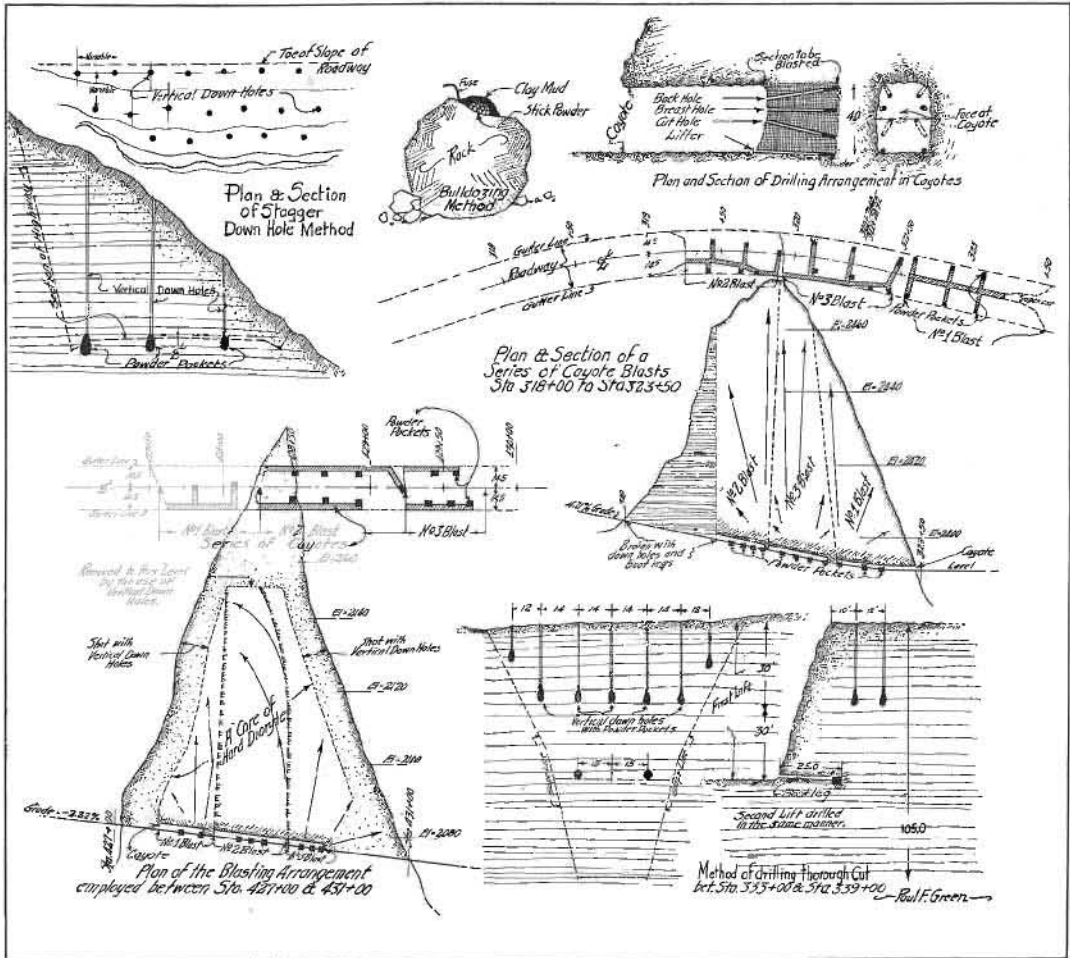
Method	Sta. to Sta.	Rock cu. yd.	Lbs. powder	
			Powder lbs.	per cu. yd. of rock
Coyote	211-218	35,000	47,000	1.34
Lift	304-309	33,000	26,000	0.80
Coyote	317-324	28,000	54,000	1.93
Lift and down hole	332-340	65,000	58,000	0.90
Coyote	409-413	16,000	22,000	1.38
Coyote	427-431	40,000	51,000	1.25

The following data cover the major part of the blasting on the project as a whole:

Sta. to Sta.	Rock cu. yd.	Powder lbs.	Lbs. powder per cu. yd. rock	per cent			Black powder lbs.
				20-30	40	60	
197-324	225,500	231,000	1.02	20,125	81,110	2,410	126,850
332-391	146,490	131,050	0.89	118,300	9,700	380	2,610
399-431	94,000	122,500	1.30	6,225	48,160	200	67,825
				144,650	138,970	2,990	197,285

HUMAN ELEMENT BLAMED

In three-fourths of the country's automobile accidents last year, improper actions on the part of operators of cars played an important part, as 645,000 of the 860,000 accidents reported involved some improper action by drivers. Ninety-one per cent of the drivers involved in fatal accidents had handled a car for more than a year. This also held true for those involved in nonfatal accidents.



POWDER POCKETS in a variety of styles are shown above, all of which were used in highway blasting operations in Shasta Canyon. The sketches reveal the careful plotting done by Highway Division engineers in planning the various "shots" to secure the best results.

Two Bridges Being Finished on Cut-off

On the Coast Highway from the Monterey County line to the San Benito River, 5.5 miles in length, a new road is being constructed via the Pincate Rocks. The roadbed will be 36 feet wide with a 20-foot Portland cement concrete pavement. This project, with a portion of the road in Monterey County 11.1 miles in length, recently completed, will eliminate the old San Juan Grade from the main Coast Highway.

Within the limits of this project there is under construction a reinforced concrete girder bridge over San Juan Creek and another over San Benito River.

Cambria-San Simeon Link to be Rebuilt

On the Coast Highway between Arroyo Grande and Los Berros Creek the road is being reconstructed with a 36-foot roadbed and a 20-foot reinforced Portland cement concrete pavement. It is now about 40 per cent complete.

Within the limits of the above project new concrete bridges are under construction across Arroyo Grande and Los Berros Creek and are about 50 per cent complete.

Bids are being received for the reconstruction of the Roosevelt Highway between Cambria and one mile north of San Simeon. This will be a 20-foot bituminous macadam pavement on a 30-foot roadbed.

State Ranks Low in Road Expenditure

(Continued from page 1)

Twenty-third in mileage constructed in 1931.

Thirty-seventh in per capita cost of highway improvements during the year.

Forty-seventh or next to the lowest in the Union in expenditures rate per registered car.

The small state of New Jersey spent \$48,000,000 as against our \$38,000,000 in 1931. Even South Carolina spent \$31,000,000 or more than 75 per cent of the California total.

All phases of public finance are involved in the acute economic condition prevailing throughout the land. Taxation is being measured by its burdensome totality rather than examined as to the relativities of its several items.

FUNDAMENTAL FACTORS

In view of the fact that California's ten-year program of highway construction is predicated on the present set-up of supporting revenues (gas tax, etc.) the continuance of the program may be involved. Recognition of the fundamentals involved will assure the stability of the great work in hand.

Highways are not a cost of government. They are a capital investment covering the cost of transportation. They are a necessary utility in the life of modern civilization.

Modern highways distribute actual savings to the motorist. As between a bad road and a good road, the savings in gas, oil, tires and maintenance made on the good road will go far to pay its cost.

In book accounting, the highway may properly be classified as a cost of transportation. The heavy credits of saving to motorists are applicable to balance the account.

Furthermore, the automobile has not created our great highway system. The building of highways has made possible the expansion of the automobile industry—its vast investments and great pay rolls. If we had no more or better highways than those of 20 years ago, we would probably have only about the same number of motor cars.

Highways are the visible, physical receipt for money expended—the stock certificate in a dividend paying enterprise.

The question of the relation of highway construction to taxation remains to be considered. The answer is easy and undeniable.

Not one cent on the tax bill of any city, county, school district or political subdivision goes to the State Highway Fund. Not one cent of the gross tax paid to the State by public utilities and carriers (electric, gas, railroad, etc.) goes to the State Highway Fund. Not one cent of any revenue supporting the State budget or State government goes to the State Highway Fund.

If the gas tax and special revenues from which highways are built should be summarily abolished, neither the fixed "cost of government" nor general taxation would be affected. The only result would be that the highways would be junked and the cost of government would have to be met from identically the same sources that are now bearing the burdens. I repeat my former statement that the financing of the highways is completely disassociated from budgets, tax rolls, tax rates and the cost of government.

The highways create their own revenue. Only those who use the highways pay it, and it is returned in service.

The gas tax is a compact between the motorist and the State. Highway money is a genuine circulating medium. The receipts of the first quarter reach our pay rolls the second quarter. We pay as we go, contracting no deficits and carrying no surplus.

ARCHITECTURAL AWARDS

For Month of March

AGNEWS STATE HOSPITAL—Contract for grading and roadwork to Earl W. Heple, San Jose, \$6,927.

SALINAS ARMORY—National Guard, contract for general work to Guth & Fox, Sacramento, \$45,786; plumbing and heating to Phillips Heating & Plumbing Co., Salinas, \$5,127; electrical work to Rodeo Electric, Salinas, \$1,845.

HUMBOLDT STATE TEACHERS COLLEGE—Training school building, for general work to Andy Sordal, Long Beach, \$112,441; for plumbing work to J. J. McDermott, Sacramento, \$8,683; for heating and ventilating work to W. H. Robinson, Monterey Park, \$17,414; for electrical work to Matson-Seabrooke Co., Oakland, \$8,156.

HUMBOLDT STATE TEACHERS COLLEGE, Arcata—Construction of tennis courts, to Malott & Peterson, San Francisco, \$7,981.

There were 46,000 automobile and truck dealers in business in the United States last year, according to figures received from the Automobile Chamber of Commerce.

More than 40 per cent of the country's wealth and 50 per cent of the buying power is now controlled by the women of the nation, according to an estimate appearing in a recent issue of the *Atlantic Monthly*.

C-3



JAMES ROLPH, JR.
GOVERNOR



Sending
greetings
and a
message
of cheer
to the
Building
Industries
Governor
Rolph urges
cooperation
in speeding
up work
programs
to give
employment
to citizens

To the Construction and Building Industry

GREETINGS:

With this issue of the Licensed Contractors' Register, I take the liberty of bringing you a word of good cheer.

You have been facing a period of subnormal business, but you have faced it courageously.

I say with all confidence that better times soon will come. Ours is a great country and our State is a great Commonwealth, filled with the sons and daughters of the pioneers who, too, battled and won over seemingly unconquerable odds. With this great heritage we are a people of vision and the urge to progress.

As you know, the State of California, of which I have the honor to be Chief Executive, has attempted to lead the way in stimulating the building industry during the past year. We have advanced our public works' schedules as much as two years so that we might give employment to our citizens and, in turn, stimulate those industries that are linked with us in the construction trade.

May I suggest that you of the Construction and Building Industry continue to support this program as a whole and adopt a like policy individually; pledging yourself to campaign throughout the whole State for a speeding up of all work programs.

In this regard, I have instructed the Registrar of Contractors to cooperate with you gentlemen in every degree.

I wish you all well.

Very sincerely yours,

Governor of California.

C-3

This facsimile letter is reprinted from the Licensed Contractors Register published by the State.

Famous Old Kit Carson Trail Being Treated With 350,000 Gallons of Oil

THE Department of Public Works, Division of Highways, opened bids on April 20th for oil treatment of 80 miles of the old emigrant road known as the Kit Carson Trail. The work extends from Pickett's Junction in Alpine County, westerly to Chapman's in Amador County, and includes as well a portion of the Luther Pass route in Alpine County from Hangman's Bridge near Markleeville to Alpine Junction.

This is the largest single oiling job this year in point of distance. The work involves spreading of over 350,000 gallons of oil.

The route passes through Hope Valley by Kirkwoods and over Carson Spur, where the scenery can not be surpassed, to Silver Lake. This portion of the road has never been oiled. From Silver Lake the road passes Tragedy Spring and Corral Flat to Cook's Station and on to Pine Grove and Jackson.

HISTORIC COUNTRY

This route is all through historic country made famous by the early trail blazers and the hardships of the '49ers. Many-out-of-State visitors will pass over the route this year, and enjoy in comfort the scenes so hardly won by the pioneers of less than a century ago.

The work, to be started as soon as road conditions permit, consists of spreading asphaltic road oil and working it in to provide a smooth, dustless surface. The preparation of the road surface, the care of traffic, and the mixing and leveling of the surface will be handled by State forces. The furnishing, hauling and spreading of the oil is to be handled by contract.

TWENTY-ONE-MILE HAUL

The oil must be hauled from Minden, Nevada, a distance of about 16 miles to the beginning of the job on the east, and from Martel for about 21 miles to the west end of the job. The oil is hauled by tender trucks to the work where it may be transferred to a spreader truck, or a spray bar may be attached to the tender truck and the spreading done without transferring the oil. The accompanying views show a spreader truck in action. The tractor and grader outfits are

covering and mixing the oiled surface material. The other is a view of the west fork of the Carson River, and is typical of many beautiful scenes on this road.

VACATION AREA

The area served by this road is a wonderful vacation country, in addition to the historical interest. The Lake Tahoe area is readily reached over Luther Pass, while an equally attractive loop trip is by way of Ebbitts Pass to Calaveras Big Trees, Angels Camp, and San Andreas, to Stockton, or by way of Minden, Bridgeport, Bishop and Mojave to southern California.

TEN-WORD SCOTCHOGRAM

Mr. John Burns,
New York City.

Bruises Hurt Erased Afford Erector Analysis
Hurt Too Infectious Dead.

Bert.

Which, translated means:

Bruce is hurt, he raced a Ford, he wrecked her, and Alice is hurt, too. In fact she is dead.

FAMILY HELPED THROUGH WINTER BY HIGHWAY WORK

Sonoma, Calif., April 19, 1932.

Col. W. E. Garrison,
Director of Public Works.

Dear Sir: If you will pardon the liberty I am taking in writing you, it is to express my appreciation, and say a word of thanks to you and the department you so ably represent. For the past four months I have been employed three days a week as a temporary worker on the highway, out of the Scheelville division. Temporary employment expires on the 30th of April, but it has been a godsend to me and my family of four over these winter months, and I for one am compelled to acknowledge what our higher officials are doing for the men of family, in need of work. I will close with remembrances and a kind regard for all, hoping to find other employment. Again, I say thanks a many.

Gratefully yours,

PAUL JOSEPHS,
Sonoma, General Delivery.



HISTORIC COUNTRY is traversed by the Kit Carson Trail, famous old route over the Sierra. Eighty miles of it will be oil surfaced through scenic countryside like this along the Carson River in Alpine County.



MODERN OUTFITS of the Division of Highways composed of tractor and grader team up in the preparatory work of leveling the road for the oil treatment and covering and mixing the oiled surface material.



PAINTING THE ROAD with a thick coat of asphaltic oil this spreader truck swiftly lays a dustless surface where the old emigrant trains trundled for miles through murky clouds of powdered dirt.

General Water Supply Conditions for State as Whole Best Since 1927

By EDWARD HYATT, State Engineer

THE beginning of the irrigation season in a large portion of the State is about April 1. By that date also the major flows of the coastal streams from the vicinity of San Francisco Bay region on the north to the Mexican line on the south has occurred, the major part of the replenishment of the underground basins along the coast has taken place, and these streams have settled down to what is often spoken of as the normal flow.

By that date also the snow surveys conducted by the State in the mountains have been completed and for all these reasons it is an appropriate time to give something of a preview of approximate water conditions which may be expected during the remainder of the year.

A more detailed report as to supply from streams draining both sides of the Sierras has been given in the Snow Supervisor's reports just issued and more detailed reports as to each area where investigations are under way or will be available. The Division of Water Resources is conducting investigations in many of the villages of the State and the following information relates to those specific areas in which the Division is in closest touch with the situation and no specific data are given for other areas.

GENERAL OUTLOOK GOOD

It is known, however, that the local water supply situation in the San Francisco Bay region is good, that the streams of Santa Barbara County have had a good run-off and that this is also true of San Diego County, where constructed reservoir capacity is sufficient to hold over a supply to the area using water for several years.

In general it may be said that the season of

1932 in California will be favorable as to water supply for irrigators, power companies and others using water from streams or from underground sources. For the dry farmer, however, the developments of the latter part of the rainy season have not been so favorable, as there has been little rainfall since about the middle of February. Taking the entire rainy season, however, up to April 1st, rain and snowfall have been normal or above except in the northern part; in some sections much above normal and in all parts of the

State much greater than during 1931. For the State as a whole it has been and is expected to be the best water year since 1927 from the standpoint of the water user. While there has been a heavy snowpack in the mountains climatic conditions have been such that the run-off is even and there have been no destructive floods. As the season is now well advanced it is not anticipated that there will be major floods unless unprecedented storms should occur.



EDWARD HYATT

FILLING UNDERGROUND BASINS

The gradual melting of the snow over a long period will afford the best opportunity for percolation and the filling up of underground basins in the central valley. This has occurred to a marked degree, particularly in the coastal valleys, and should continue for some time to come in the central valley. A year of more than normal rainfall was badly needed in the State and the fact that such a year has occurred without destructive floods makes the situation particularly bright.

SOUTH COASTAL BASIN—This is the term applied for convenience to the area embraced in the valleys of Santa Ana, San

Good Gains in Southern Water Planes

(Continued from preceding page)

Gabriel and Los Angeles rivers and the coastal plains.

The rainfall here has been above average both in the valley and in the mountains, with a larger proportion of snowfall in the mountains than has been usual since observations were started. Run-off from the mountains has not been large, but has been unusually uniform, so that a large proportion percolated into the underground basins. Waste into the ocean has been small considering the rainfall. Owing to the numerous subdivisions into which South Coastal Basin is divided a detailed statement would be extremely lengthy.

It may be said that the upper Santa Ana Valley, that is, the part above lower Santa Ana Canyon, embracing the area from Pomona to San Bernardino, Redlands and Riverside, shows an average rise of water plane up to about April 1 of about 8 feet as compared to the low of last fall.

Upper San Gabriel Basin, which lies above Whittier Narrows and covers the territory from Pasadena to La Verne, shows a rise averaging about 10 feet.

The San Fernando Valley shows a rise averaging about 5 feet. The western coastal plain shows no rise.

The southern coastal plain, which is the area embracing Compton, Long Beach, Santa Ana and the western part of Orange County, in general shows an average rise of about 7 feet.

The outlook in some basins is for a further rise and for a sustained mountain run-off larger than has been the case in the past several years and approximating normal.

WELLS HAVE RISEN

MOJAVE RIVER—For the first time in several years the flow of Mojave River has been sufficient to cause discharge past Mojave Valley proper and into the desert sink. At the present time the discharge of the river is sufficient to take the flow past Barstow before it is all absorbed by the river bed. Wells near the river have risen but to date no effect has been found in wells at a distance from the river.

COLORADO RIVER—The outlook on the Colorado River is for normal flow or for flow perhaps even above normal.

OWENS VALLEY—The run-off into this valley is the principal source of water sup-

ply for the city of Los Angeles. Water is obtained both by pumping from the underground reservoir of the valley and by gravity diversion of Owens River and its tributaries. The streams are in flood from some time in April until the middle of July. The outlook is for a run-off somewhat above the long time average and more than twice that of last year, which should furnish the aqueduct demands and to an extent replenish the underground supply if this has been depleted by the pumping operations of the past several years.

PIT RIVER—This is a tributary of the McCloud River and thence the Sacramento. It drains the high plateau region of north-east California. The outlook is for discharges well above those of the past several years, but still somewhat below average. It is believed that the total run-off will be approximately the same as it was in 1928, which was about 20 per cent below the long time average.

INCREASED RUN-OFF

SURPRISE VALLEY—The situation in Surprise Valley is similar to that on the upper pit River. The streams of Surprise Valley rise on the east side of the Warner Range while the headwaters of the Pit originate on the west side. The run-off in Surprise Valley is expected to be well above that of the past several years and approximately 80 per cent of normal.

SACRAMENTO VALLEY—Only about 25 per cent of the area irrigated in Sacramento Valley draws its supply from wells. The remainder is irrigated from streams. Observations by the State on fluctuations of water levels are made only in the fall.

The outlook is for flows well above normal during the spring and summer from the principal tributaries rising in the Sierras on the east side south of Feather River. The principal discharge from the west side streams has already occurred and has been large, although actual discharges are not yet available.

From the Feather River and from the Sacramento proper above Red Bluff, snow surveys indicate a discharge below normal, but larger than that of the last few dry years.

SAN JOAQUIN VALLEY—There has been greater rise in the water plane near the water courses than at a distance, but an additional

(Continued on Page 20)

Groynes Will Make Ocean Build Beach

(Continued from page 2)

ately that some type of shore protection work should be designed other than the massive seawalls or heavy riprap which have been successfully used elsewhere on the State highway system.

Experiments with the use of groynes have been under way on this portion of the coast for many years. Nearly ten years ago short wooden groynes constructed by this department on this section were successfully used to build up narrow sand beaches which "softened" the attack of the ocean and enabled us to protect exposed embankment slopes with a comparatively small amount of riprap.

Wilkie Woodard, engineer for R. C. Gillis and later for Alphonso Bell, constructed longer groynes which built up very large sand beach areas which these gentlemen have given to public use without cost for several years. A newer type of groyne is that built of steel sheet piling, and the effect of their installation is shown on an accompanying photograph.

EFFECT OF GROYNES

The purpose of the groyne is to intercept or check a portion of the current or littoral drift which follows along the beach in a direction about parallel to the shore. This current carries sand in suspension and it is a well known fact that a current of water carrying sand or silt will deposit this material when the current is checked. When the current of water is checked by the groynes, sand is deposited and is carried shoreward by wave action. As this process is continued the beach is built up along the groyne. By spacing these groynes at suitable intervals and con-

structing them of proper type and elevation along the shore a continuous beach can be built up. Eventually the groynes are nearly covered by sand.

This method has been used very successfully in building up the beach both east and west of the park area under consideration and at several other locations along Santa Monica Bay.

ADDS BATHING BEACH

It was decided that the highway slopes could be protected by building up the beach in this manner at a much less cost than in any other way and there would be the added advantage of providing a good bathing beach along the park areas which could be used by the public.

A design for groynes was accordingly worked up by State engineers. Each groyne is to extend 200 feet out from the toe of highway embankment. The 50 feet nearest the highway, which will be the first portion to be built up with sand after construction of groynes, was designed with light steel sheet piling, while the remaining 150 feet, which extends out into the surf, was designed with heavy type steel sheet piling to withstand wave action.

The contract for the construction of five of these groynes is being awarded in addition to the contract for widening the roadbed. Work under these two contracts will be carried on simultaneously with the view to completing the entire project in the shortest possible time. It is anticipated that work will be completed in time for use during the latter part of the coming summer.

Yellowstone Cut-off Celebration Planned

Heralding the virtual completion of the Yellowstone Cut-off project a public celebration will be held at Burns, Oregon, in June, reports the California State Automobile Association. Work on the principal remaining link in the series of connecting routes is in the final stages. This is a section of new road, 91 miles long, between Lakeview and Burns.

The Yellowstone Cut-off will provide a new

direct highway connection between California, Yellowstone National Park, and other important tourist and trading centers of the Northwest. It is officially designated as running from Redding through the Pit River Pass and the southeastern portion of Oregon to Boise, a distance of 560 miles.

The governors of California, Oregon, and Idaho, together with other officials and representatives of organized motorists in those states, have been invited by the people of Burns to take part in the dedication of the new road.

Two Tunnels and Bridge Necessary to Cross Deep Gorge

(Continued from page 4)

interesting. The south slope of the Topatopa Mountain range affords wonderfully interesting views of the Santa Barbara coast and islands. Side roads along the ridges and creeks crossed, can, with little difficulty, open up additional recreational areas that will soon be over-run by people from both the valley and the coast.

Pine Mountain is crossed at an elevation of 5000 feet and Topatopa Mountain at an elevation of 3700 feet. The Sespe Valley, which is followed for 8 miles, ranges from 3500 to 4500 feet elevation. All but the southern 20 miles, which is near the coast, and the northern 10 miles, is above 3000 feet elevation and can qualify as a scenic mountain road.

The width of roadway is to be 20 feet of traveled way. The alignment and grades are on good standard consistent with such rugged country.

A very unique feature exemplifying the difficulties encountered in the construction of this road is shown on the accompanying view of two tunnels with a bridge between them and so close together that the photographer has registered them all in one view. Such construction was necessary to get through the narrow tortuous defile, known as Wheeler Gorge, in a satisfactory manner. The gorge is only a short distance above Wheeler Hot Springs, a noted resort on this route.

Both coast and valley people have looked forward a long time to the completion of this important connection and the joint highway district organization deserves credit for the progress made in the face of great physical and financial difficulties.

The district constructed the section from Pine Mountain to the northern terminus, the State cooperating in cost under the Joint Highway District Act of 1917. Construction now under way in the north fork of Matilija River is being done by the U. S. Bureau of Public Roads and is a cooperative project financed from Federal Forest Highway Funds and County and State money in the Joint Highway District Fund. The uncompleted section of the through route will be similarly financed as Joint Highway District assessments upon the counties and the State become available.

Prunedale Cut-off, By-passing San Juan Grade, Opens in July

COMPLETION of the new highway project known as the Prunedale Cut-off and opening of the route to through traffic will take place about July 1, according to an announcement by C. H. Purcell, State Highway Engineer. With the opening of this stretch of approximately 16½ miles of new, modern highway, the bottleneck on the Coast Route, U. S. 101, created by the steep and winding San Juan Grade, will be removed.

The general location of the Prunedale Cut-off is on the Coast Highway about 100 miles south of San Francisco. Starting at a point about three miles north of San Juan Bautista, the road passes through the villages of Dumbarton, Prunedale and Santa Rita and rejoins U. S. 101 about two miles north of Salinas. Eleven miles of the southerly part of the route are now in use for local traffic and for those familiar with county roads in the vicinity.

While the San Juan Grade passes over the Gabilan range of mountains, the Prunedale Cut-off proceeds over mesas and through valleys in the foothills on a route where the highest elevation is 550 feet, compared to 1050 on the San Juan Grade. Long flat curves and easy grades will permit high gear travel the entire distance on the new route. There will be a saving of 1.2 miles in distance. The cost of the project is nearly \$1,000,000.

Scenic and historical attractions will also be offered by the Prunedale Cut-off. The road follows partly along the route of the old "Camino Real," between San Benito and Monterey counties. At one point it passes through a narrow gorge known as the "Pinecate Rocks," a bandit lair in early days. In order to preserve this point of interest 12 acres of additional right of way have been obtained at "The Rocks."

The old San Juan Grade route will be retained as a part of the State highway system.

FOREST TRAGEDIES

Predatory ants are blamed for the destruction of young quail, according to a report from the Tahoe National Forests. Ants sometimes attack the quail chicks immediately after they are hatched and consume them completely, even polishing the bones.

Three does with horns paid the penalty of their masculine disguise during the past hunting season. One was killed on the Sequoia National Forest and two on the Modoc National Forest, according to reports from the forest supervisors.

Fifteen Major Highway Projects in Fourteen Counties Advertised for Bids

THE impetus given to the advertising of projects for construction on California's State highway system by the arrival of spring has shown marked advancement in the program of the Division of Highways.

The April advertising program of State highway construction includes 15 separate major projects, located in 14 counties, and involves improvement to 80.2 miles of highway and the construction of five major bridges, with a total estimated cost of approximately \$2,400,000.

In addition to major projects, the annual program of the Division for applying oil as a dust palliative to unpaved roads and earth shoulders is now in full swing. The 1932 oiling program plans the application of oil to approximately 1660 miles of State highways at an estimated cost of approximately \$550,000.

During March projects for dust layer oiling, amounting to approximately \$100,000 and covering nearly 300 miles of State highways, were advertised and plans indicate that these figures will be more than doubled during April.

PROJECTS DESCRIBED

Brief descriptions of the more important projects which will be advertised during April follow:

In Solano County an important improvement to the San Francisco-Sacramento lateral will be started with the advertising for bids of the relocation of this important and heavily traveled arterial between Cordelia and Fairfield. The new location of this portion of the highway will be on a more direct routing between these two towns than obtains on the existing road, eliminating the present division via Rockville. The new highway will be paved with Portland cement concrete 20 feet wide and will shorten the distance by nearly a mile.

Another improvement to this highway between the San Francisco Bay area and the State Capital will be started with the advertising for bids for placing a Portland cement concrete pavement between Swingle and the Yolo Causeway in Yolo County. This new

pavement will be located between the town of Davis and Sacramento and will replace a particularly rough section of existing pavement. The work will include widening the roadbed to the standard 36-foot width throughout the length of the improvement and providing adequate 8-foot shoulders on each side of the new 20-foot pavement.

ARROWHEAD TRAIL LINK

Further improvement to the interstate highway which is the most direct route between Los Angeles and Salt Lake City will be started in San Bernardino County between Halloran Summit and Mountain Pass. The proposed improvement will be the same type which the Division of Highways has used so successfully on the hundreds of miles of desert and mountain roads in southern California, consisting of a standard 36-foot graded roadbed surfaced with bituminous treated crushed rock 20 feet wide.

Improvement to this route has been pushed eastward from San Bernardino towards the State line near Jean, Nevada, as rapidly as possible. Of the 193 miles between San Bernardino and the State line 156 miles have been completed or are under construction at the present time and the completion of the present project of the 16.5 miles between Halloran Summit and Mountain Pass will leave only 21.5 miles of highway remaining to be brought to modern standards.

The third and final unit of the construction of the new juncture of the Oxnard-Serra Highway with the Coast Route near El Rio in Ventura County will be set in motion with the advertising for the grading and paving of the portion of the Oxnard-Serra Highway north of Oxnard.

Construction is now in progress on the new 1800-foot steel plate girder bridge across the Santa Clara River on the Coast Route just northwesterly of the proposed new junction of these two routes, and work is nearing completion on the grade separation under the tracks of the Southern Pacific Railroad on the new alignment of the Serra-Oxnard road.

The present project proposes grading the roadbed on the new alignment and placing a 20-foot concrete pavement over the new por-

(Continued on page 21)

Work Offered for Bids in April

Improvements totaling \$2,374,000, estimated cost, scheduled to be advertised for bids prior to May 1, 1932, include fourteen major projects on State highways in fifteen counties. The work offered for contract comprises 80.2 miles of pavement and surfacing and five bridges as follows:

DETAILED LIST OF PROJECTS

County	Location	Miles	Type of Surface
Solano	At Rio Vista	0.8	P. C. C. Pave.
Ventura	Santa Clara River to Ox- nard	2.0	{ P. C. C. Pave. A. C. Pave.
Solano	Cordelia to Fairfield	6.4	P. C. C. Pave.
Yolo	Swingle to Yolo Causeway	1.7	P. C. C. Pave.
Orange	Laguna Beach to Dana Point	7.5	P. C. C. Pave.
Del Norte	Crescent City to Madrona Camp	6.9	B. T. Cr. Rock
San Bernardino	Halloran Summit to Mountain Pass	16.5	B. T. Cr. Rock
Tulare	Lemon Cove to Three Rivers	8.5	B. T. Cr. Rock
San Mateo	San Mateo to Redwood City	7.3	B. T. Cr. Rock
San Luis Obispo	Cambria to San Simeon	9.7	B. T. Cr. Rock
Sacramento	McConnell to Sacramento	11.9	B. T. Cr. Rk. B'drs.
Tuolumne	Sonora to $\frac{3}{4}$ Mile East	0.6	U. Cr. Rock
Shasta	At Clear Creek Near Tower House	0.4	U. Cr. Rock
San Luis Obispo	Across San Simeon Cr. and at Station 141		2 Bridges
Los Angeles	Across Los Alamos and Gorman Creeks		3 Bridges

SUMMARY

Type	Miles	Amount
Portland Cement Concrete Pavement.....	17.2	} \$826,500
Asphalt Concrete Pavement.....	1.2	
Bituminous Treated Crushed Rock Surfacing---	48.9	1,170,700
Bituminous Treated Crushed Rock Borders-----	11.9	185,400
Untreated Crushed Rock Surfacing-----	1.0	45,400
Bridges-----	(5)	146,000
Totals-----	80.2	\$2,374,000

Full Reservoirs in San Joaquin Valley

(Continued from page 15)

large contribution to the ground water is to be expected from the canals used for gravity diversion from the streams and distribution of waters, and this will occur after the irrigation season has started.

The outlook is for large well sustained run-off in the numerous streams from the mountains. It is expected that this will be well above normal and several times that of the past dry years. This will begin with the melting snow and the quantity should be sufficient to fill all reservoirs to overflowing.

BEST SINCE 1922

The larger amount of water available for gravity diversion, as well as causing greater deep percolation to the water plane both from stream beds and gravity ditches, will decrease the amount of pumping necessary, and these two conditions are both helpful to the underground water situation.

As of April 1, a few representative wells not situated near water courses showed, as compared to last fall, rises of from 2 to 5 feet. The indications are that on the average a greater rise will occur in the water plane of the San Joaquin Valley during the coming irrigation season than has occurred in any season since 1922.

NAPA VALLEY—Measurements at representative wells in Napa Valley on approximately April 1, show a rise from last fall of from less than 1 foot to 20 feet with an average of 8.5 feet. In the St. Helena area the average rise of the wells measured was approximately 9 feet, in the Napa area 6 feet and in the delta of the river 10 feet.

ABOVE AVERAGE

Rainfall and run-off were both above average for the season, and large quantities of water wasted into the bay. Only a small part of the stream flow percolates into the underground basins as conditions are unfavorable for such percolation. Geological conditions in the valley indicate the probability that underground supplies do not yet fully show the effect of the wet winter.

Outlook is for better sustained summer flow than has been the case for some years back.

SANTA CLARA VALLEY (SANTA CLARA COUNTY)—Both rainfall and run-off have been above the long time average,

but no data are available at the present time from which the actual run-off can be computed. A considerable amount of water has wasted into the ocean from the mountains and the run-off from the valley floor itself into the ocean has been large. The average rise in water plane over the entire valley has been about 23 feet since last fall up to the first of April and the major average rise has been in the broad central part of the valley and near Alamitos.

In a limited area south of Cupertino and west of Campbell, extending to the foothills, the rise has been 5 feet or less. This same approximate rise took place also in the area between Evergreen on the east side of the valley and the city of San Jose.

Immediately around Cupertino the rise has been 15 feet or somewhat less than over the entire remaining valley the rise has been 15 feet or more with the greatest recovery in the vicinity of the streams, particularly the major west side streams where several wells showed rises of over 40 to 50 feet. The greatest rise measured was south of Guadalupe Creek near Alamitos where one well shows a recovery in water plane of over 70 feet.

Water levels on the valley floor are considerably lower, however, than one year ago at this time, a comparison of levels in the Cupertino, Santa Clara and San Jose area showing a recession during the year of about six feet. The outlook is for summer flows larger than during the past several dry years, but the amount of summer flow in Santa Clara Valley is never of significant proportions.

WELLS SHOW RISE

SALINAS VALLEY—Measurements on representative wells in Salinas Valley on approximately April 1, show a rise of from 2 feet to 29 feet since last fall with an average of 11.5 feet. In the Greenfield area south of Soledad the average rise of wells measured was approximately 8 feet; in the Soledad area, 6 feet; in the Gonzales area, 11 feet; and in the Salinas area 13 feet.

Rainfall and run-off were both above average for the season and one flood was particularly heavy. The situation along the river and its tributaries below King City is very favorable for percolation from the stream and

Wells Show Rises Up to Fifty Feet

(Continued from preceding page)

large contributions to the underground water have occurred from this source. Measurements indicate that the cone of Arroyo Seco is especially adapted for percolation.

Outlook is for better sustained summer flow and water level than has been the case for some years past.

VENTURA COUNTY—The rainfall and run-off in Ventura County was well above normal during the past winter season. Large discharge into the ocean occurred and even yet, despite considerable natural percolation in stream beds and diversions to spreading works off stream, there is a discharge of about 60 second-feet into the ocean from Santa Clara River.

This river is the principal stream of the county and along its valley and the cones of its tributaries rise in water levels in representative wells about April 1 has been in some cases more than 50 feet. The average rise at several such wells at and above Saugus is only about two feet, but in the Castaic area it varies from 12 to 30 feet. Around Piru it averages about 46 feet, around Fillmore 10 to 15 feet, and around Santa Paula

it averages about 17 feet, but some wells have risen as much as 40 feet.

FIFTY-FOOT RISE SHOWN

In the vicinity of Saticoy and Montalvo the rise at the wells measured averages about 12 feet; in the Oxnard Plain about 10 feet; in the general vicinity of Camarillo about 10 feet and in the Santa Rosa area about 10 feet. In the Moorpark area there is very little rise but in the Santa Susana or Simi Valley the rise varies from 1 to 14 feet.

In the Ojai Valley in the vicinity of Ojai the rise at the wells measured averages 50 feet and in the Ventura River Valley 6 to 20 feet.

The outlook is for summer flows better than usual and for further rise in water plane in some areas.

Due to the more than normal snowpack in the mountains in January it was feared that destructive floods might occur in the central valley; however, the season has developed in such a way that this has not happened. Inasmuch as large storms seldom occur after the first of April, it is hardly to be anticipated that there will be appreciable flood damage.

Fifteen Highway Projects Advertised

(Continued from page 18)

tion, widening the existing roadbed and placing a new asphalt concrete pavement on the portion where the line follows the present alignment.

In San Luis Obispo County two projects are proposed for advertising in April for construction on the 10 miles of the San Simeon-Carmel Highway north of Cambria. The one project plans the reconstruction of the highway on an improved alignment skirting the crest of the rugged bluffs along the ocean and the other includes the construction of two bridges on the new line. The new highway will be surfaced with 20 feet of bituminous treated crushed rock and the bridges, one across San Simeon Creek and the other across an unnamed inlet at Engineer's Station 141, will both be of the steel stringer type, resting on concrete piers set on timber piles, with

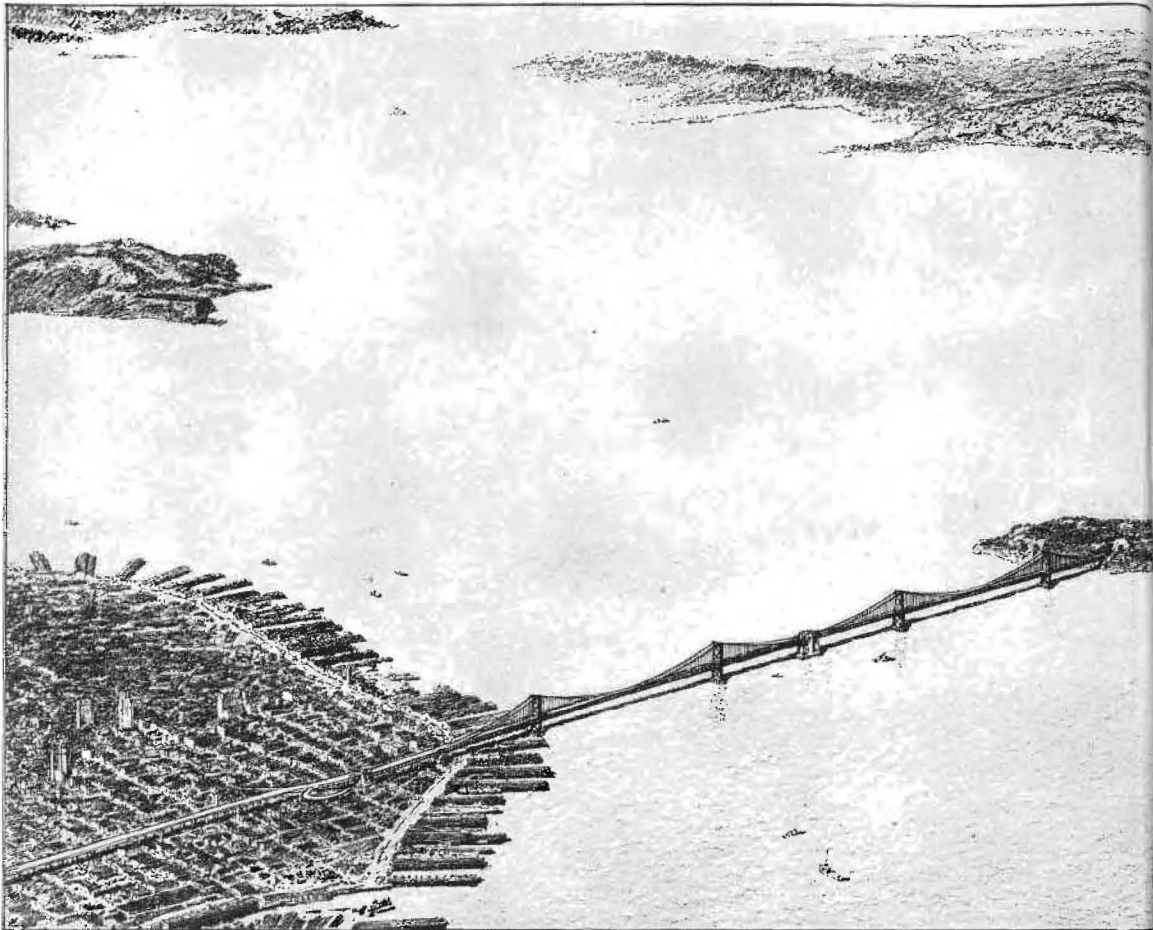
a 24-foot roadway and concrete decks. The bridge across San Simeon Creek will be 398 feet long, and the one at Station 141, 268 feet long.

Further work on the Bay Shore Highway will be put under way providing for placing a bituminous treated crushed rock surfacing 42 feet wide on the section of this new route between San Mateo and Redwood City. This portion of the highway is built upon heavy fills over tidelands and was temporarily surfaced two years ago to allow time for settlement before the permanent pavement was placed. Settlement and subsidence of the fills has taken place in several sections so that it now becomes necessary to bring the roadbed up to grade and resurface the entire section.

A project which proposes the widening of the effective pavement on the heavily traveled

(Continued on page 44)

General Final Plan Accepted for the



THE preliminary final design of the San Francisco-Oakland Bay Bridge was completed early in April and presented to Colonel Walter E. Garrison, Director of the State Department of Public Works. The design of the \$75,000,000 structure was prepared by Chief Engineer C. H. Purcell and his staff.

Following its approval by Colonel Garrison, the design was submitted to the Board of Engineering Consultants, headed by Ralph Modjeska, which met in San Francisco on April 18th. Its approval by the Board means that final designs will be prepared immediately.

The preliminary design calls for a cantilever type structure for the East Bay channel and a central anchorage type for the West Bay crossing.

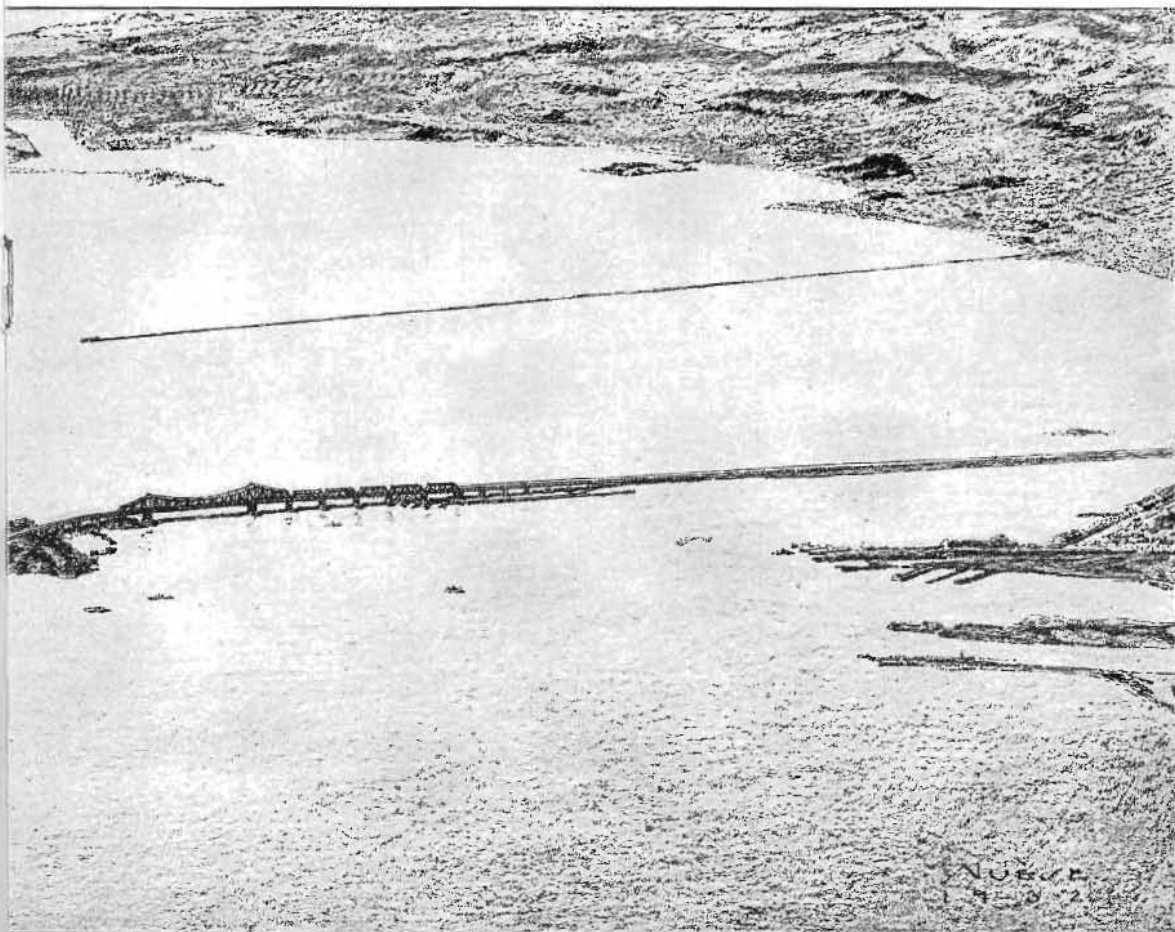
REQUIRES TWENTY SPANS

The design for the East Bay structure calls for one 1400-foot center span, five 504-foot spans and fourteen short spans of 288 feet each to the Key Route Mole. The East Bay structure will have a clearance of 185 feet above high water, graduating to 165 feet at the harbor line.

The center anchorage type recommended for the West Bay crossing calls for two 2310-foot spans and four 1160-foot side spans. To join the two independent structures a center anchorage is required to which the cable from each side structure will be secured.

The center anchorage as designed will be 120 x 210 feet with a clearance above high water graduating from 214 feet at the center to 180 feet at the harbor line.

San Francisco-Oakland Bay Bridge



CONNECTED BY BORE

The two structures will be connected by a single bore tunnel through Yerba Buena Island, approximately 500 feet in length, 70 feet wide and 50 feet high.

Foundation borings for the San Francisco approaches have been completed, according to Chief Engineer Purcell. Island borings and bay borings were completed in time to submit to the Board of Engineering Consultants.

Property owners of San Francisco and the East Bay communities will not be called upon to finance the cost of constructing approach facilities for the Bay Bridge, and both sides of the bay will receive identical treatment.

This was made plain in a statement recently issued by Colonel Garrison, Director of the

State Department of Public Works, in amplification of his address at the ceremonies officially starting the bridge toward construction, held at Yerba Buena Island, February 24th. Colonel Garrison's statement was embodied in telegrams sent to the Alameda Taxpayers' League and the Central Council of Civic Clubs of Alameda County. Those groups had announced petition campaigns against formation of assessment districts to finance approaches.

PROPERTY OWNERS ASSURED

Colonel Garrison advised the groups as follows: "Arrangement of adequate approach facilities on both sides of the bay contemplate identical treatment. Our plans provide for adequate approach facilities connecting with the street systems of the East Bay

(Continued on page 42)

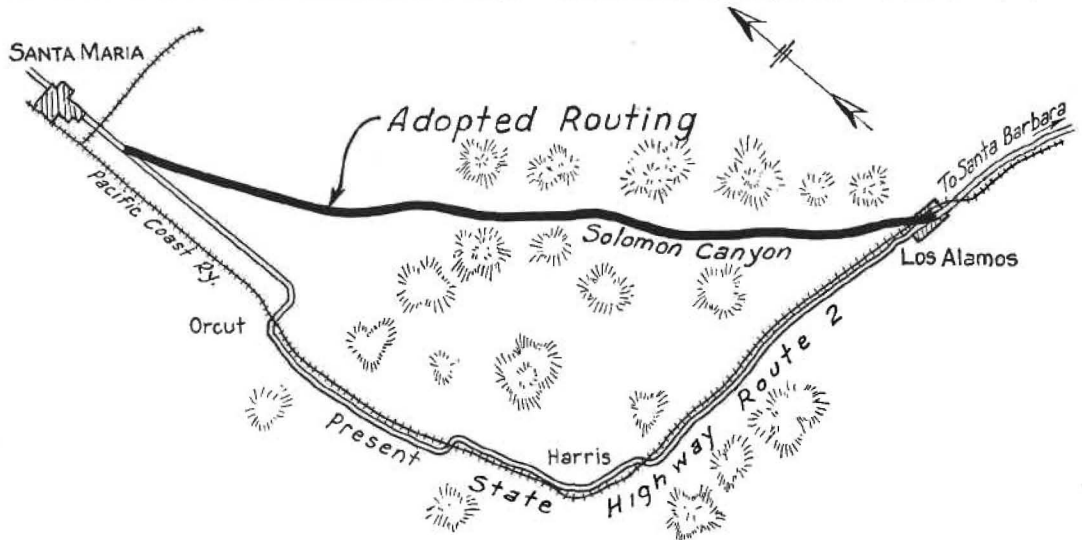
Solomon Canyon Cut-off to Effect Annual Savings of \$84,000 for Traffic

By N. D. DOUGLAS, Assistant Engineer, Surveys and Plans

WITHIN the last few years, the State has put under way a comprehensive highway improvement program with a view toward developing the entire State Highway System as quickly as possible to a standard which will serve traffic efficiently. Owing to the phenomenal growth of the volume and speed of automotive traffic during the past fifteen years, and to the existence of a large

FOUR GRADE CROSSINGS

Aside from the condition of the pavement, the existing road involves several other features which are disadvantageous to traffic, *e.g.*, several sharp right-angle curves, four grade crossings over the Pacific Coast Railroad, and (as will be noted on the accompanying sketch map) a loss of about five miles of distance due to following a sparsely settled agricultural valley between Los Alamos and Orcutt.



mileage of roads built prior to this unforeseen growth, a certain amount of relocation of existing roads is necessary in connection with the improvement program.

The so-called Solomon Canyon relocation is now under construction between the towns of Los Alamos and Santa Maria on the Coast Highway (U. S. 101) in northern Santa Barbara County. The existing road consists of a Portland cement concrete pavement 4 inches thick and 15 feet wide on a graded roadbed varying from 15 to 21 feet in width. Most of this was built in 1913-1914 and the pavement is practically worn out now, having served the bulk of its economic life. The necessity for early replacement, therefore, was inevitable, as the fast heavy modern traffic is rapidly breaking up the 18-year-old pavement, requiring increasingly heavy maintenance expenditures.

Regarding this last point, it must be remembered that the original road was located when through traffic was very light and local traffic was relatively much more important than now. It constituted the only improved north and south road in this vicinity and properly served a majority of the local rural population, although its builders must have been aware of the existence of the Solomon Pass through the hills north of Los Alamos, which provides a natural highway location on almost a straight course between Los Alamos and Santa Maria.

As the time for repaving approached, traffic conditions had changed decidedly. Eighty-five per cent of the total was now through traffic, and only 15 per cent was local. Average road speeds were 40 miles per hour instead of 25, making the effect of the existing curves most objectionable. The exist-

New Route Eliminates 33 Curves

(Continued from preceding page)

ing pavement was too old to handle the total traffic much longer, but in good enough conditions to handle the light local traffic alone indefinitely with little maintenance, thereby providing efficient local service and a maximum salvage value.

In recent years, engineers had gained definite knowledge of the cost of automobile operation and of the operating economies of distance reduction. And the Solomon Pass provided a natural route slightly over $4\frac{1}{2}$ miles shorter than the existing road. Relocation was decided upon as the result of exhaustive comparative studies.

The completed project which is now under construction will cost about \$530,000, and will provide a modern concrete pavement from 7 to 9 inches thick and 20 feet wide, on a 36-foot graded roadbed.

Resurfacing the existing road to an equal standard which is the minimum required by the present average traffic of 2000 vehicles per day, would cost as much or more due to its additional length. Therefore, there is no increased cost due to relocation. On the other hand, the relocation will effect for the average present through traffic an actual saving in operating costs of about \$84,000 per year due to distance reduction.

This saving represents an interest or income of nearly 16 per cent on the total expenditure for the improvement, which is obtained entirely by means of the relocation, and which will increase almost directly in proportion to the volume of traffic. In what other line of investment could such a yield be obtained?

THIRTY-THREE CURVES ELIMINATED

A general comparison between the existing and relocated roads is shown in the following table:

	Existing road	Relocation
No. of curves less than 1000-foot radius.....	33	0
No. of curves less than 500-foot radius.....	8	0
Total rise and fall.....	1300 feet	1470 feet
Total curvature.....	1222 degrees	257 degrees
Maximum gradient.....	6.00 per cent	5.45 per cent
Length of gradient over 5 per cent.....	2000 feet	500 feet
Minimum vertical sight distance.....	300 feet	800 feet
No. of railroad grade crossings.....	4	2
Length.....	20.30 approx.	15.69 miles

HOW ROAD CONDITIONS AFFECT OPERATING COSTS

The following table, taken from "Operating Cost Statistics of Automobiles," a bulletin by Professors T. R. Agg and H. S. Carter of Iowa State College, gives enlightening information on the effect of road conditions on various items of operating costs:

Item of cost	Sum expended for the item when using high type roads	Sum required for equal mileage on intermediate type roads	Sum required for equal mileage on low type roads
Gasoline	\$1 00	\$1 20	\$1 47
Oil	1 00	1 00	1 00
Tires and tubes	1 00	2 22	2 90
Maintenance ..	1 00	1 20	1 47
Depreciation ..	1 00	1 10	1 24
License	1 00	1 00	1 00
Garage	1 00	1 00	1 00
Interest	1 00	1 00	1 00
Insurance	1 00	1 00	1 00

MOTOR TRUCKS ON SAHARA

Establishment of a regular motor transport service over the Sahara Desert is being considered. The plan depends on results of an experimental trip by a caravan of eight trucks, equipped with heavy oil engines. The proposed run extends between Algiers and Gao, on the southern boundary of the desert, a round trip distance of 3840 miles.

From the preceding discussion, it is evident that the Solomon Canyon relocation represents in all respects an efficient investment of highway funds. It leaves the existing road to serve as a detour during construction and to efficiently accommodate the local wayside traffic with complete utilization of every unit of its salvage value.

It provides for through traffic a road of the highest standards of construction, adapted to unlimited future development in width, etc., as required by future traffic, and suitable for unlimited traffic speeds. It provides an ultimate location for which there never will be a reason or excuse for relocation. And it yields a handsome return on the funds expended for its construction.

In closing, it may be stated again that the economic features of this relocation are typical of all of the relocations which have been made or are yet to be made by the State. In every case, departure from the existing road is made only on the basis of a thorough economic analysis.

Highway Commission Holds Meetings at Riverside and San Luis Obispo

THE California Highway Commission had a busy month, holding three meetings in different parts of the State, each meeting a crowded gathering of official delegations and citizens eager to hear and be heard on road matters in which they are vitally interested. Two of the meetings were held in the county seats of Riverside and San Luis Obispo, the third at the Commission's headquarters in the State capital.

The meeting at Riverside on March 28 was held conjointly with the ceremonies attending the dedication of the new Rubidoux Bridge at the westerly gateway to the city by Governor James Rolph, Jr., on March 29th.

The entire commission and executive staff present at the meeting were: Commissioners Earl Lee Kelly of Redding, chairman; Frank A. Tetley of Riverside; Harry A. Hopkins of Taft; Timothy A. Reardon of San Francisco; Philip A. Stanton of Anaheim; Colonel Walter E. Garrison, Director of Public Works; C. H. Pureell, State Highway Engineer; C. C. Carleton, chief of the Division of Contracts and Rights of Way, and John W. Howe, secretary.

FOURTEEN HEARINGS

The spacious and splendidly equipped audience chamber of the Riverside County Supervisors in the County Courthouse, assigned to the use of the Commissioners was thronged with several hundred men and women all through the session while fourteen delegations were given hearings and decisions.

A delegation of five representatives of the Victorville-Bear Valley Road Improvement Association—C. E. Cooper, A. J. Lintner, T. J. Thomas, Judge Hoffman, Frank Hubbard, James Goulding and June Gobar requested the inclusion in the State secondary highway system of the road from Big Bear Lake to Victorville.

W. A. Ayer and D. Mulherron asked the allocation of funds to improve eight feet of shoulders through the town of San Clemente.

A delegation from Brawley including C. J. Park, Henry Jackson, S. D. Carey, G. E. Krueger, R. L. Baker, requested State cooperation in the improvement of Western Avenue in that city, presenting a resolution embodying the request signed by Mayor J. C. Fluke and Councilmen H. E. Hubbard, I. A. Pearson, R. L. Baker and A. S. Wolfe.

The improvement of Route 59, Lancaster to Cajon, was urged by Secretary R. H. Mack of the San Bernardino Chamber of Commerce, J. B. Gill, I. N. Gilbert, Arthur L. Doran, Howard L. Way.

ASK ROUTE CHANGE

Stanley W. Guthrie, Frank B. McMillan and Charles S. McMillan requested a change in the realignment of Brea Canyon Road, southwest of Pomona.

The following delegation appeared relative to the proposed location of the State highway west of Pomona: A. B. Marshall, Mrs. J. M. Whitehead, Margaret H. Mackensie, Cecil George, David Porter, W. L. Williams, Mrs. Arthur Bates, Charles A.

Emory, W. L. Rose, J. M. Paige, Mark Potter, A. P. Nichols and W. M. Harris.

A change in the proposed routing of the State highway from Pomona through the city of Chino was requested by Ernest W. Soper, Frank Mogle, W. A. Kutz and Dr. Harold Miller.

Chairman H. W. Wright of the Los Angeles County Board of Supervisors asked that additional time be given that county for securing rights of way on a proposed cooperative project between La Canada and Lincoln Boulevard before withdrawal of the State's share of \$210,000 set up for that project. Supervisor Wright also asked that consideration be given to the Pasadena-Palmdale cut-off as part of the State system.

ADDING A MILE

The following officers of Joint Highway District No. 17 asked State cooperation in the construction of an additional mile on the westerly end of the Julian-Kane Springs project now under construction: Leroy H. Aul, Henry L. Jackson and George E. Krueger.

Supervisor Tom Turley of San Diego County asked the Commission to consider the early payment of a \$25,000 reimbursement to San Diego County for expenditures made on the State highway near Tia Juana. He also asked that the State recommend allocation of Federal funds to the road from Baxter to Warner Dam through an Indian reservation and Forest Reserve.

J. R. Robinson, C. H. Hutchinson, Mayor W. Pfunder and Irving Knopsnyder comprised a delegation urging the routing of the Valley Boulevard through Colton on I street.

A delegation from the Perris Valley Chamber of Commerce relative to the requested rerouting of Route 78 through Perris included H. M. Harford, Van W. Dodson, V. E. Reynolds, J. W. Kirkpatrick, I. L. Haas, Frank Beatty, C. J. Cutler.

JACK RABBIT TRAIL

Dave Kiler of Mecca appeared relative to the routing of Mecca-Blythe Highway through Box Canyon and was followed by a large delegation from the Riverside Chamber of Commerce introduced by Supervisor J. E. McGregor requesting the realignment and reconstruction to State standard of the Jack Rabbit Trail between Beaumont and Riverside. Supervisor R. E. Dillon presented the matter in detail and the delegation included Mayor Joseph S. Long, T. E. Gore, E. P. Clarke, A. C. Fulmor, A. A. James, Dewitt B. Hutchings, C. D. Hamilton, T. C. Rosenberger, Guy Boghard, A. L. Wood, Mark Potter.

Between the morning and afternoon sessions the Commission and staff were entertained at luncheon at Mission Inn as guests of Mayor John S. L. Long, the City Council and Board of Supervisors of Riverside County. On the following day the official party were guests at a similar function given in their honor by the Lions Club at the conclusion of the bridge dedication ceremonies. Several thousand people gathered at the grandstand for this event to greet and hear Governor Rolph, and the occasion was made doubly impressive as a spectacle by the presence of



A GALA DAY was enjoyed by the people of Riverside on March 29th when Governor Rolph and the California Highway Commission attended ceremonies at the dedication of the newly reconstructed Rubidoux Bridge and the planting of a memorial palm tree on the bridge approach. No. 1 shows the Governor leading the parade to the bridge in a car. No. 2 pictures the fine, wide, bridge roadway and No. 3 reveals part of the great throng at the celebration. In No. 4 the Governor is seen preparing to plant the big tree shown being lifted into place in No. 5. In No. 6 is the scene at the grandstand with Governor Rolph speaking.

Plan to Make Old Bottleneck Bridge Serve as Detour While Being Rebuilt

By M. A. KOONTZ, Designer, Bridge Department

THE Bridge Department is now engaged in the preparation of plans and specifications for the reconstruction and widening of the existing bridge across Ventura River at the city of Ventura. The project together with grading and paving of the bridge approaches will be advertised in May of this year.

Two prime considerations have made it expedient at this time to widen and reconstruct the present bridge, namely, present and future traffic requirements, and deterioration of superstructure of the existing bridge.

TRAFFIC BOTTLENECK

All north-bound traffic on Route 2 (Roosevelt Highway) and Route 60, (Coast Highway) together with local north-bound traffic, must cross Ventura River by way of the present bridge. This traffic volume now somewhat exceeds the safe traffic capacity of the existing two-lane structure. Estimates of future traffic indicate that by 1940 the present two-lane structure will be totally inadequate.

Future traffic requirements, together with the close proximity of the city of Ventura, dictate that the existing two-lane structure should be widened to provide four lanes.

The present bridge as now existent consists of a series of eight concrete deck arch spans and four concrete deck girder spans providing a clear roadway width of 20 feet. The eight arch spans consisting of two 115-foot and six 120-foot spans were constructed by Ventura County in 1913. In 1914 the bridge approaches were washed out by flood and replaced with timber trestle. By 1924 the timber trestle was in such condition as to require replacement, which the State did with three 60-foot and one 30-foot reinforced concrete girder spans.

MUCH REPAIRED

Time, aided by poor concrete, has made great inroads on the existing arch spans. Much repair has been required to maintain the arch spans in usable condition, since failure has occurred at many points including the slab and railing.

Economic considerations urged the incor-

poration into the new structure of whatever portions of the existing structure were suitable and practicable.

A further requirement was that there be a detour that could not be washed out by flood water with consequent tie-up of all coastwise traffic and its attendant difficulties. Hence the existing bridge is to be used as a detour during construction operations.

USING OLD PIERS

In order to meet the above requirements, a bridge was designed which, while not utilizing any of the superstructure—on account of its deteriorated condition—does make full use of the substructure of the present bridge. The existing arch span piers will be cut off at ground line and used as footings for new piers. The existing girder span piers with minor alterations will be used as now existent.

To allow the use of the old bridge as a detour the new bridge was designed so that it may be constructed in separate halves. The contractor will construct on the downstream side of the existing bridge one-half of the proposed bridge, meanwhile maintaining two-way traffic over the present bridge. **This half bridge, with a temporary railing at the ultimate centerline, will provide a detour while the existing bridge is being removed and the upstream half is being constructed—use being made of the old piers as mentioned above.**

FOUR-LANE ROAD

Upon completion of the upstream half, the temporary railing will be removed and there will then be opened to traffic a 44-foot roadway with 5-foot pedestrian walks at each side.

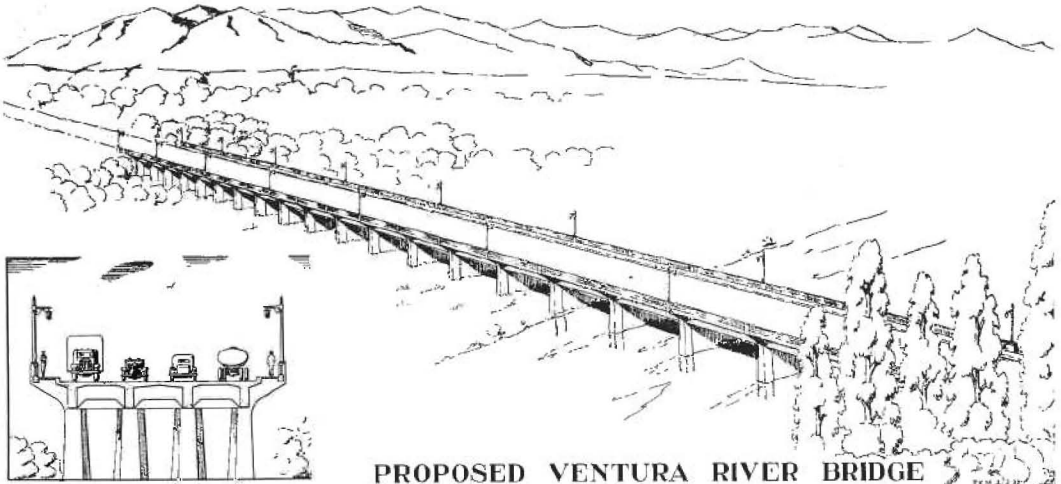
This new structure will consist of two 40-foot, thirteen 60-foot, and three 64-foot reinforced concrete deck girder spans with an aggregate length of 1233 feet founded on concrete piers and abutments.

In view of the close proximity of the city of Ventura special attention has been given to esthetic details one of which is an ornamental electric lighting system.

This project is a cooperative one with the city of Ventura constructing connections making easy access to the bridge.

Provides for Traffic and Pedestrians

121 Ven 7-D



PROPOSED VENTURA RIVER BRIDGE

Reconstruction of Roosevelt Highway Link Half Completed

GRADING and paving the approaches, one-half mile in length, to the new steel and concrete bridge across the Salinas River at Bradley is complete. This is a 20-foot reinforced concrete pavement on a 36-foot roadbed.

On the Roosevelt Highway between San Remo Divide and Rocky Creek, a distance of 8.3 miles, the old road, taken over by the State from Monterey County, is being reconstructed on new alignment with a roadbed 24 and 30 feet in width with a selected material surface 20' x 8". This project is 50 per cent complete.

Plans are complete for the reconstruction of a portion of the road from San Remo Divide to the Carmel River, a distance of 3.7 miles. This is through the Carmel Highlands, an improved residential section.

On the Roosevelt Highway south of Carmel at Bixby Creek a reinforced concrete arch bridge is about 70 per cent complete, being constructed under the supervision of the Bridge Department.

Bids have been received on a reinforced concrete arch bridge across Rocky Creek, on the

Roosevelt Highway, about one-half mile north of Bixby Creek. The completion of this structure with the work now completed or under contract will open a new road into the Big Sur country that will be much easier and safer to travel than the old road.

New maintenance buildings including a residence for the Maintenance Superintendent have been completed at Salinas.

Carleton Named to National Legal Body

The Executive Committee of the American Association of State Highway Officials has decided to create a new committee on Legal Affairs.

It is expected that this committee will develop matters that will be of great assistance in coordinating legal procedure helpful to the State Highway Departments of the various states of the Union.

C. C. Carleton, attorney at law, Chief of the Division of Contracts and Rights of Way, California Department of Public Works, has been named a member of the new committee.

THE "YES" MAN

Muggins—What did the traffic cop say to you?
Chuggins—I haven't the faintest idea. I was so busy saying "Yes, sir" that I couldn't hear him.—*Motor Land.*

Prospect: "I want to pay cash for this car."
Auto Dealer: "Yes, sir, but this request is so unusual that I am afraid you will have to give us references."—*Motor Trader.*

Highway Bids and Awards for March

AMADOR, CALAVERAS, TUOLUMNE AND STANISLAUS COUNTIES—Applying oil to 180 roadside miles for weed eradication. Dist. X. C. W. Wood, Stockton, \$2,846; L. J. Immel, Berkeley, \$3,351; Dee Strong, Rio Vista, \$2,277; Basalt Rock Company, Inc., Napa, \$3,189; Tiffany-McReynolds-Tiffany, San Jose, \$3,042. Contract awarded to Oilfields Trucking Co., Taft, \$2,028.

FRESNO, TULARE AND KERN COUNTIES—Furnishing and applying oil to roadside vegetation, about 85 miles. Dist. VI. Pacific Tank Lines, Inc., Los Angeles, \$7,139; Fred W. Nighbert, Bakersfield, \$4,212; Stewart & Nuss, Inc., Fresno, \$4,471; Oilfields Trucking Co., Taft, \$4,492. Contract awarded to Basalt Rock Company, Inc., Napa, \$4,104.

LOS ANGELES COUNTY—Dist. VII, Rt. 59 and 61. Treating about 2 miles between Neenach School and Neenach with fuel oil, and about 4.1 miles between La Canada and Fern Canyon with road oil and screenings. Square Oil Co., Los Angeles, \$3,676; J. J. Lilley, Fullerton, \$3,706; H. E. Cox & Son, Pasadena, \$3,936; A. O. Nelson, Pasadena, \$4,905. Contract awarded to Oilfields Trucking Co., Taft, \$3,589.

LOS ANGELES COUNTY—Between Santa Inez and Santa Monica canyons, about 2.4 miles to be graded and paved with asphalt concrete. Dist. VII, Rt. 60. Sander Pearson, Santa Monica, \$159,556; Ed Johnson & Sons, Los Angeles, \$157,681.80; L. A. Paving Co., Inc., Los Angeles, \$182,677; Hall-Johnson Co., Alhambra, \$185,284; Macco Construction Co., Inc., Clearwater, \$164,055; George R. Curtis Paving Co., Los Angeles, \$161,987; Gibbons and Reed Co., Burbank, \$176,677; Southern Cal. Roads Co., Los Angeles, \$163,374. Contract awarded to Griffith Company, Los Angeles, \$148,830.

LOS ANGELES AND VENTURA COUNTIES—Furnishing and spraying oil on roadside vegetation. Dist. VII. Consumers Oil Co., Los Angeles, \$2,349; Seaside Oil Co., Summerland, \$2,454; Gilmore Oil Company, Ltd., Los Angeles, \$3,015; Pacific Tank Lines, Inc., Los Angeles, \$3,213. Contract awarded to Square Oil Company, Inc., Los Angeles, \$2,268.

LOS ANGELES, ORANGE, SAN DIEGO AND IMPERIAL COUNTIES—Furnishing and spraying oil on roadside vegetation. Dist. VII. Consumers Oil Co., Los Angeles, \$2,368; Gilmore Oil Company, Ltd., Los Angeles, \$2,936; Pacific Tank Lines, Inc., Los Angeles, \$3,024. Contract awarded to Square Oil Company, Inc., Los Angeles, \$2,016.

MENDOCINO-HUMBOLDT COUNTIES—Between Ridgewood and Stephens Grove, Roadside oiling of vegetation, 56 miles. Dist. I, Rt. 1. Basalt Rock Co., Napa, \$1,512; Smith Bros. Co., Eureka, \$1,708; Oilfields Trucking Co., Taft, \$1,176. Contract awarded to Chas. Kupfinger, Lakeport, \$912.

MENDOCINO, SONOMA, MARIN, SOLANO, LAKE AND NAPA COUNTIES—Furnishing and spraying oil on roadside vegetation, about 106 miles. Dist. IV. O. V. Freeman, Palo Alto, \$6,488; Basalt Rock Co., Napa, \$5,607; Oilfields Trucking Co., Taft, \$6,723; Skeels-Graham Co., Roseville, \$7,128; The A. Helwig Construction Co., Sebastopol, \$6,795; C. F. Frederickson & Sons, Lower Lake, \$6,621. Contract awarded to Chas. Kupfinger, Lakeport, \$5,580.

MONO COUNTY—Across West Walker River about 24 miles north of Bridgeport, R. C. Bridge of 3-30' 0" spans on concrete bents and abutments with wing walls. Dist. IX, Rt. 28. J. W. Terrell, Sacramento, \$29,910; J. W. Hoopes, \$19,209; Nelson Bros, Escalon, \$21,812; Robinson-Roberts Co., Los Angeles, \$19,920; Schuler & McDonald, Inc., Oakland, \$21,463; F. H. Neilson, Orland, \$19,665; Nevada Contracting Co., Fallon, Nevada, \$21,734; Lord & Bishop, Sacramento, \$24,845. Contract awarded to Carl Ingalls, Inc., Bakersfield, \$14,633.

ORANGE COUNTY—Bridge across Anaheim Bay near Seal Beach. 1-55' plate girder span and 11-30' R. C. girder and 11-30' R. C. girder spans to be widened. Dist. VII, Rt. 60. Merritt Chapman & Scott Corp., San Pedro, \$53,529; R. B. Bishop, Long Beach, \$68,984; R. H. Travers, Los Angeles, \$72,887; Herbert M. Baruch Corp., Ltd., Los Angeles, \$63,885; Oberg Bros., Los Angeles, \$58,495; Byerts & Dunn, Los Angeles, \$57,742. Contract awarded to Nead Construction Co., Wilmington, \$49,982.

RIVERSIDE COUNTY—Between Shavers Summit and Desert Center, about 19.5 miles to be graded and surfaced with oil treated crushed gravel or stone. Dist. VIII, Rt. 64, Sec. F. Morrison-Knudsen Co., Los Angeles, \$612,057; George Herz & Co., San Bernardino, \$559,659; Macco Construction Company, Inc., Clearwater, \$599,771; R. E. Hazard Contracting Co., San Diego, \$580,835; New Mexico Construction Co., Albuquerque, New Mexico, \$600,042; V. R. Dennis Construction Co., San Diego, \$572,021; H. W. Rohl Co., Los Angeles, \$548,554; S. H. Palmer and J. P. Holland, Inc., San Francisco, \$595,802; Ralph Pleasant Construction Co., Phoenix, Arizona, \$579,714; Von der Hellen & Pierson, Castaic, \$616,096; A. Telchert & Son, Inc., Sacramento, \$643,176; Granite Construction Company, Ltd., Watsonville, \$561,910; Hanrahan Co., San Francisco, \$615,693; Jack Casson, Hayward, \$623,242. Contract awarded to Basich Brothers, Torrance, \$528,678.

SAN BENITO, MONTEREY, SAN LUIS OBISPO AND SANTA BARBARA COUNTIES—Furnishing and spraying oil on roadside vegetation. Dist. IV. Bradley Truck Co., Santa Maria, \$9,116; Fred W. Nighbert, Bakersfield, \$10,560; Oilfields Trucking Co., Taft, \$8,060; Pacific Tank Lines, Inc., Los Angeles, \$9,757. Contract awarded to Western Motors Transfer, Inc., Santa Barbara, \$7,568.

SAN BERNARDINO COUNTY—Between Upland and San Bernardino, removing dead trees from right of way. Dist. VIII, Rt. 9, Secs. A, B, C. Fred Jackson, San Bernardino, \$627; Harry M. Rouse, San Bernardino, \$461; Chas. E. Moore, Ontario, \$737; Chas. Berkowitz, Riverside, \$418; H. S. Littlefield & G. W. Prong, San Bernardino, \$891; Carl S. Rousseau, Pasadena, \$551; Edwin Anderson, San Francisco, \$2,090; W. D. Bohan, San Bernardino, \$2,230. Contract awarded to Arthur Hubbs, Colton, \$188.

SAN BERNARDINO COUNTY—Erecting maintenance station buildings at the Panorama Maintenance Station. Dist. VIII, Rt. 43, Sec. A. J. W. Cramp, San Bernardino, \$12,473; Wm. G. Gannon, Pomona, \$12,483; C. H. Want, Los Angeles, \$12,700; Bakker & Robinson, San Bernardino, \$12,920; John Strona, Chino, \$13,392; Fred Walsh, San Bernardino, \$13,800; Martin Green, San Bernardino, \$14,447. Contract awarded to Arthur Cox, Pasadena, \$10,129.

SAN BERNARDINO COUNTY—Water supply well complete in place at Yermo Maintenance Station. Dist. VIII, Rt. 31, Sec. H. W. D. Anderson, San Bernardino, \$1,162; J. W. Burkhart, Victorville, \$1,987; W. A. Rice, Riverside, \$2,407. Contract awarded to Lyon Bros., Los Angeles, \$937.

SAN DIEGO COUNTY—Erection of maintenance station buildings and fence at Escondido. Dist. VII. C. M. Martin, Escondido, \$5,749; J. B. McIntosh, Los Angeles, \$5,951; John A. Malloy, Los Angeles, \$5,956; S. Giannone, Los Angeles, \$6,299; K. W. Wellington, Escondido, \$6,486; Walter Trepte, San Diego, \$7,450. Contract awarded to J. A. Hunt, East San Diego, \$5,593.

SAN MATEO, ALAMEDA, SANTA CRUZ, SANTA CLARA AND CONTRA COSTA COUNTIES—Furnishing and spraying oil on roadside vegetation, about 80 miles. Dist. IV. Oilfields Trucking Co., Taft, \$5,100; Skeels & Graham Co., Roseville, \$4,634; O. V. Freeman, Palo Alto, \$4,141; Air-o-Spray Equipment Co., San Jose, \$5,100; Tiffany-McReynolds-Tiffany, San Jose, \$3,946; W. H. Larson, Berkeley, \$4,230. Contract awarded to Dee Strong, Rio Vista, \$3,663.

STANISLAUS, SACRAMENTO, SAN JOAQUIN, AMADOR AND CALAVERAS COUNTIES—Applying oil to 148 roadside miles for weed eradication. Dist. X. C. W. Wood, Stockton, \$2,646; Basalt Rock Company, Inc., Napa, \$3,402; Oilfields Trucking Co., Taft, \$4,510; Dee Strong, Rio Vista, \$3,307; E. F. Hilliard, Sacramento, \$4,498; O. V. Freeman, Palo Alto, \$2,872; Tiffany-McReynolds-Tiffany, San Jose, \$3,830; Rotary Oil & Burner Co., Sacramento, \$3,339. Contract awarded to Lee J. Immel, Berkeley, \$2,499.

TEHAMA, SHASTA, SISKIYOU AND LASSEN COUNTIES—Applying Diesel oil to roadside vegetation over a distance of about 94 miles. Basalt Rock Company, Napa, \$4,460; E. F. Hilliard, Sacramento, \$5,274. Contract awarded to Oilfields Trucking Co., Taft, \$4,460.



Approval by the county supervisors of a petition for the organization of the Elsinore Water Conservation District comprising an area fronting on Lake Elsinore in Riverside County and the issuance of an order authorizing the use of the Big Tujunga Dam, an important unit in the Los Angeles Flood Control System are two of the interesting news items in the report of State Engineer Edward Hyatt covering activities of the Division of Water Resources for March. Other matters affecting dams, irrigation districts, reclamation projects, snow surveys, etc., are detailed in the report as follows:

A resolution dated March 14, 1932, by the supervisors of Riverside County, approving the sufficiency of a petition for the organization of the Elsinore Water Conservation District, was received by the State Engineer with the request for a report on the proposed district. The area proposing to organize adjoins the town of Elsinore on the west, and fronts the lake in the beautiful Elsinore Valley near the west line of Riverside County.

Visits for the purpose of conference or investigation of matters connected with the 1931 report on irrigation districts were made to the following districts: Tranquillity, James, Stinson, Riverdale, Laguna, Consolidated and Fresno irrigation districts, Fresno County; Alpaugh, Vandalia, Lindsay-Strathmore and Tulare irrigation districts, Tulare County; Island No. 3 irrigation district, Kings County; Merced and El Nido irrigation districts, Merced County, Turlock, Modesto and Oakdale irrigation districts, Stanislaus County; South San Joaquin and Woodbridge irrigation districts, San Joaquin County; and Camp Far West Irrigation District, Placer County.

The directors of the South San Joaquin Irrigation District appeared before the California Districts Securities Commission with a request for the reallocation of funds received from power sales, under section 32d (1931) of the Irrigation District Act. The Commission decided that since such revenues had already been allocated by the district under the contract of 1925 with the power company they were a direct obligation to the bonds of the issue voted for and used, in the construction of the Melones Dam, and that the act of 1931 could not be used to modify this obligation.

DAMS

To date 793 applications have been received for approval of dams built prior to August 14, 1929; 93

for approval of plans for construction or enlargement and 250 for repair or alterations.

Applications Received for Approval of Plans for Repair or Alteration.

Fourteen such applications were received during this period from all sections of the State, indicating the willingness of owners to place their dams in condition for approval prior to the date fixed by law for such approvals, i.e., August 14, 1932.

Plans were approved for the construction of the Greenspot Dam, an earthfill dam to be built by the Western Fruit Growers in San Bernardino County.

Plans Approved for Repairs or Alterations.

Dam	Owner	County
Mill Creek	Coast Counties Gas & Elec. Co.	Santa Cruz
Medley Lake	Pacific Gas and Electric Co.	El Dorado
Finnon	Pacific Gas and Electric Co.	El Dorado
El Dorado Forebay	Pacific Gas and Electric Co.	El Dorado
Upper Cleese	John P. Cleese	El Dorado
Millbrae No. 1	Mills Estate Inc.	San Mateo
Bowles	Clement Pines Corporation	Alameda
Hart	E. C. and Kate C. Hart	Siskiyou

Plans were approved for removal of the Montezuma Dam, owned by the Pacific Gas and Electric Company in Tuolumne County.

An order authorizing use of the Big Tujunga Dam was issued to the Los Angeles County Flood Control District. This is a 180-foot concrete variable radius arch dam on Big Tujunga Creek built by the Los Angeles County Flood Control District and is an important unit in the system of flood control dams being built by the district.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

During this period there have been no activities other than routine maintenance work. Maintenance clearing in the Butte Slough and Tisdale by-passes was terminated on February 22d after a total of \$23,000 had been expended in such work this season.

The maintenance headquarters near Sutter City has been practically completed, only certain finishing work remaining to be done. Moving in has been commenced and will be completed within ten days.

There has been practically no rainfall during this period and the drainage pumping plants on the Sutter By-pass have not been operated.

Sacramento Flood Control Project.

A crew consisting of approximately sixty to seventy men was placed at work on construction clearing on February 19 and continued to March 12, when the fund of \$5,800 provided by the Reclamation Board was exhausted. At this time no channel clearing work is in progress.

Emergency Bank Protection Begun

(Continued from preceding page)

A contract has been entered into with Samuel Ewell of Marysville for clearing and grubbing 13 acres in the Feather River bottoms about five miles north of Marysville.

Emergency Flood Protection and Rectification of Rivers.

River rectification work on Bautista Wash, a tributary of the San Jacinto River, in cooperation with Riverside County and landowners has been commenced. This work will cost \$1,500.

Arrangements have been completed and work will commence at once on emergency bank protection at three points on the left bank of the San Joaquin River between the Mossdale Bridge and the Banta-Carbona intake, in cooperation with a group of landowners organized as the San Joaquin River Association. This work will cost between four and five thousand dollars.

Sacramento Flood Control Project—Bank Protection.

No work of this class is under way at the present time. The work contemplated by Reclamation District No. 730 at Russell Bend and Reclamation District No. 70 at Girdner Bend has not proceeded, and it is apparently the intention of these districts to postpone work. This is due to the financial condition of the districts.

Navarro River.

Preparations are complete for the placing of 300 tons additional rock on the jetty at the mouth of the Navarro River for the Fish and Game Commission. This work will be completed by April 1.

Russian River Jetty.

During this period work is being confined to repairing the damage done by the storms of last December, particularly to the steel trestle. It has been possible to carry on this work only during good weather and low tide and it has consequently been slow. It is the intention to make things secure and defer further construction until after good weather is insured, some time during the month of May.

Captain C. A. Nelson, construction foreman on the jetty, was killed on March 2, 1932, by falling from a cable. J. P. Kelly, river foreman, is in temporary charge of the work.

Flood Measurements and Gages.

The valley streams have been at an unusually low stage for this season of the year, and no discharge measurements have been made. Continuous records of water heights have been kept at the various stations maintained by this office, and in the office the compilation of records has been continued.

WATER RIGHTS

Applications to Appropriate.

Fourteen applications to appropriate water were received during February; 12 were canceled and 13 were approved during the same period. Seven per-

mits were revoked and the rights under 13 were confirmed by the issuance of a license.

Among more important applications received was one filed by Robert D. Nicol and C. M. Carter of Oakland, California, proposing appropriations from Big Granite Creek and other tributaries of North Fork of American River in Placer County for power and domestic purposes at an estimated cost of \$500,000. Among the more important applications approved was one by Central Pacific Railway Company proposing an appropriation from Donner Creek in Nevada County for industrial and domestic purposes at an estimated cost of \$30,000, and another by O. J. Laing of Paradise, Butte County, proposing an appropriation from springs tributary to West Branch of North Fork of Feather River for placer mining purposes at an estimated cost of \$10,000.

ADJUDICATIONS

Shasta River (Siskiyou County)—Case pending in the Superior Court of Siskiyou County.

Whitewater River (San Bernardino and Riverside counties)—Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

North Cow Creek (Shasta County)—A decree defining the water rights on North Cow Creek, based upon the amended stipulation for judgment heretofore signed by all parties, has been prepared by the Division upon request of the Superior Court of Shasta County, and is being circulated among counsel.

Oak Run Creek (Shasta County)—Case pending in the Superior Court of Shasta County awaiting the entry of a decree in the North Cow Creek case.

Clover Creek (Shasta County)—Action on the case in the Superior Court of Shasta County is pending the outcome of negotiations for settlement by stipulation.

Butte Creek (Siskiyou County)—Case pending in the Superior Court of Siskiyou County awaiting action by the parties involved.

Davis Creek (Modoc County)—Case pending in the Superior Court of Modoc County awaiting entry of Court's decree.

Deep Creek (Modoc County)—A schedule of allotments for trial distribution during the 1932 irrigation season was prepared and submitted to the water users for approval at a meeting held on March 15, 1932, at Cedarville.

Franklin Creek (Modoc County)—A stipulation for consent judgment was submitted to the water users at a conference held at Alturas on March 14, 1932.

New Pine Creek (Modoc County)—A stipulation for consent judgment was submitted to the water users at a conference held at New Pine Creek on March 15, 1932.

Eagle Creek (Modoc County)—A schedule of allotments for trial distribution of the waters of the

Snow Survey Results Above Normal

(Continued from preceding page)

stream for the 1932 irrigation season was submitted to the water users at a conference held at Eagleville on March 15, 1932.

South Fork Pit River (Modoc County)—The case of W. E. Armstrong, et al. vs. Frank McArthur, et al., involving the rights to the use of the waters of the South Fork of Pit River and its tributaries above the confluence of Pine Creek was referred to the Division by the Superior Court of Modoc County by Order of Reference dated February 29, 1932. The determination covers an irrigated area of approximately 19,400 acres served by some 45 diversion conduits.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Work on this project in the past month has been in compilation of the annual report which will present all 1931 data on the diversions, stream flow, return flow, use of water, salinity, etc., for the Sacramento-San Joaquin territory. This involves the computation of daily, monthly and seasonal diversions of water by some five hundred pumping plants. Good progress has been made. Work has continued on the special report of damage in 1931 due to salinity and water shortage.

Sampling at nineteen permanent salinity stations in the Upper Bay and Delta regions and operation of tide gages has been maintained. There is now practically no salinity in the Delta channels. Tests of samples taken on March 10 were as follows:

SALINITY-UPPER BAY AND SACRAMENTO-SAN JOAQUIN DELTA

Station	Salinity in parts of Chlorine per 100,000 parts of water
Point Orient.....	1300
Point Davis.....	640
Bullshhead.....	130
Bay Point.....	16
O. and A. Ferry.....	4
Collinsville.....	2
Antioch.....	4
Emmaton.....	2
Jersey.....	4
Central Landing.....	1
Middle River P. O.....	3

CALIFORNIA COOPERATIVE SNOW SURVEYS

The season's second series of surveys at the key snow courses throughout the State were completed in late February and early March by the various cooperating agencies working under the State's supervision. The results of the surveys as well as all precipitation data available to March 1st were reported in the March 1st Snow Survey Bulletin.

There were no general storms over the Sierra in February subsequent to the one ending in the first

few days of the month and this resulted in considerable melting of the snow at low elevations and a marked solidification and increased density of the pack at the higher elevations. In general, the surveys indicated a depth and water content of the snow to March 1st from two to four times greater than the depth and water content of a year ago.

For a few courses, only, the period of record of the surveys has been sufficient to permit of the development of normals. Of these, three in Yuba Basin indicated an average water content of the snow to March 1st amounting to 116 per cent of the normal for the entire season (up to April 1st) and Blue Lakes on the Mokelumne-Carson divide, Rhinedollar Lake, close to the Tuolumne-Mono divide, and Mammoth Pass on the San Joaquin-Owens divide showed respective water contents of 113, 123 and 124 per cent of the entire season normal.

The amount of snow reported on the ground at Donner Summit on March 1st was 110 inches. This was 12 per cent above a 33-year average for this date of 98 inches. In ten of the years in the period from 1898 to date the depth on March 1st has exceeded 110 inches and a maximum March 1st depth of 215 inches was recorded in 1911.

The data from the precipitation stations showed, in general, a progressive increase in the percentages of normal to March 1st in going from the northern to the southern stream basins, thus: The average precipitation up to March 1st was from 10 to 15 per cent below normal in the Upper Sacramento, Pit, McCloud and Feather River basins; from 5 to 10 per cent above normal in the basins from Yuba to Stanislaus; about 30 per cent above normal in the Tuolumne and Merced basins; from 45 to 50 per cent or better above normal from Upper San Joaquin to Kern basin; and from 60 to 90 per cent, with a general average of about 75 per cent above normal in the Los Angeles, San Gabriel and Santa Ana basins. A comparison with the corresponding percentages on February 1st showed that during February the precipitation in the northern basins fell from above to below normal; maintained about the same percentage above normal or fell slightly in the central basins; and considerably increased the percentage above normal in the basins of the south. As an average for the eastern basins, the data indicated precipitation to March 1st varying from 20 per cent above normal in the Tahoe-Truckee and Mono basins to 100 per cent above normal in the Owens basin.

The main surveys at all snow courses in the State will take place at the last of March and the April 1st bulletin will present the forecasts of the April-July stream flow and seasonal water supply as determined from the snow survey and precipitation data.

Irrigation Investigations—Federal Cooperation.

In connection with the Federal-State cooperation for irrigation investigations an agreement was reached and program drawn up covering the future work in the Sacramento-San Joaquin Delta. This includes a continuation of studies of the consumptive use of water by tules, aquatic plants, weeds and other non-economic growths of the delta and the evaporation from bare soil and open water surfaces.

(Continued on page 36)

New Salinas River Bridge at Bradley Built With Novel Widening Features

By H. E. FEARNALL, Resident Engineer

THE RECENT completion and opening to traffic of the Salinas River Bridge near Bradley on the Coast Highway between San Francisco and Los Angeles marks the completion of another unit in the general program of reconstructing the old and inadequate structures on the Coast Highway. The old bridge at Bradley has long been a barrier to traffic due to its poor alignment, narrow width and structural weakness.

The construction of the new bridge was necessitated by the unsafe condition of the old bridge which had been designed originally for the light traffic demands of the late eighties and was entirely inadequate for modern high speed traffic and present day truck loads. Before the new structure could be completed it was necessary to have watchmen at each end of the bridge to restrict the speed of all vehicles and to issue special permits for all trucks restricting their speed and load limit.

NARROW ROADWAY

The old structure consisted of three timber trusses 114 feet long built in 1883 and four light steel trusses 110 feet long which were erected in 1915 to replace old wooden spans that had been carried away by high water. The minimum roadway width between curbs was only 15 feet. At the west end of the structure there was a sharp dangerous curve which was the contributing cause of numerous serious accidents.

To avoid these unsafe conditions, it was necessary to construct the new bridge at a new location. The new structure is about 600 feet downstream from the old bridge on an alignment amply adequate for the trunk line traffic demands of this era.

The new bridge, built at a cost to the State of approximately \$275,000, is 1666 feet in length and has a roadway width of 24 feet. It consists of eighteen 45-foot reinforced concrete girder spans resting on reinforced concrete caps and columns and six 140-foot steel deck spans supported by heavy reinforced concrete piers.

This type of bridge was adopted not alone for economy but also for ease in future widening. The volume of traffic at this location

does not demand more than a two-lane width, and in so far as future traffic needs can be predicted a two-lane width will be adequate for some years. Consequently it was not deemed necessary from an economic standpoint to construct a wider bridge at this time.

When the decks of the concrete span were poured, a strip of concrete seven by six inches along the outer edge of each floor slab was omitted. Long hook dowels were embedded in the slab and extended into this unpoured strip to be used as anchorage in future widening. After the concrete in the deck was thoroughly cured, the unpoured strip together with all the protruding reinforcing steel was given a coat of asphalt paint so that when the strip was poured there would be very little bond between this strip and the remainder of the slab.

EASY TO WIDEN

By this means, when it is deemed necessary to widen the bridge, this removable strip of concrete can very readily be taken out. The caps were also poured with a removable strip and the floor beams in the steel spans are all punched ready to be spliced for future widening. The reinforced concrete railing was constructed in sections bolted to the slab in such a manner that they can be lifted out and then replaced on the newly widened deck.

All of the excavation for piers in the river channel was wet excavation as the water was within approximately one foot of the surface. Cofferdams built of steel sheet piling were used and gave excellent results. The material encountered in the different piers was practically the same for each pier, consisting of sand and gravel, then a layer of black mud with strata of clay, coarse gravel and boulders. The material encountered at the west end of the structure consisted of compressed clay with layers of cemented gravel. Each pier is supported by Douglas fir piling. The footings of all bents of the reinforced concrete girder spans with the exception of bents 23, 24 and 25 rested on reinforced concrete piles.

In order to meet with the alignment of the new highway, all of the spans at the west end



DECREPIT AND DANGEROUS, this old bridge on the Coast Route over the Salinas River at Bradley, with its 15-foot roadway, shaky wooden spans and sharply curved end, has been supplanted by a modern structure.



PERENNIAL YOUTH seems assured for this new concrete structure at Bradley by novel features that will permit the easy widening of its 24-foot roadway to meet future traffic conditions on the busy Coast Highway.

of the structure are built on a 1095-foot radius curve, superelevated for high speed traffic. The bridge is constructed on a grade of approximately 0.94 per cent with flat vertical curves at each end. These features so essential to present and future traffic requirements are designed to meet the demands of motor vehicle traffic and give the greatest benefit through a reasonable expenditure of funds.

A PROBLEM IN ANATOMY

The pavement was wet from a recent rain, and as the motorist swung round the corner his car skidded out of control, crashing into a butcher's delivery cart. As soon as he could bring his car to a stop, the motorist jumped out and ran back to where the butcher's boy was excitedly surveying the damage.

"I say, my boy, are you hurt much?" the motorist asked.

"No-o, I guess not," the boy answered, "but I can't find my liver!"—*Motor Land*.

A patrol wagon isn't much of a car, but it'll do in a pinch.

U. S. Contribution to Aid Water Plan

(Continued from page 33)

WATER RESOURCES

South Coastal Basin Investigation.

The South Coastal Basin Investigation is proceeding in a routine manner. Material for a bulletin on water levels has been assembled and is about ready to be placed in the hands of the printer. This will be a manual on water levels and should prove of great value in portraying conditions over the past.

Mohave River Investigation.

This investigation has proceeded in a routine way. The run-off has been much heavier than has been the case in past years of the investigation and more valuable data have been secured.

Salinas Valley Investigation.

The winter has been a very wet one in the Salinas Valley and excellent data as to run-off, percolation and movement of underground water levels have been secured. The work is now proceeding along regular lines.

Ventura County Investigation.

The rainfall in the Ventura County area has been above normal and in contradistinction to conditions during the past three years of the investigation, excellent data have been secured which will give better indications of the possibilities than have been secured in the prior years of the investigation.

Pit River Investigation (Modoc and Lassen counties).

Good progress has been made this month on the work of the report covering the three years investigation of the Pit River.

A report entitled "Supervision of Diversions from Pit River and Rattlesnake Creek in Hot Springs Valley, Modoc County, California, 1931 season" has been completed. This report covers the distribution of water in Hot Springs Valley during the 1931 irrigation season.

Santa Clara Valley Investigation.

The unusual rains occurring during the early part of February and immediately preceding afforded an opportunity for observing the contributions of the various smaller streams tributary to the Santa Clara Valley and the waste of those streams into San Francisco Bay. Gagings were made and a record of discharge maintained at a total of 29 stations on San Antonio Creek, Permanente Creek, Stevens Creek, Calabazas Creek, San Tomas Creek, Campbell Creek, Silver Creek, Dry Creek, Penitencia Creek and Berryessa Creek.

Percolation tests were made on Guadalupe, Los Gatos, San Tomas, Dry, Berryessa, San Antonio, Calabazas and Campbell creeks and on Coyote River.

The small group of wells which has been under special observation during recent months for the purpose of determining the rapidity with which surface streams contribute to the underground basin was read on January 28, February 11 and February 25.

Napa Valley Investigation.

Dry Creek, Rector Creek, Conn Creek and Napa River were measured during the comparatively high stages. Practically daily gaging was necessary at the temporary stations due to rapidity of changes.

Assembly of pump diversion data covering the irrigation season of 1931 was completed and the information forwarded to Sacramento.

The group of wells which has been under monthly observation was observed on February 26 and 27.

Santa Ana Construction Works.

Work is proceeding on Cucamonga Cone, Deer-Day Creek Cone, Lytle Creek Cone and Waterman and Twin Creek cones. The works being constructed are combined spreading and flood control works and are of considerable magnitude as compared to most works of this nature so far constructed in southern California.

Colorado River.

The agreement of August 18 as to allocation of Colorado River water belonging to areas in California was endorsed by six of the seven interests concerned. The Palo Verde Irrigation District at the time did not agree to the allocation. It has now submitted a proviso to its allocation which has been submitted to the other six parties by this office. The Metropolitan Water District and city of Los Angeles have endorsed the new proviso and it was written into the contract between Imperial Irrigation District and the Secretary of the Interior. The proviso leaves the agreement substantially as it was before and affects only the right of Palo Verde Irrigation District.

STATE WATER PLAN

The California Water Resources Commission held a series of meetings in the State Building, San Francisco, on March 17, 18 and 19, meeting jointly with the Joint Legislative Water Committee on the afternoon of March 18.

On March 17, the California Water Resources Commission was informed of the recommendations submitted in a report made by Lieut. Col. Robins, Division Engineer, Pacific Division, U. S. War Department, to the Chief of Engineers, U. S. Army, concerning the further improvement of the Sacramento, San Joaquin and Kern rivers, California, in the combined interest of navigation, flood control, power development and irrigation. The recommendations made by Colonel Robins are of importance to the State in carrying out the State Water Plan. Lieut. Col. Robins in a public notice dated March 14, 1932, concerning his final report, states in part as follows:

"If the State and/or other responsible local interests will construct the proposed Kennet Reservoir and operate it so as to reduce high water flows on the Sacramento River and to maintain a low water flow of not less than 6000 second-feet between Chico Landing and Sacramento, the report finds that a Federal contribution of about \$7,370,000 to the first cost of the

(Continued on page 39)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

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

COLONEL WALTER E. GARRISON.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 10 APRIL, 1932 No. 4

CALIFORNIA ROAD ECONOMY

The California Department of Public Works has just made public an interesting and informative survey of the public highway work done in all the states during 1931.

Some thoughtless people consider that California's highway development and maintenance expenditure last year of \$38,073,273, derived from the gasoline tax almost exclusively, is a great amount. Yet nine other states each devoted a larger sum to their roads. Even such commonwealths as New Jersey, Louisiana and Iowa exceeded this State last year in highway costs.

Furthermore, 36 other states exceeded California in total mileage of highway construction last year, while 46 states each expended a greater amount per car in road work than did California.

This State's ten-year plan is systematic and economical and is progressing steadily with the aim of making highway accommodation absolutely adequate for conditions expected to exist in 1942.—*Los Angeles Evening Herald and Express.*

SOWING THE SEED

The extraordinary man who is Governor of California is now disclosed as a spreader of wild flower seed in a big way. At his ranch in San Mateo and Santa Clara counties he has sown acres of poppies and blue lupine in alternating patches. And he tells the "Sacramento Bee":

"Whenever I go on a motor trip in any part of the State I take along a sack of poppy or mixed wild flower seed. I scatter these seeds along the highways, around camping places, in fields and meadows—in fact, any place I think flowers would add to the scenic beauty.

If everyone in California would follow the

Large Traffic Gain for West Indicated by Federal Survey

AS THE RESULT of a survey of traffic on the federal-aid highway system in 11 western states, this area may expect an increase of 45 to 60 per cent in highway traffic during the present decade, according to a report by the Bureau of Public Roads.

The survey was conducted in cooperation with the highway departments of Arizona, California, Colorado, Idaho, Nebraska, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming. The federal-aid system is approximately 7 per cent of the total rural road mileage in each of these states and is made up of important state and interstate routes.

The purpose of the survey was to obtain essential facts concerning the present density, type, capacity, and distribution of traffic units as a basis for planning highway development to serve present and future traffic. The data obtained is available for use of the states as a basis for preparing a program of road construction, reconstruction and maintenance consistent with traffic requirements for each year up to 1940.

In 1930 it was found that 11.3 per cent of the mileage carried heavy traffic, or more than 1500 vehicles a day; 18 per cent carried intermediate traffic, between 600 and 1500 vehicles a day; and 65.9 per cent carried light traffic, or less than 600 vehicles a day.

For 1935 the indicated figures are 14 per cent, 22.1 per cent, and 59.1 per cent. For 1940 they are 16 per cent, 25 per cent, and 54.2 per cent.

The annual travel of vehicles on the federal-aid highways in the 11 states was found to be 8,400,000,000 miles.

A federal law is now proposed to fix the speed at which parachute jumpers may fall. Why not something on the distances pedestrians may bounce?—*Arkansas Gazette.*

Black lettering on an orange background, the color scheme of automobile license plates in California for 1932, is also the color combination being used this year in Idaho and Kansas.

same policy the Golden State would soon be known the world over as the paradise of the wild flowers."

Governor Rolph adds his voice to those who plead for conservation of wild flowers, and says that to deliberately waste them is "almost criminal."—*San Francisco News.*

F. G. Somner, Pioneer District Engineer Retires; J. W. Vickrey Succeeds Him

By T. E. STANTON, Materials and Research Engineer

THE TWENTIETH anniversary of the starting of State highway work in California marks the retirement of Francis G. Somner, District Engineer of District IX, who was appointed District Engineer of District I on January 1, 1912. He will be succeeded by J. W. Vickrey, District Maintenance Engineer of District III, transferred to District I with the title of Acting District Engineer.



F. G. SOMNER

To have served 20 years in a responsible position in any organization is an honor which comes to few but, rarer still, is the honor of so serving an organization which has the record of the State Highway Department of California. Somner was a man already mature in years when he took up his duties as District Engineer. Born in Dunedin, New Zealand, educated in the grammar schools of Levuka in the Fiji Islands and at the University of California, Somner started his professional career as county surveyor of Plumas County in 1884. In 1886 he became assistant topographer of the United States Geological Survey in Nevada and Placer counties, and in 1887 entered the service of the Southern Pacific Company as level man and transit man on location. He subsequently served the Southern Pacific as assistant engineer and later as road master in charge of tracks, bridges, and buildings in the Red Bluff district.

In 1903 Somner became assistant chief engineer and later chief engineer of the Diamond Match Company during the pioneer stage of the company's operations. He was in responsible charge of location and construction of the Butte County Railroad from Chico to Stirling City—a distance of 31 miles, and also held a commission as United States Deputy Mineral Land Surveyor.

IN AT BEGINNING

He entered the employ of the State of California when State highway work was first started, and on January 1, 1912, was appointed District Engineer of District I, with headquarters at Willits.

District I comprises all of the California coast counties from Mendocino north through Humboldt and Del Norte to the Oregon line. Twenty years ago this territory was by far the most difficult section of the State in which to locate and build highways, and it demanded its pound of flesh from the hardy engineers who pioneered the work.

The heavy growth beneath the redwoods rendered it impossible to see the ground for any distance ahead—

one of the prerequisites for intelligent and economical highway location. In order to get from one point to another it was necessary for the engineer to get down on his hands and knees and crawl through the saturated underbrush, emerging in the cleared spaces with clothes wet through to the skin.

It was impossible to travel from the Division Headquarters at Willits to the northern part of the district in the vicinity of Eureka and Crescent City except by boat, which had to be taken at San Francisco. Therefore, it required weeks to make the round trip to the northern part of the district and return. How different the situation today and how little, when driving over the broad, well-aligned Redwood Highway which has now been opened for the entire distance along the coast to the Oregon line, do we realize the hardships under which the pioneer road builders of our State had to work.



J. W. VICKREY

EARLY EQUIPMENT

The following interesting incidents may be noted during the period when Somner was located in District I.

The first power shovel owned by the State and engaged in State highway work was purchased for use in District I.

The first and only saw mill owned by the State and used in highway construction was purchased for District I in 1915.

On the south fork of the Eel River, Mendocino County, a double timber arch bridge 155 feet in length spanning a chasm 160 feet in depth was framed on either rim of the chasm and each complete truss swung into place by means of overhead cable, block, and tackle. This structure, together with the methods of erection, was designed in the District I office by Mr. Somner's assistant, F. W. Haselwood, who is now District Engineer of District II. The achievement was at the time announced by the *London Engineering News* as being decidedly unique and original in both design and erection methods.

The first section of road selected to be built by convict labor, after the enactment of the Convict Labor Act in 1915, embraced that portion of the Redwood Highway lying along the south fork of the Eel River and located in Humboldt and Mendocino counties; a length of 75 miles.

Work was commenced in December, 1915, and completed in December, 1918. The country traversed

Built Great Scenic Highway Through a Rugged Virgin Area

(Continued from preceding page)

was as rugged and picturesque as any portion of California, in a virgin state with only a few settlers and inaccessible except by trail built by the engineers during the survey of the road. Crossing of the canyons involved nine bridges of 150 to 300 feet in length and from 130 to 150 feet in height, of original and unique design. A portable saw mill for the production of the timber was sledged in on trail. The press in describing "a great scenic highway" commented as follows:

NEEDED BIG MAN

"It is a fortunate thing for Humboldt that the Division Engineer, Mr. F. G. Somner, is a big man both physically and mentally for none other could have carried through such a work in the time taken. Such engineering work is difficult under the very best of conditions, but when it is realized that the workmen engaged in the undertaking were convicts from San Quentin, inexperienced and an unknown quantity in the labor world, F. G. Somner is to be congratulated on his work of blasting a roadway into Humboldt."

RETIREES VOLUNTARILY

Fatigued and worn by his arduous work in District I Somner, on October 11, 1923, was transferred to Bishop to become District Engineer of the newly created District IX east of the Sierra Nevadas, where he has since served as District Engineer, and has endeared himself to the residents of that section of the State.

Several years ago he was taken with an illness which required a serious operation, since which time he has found it difficult to perform the duties of his position in the vigorous manner with which he was accustomed to work during the previous period of his service. He is, therefore, retiring voluntarily to a well-earned rest.

This abiding faith in mankind, sense of humor, and charity towards all has endeared Somner to all with whom he came in contact, and it is with sincerest regret on the part of all that we say to him "hail and farewell."

ROSE FROM RANKS

J. W. Vickrey who takes Somner's place at District IX headquarters in Bishop as Acting District Engineer is a young man who has won his way up from the ranks by his technical and executive ability to a high place in the esteem of his superior officers.

After graduating from Los Angeles Polytechnic School and spending two years at college he began his engineering career as a rodman and transitman in the service of Los Angeles County and the Southern Pacific Railroad. He entered the State's service as a transitman in District I under Somner, the man he is succeeding. Transferred to District III he rose through the grades of chief of party and locating engineer; construction engineer, assistant district engineer and maintenance engineer in which latter capacity he has served for the last four years.

Her Father—"You wish to wed my daughter—my answer depends on your financial position."

Suitor—"What a coincidence—my financial position depends on your answer."—*The Ground-hog.*

AUTOS AND ROADS KEPT 8,000,000 MEN AT WORK IN 1931

Even during the quiet of 1931, the automobile kept 4,000,000 directly at work and an additional 1,000,000 men busy supplying raw materials. Highway and street building employed 1,000,000 workers directly and the labor of 2,000,000 others was required in supplying equipment and materials. But if during the last few years highway construction had lagged, no one knows how much more serious economic conditions would be at present.

Frederick E. Everett, President,
American Association of State
Highway Officials.

REPORT OF WATER RESOURCES APRIL 1, 1932

(Continued from page 36)

reservoir will be justified in the interest of navigation and flood control. The report also finds that, in the interest of navigation, the proposed transfer of water by pumping from the Sacramento Valley southward should be required to be made through a series of navigable pools in the San Joaquin River between Stockton and Mendota, with suitable locks installed at the dams forming these pools. If this is done the United States will be warranted in contributing about \$4,000,000 to the first cost of the locks and dams and in assuming their maintenance and operation."

On March 19, Governor James Rolph, Jr., attended the meetings of the California Water Resources Commission and the Joint Legislative Water Committee, which bodies have under consideration the formulation of a proposed constitutional amendment providing for the fulfillment of the State Water Plan.

EFFECT OF PUBLIC WORKS

I recognize that there is an emergency value to public works construction. Construction is one of the few major industrial activities that creates a wage fund available to increase consuming power without, at the same time, creating more goods that must be bought. In other words, when a manufacturer doubles his operations, he pays out twice as much in wages, let us say, to increase consuming power; but he has made twice as much goods that must be bought. So we do not get ahead very fast. But when we spend money on construction, especially public works, we are creating a wage fund to increase consumption without, at the moment, producing more goods that must be bought and thereby outweigh the effect of the increased wage fund.—Willard T. Chevalier in *National Sand and Gravel Bulletin.*

"See here," the Indian inspector declared, "it is a violation of the law now to have more than one wife, and the law must be obeyed. When you get back home you tell all of your wives, except one, that they can no longer look upon you as their husband."

"You tell 'em," suggested the Indian after a moment's reflection.—*Public Construction News.*

Vital Statistics on Dam Construction

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources, during the month of March, 1932.

LASSEN COUNTY—Horse Lake Dam No. 245. M. Jauregui, Williams, owner; earth and rock, located in Sec. 4, T. 32 N., R. 14 E., M. D. B. and M.

SAN MATEO COUNTY—Cassinelli Dam No. 605. Angelo Cassinelli, San Francisco, owner; concrete buttress, 17 feet above streambed with a storage capacity of 30 acre-feet, situated on Arroyo Leon tributary to Pillarcitos Creek in Sec. 33, T. 5 S., R. 5 W., M. D. B. and M. For storage purposes for irrigation use.

SAN MATEO COUNTY—Johnston Dam No. 605-2. E. J. Cassinelli, San Francisco, owner; gravity, 22 feet above streambed with a storage capacity of 68 acre-feet, situated on Arroyo Leon tributary to Pillarcitos Creek in Sec. 32, T. 5 S., R. 5 W., M. D. B. and M. For storage purposes for irrigation use.

CALAVERAS COUNTY—Cherokee Dam No. 494. Cherokee Development Company, Angels Camp, owner; gravity, 13 feet above streambed with a storage capacity of 10.6 acre-feet, situated on Cherokee Creek tributary to Calaveras River in Sec. 9, T. 2 N., R. 12 E., M. D. B. and M., for storage purposes for mining use.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources, during the month of March, 1932.

MARIN COUNTY—Belvedere Dam No. 33-4. Marin Municipal Water District, San Rafael, owner; earth dam with a storage capacity of 23 acre-feet.

EL DORADO COUNTY—El Dorado Forebay Dam No. 97-53. Pacific Gas and Electric Company, San Francisco, owner; earth, situated on Long Canyon tributary to South Fork American River in Sec. 25, T. 11 N., R. 12 E., M. D. B. and M.

TOULUMNE COUNTY—Montezuma Dam No. 97-76. Pacific Gas and Electric Company, San Francisco, owner; earth, 9 feet above streambed with a storage capacity of 11½ acre-feet, in Sec. 30, T. 1 N., R. 14 E., M. D. B. and M. For regulation purposes for irrigation and mining use.

STANISLAUS COUNTY—Dallas-Warner No. 1 Dam No. 59. Modesto Irrigation District, Modesto, owner; earthen, located in Sec. 20, T. 3 S., R. 12 E., M. D. B. and M.

ORANGE COUNTY—Basin "A" Dam No. 795. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., S. B. B. and M.

ORANGE COUNTY—Basin "B" Dam No. 795-2. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., S. B. B. and M.

ORANGE COUNTY—Basin "C" Dam No. 795-3. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., S. B. B. and M.

ORANGE COUNTY—Basin "D" Dam No. 795-4. Union Oil Company, Los Angeles, owner; earth, located in Sec. 11, T. 3 S., R. 10 W., S. B. B. and M.

LOS ANGELES COUNTY—Mulholland Dam No. 6-17. City of Los Angeles, Los Angeles, owner, situated on Weid Canyon in Sec. 3, T. 1 S., R. 14 W., S. B. B. and M.

ORANGE COUNTY—Yorba Dam No. 791. Anaheim Union Water Company, Anaheim, owner; located in Sec. 27, T. 3 S., R. 9 W., S. B. B. and M.

AMADOR COUNTY—Henderson Dam No. 1-10. Preston School of Industry, Waterman, owner; earth, situated on Middle Fork of Mule Creek tributary to Sutter Creek in Sec. 9, T. 6 N., R. 10 E., M. D. B. and M.

LOS ANGELES COUNTY—Harold Reservoir No. 57-2. Palmdale Irrigation District, Palmdale, owner; earth, located in Sec. 3, T. 5 N., R. 12 W., S. B. B. and M.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of March, 1932.

CONTRA COSTA COUNTY—Antioch Dam No. 3. Town of Antioch, Antioch, owner; earth, 28.5 feet above streambed with a storage capacity of 570 acre-feet, situated on unnamed creek tributary to San Joaquin River in Sec. 36, T. 2 N., R. 1 E., M. D. B. and M. For storage purposes for municipal use.

ORANGE COUNTY—Irvine Conservation Dam No. 793-3. The Irvine Company, Tustin, owner; earth, 23½ feet above streambed with a storage capacity of 16,846 acre-feet, tributary to Newport Bay in Lot 442, Block 57, Irvine's Subdivision. For storage purposes, for irrigation use.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of March, 1932.

SISKIYOU COUNTY—Hart Dam No. 181. E. C. and Kate C. Hart, Montague, owner; earth, situated on Martin Creek tributary to Little Shasta River.

EL DORADO COUNTY—El Dorado Forebay Dam No. 97-53. Pacific Gas and Electric Company, San Francisco, owner; earth, situated on Long Canyon tributary to South Fork American River in Sec. 25, T. 11 N., R. 12 E., M. D. B. and M.

TUOLUMNE COUNTY—Montezuma Dam No. 97-76. Pacific Gas and Electric Company, San Francisco, owner; earth, 9 feet above streambed with a storage capacity of 11½ acre-feet, located in Sec. 30, T. 1 N., R. 14 E., M. D. B. and M. For regulation purposes for irrigation and mining use.

STANISLAUS COUNTY—Dallas-Warner Dam No. 59. Modesto Irrigation District, Modesto, owner; earth, located in Sec. 20, T. 3 S., R. 12 E., M. D. B. and M.

ORANGE COUNTY—Basin "A" Dam No. 795. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., M. D. B. and M.

ORANGE COUNTY—Basin "B" Dam No. 795-2. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., S. B. B. and M.

ORANGE COUNTY—Basin "C" Dam No. 795-3. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., S. B. B. and M.

ORANGE COUNTY—Basin "D" Dam No. 795-4. Union Oil Company, Los Angeles, owner; earth, located in Sec. 11, T. 3 S., R. 10 W., S. B. B. and M.

LOS ANGELES COUNTY—Mulholland Dam No. 6-17. City of Los Angeles, Los Angeles, owner; gravity, situated on Weid Canyon in Sec. 3, T. 1 S., R. 14 W., S. B. B. and M.

SAN DIEGO COUNTY—Smaller Lemon Grove Dam No. 56-8. La Mesa, Lemon Grove and Spring Valley Irrigation District, La Mesa, owner; earth, located in Sec. 30, T. 16 S., R. 1 W., S. B. B. and M.

ORANGE COUNTY—Yorba Dam No. 791. Anaheim Union Water Company, Anaheim, owner; earth dam.

SAN DIEGO COUNTY—Larger Lemon Grove Dam No. 56-7. La Mesa, Lemon Grove and Spring Valley Irrigation District, La Mesa, owner; earth, located in Sec. 25, T. 16 S., R. 2 W., S. B. B. and M.

SAN DIEGO COUNTY—Harold Dam No. 57-2. Palmdale Irrigation District, Palmdale, owner; earth, located in Sec. 3, T. 5 N., R. 12 W., S. B. B. and M.

More than 18½ feet of snow has fallen at Big Bear Lake in the San Bernardino mountains this winter. The precipitation has been 55.75 inches. The lake has risen seven feet six inches from its former level, it is reported, and is now at the 44-foot 11-inch mark on the dam.

March Water Applications and Permits

Applications for permits to appropriate water filed with the Department of Public Works, Division of Water Resources, during the month of March, 1932.

SISKIYOU COUNTY—Application 7197. Johan Stephanson, Somes Bar, for 10 c.f.s. from Sandy Bar Creek tributary to Klamath River to be diverted in Sec. 21, T. 13 N., R. 6 E., H. B. and M., for mining purposes.

DEL NORTE COUNTY—Application 7198. Harry T. Wilkerson, 1824 Thousand Oaks Blvd., Berkeley, for 50 c.f.s. from Hurdy Gurdy Creek tributary to South Fork of Smith River to be diverted in Sec. 20, T. 16 N., R. 3 E., H. B. and M., for mining purposes.

SAN MATEO COUNTY—Application 7199. W. R. Bartley and M. S. Woodhams, c/o Maurice S. Woodhams, Atty., La Honda, for 166 acre-feet per annum from Alpine Creek tributary to San Gregorio Creek to be diverted in Secs. 23 and 26, T. 7 S., R. 4 W., M. D. B. and M., for recreational and domestic purposes.

SAN MATEO COUNTY—Application 7200. W. R. Bartley and M. S. Woodhams, c/o Maurice S. Woodhams, Atty., La Honda, for 0.02 c.f.s. from La Honda Creek tributary to San Gregorio Creek to be diverted in Sec. 23, T. 7 S., R. 4 W., M. D. B. and M., for recreational and domestic purposes.

EL DORADO COUNTY—Application 7201. B. W. Stone, 161 Ellis Street, San Francisco, for 500 c.f.s. and 125,000 acre-feet per annum from (1) Rubicon River (2) Pilot Creek (3) Gerle Creek (4) Loon Lake (5) Buck Island Lake (6) Rock Bound Lake (7) Little South Fork Rubicon River tributary to American River drainage area to be diverted in Sec. 9, T. 13 N., R. 16 E., Sec. 11, T. 12 N., R. 12 E., Sec. 24, T. 13 N., R. 13 E., Secs. 1, 31 and 34, T. 14 N., R. 14 E., Sec. 4, T. 13 N., R. 15 E., Sec. 2, T. 13 N., R. 14 E., M. D. B. and M., for municipal purposes.

SAN BERNARDINO COUNTY—Application 7202. W. T. Elliot, Summit, for 0.025 c.f.s. (1 miners inch) from unnamed stream tributary to Canada Stream (Little Horse Thief Canyon) thence Mojave River to be diverted in Sec. 33, T. 3 N., R. 5 W., S. B. E. and M., for irrigation and domestic purposes (1 acre). Estimated cost \$5.

PLUMAS COUNTY—Application 7203. Johnson and Openshaw, Oroville, for 3.0 c.f.s. from Indian Creek tributary to middle branch Feather River, Feather River, thence Sacramento River to be diverted in Sec. 19, T. 26 N., R. 10 E., M. D. B. and M., for irrigation purposes. (240 acres.) Estimated cost \$7,500.

TULARE COUNTY—Application 7204. Regents of the University of California, c/o Calkins, Hagar, Hall and Linforth, Atty., Crocker Bldg., San Francisco, for total of 65,000 gallons per day tributary of East Fork Eshom Creek tributary to Camp Creek and West Fork Eshom Creek tributary to Keweah River to be diverted in Secs. 15 and 16, T. 14 S., R. 28 E., M. D. B. and M., for recreational and domestic purposes. Estimated cost \$300.

HUMBOLDT COUNTY—Application 7205. Verne Cephart, Bluff Creek, via Weitchpec, for 2 c.f.s. from French Bar Gulch tributary to Klamath River to be diverted in Sec. 21, T. 10 N., R. 5 E., H. B. and M., for mining purposes. Estimated cost \$200.

RIVERSIDE COUNTY—Application 7206. Palm Springs Land and Irrigation Company, c/o A. L. Sonderegger, Consulting Engineer, 925 Central Bldg., Los Angeles, for 1 c.f.s. and 730 acre-feet per annum from Virgin Spring tributary to unnamed creek thence Horse Thief Creek to be diverted in Sec. 26, T. 7 S., R. 5 E., S. B. B. and M., for recreational and domestic purposes.

RIVERSIDE COUNTY—Application 7207. Palm Springs Land and Irrigation Company, c/o A. L. Sonderegger, Consulting Engineer, 925 Central Bldg., Los Angeles, for 5 c.f.s. and 2,000 acre-feet per annum from Omstott Creek tributary to Palm Canyon to be diverted in Sec. 10, T. 7 S., R. 5 E., S. B. B. and M., for recreational and domestic purposes.

RIVERSIDE COUNTY—Application 7208. Palm Springs Land and Irrigation Company, c/o A. L. Son-

deregger, Consulting Engineer, 925 Central Bldg., Los Angeles, for 1 c.f.s. and 730 acre-feet per annum from Cactus Spring tributary to Horse Thief Creek to be diverted in Sec. 18, T. 7 S., R. 6 E., S. B. B. and M., for domestic and recreational purposes.

RIVERSIDE COUNTY—Application 7209. Palm Springs Land and Irrigation Company, c/o A. L. Sonderegger, 925 Central Bldg., Los Angeles, for 10 c.f.s. and 5,000 acre-feet per annum from Deep Canyon Creek tributary to Whitewater River to be diverted in Sec. 12, T. 7 S., R. 5 E., S. B. B. and M., for irrigation purposes.

RIVERSIDE COUNTY—Application 7210. Palm Springs Land and Irrigation Company, c/o A. L. Sonderegger, 925 Central Bldg., Los Angeles, for 10 c.f.s. and 5,000 acre-feet per annum from Deep Canyon Creek tributary to Whitewater River to be diverted in Sec. 12, T. 7 S., R. 5 E., S. B. B. and M., for recreational and domestic purposes.

HUMBOLDT COUNTY—Application 7211. Fred Bair, Standard Bldg., Eureka, for 0.25 c.f.s. from Bair Creek tributary to Klamath River to be diverted in Sec. 36, T. 10 N., R. 4 E., H. B. and M., for irrigation and domestic purposes. (5 acres.) Estimated cost \$500.

TEHAMA COUNTY—Application 7212. Stanley B. Mathews and Warren P. Clark, c/o Stanley B. Mathews General Delivery, Chico, for 0.02 c.f.s. from Digger Creek tributary to Thoms Creek, thence Sacramento River to be diverted in Sec. 26, T. 24 N., R. 7 W., M. D. B. and M., for industrial purposes. Estimated cost \$100.

TEHAMA COUNTY—Application 7213. Stanley B. Mathews and Warren P. Clark, c/o Stanley B. Mathews, General Delivery, Chico, for 0.15 c.f.s. from Digger Creek tributary to Thoms Creek, thence Sacramento River to be diverted in Sec. 26, T. 24 N., R. 7 W., M. D. B. and M., for mining and domestic purposes. Estimated cost \$200.

LOS ANGELES COUNTY—Application 7214. United States, Angeles National Forest, c/o William V. Mendenhall, Supervisor, 501 Brownstein Louis Bldg., Los Angeles, for 0.003 c.f.s. from unnamed spring tributary to Piru Watershed to be diverted in Sec. 12, T. 6 N., R. 13 W., S. B. E. and M., for fire protection purposes. Estimated cost \$500.

LOS ANGELES COUNTY—Application 7215. United States, Angeles National Forest, c/o William V. Mendenhall, Supervisor, 501 Brownstein Louis Bldg., Los Angeles, for 1 c.f.s. from Big Tujunga Ranger Station Spring tributary to Big Tujunga River, thence Los Angeles River to be diverted in Sec. 31, T. 3 N., R. 13 W., S. B. B. and M., for irrigation and domestic purposes. (1 acre.) Estimated cost \$150.

SIERRA COUNTY—Application 7216. Chas. J. Scanlan, Jr., Camptonville, for (1) 2 c.f.s. (2) 1 c.f.s. total 3 c.f.s. from (1) South Fork of North Fork of Indian Creek (2) North Fork of Indian Creek tributary to Indian Creek, thence North Fork Yuba River and Yuba River to be diverted in Sec. 21, T. 19 N., R. 9 E., M. D. B. and M., for mining and domestic purposes.

NEVADA COUNTY—Application 7217. Harry Ramsden, 1253 35th Avenue, San Francisco, for 10 acre-feet per annum from natural reservoir to be diverted in Sec. 7, T. 17 N., R. 8 E., M. D. B. and M., for irrigation and domestic purposes.

ALAMEDA COUNTY—Application 7218. Lida A. Morris, P. O. Box 205, Ogden, Utah, for 0.55 c.f.s. from Arroyo De La Laguna tributary to San Francisco Bay to be diverted in Sec. 3, T. 5 S., R. 1 W., M. D. B. and M., for irrigation purposes. (35.15 acres.) Estimated cost \$400.

MONO COUNTY—Application 7219. Inyo National Forest, Bishop, for 0.006 c.f.s. from unnamed stream tributary to Mammoth Creek and Owens River to be diverted in Sec. 9, T. 4 S., R. 27 E., M. D. B. and M., for domestic purposes.

LASSEN COUNTY—Application 7220. C. A. Molster, 1407½ W. 11th Place, Los Angeles, for 3 c.f.s. from Smoke Creek tributary to Mud Flat to be diverted in Sec. 13, T. 32 N., R. 17 E., M. D. B. and M., for irrigation purposes. (164 acres.) Estimated cost \$125.

Permits Issued to Appropriate Water in Various Counties

(Continued from preceding page)

DEL NORTE COUNTY—Application 7221. Carl Bruno, Klamath, for 0.15 c.f.s. from 2 unnamed streams tributary to small stream flowing into Pacific Ocean to be diverted in Sec. 20, T. 14 N., R. 1 E., H. B. and M., for power purposes. (1.5 h.p.) Estimated cost \$2,500.

DEL NORTE COUNTY—Application 7222. Carl Bruno, Klamath, for 0.125 c.f.s. from 3 unnamed streams tributary to a small stream flowing into Pacific Ocean to be diverted in Sec. 20, T. 14 N., R. 1 E., H. B. and M., for recreational and domestic purposes. Estimated cost \$2,000.

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of March, 1932.

YUBA COUNTY—Permit 3863, Application 7130. Andrew J. Thickstun, Clipper Mills, March 7, 1932, for 50.00 c.f.s. from Slate Creek tributary to North Fork Yuba River in Sec. 10, T. 19 N., R. 8 E., M. D. B. and M., for mining. Estimated cost \$5,000.

SAN DIEGO COUNTY—Permit 3864, Application 7128. John Allen and Almira B. Crawford, Potrero, March 12, 1932, for 0.05 c.f.s. from Campo Creek in Sec. 24, T. 18 S., R. 4 E., S. B. B. and M., for recreational and domestic purposes. Estimated cost \$1,000.

EL DORADO COUNTY—Permit 3865, Application 7019. E. R. Hickey, G. L. Davenport and L. J. Caldwell, Kyburz, El Dorado County, March 15, 1932, for 600 gallons per day from unnamed stream tributary to South Fork American River in Sec. 13, T. 11 N., R. 16 E., M. D. B. and M., for domestic purposes. Estimated cost \$75.

PLUMAS COUNTY—Permit 3866, Application 7003. J. B. Higgins, Quincy, March 17, 1932, for 8.00 c.f.s. from Blackhawk Creek tributary to Spanish Creek and Feather River in Sec. 27, T. 25 N., R. 9 E., M. D. B. and M., for mining and domestic purposes. Estimated cost \$1,000.

SANTA BARBARA COUNTY—Permit 3867, Application 7185. Mrs. Stanley McCormick et al., Santa Barbara, March 21, 1932, for 1.05 c.f.s. and 35 acre-feet per annum from Cold Spring Creek tributary to Pacific Ocean in Sec. 7, T. 4 N., R. 26 W., S. B. B. and M., for domestic purposes and irrigation of 85 acres. Estimated cost, \$1,500.

SANTA BARBARA COUNTY—Permit 3868, Application 7159. Mrs. Stanley McCormick et al., Santa Barbara, March 21, 1932, for 0.80 c.f.s. and 3.0 acre-feet per annum from Hot Spring Creek tributary to Pacific Ocean in Sec. 7, T. 4 N., R. 26 W., S. B. B. and M., for domestic purposes and irrigation of 85 acres. Estimated cost \$100.

INYO COUNTY—Permit 3869, Application 7115. Standard Oil Company of California, 225 Bush Street, San Francisco, March 22, 1932, for 40,000 gallons per day from Last Chance Springs in Sec. 2, T. 8 S., R. 39 E., M. D. B. and M., for mining and domestic purposes. Estimated cost \$500.

SAN DIEGO COUNTY—Permit 3870, Application 6864. Coleman M. Gray, Pala, San Diego County, March 22, 1932, for 0.0225 c.f.s. from Castro Creek tributary to San Luis Rey River in Sec. 18, T. 9 S., R. 7 W., S. B. B. and M., for irrigation of 6 acres. Estimated cost \$1,870.

SISKIYOU COUNTY—Permit 3871, Application 7084. Marshall M. Crawford, Happy Camp, March 28, 1932, for 3.00 c.f.s. from China Creek tributary to Klamath River in Sec. 9, T. 16 N., R. 8 E., H. B. and M., for domestic and irrigation of 140 acres in said Sec. 9. Estimated cost \$1,500.

MODOC COUNTY—Permit 3872, Application 6290. Estate of J. L. Porter, by Mrs. Pearl F. Porter, Administratrix, Box 121, Alturas, March 29, 1932, for 180 acre-feet per annum from Parker Creek tributary to Pit River in Sec. 18, T. 42 N., R. 13 E., M. D. B. and M., for irrigation of 108 acres. Estimated cost \$2,000.

MODOC COUNTY—Permit 3873, Application 6291. James C. Porter and Mrs. P. E. Porter, Alturas, March 29, 1932, for 6.00 c.f.s. and 292.5 acre-feet per annum from Parker Creek tributary to Pit River in Sec. 18, T. 42 N., R. 14 E., M. D. B. and M., for irrigation of 172 acres. Estimated cost \$3,000.

Bay Bridge Plans Provide Space for 2 Railroad Tracks

(Continued from page 23)

cities and San Francisco without cost to abutting property or to the cities."

The San Francisco-Oakland Bay Bridge engineering staff are now conducting approach studies to determine locations, in cooperation with the Board of Engineers appointed by the city authorities. Final locations, however, can not be determined until completion of the East Bay transportation study, which will undoubtedly result in a close working agreement or consolidation of the Key Route and the Southern Pacific.

Plans for the Bay Bridge now call for but two operating tracks for interurban cars. Two tracks will care for double the present commuter traffic. Investigation shows that it would be economically unsound to provide for additional facilities.

MEANS \$800,000 SAVING

With provision being made for but two tracks, a merger or a close operating agreement between the Key System and the Southern Pacific Company will become necessary. The California Railroad Commission has advocated a merger of the two East Bay interurban systems since 1927.

It is agreed that this consolidation will result in operating economy without any detriment to the present service. Estimates of the saving due to the elimination of duplication run as high as \$800,000 per year. The engineers of the Bay Bridge have had several conferences with the officials of the two companies to the end that an agreement as to operating details and the rearrangement of tracks may be decided along with the plans for the east approach to the bridge.

Chief Engineer Purcell is hopeful that these negotiations may lead to a speedy agreement. The railroads have indicated their cooperation through the retention of H. G. Butler, consulting engineer of San Francisco, who is collaborating with the engineers of the bridge in a study of the best track arrangements and of all engineering problems. These investigations are now under way.

HOW TO FLY HIGH

Mrs. Rideout—What lovely, fleecy clouds. I'd like to be up there sitting on one of them.

Mr. Rideout—All right—you drive the car.

They laughed when I started to make a new kind of dynamite, but when I dropped it, they exploded.—*Cornell Widow.*

Coast Traffic Compels Wider Span

By C. W. JONES, Engineer, Bridge Department

IN CONNECTION with the work of widening the Coast Highway between Los Angeles and San Diego to meet increased traffic needs, the Division of Highways recently remodeled the bridge over the Santa



PONY TRUSS spans of steel carried coast traffic over the old inadequate 24-foot bridge across the Santa Ana River in Orange County.

Ana River which was built by Orange County some eight years ago.

The old structure was 24 feet wide. It was composed of a number of steel pony truss spans, together with concrete approach spans, a total length of 420 feet.

As far as possible, the Division of Highways has tried to avoid the use of types of bridge structures having supporting trusses which extend above the roadway pavement, for when bridges are widened, it is undesirable to have central obstructions which vehicles may strike. Although the old Santa

Ana River bridge had such trusses, investigation showed that clear deck type of construction could be built economically without reducing flow capacity. It also showed that Orange County, which gave the structure to the State, had need for the old trusses and would be glad to have them turned back to the county for use on a county road.

Decision was therefore reached to give the old trusses to the county and widen the bridge, providing a roadway width of 46 feet, including sidewalk, entirely free from central obstruction. An asphaltic wearing surface was



MODERNIZED by a widening operation and new concrete railings, the recently remodeled structure now provides a 46-foot roadway with sidewalk.

placed across the entire new deck to level off the surface and produce not only good appearance but good riding quality.

Construction work was done for a contract price of approximately \$60,000.

Watch All Traffic at Highway Crossings

Be careful in driving across intersections. The law requires motorists to be watchful of all other traffic under such circumstances. The Appellate Court in a recent decision held that the driver of an automobile proceeding across an intersection is negligent unless he observes traffic coming from either direction on the intersecting street, even though he is driving slowly. The court said it is not enough to look in one direction until reaching the center of the intersection and then look in the other direction.

March Auto Output in U. S. Shows Gain

Estimates of motor vehicle production in the United States in March indicate an output of 130,700 cars and trucks, according to a report received from the Automobile Chamber of Commerce.

This estimate was based on incomplete reports from manufacturers and points to an increase of 6 per cent in March production over that of the preceding month.

Peters—Is your wife a good driver?
Jeters—Well, I'm not sure whether she is or whether all the drivers she meets are.

Highway Commission Hears Delegates on Road Problems

(Continued from page 26)

uniformed military units and bands from March Field, 185th Infantry, California National Guard, R. O. T. C., and a detachment from the Sherman Institute Indian School.

AT SAN LUIS OBISPO

The regular meeting of the Commission held at San Luis Obispo on April 15th in the Division of Highway headquarters building proved another very busy session with a crowded calendar and a room filled to capacity with delegations and spectators numbering several hundred in attendance throughout the entire day.

Eight delegations and speakers were formally heard and additional matters were informally presented by others present.

A joint delegation of Kings County and San Luis Obispo County representatives introduced by Assemblyman Chris Jespersen urged inclusion in the secondary highway system of the road from Fresno to Morro Bay via Stratford, Kettleman Hills, Cottonwood Pass and Atascadero. Chairman S. E. Railsback and Supervisors H. M. Nelson, J. H. McGlashan, T. E. Cochrane and County Engineer Roy May appeared for Kings County. Chairman H. Twisselman with Supervisors E. W. Black, John Norton, John Marquart and Asa Porter represented San Luis Obispo County.

SIERRA-TO-THE-SEA ROUTE

The claims of the Sierra-to-the-Sea Highway for allocation of funds towards construction of the route west of Coalinga were discussed by Supervisors George Dudley, W. E. Goodspeed and D. B. Talbot of Monterey County, George S. Gould of Salinas and H. R. Sump of Coalinga.

Delegations from Santa Barbara County included Supervisors C. L. Preisker and Roland M. Adam; County Planning Commissioner L. Deming Tilton, C. Kelley Hardenbrook, A. G. Bodine, H. R. Graham and Ralph Coane. Request was made for the inclusion in the secondary highway system of a road from Las Cruces to Lompoc, to Guadalupe, to Pismo to relieve trucking and tourist traffic on the Coast Route.

Mr. Tilton submitted a parkway plan for improvement of traffic conditions through Montecito and Mr. Bodine entered a protest against any proposal to close the present State highway through Buellton by the construction of the San Marcos Pass Road.

President Graham of the Santa Barbara City Council asked cooperation by the State in a plan for routing through traffic within the city limits.

SURVEY REQUESTED

Mr. Coane, representing the Santa Barbara Chamber of Commerce, requested a survey of the San Marcos Pass Road for final location and allocation of funds for the coming biennium.

B. J. Ahern, secretary of the San Juan Bautista Chamber of Commerce, and Reverend Father Caffrey of Mission San Juan Bautista asked consideration for a connecting road between San Juan Bautista and the Prunedale cut-off.

A delegation from Monterey County included Supervisors Robert Stirling and A. A. Caruthers; E. H. Tickle, C. M. Brown, Peter Mawdsley, Robert Parrott,

Paving Last Link of Redwood Highway in Del Norte County

(Continued from page 21)

Los Angeles-Sacramento arterial will begin when the advertisement is published for the construction of bituminous treated crushed rock borders on each side of the existing pavement over the 12 miles just south of Sacramento. These borders will be 2 feet wide, providing a surfaced road 24 feet wide with 6-foot shoulders, as a decided improvement to the present 20-foot pavement. The borders will extend from 2 miles north of McConnell Station to the one-half mile southeasterly of the Sacramento city limits.

Last season grading of a roadbed was completed on that section of the scenic Redwood Highway immediately north of Crescent City in Del Norte County. It is now proposed to place a bituminous treated crushed rock surface 20 feet wide over the new roadbed.

The limits of this project include the last of the unconstructed portions of this popular route along the north coast country between San Francisco and the Oregon line. The new road is an improvement to line, grade and width and its surfacing will bring this section to modern standards of highway construction.

The increasing popularity of this route between San Francisco and Oregon is evidenced by the increase in travel over the portion north of Crescent City in the last few years, traffic having tripled since 1926 on this section.

Wife (from depths of fashion journal)—Dear, do you know what the well dressed woman will have on this season when she goes out driving?

Hubby—Yes, the hand brake.

"Jones always strikes me as an indolent sort of chap."

"Indolent? Why that fellow is so lazy he always runs his automobile over a bump to knock the ashes off his cigar."

A. W. Files, G. S. Gould, M. J. Murphy, D. N. Staniford, Charles McGrath, J. H. Thompson, and W. J. Crabbe. They asked for the inclusion of a road from Castroville to a connection with the Prunedale cut-off in the secondary system.

Mr. Tickle urged that sufficient funds be allocated during the coming biennium for completion of the Carmel-San Simeon Highway.

The Commission and staff, during their visit were entertained by the supervisors of San Luis Obispo County at a barbecue given by the brookside in Estrada Gardens.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR. ----- Governor

COLONEL WALTER E. GARRISON ----- Director

JAMES I. HERZ ----- Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

EARL LEE KELLY, Chairman, Redding
 HARRY A. HOPKINS, Taft
 TIMOTHY A. REARDON, San Francisco
 PHILIP A. STANTON, Anaheim
 FRANK A. TETLEY, Riverside

C. H. PURCELL, State Highway Engineer, Sacramento

JOHN W. HOWE, Secretary

HUGH K. McKEVITT, Attorney, San Francisco

HEADQUARTERS STAFF, SACRAMENTO

G. T. McCOY, Principal Assistant Engineer
 L. V. CAMPBELL, Office Engineer
 T. E. STANTON, Materials and Research Engineer
 FRED J. GRUMM, Engineer of Surveys and Plans
 C. S. POPE, Construction Engineer
 T. H. DENNIS, Maintenance Engineer
 F. W. PANHORST, Acting Bridge Engineer
 R. H. STALNAKER, Equipment Engineer
 E. R. HIGGINS, Comptroller

DISTRICT ENGINEERS

H. S. COMLY, District I, Eureka
 F. W. HASELWOOD, District II, Redding
 CHARLES H. WHITMORE, District III, Sacramento
 J. H. SKEGGS, District IV, San Francisco
 L. H. GIBSON, District V, San Luis Obispo
 E. E. WALLACE, District VI, Fresno
 S. V. CORTELYOU, District VII, Los Angeles
 E. Q. SULLIVAN, District VIII, San Bernardino
 F. G. SOMNER, District IX, Bishop
 R. E. PIERCE, District X, Sacramento
 General Headquarters, Public Works Building,
 Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
 J. J. HALEY, Jr., Administrative Assistant
 HAROLD CONKLING, Deputy in Charge Water Rights
 A. D. EDMONSTON, Deputy in Charge Water
 Resources Investigation

R. L. JONES, Deputy in Charge Flood Control and Reclamation

GEORGE W. HAWLEY, Deputy in Charge Dams

SPENCER BURROUGHS, Attorney

EVERETT N. BRYAN, Hydraulic Engineer, Water Rights

A. N. BURCH, Irrigation Investigations

H. M. STAFFORD, Sacramento-San Joaquin Water Supervisor

GORDON ZANDER, Adjudication, Water Distribution

KATHERINE A. FEENY, Chief Clerk

MABEL PERRYMAN, Secretary

DIVISION OF ARCHITECTURE

GEO. B. McDOUGALL, Chief, Division of Architecture

P. T. POAGE, Assistant Architect

W. K. DANIELS, Deputy Chief of Division

HEADQUARTERS

H. W. DeHAVEN, Chief Architectural Draftsman
 C. H. KROMER, Structural Engineer
 CARLETON PIERSON, Specification Writer
 C. O. PALM, Chief Clerk
 C. E. BERG, Engineer, Estimates and Costs
 J. W. DUTTON, General Superintendent Construction
 W. H. ROCKINGHAM, Mechanical Engineer
 C. A. HENDERLONG, Assistant Mechanical Engineer
 W. M. CALLAHAN, Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief
 FRANK B. DURKEE, General Right of Way Agent
 C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
 Port of San Jose—Not appointed
 Port of San Diego—Edwin P. Sample



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

1931

LEGEND

Primary Roads ———
Secondary Roads - - - - -

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