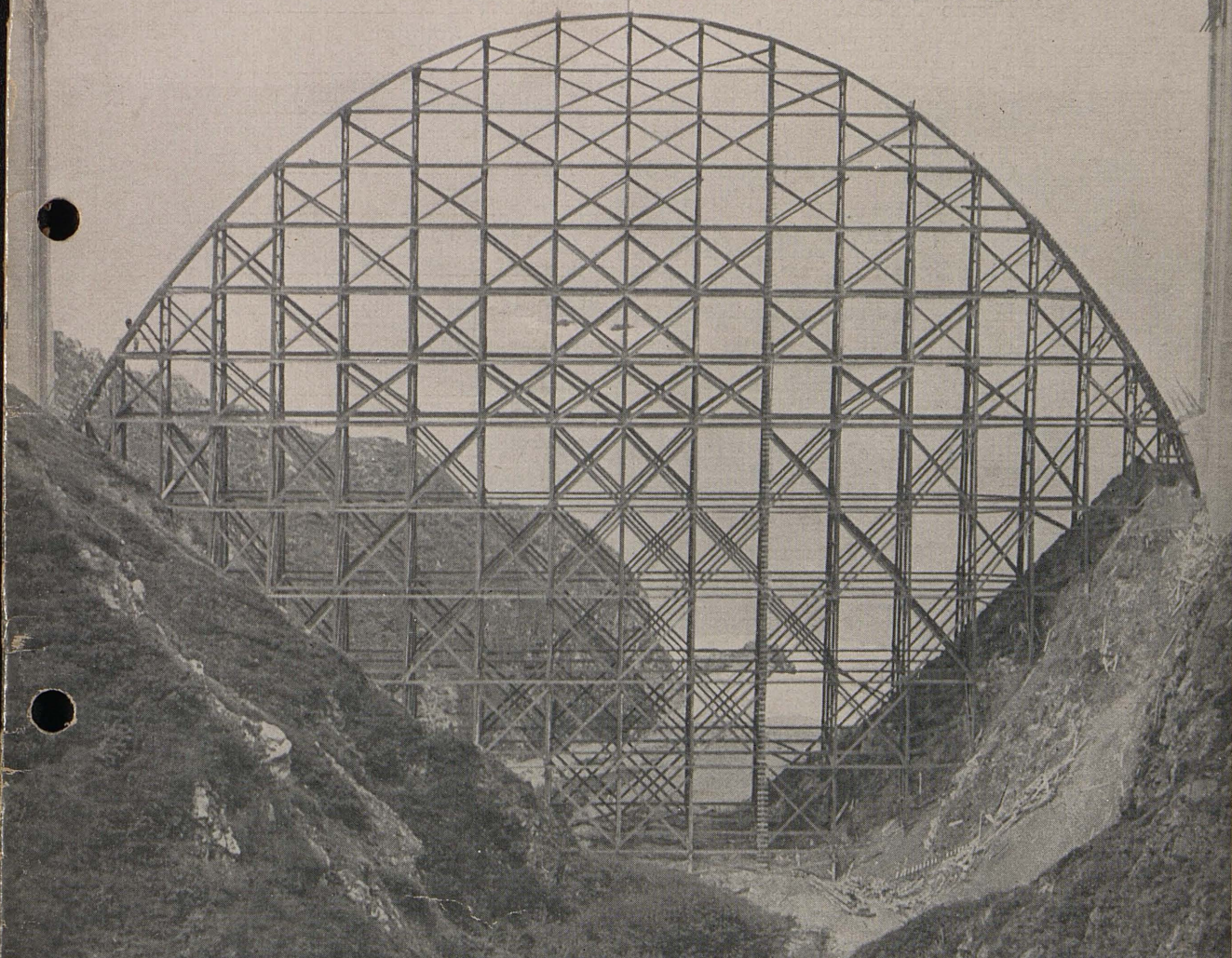


CALIFORNIA HIGHWAYS and PUBLIC WORKS



*Bixby Creek Bridge
under construction - San Simeon -
Carmel Coast Highway*

JULY 1932

Official Journal of
THE DEPARTMENT OF PUBLIC WORKS
STATE OF CALIFORNIA

D50 Illuminant, 2 degree observer

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3.24	18.11	4.34	13.80	9.82	33.43	54.26	14.51	48.55	0.40	0.50	0.75	1.06	1.19	1.07
15.07	19.72	22.69	24.49	24.49	30.93	59.97	46.07	19.51	1.19	0.23	0.21	0.63	0.29	0.19
									0.04	0.09	0.15	0.22	0.36	0.51

Density

Golden Thread

16(M)	17	18(B)	19	20	21	22	23	24	25	26	27	28	29	30
49.25	38.62	28.86	16.19	8.29	3.44	31.41	72.46	72.95	29.37	54.91	43.96	62.74	62.79	50.87
-0.16	-0.18	0.54	-0.05	-0.81	-0.23	20.98	24.45	16.83	13.06	38.91	52.00	3.45	50.88	27.17
0.01	-0.04	0.60	0.73	0.19	0.49	-19.43	55.93	68.80	-49.49	30.77	51.29	12.72	28.46	

Colors by Munsell Color Services Lab

Don Williams

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\$24,030,500 of Road Work Finished or Under Way in First Half of Year

Semiannual Report Shows 63 Per Cent of Highway Division's
Biennium Program Accounted for in Going Contracts
Carrying Millions of Dollars to Labor

By COLONEL WALTER E. GARRISON, Director of Public Works

IN THE Highway Division of the Department of Public Works steady progress on the biennium program has been maintained. An examination of the figures show that this progress on projects, as set forth in the Governor's budget for highway construction during the 83d-84th fiscal years, is well advanced. Figures compiled as of July 2, 1932, show that with 50 per cent of the biennium passed, work amounting to 63 per cent, or \$16,828,900 of the adjusted budget of \$26,896,600 has been put under way.

The monetary totals for the first six months of the current calendar year are as follows:

Construction and reconstruction	\$10,139,200
Maintenance	3,172,700
Balance to complete work carried over from 1931	10,718,600
Total	\$24,030,500

In addition to the above, there were calls for bids out on June 30, covering improvement to 26.5 miles of State highway, estimated to cost approximately \$1,009,400, making a total of \$25,039,900 in construction and maintenance work under way or set in motion during the first half of the year.

143 GOING CONTRACTS

The number of going contracts on June 30 was 143, consisting of 118 road construction contracts and 25 for the construction of bridges and grade separations.

The following summary presents a picture of the type, mileage and amounts of work let to contract from January first to June 30th, inclusive:

Type	Miles	Amount
Portland cement concrete pavement	69.9	\$2,294,900
Asphalt concrete pavement	35.3	1,261,000
Bituminous treated crushed gravel or stone surfacing	111.1	1,990,300

Type	Miles	Amount
Untreated crushed gravel or stone surfacing	3.0	\$94,000
Graded roadbed	42.6	1,630,400
Oiling roadbed and shoulders to alleviate dust nuisance	1350.5	539,800
Bridges	(14)	561,800
Minor improvements, etc.	----	1,767,000
Total	-----	\$10,139,200

ADVERTISED FOR BIDS

The \$1,009,400 in projects for which advertisements were outstanding on June 30th are classed according to the following tabulation:

Type	Miles	Amount
Portland cement concrete pavement	10.5	\$543,200
Bituminous treated crushed gravel or stone surfacing	16.0	311,800
Bridges	(1)	135,400
Minor improvements, etc.	-----	19,000
Total	-----	\$1,009,400

The improvement to State roads represented in the above statement includes construction or maintenance work in every county of the State. It is a matter of satisfaction to record that, despite the general business depression, the vigorous momentum of the department has been maintained, carrying with it the distribution of millions of dollars to labor and in the stimulation of business; and the orderly program for highway development has been followed as set forth by the mandate of the Legislature.

111 BUILDING PROJECTS

For the six months following January 1, the Division of Architecture had 111 going projects under construction in the field, representing a total construction value of \$3,800,000. As much of this work was contracted, no accurate figures as to the number of men given employment on these building projects is available.

(Continued on page 8)

First Coast Traffic Circle-Subway Improvement Completed at Fresno

By WALTER BEUTHEL, Assistant Highway Engineer

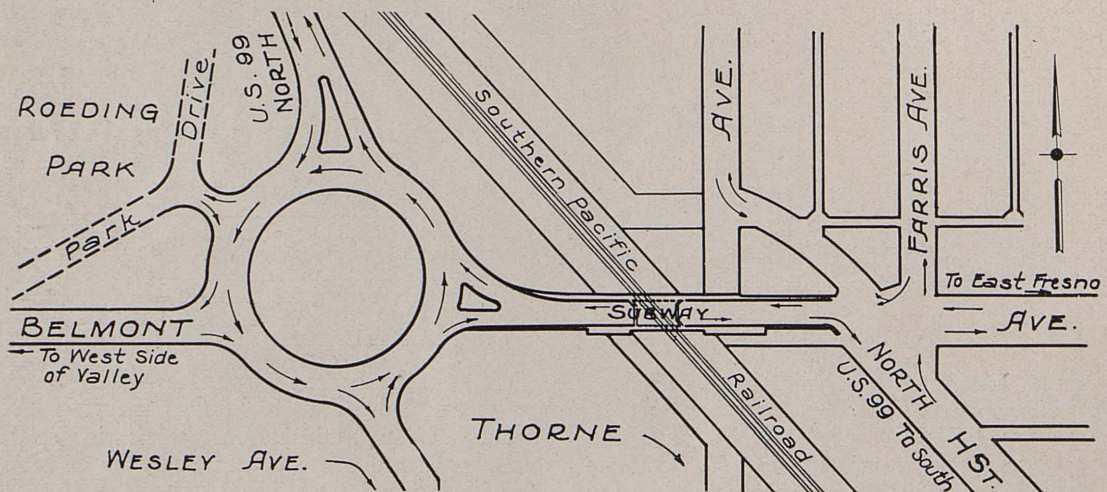
THE BELMONT SUBWAY and Traffic Circle just completed at the north entrance to Fresno is a cooperative project in which the State of California participated together with the Southern Pacific Railroad Company, the city of Fresno, and the county. The portion of U. S. No. 99 which includes the site of the improvement was constructed and maintained as State highway for a number of years but relinquished to the city in 1927.

State participation in the project was made possible through an act of the Legislature as set forth in Statutes of 1931, chapter 807,

the railroad icing and classification yards two miles to the north.

For several years Sunday traffic counts during the summer on Belmont Avenue at the subway site reached 11,000 vehicles in 16 hours. About 5000 of these vehicles used the State route north, the balance entering the adjoining city park or the county paved highway.

The traffic circle, in combination with the underpass, is believed to be the first actual construction of this plan on the Pacific coast, although many instances of similar devices for traffic control have been built in the East-



and in this case involved cooperation in improvement of the "Golden State Highway" through Fresno.

The underpass beneath two tracks of the main line of the Southern Pacific's valley route removes a definite traffic hazard and a source of frequent delay to the users of the State highway and the county highway east and west and the city connection with Roeding Park.

TRIPLE TRAFFIC FLOW

Heavy automobile and truck travel on these roads is seasonal and coincides with frequent movement of fruit trains together with considerable switching across Belmont Avenue to

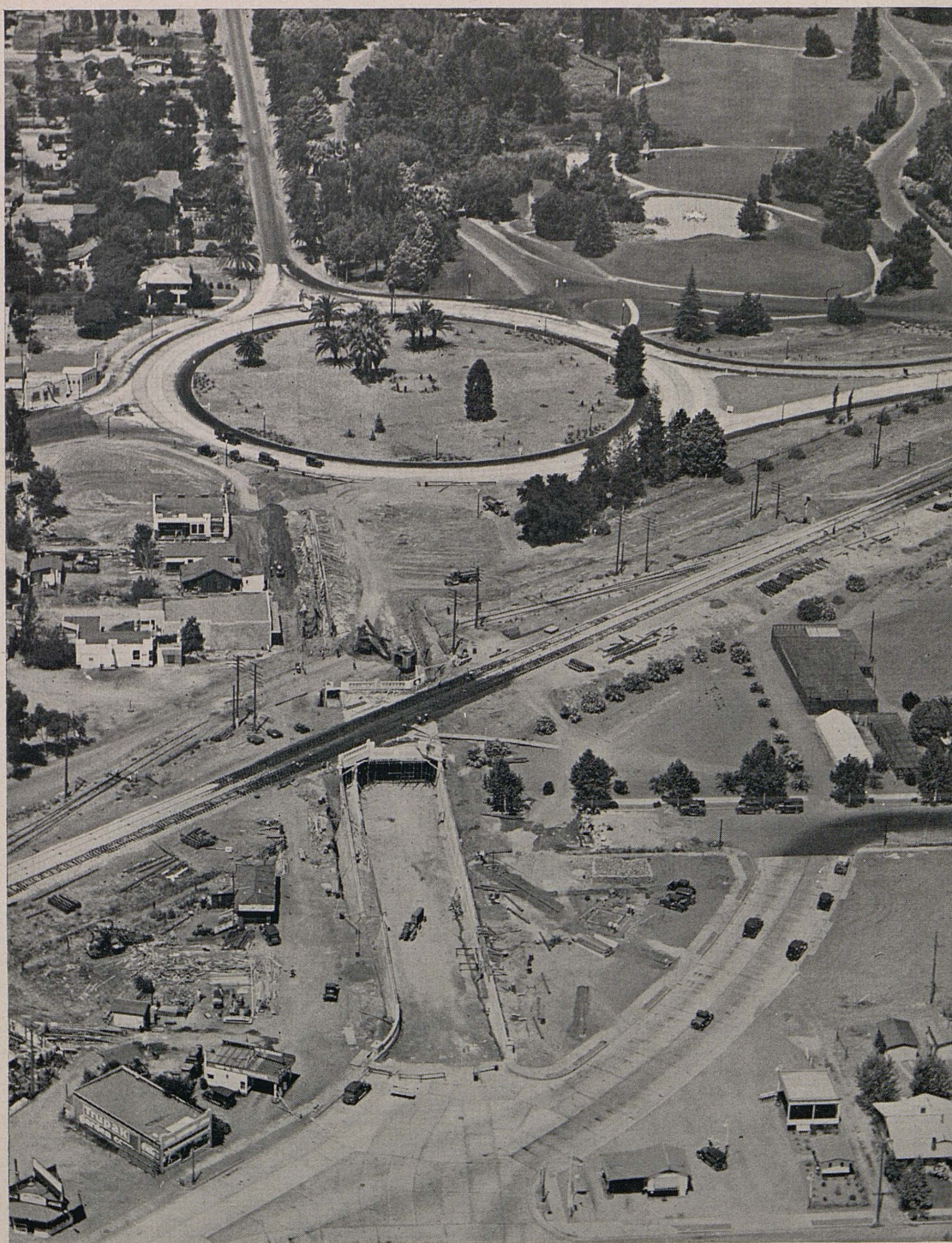
ern States. New Jersey in particular has done much in the way of adapting the traffic circle plan to the most varied and complicated situations presented in a highly developed territory.

DIFFICULT PROBLEM

The traffic circle was adopted by the city of Fresno as a solution of the traffic problem for the Belmont Avenue crossing after conferences with traffic experts and it appeared to be the best solution of a difficult problem.

The movement of vehicles at the intersection of two main routes and several intersecting roads is confined to one direction with

(Continued on page 27)



A TRIPLE TRAFFIC THREAT at the north entrance to the city of Fresno that occasionally materialized in accidents and blocked highways has been ended by the completion of this combination plan of traffic circle and subway shown under construction in the above photograph. A railroad crossing, the Golden State Highway and a main east and west paved county highway were involved in the problem, together with an entrance to a city park. The subway under the Belmont Avenue railroad crossing obviates hazard and delay from train movements and the circle keeps the intersectional traffic flowing in one direction with only right hand turns and no possibility of entanglement.

Alternate Ridge Route Completion Will Mean \$1,369,000 Annual Savings

By shortening the distance between Los Angeles and Bakersfield nearly ten miles, the Ridge Route relocation will save motor traffic \$867,000 annually in straight operating costs as compared with the present route. Its easier grades and fewer curves reflect another lowered power cost of \$392,000, while the reduced driving time figures an additional \$110,000 expense economy for commercial vehicles. From an engineering standpoint it is a prodigious undertaking of which many interesting details are given in the following article by District Engineer S. V. Cortelyou who is in charge of the project.

By S. V. CORTELYOU, District Engineer

THE RIDGE Route Alternate highway, now under construction in Los Angeles County, on the route connecting the San Joaquin Valley and southern California, is one of the largest and most important projects ever undertaken by the State Highway Department.

In order to grasp the underlying reasons for this enterprise it is necessary to go back to the early days of the State Highway Department in 1912, when the problem was being considered of determining the most direct and practicable route for a main trunk highway to connect the San Joaquin Valley and southern California.

Two principal routes were under consideration at that time. One of these was the so-called Tehachapi Route, extending easterly from Bakersfield through Tehachapi and Mojave, thence through Antelope Valley and Mint Canyon to Saugus. This route was substantially that followed by the Southern Pacific Railroad and involved comparatively light construction.

FIFTY MILES SHORTER

The other route, known as the Ridge Route, followed Tejon Pass and was a much more direct line, being about 50 miles shorter than the Tehachapi Route. A large portion of the Ridge Route was across extremely rough mountainous country which would involve correspondingly high construction costs. The problem at that time was to locate a highway if possible along the shorter route and at the same time make the location so that the road could be built with the limited funds available for the purpose.

The Ridge Route, following the most readily traversible and least expensive location on this general route was surveyed and finally adopted and built. This highway was considered one of the most important links in the State highway system.

It was a great achievement in highway construction, principally on account of what was considered at that time the enormous amount of excavation involved. It conformed to the recognized standards of alignment and grade of that time. It was 50 miles shorter than the shortest alternate route. On its completion the run from Los Angeles to Bakersfield could easily be made by automobile in less time than was required by the fastest limited train.

TRAFFIC INCREASED

A tiny stream of traffic formed, interrupted only occasionally when deep snows in the higher mountains temporarily blocked the road. This stream of traffic gradually increased in size as tributary roads were built and the use of automobiles increased.

With the increase in number and general usage of automobiles came increased speed of travel. Some of the sharper curves on the Ridge Route were found to be dangerous and were improved by "daylighting" and finally by removing the points. These formed crescent shaped areas with the original pavement. A number of these areas were paved with light bituminous type pavement and these improvements increased the safety of the road to a considerable extent.

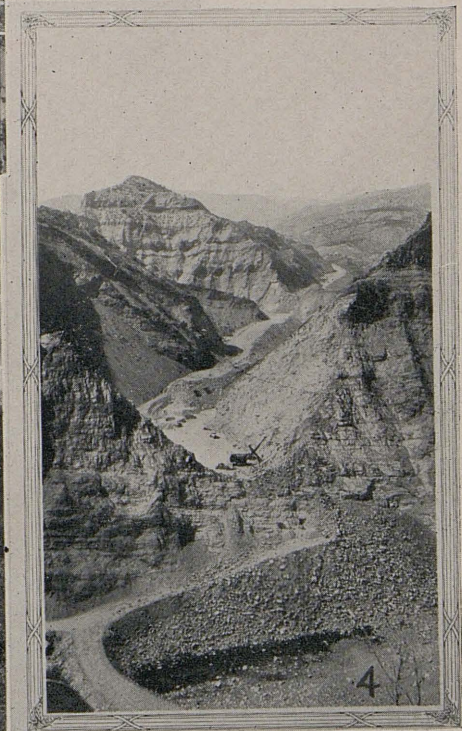
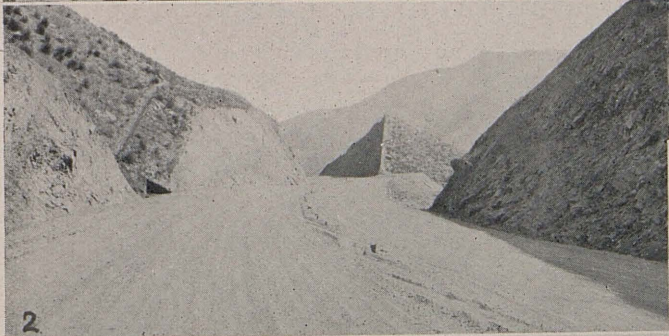
This work of improving alignment on the worst curves was started in 1924 and the

(Continued on page 16)



PIRU GORGE, shown from the air, was a tough spot for planners of the new Ridge Route.

- A. Frenchman's Flat where highway swings up Oso Creek.
- B. Concreted channel change saving two bridges.
- C. Large cut involving excavation of 225,000 cubic yards.
- D. Temporary construction road.
- E. Completed road in Liebre Canyon.
- F. Location of Piru Creek just above the junction with Liebre Canyon.



"HIGH, WIDE AND HANDSOME" the motorist will speed over the broad easy grades of the Ridge Route Alternate when it is opened the latter part of this year. No. 2 picture shows a portion of the completed roadway five miles north of Castaic. No. 3 shows the grading and heavy construction in Liebre Canyon five miles north of the junction with Piru Creek. No. 4 is a view of the "Big Cut" and the road up the gorge behind it. The cut is 206 feet deep on the center line and 400 feet long. The power shovel is 38 feet above grade. The two gopher holes shown in the cliff below it are on grade. Gopher holes and down holes were used in blasting with 60 per cent dynamite.

Twenty Years of California Highway History—An Anniversary Retrospection

By EARL LEE KELLY, Chairman California Highway Commission

LOOKING back twenty years in California's highway history, we find the first California Highway Commission starting the first work under the first contract to be financed by the first State highway bond issue.

That historic event occurred on August 7, 1912, when Burton A. Towne, the first chairman of the commission, turned the first shovelful of earth on the Coast Highway in San Mateo County between San Francisco and Burlingame, thereby beginning the development of California's splendid system of highways, including more than 5500 miles of surfaced roads and representing an expenditure of more than \$200,000,000.

The pioneer highway commission faced the herculean task of building \$50,000,000 worth of highways with \$18,000,000 bond issue funds as, if, and when the bonds could be sold for par at the low interest rate of four per cent. They labored mightily and well, setting the compass and charting the course for all highway commissions that have followed.

GIVEN WIDE POWER

Burton A. Towne of Lodi, Charles D. Blaney of Saratoga, and N. D. Darlington of Los Angeles were the members of the first commission. They were charged under their appointment by the Advisory Board of the Department of Engineering, and Governor Hiram W. Johnson, with wide jurisdiction and powers, to wit:

1. To take full charge of the entire matter of the construction and acquisition of a system of State highways in and for the State, as and in such manner provided by law, at a cost not to exceed in the sum of \$18,000,000 under and in pursuance of the Act of the Legislature of the State of California approved March 22, 1909, and known as the State Highway Act and to do and perform as fully and completely as may be done by any part, or representative, or committee of this Advisory Board, every act and thing that may be requisite to be done and performed in connection with the highways of the State of California or that ought to be done and performed under the said State Highway Act.

2. To do and perform every act and thing in and about the premises that a committee of this board may be lawfully authorized to do for or on behalf of this board; and to have full charge and

control of the acquisition and construction, of the laying out and the building of a system of such highways.

3. To report from time to time to this board their actions and proceedings and to submit to this board for determination such matters as the law requires this board to act upon and to superintend the work and operations of the Highway Engineer whose appointment is provided for by the act of the Legislature of the State of California, approved April 8, 1911.

4. To perfect such organization as they may deem necessary to carry on with celerity and efficiency the work to be done in the matter of the acquisition and construction of the said system of State highways, and under said State Highway Act; and generally to do all and singular every act and thing that may be necessary for the due, speedy and efficient performance of all that may be required under the said State Highway Act, and under the Act of the Legislature of the State of California, approved April 8, 1911.

In planning a State road system the Highway Commission was allowed ample latitude as to route, the provision of the statute being that:

INCLUDED COUNTY SEATS

"The route or routes of said State highways shall be selected by the Department of Engineering, and said routes shall be so selected and said highways so laid out and constructed or acquired as to constitute a continuous and connected State highway system, running north and south through the State, traversing the Sacramento and San Joaquin valleys and along the Pacific coast by the most direct and practical routes, connecting the county seats of the several counties through which it passes, and joining centers of population together with such branch roads as may be necessary to connect therewith the several county seats lying east and west of such State highways."

The commission started promptly to work after their appointment on August 8, 1911, sent survey parties out, divided the State into seven districts with an engineer for each district, made many momentous decisions, including the selection of concrete pavement for the State system, with the result that in less than a year a thousand miles of highway had been surveyed and actual construction begun, with only about a third enough money to do the job.

A second bond issue of \$15,000,000 was passed in 1916, and the Legislature added about \$10,000,000 additional roads to the system. The World War followed and halted

(Continued on page 14)



TWENTY YEARS AGO on August 7, 1912. Chairman Burton A. Towne of the first California Highway Commission turned the first shovelful of earth on the first State highway contract. The scene is reproduced from the book "California Highways" by Ben Blow, field secretary of the National Automobile Club.



CARRYING ON TODAY, members of the present California Highway Commission, serving without pay, come up smiling at the end of a hard day's work. From left to right: Harry A. Hopkins, Frank A. Tetley, Chairman Earl Lee Kelly, Timothy A. Reardon and Philip A. Stanton.

Dam Investments Total \$149,048,240

(Continued from page 1)

Nevertheless, it is believed that 1500 mechanics have been gainfully employed.

Since the first of the year, the Division began work on 70 projects, an average of more than 11 begun each month. The total construction value of the new projects is \$1,850,000. Several large projects have been completed. Among these are the California State Office Building in Los Angeles, the new units at Agnews State Hospital, and the California Institute for Women. These projects represent a total of \$3,000,000 and are not included in the figures heretofore mentioned.

WIDESPREAD SERVICE

In the Division of Water Resources there is a widespread service that does not always come to the attention of the public. Much of it is supervisory and also a considerable percentage of it is in cooperation with local authorities. It may be stated, however, that, in addition to the preparatory work done on the state-wide water program, much has been accomplished in service to local communities. The cooperative work has been done on the Santa Ynez, San Joaquin, San Jacinto, Pajaro and other streams.

The storage of water, as reflected by dam construction, is interesting. The total number of dams already built or under construction is 762. Dams built previous to August 14, 1929, have a storage capacity of 6,500,000 acre-feet. The new ones have a storage capacity of 813,069 acre-feet, a total of 7,313,069.

The total estimated cost of these existing improvements is placed at \$149,048,240. It is interesting to note that, of the 11 dams now in the course of construction, 9 are for municipalities or flood control districts. During the first six months of 1932, 68 applications were received for the approval of plans for repairs of dams. Ten plans for construction were received and 74 plans for repair work were approved.

ACCURATE PREDICTIONS

The diversified and intensive information necessary for the development of the state-wide water conservation plan may be illustrated by reference to the cooperative snow surveys that have been under way for several



COLONEL WALTER E. GARRISON
Director of Public Works

seasons. In the intricate relation between the use of reservoirs for irrigation, power, flood control, etc., it is essential that accurate predictions of the run-off be available, and where the snow surveys have been conducted for a considerable period, a comparison of the actual stream flow with the predictions has demonstrated most satisfactorily that a high degree of accuracy can be obtained.

The confident prediction of stream flow from the snow crop requires that the records be available for a number of years, the longer the period the better. The real value of this work, therefore, will become more evident with the extension of the record, and if carried on without a break, will prove invaluable in the great reservoir development that is proposed under the state-wide water plan.

An inspection of the records of the Division of Water Resources discloses a range of work that is indeed many sided, and with results that will contribute materially to a solution of the State's paramount problem.

How State Protects Highways Against Excessive Overloads

IN HIGHWAY work the question of design of the road section and of bridges is most important. The pavement must be of sufficient width and of a thickness that will carry traffic during a reasonably long period. The structures must have a sufficient factor of safety to allow for deterioration for a considerable period. On the other hand funds are limited and it is obviously not economical to construct improvements to provide for the occasional excessive load.

In order to protect the highways, and to allow of designs within economical limits, the Legislature has set up certain maximum limits for height, width, and weight of loads. The height and width limits establish the design limits for overhead clearances at structures and lane widths of pavements. The weight limit allows construction of a reasonable thickness of surfacing and of economical bridge design.

THREE WEIGHING STATIONS

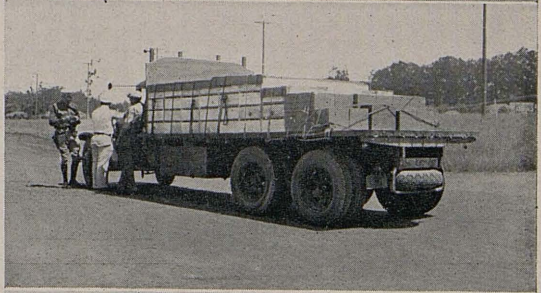
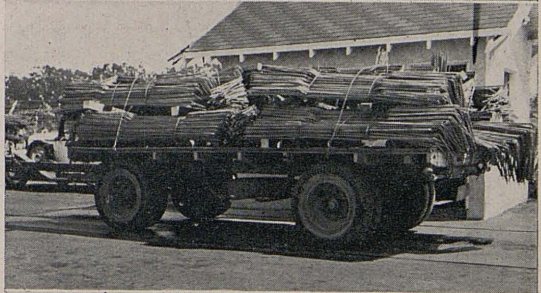
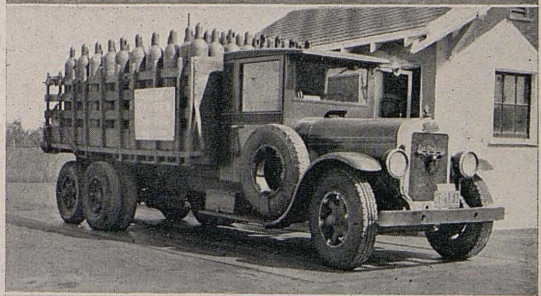
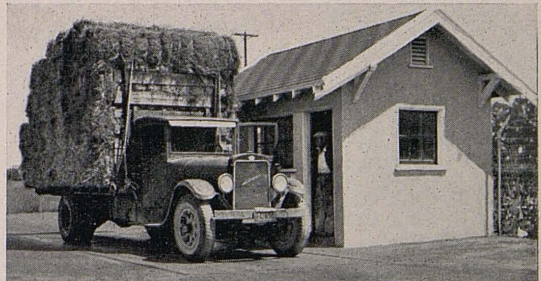
Under the law permits may be issued for overloads at the discretion of and under such restrictions as may be deemed advisable by the Department of Public Works or local officials having jurisdiction of the highways. In so far as State highways are concerned restrictions are designed to protect other traffic as well as the highways. Excessive overloads are not permitted where hazard to traffic or structures exists.

The officers of the Highway Patrol are responsible for checking up on overloads. Regular crews are assigned to this work. They are furnished with loadometers, which are small weighing units designed to weigh one wheel of the equipment at a time.

In order to assist in this work standard scales have been installed by the Division of Highways at three points on heavy trucking routes. One scale is located south of Banning on route 26 into the Imperial Valley, one at Rose Station near the Grapevine south of Bakersfield, and one at Burlingame on the Bay Shore Highway.

These scales serve to furnish a more accurate check on weights and provide a check on the tendency of some hauling outfits to "put on everything they can start," as one driver expressed it.

WATCHING AND WEIGHING



TOO HEAVY for the highways are some big truck loads so Highway Patrolmen weigh them with loadometers or check them at standard scales maintained by the State.

Financing of San Francisco-Oakland Bridge Possible Under U. S. Relief Bill

WITH Federal financing practically assured for the \$75,000,000 San Francisco-Oakland Bay Bridge project, Colonel Walter E. Garrison, State Director of Public Works, and Chief Engineer Charles H. Purcell have ordered "full steam ahead" in the completion of final designs.

The relief measure authorizes the Reconstruction Finance Corporation to loan \$1,500,000,000 to self-financing projects of public character. Under the terms of the bill the Reconstruction Corporation may loan to public agencies of States, which would include the State Toll Bridge Authority. The relief measure, as originally introduced, excluded the transbay bridge project. Chief Engineer Purcell immediately proceeded to Washington, and was successful, through the cooperation of California's congressional delegations, in having the measures amended.

A preliminary letter descriptive of the transbay bridge project as fitting the requirements of the relief measure in every possible way has already been filed with the Reconstruction Finance Corporation. This letter, signed by George T. Cameron, Chairman of the Executive Committee of the Financial Advisory Committee appointed by Governor James Rolph, Jr., points out these essential facts:

JOINS MAJOR CITIES

Two major cities of the United States—San Francisco and Oakland—with adjacent East Bay cities with populations of 700,000 in San Francisco, and over 500,000 in Oakland and adjoining cities, are separated by the natural barrier of San Francisco Bay, with only ferry service between.

The growth and commercial welfare of these bay cities has been and is greatly handicapped by the waste of time in crossing four miles of water by ferry. San Francisco is isolated on the north and east from the mainland.

This proposed bridge will make a direct connection for San Francisco to the mainland and remove this barrier. It will greatly benefit commercial life and will facilitate national defense.

GREAT TRAFFIC INCREASE

Automobile traffic across the bay, in spite of the ferry handicap, has rapidly increased during the past ten years. In 1915 364,000 vehicles crossed the bay. By 1930 this number had increased to 4,500,000. Conservative estimates indicate that by 1937—when this bridge can be completed—the traffic will have increased to 8,000,000 vehicles.

In addition, 35,000,000 commuters cross the bay every year. The bridge will save each automobile approximately thirty minutes per trip, and each commuter fifteen minutes per trip. Based on the present rate of tolls, this project will earn, on conservative traffic estimates, an average of from 1.6 to 2 times the interest requirements over the first five years of operation, depending on the rate of interest and necessary bond discount. After five years, due to the cer-

tain increase in traffic, this earning power will increase. Conservative traffic estimates indicate that, on six per cent net interest return, this project will be fully amortized in from 22 to 25 years. If money can be obtained at a lower rate, the period of amortization will be proportionately reduced.

LARGE SAVING POSSIBLE

If this project can get under way in the immediate future, a great saving can be made in the cost of construction due to the low market values of materials. A lower capital investment will increase the future net earning power of the bridge, and will fortify the financial integrity of this project.

The proposed bridge is approximately seven and one-half miles long from end to end of approaches. The main structure extends from the San Francisco shore over the West Channel to Yerba Buena Island, thence over this island and the East Channel to the Oakland shore.

The West Channel crossing consists of twin suspension bridge with central spans of 2310 feet. The East Channel crossing consists of a 1400-foot span cantilever bridge with five 500-foot steel spans and fourteen 290-foot steel spans approach.

DOUBLE DECK TYPE

The roadway is of the double deck type with 57-foot roadway on the upper deck accommodating six lanes of fast automobile traffic. The lower deck carries a 30-foot roadway for three lanes of truck traffic and two interurban electric tracks.

The bridge is to be constructed under State authority by the Department of Public Works of the State of California, the State Toll Bridge Authority being the fiscal agency which was authorized by the 1929 Legislature to issue income bonds secured by tolls for the construction of this and other worthy bridge projects. These laws have been referred to the Supreme Court of California and have been declared constitutional by unanimous opinion of this court.

The plans have been approved by the War Department of the United States, and a permit has been given by it, through consent of Congress, to build the bridge.

EMINENT CONSULTANTS

The bridge is being designed by engineers of the Department of Public Works of the State of California, in cooperation and constant consultation with a board of eminent consulting engineers. Mr. Ralph Modjeski is chairman of this board, and Messrs. Moran and Proctor, Leon S. Moisseiff, H. J. Brunner, and Professor Charles Derleth, Jr., are members. All of these men are of the highest qualifications obtainable in bridge engineering.

Very extensive foundation borings have been completed, with the result that excellent foundations are known to be available.

Foundation and superstructure plans have advanced to such a point that the first contract for foundations can be advertised by the middle of August, 1932, if the money is available; this contract to be followed by others as rapidly as possible.

Widespread Stimulus to Employment

(Continued from preceding page)

This project will employ locally on the average of 6000 men over a period of three and one-half years, with approximately 4000 men in other parts of the United States at steel mills, lumber mills, and equipment manufacturers. No estimate can be made of the added employment due to the general stimulating effect of this project.

STIMULATES INDUSTRIES

The materials required are approximately as follows: 160,000 tons of steel, which will be for the most part, if not entirely, rolled and fabricated in the eastern states from ore obtained in Michigan and handled by ships on the Great Lakes. The fabricated steel will be hauled across the continent by rail, or by water through the Canal; 200,000 gallons of paint

Construction can be started at an early date and, in consequence, will afford quick relief.

The estimated cost of construction contracts is \$60,000,000, to which must be added interest during a construction period of from three and one-half to four years, together with other charges amounting to approximately \$15,000,000, depending upon interest rate, discounts, etc., making a probable total capital expenditure of \$75,000,000.

The project is financially sound and self-liquidating within a reasonable period of time.

A PUBLIC NECESSITY

It is a public necessity in the welfare and development of the bay cities and northern California, and an aid to national defense in war.



THE EAST CHANNEL CROSSING of the San Francisco-Oakland Bay Bridge project consists of a 1400-foot span cantilever bridge with five 500-foot steel spans and fourteen 200-foot steel span approaches. It will carry an upper and lower deck with 57-foot roadway on the upper deck to accommodate six lanes of fast automobile traffic and a 30-foot roadway on the lower deck for three lanes of truck traffic and two interurban electric tracks.

will stimulate the paint industry; 40,000,000 to 50,000,000 B.M. of lumber will greatly stimulate the lumber industry in Oregon and Washington.

One and one-half million barrels of cement will operate the cement mills of California for a considerable time. One million cubic yards of concrete aggregates will constitute the full capacity of the local aggregate plants for a long period.

Construction equipment on a large scale will be required and will, in consequence, have a stimulating effect on equipment manufacturers in other parts of the United States. Forty thousand to 50,000 tons of reinforcing steel will further stimulate the steel and transportation industries.

WORK WIDELY DISTRIBUTED

In general, this project can not be considered as local in its character. The materials required in its construction and the labor used in its manufacture is widely distributed over the United States.

It will be a publicly owned bridge, subject to tolls until amortized, and then free.

It is being designed by the State of California under the guidance of the world's most able and eminent engineers, and has been declared by them to be structurally and economically sound.

LEGALLY SOUND

The laws under which it is to be constructed have been declared constitutional by the Supreme Court, and its construction has been approved by the Department of War.

It has the unanimous approval and support of the entire population of northern California, comprising over 2,500,000 people.

By act of the California Legislature, the Department of Public Works is empowered to make this bridge a part of the State Highway system and to provide funds from its revenues from the gasoline and motor vehicle taxes to maintain the bridge when completed.

Traffic Hazard on Trinity Lateral Removed by Water Level Relocation

By E. J. BASSETT, District Office Engineer

WITH the opening to traffic of the Canon Creek bridge at Junction City in Trinity County on June 25, one of the hazardous barriers to traffic, on the Trinity Lateral (State route No. 20) between Redding and Eureka, was removed. The opening of this structure made available for use 4.76 miles of newly graded and oiled highway and eliminated for all time one of the most narrow and dangerous stretches of road on the entire route.

The primary purpose of Route 20 between Weaverville and Eureka was to provide a cross connection between the coast and the interior valley trunk line highways, as well as a connection between the county seats of Humboldt and Trinity counties. Due to topographic and climatic conditions, the Trinity River route was chosen as the most practicable after comparisons and consideration of other locations.

Prior to 1923, Trinity County had no connection to the coast by way of the Trinity River and no road of any kind west of Helena. Very difficult mountain roads led in from the east to Helena and from the west to Salyer, leaving a gap of 40 miles along the rugged Trinity River Canyon which was accessible only by pack train.

STARTED IN 1919

Construction work on this gap was started in the spring of 1919 and was completed five years later, both the State and the U. S. Bureau of Public Roads participating. The construction work was of a low character but was to standards consistent with this class of highway in that period of development. Construction between Valdor and Weaverville was, however, delayed for several years, pending the completion of other more important

sections of this route, and it was not until December, 1930, that operations were again resumed, the availability of convict forces which had been elsewhere engaged making it possible.

Following the completion of the highway over Buckhorn Summit in Shasta and Trinity counties on this route it was found expeditious to continue construction activities on other portions of the route where the old county road was still in use.

The section of old road between Valdor and Junction City was a particularly difficult one, owing to its narrowness, its steep and adverse grades and many sharp and difficult curves.

Following along Canon Creek for two miles, it rose abruptly, passed through a saddle high above the Trinity River and continued climbing for another mile along the less precipitous and more earthy slopes of the mountain, in effect, following the line of less resistance in cost. It then followed a general descent to Valdor, near the end of the project, traversing a distance of 5.1 miles.



E. J. BASSETT

SCENE OF ACCIDENTS

Since 1926 this section has been under State maintenance, and minor improvements and betterments reduced the ordeal to traffic to a considerable degree. Nevertheless, intelligent driving was the essence of safety, and inattention to the rules of safe driving has contributed to the toll of serious and fatal accidents.

The new location follows the east bank of the Trinity River on a water grade. Except for four exceptionally heavy bluffs, the work is moderate, considering the mountainous character of the locality. While this location is not materially shorter than the old road, the absence of adverse grade is one of the

reduced the ordeal to traffic to a considerable degree. Nevertheless, intelligent driving was the essence of safety, and inattention to the rules of safe driving has contributed to the toll of serious and fatal accidents.



IT WENT BOOM and 10,250 yards of solid rock were torn from this bluff and hurled into the Trinity River.



NOW IT'S FINE level highway, no bluff, cutting out a steep mountain climb between Valdor and Junction City.

most outstanding features of the improvement.

A comparison of the roadbed width is, of course, beside the point, as the new construction has a width of 24 feet while the old road is barely wide enough at many points for passing at slow speeds. The element of danger has been eliminated so far as is possible in modern, up-to-date construction, and the maximum legal speed may be maintained over the entire unit.

IMPROVEMENT EXTENDED

Work was inaugurated on this project in December, 1930. The original plan contemplated the construction only of the Valdor-Junction City section. A later addition ex-

tended the work to Oregon Gulch, east of Junction City, with a temporary connection to the existing road, approximately three-fourths of a mile in length. This new construction will be completed in September of the present year, but all except 0.6 mile is in use at the present time.

The work involves the removal of 280,000 cubic yards of excavation, the greater portion of which is encountered in four rock bluffs rising precipitously from the water's edge of the Trinity River. One of these, immediately below Junction City, is probably the most extensive, containing 54,000 cubic yards in 0.47 of a mile of distance.

An interesting feature of the construction of this bluff was the loading and shooting of

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Rolph's Prophecy Becomes a Reality

(Continued from page 6)

highway work almost entirely in many states, though not to that extent in California. But in 1918 the California Highway Commission again needed funds to carry on and another bond issue was necessary.

ENCOURAGED BY ROLPH

With the aid of the State Association of Boards of Supervisors, the automobile clubs, various chambers of commerce and road booster organizations, a committee was formed that met in the San Francisco City Hall on February 12, 1919, to decide on a program to present to the Legislature.

They were greeted and encouraged by Mayor James Rolph, Jr., of San Francisco, who 11 years later as Governor of this great State was to appoint and encourage the present California Highway Commission. He told them that California needed more and better highways, that the completion of the system meant much to the prosperity of the State and the happiness of its people, and that he thoroughly believed in and espoused their cause. His words, a mere prophecy then, are an actual reality today.

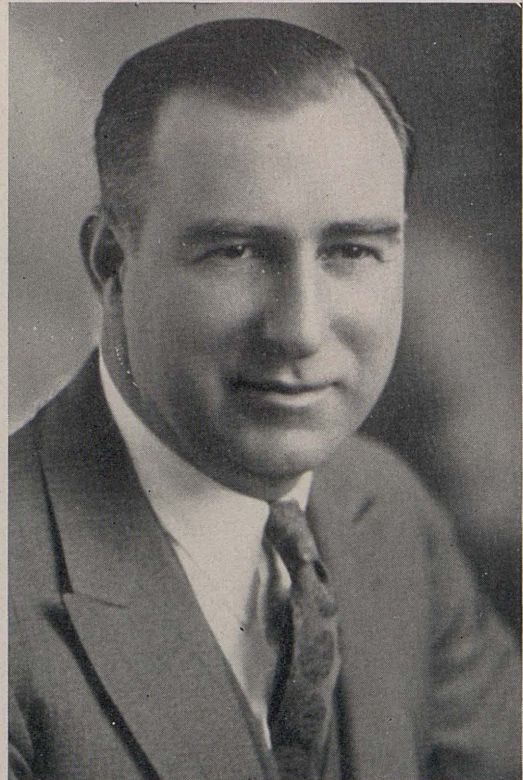
The committee thought a \$20,000,000 bond issue would be sufficient to finish up the system, but after three days of deliberation and discussion of the various roads presented and vigorously urged, they concluded that at least \$40,000,000 would be necessary. The convention's conclusion and request were presented to the Legislature and the bill passed.

By 1920, 1500 miles of concrete pavement had been laid and still the State system was far from complete. Three State bond issues had totaled \$73,000,000. Long term bonds were issued.

In the amortization of these bonds our taxpayers eventually will have paid approximately one hundred fifty-two millions of dollars. In other words, the interest through the years will amount to more than the principals of the three bond issues.

NEW TAX PLAN

While the people of California had been responsive to these three bond issues, yet the knowledge was dawning upon them that



EARL LEE KELLY

through a newly developing form of taxation, namely, the gasoline tax, huge savings would be made possible through the adoption of a "pay as you go" system.

In 1923 the first gas tax was passed by the Legislature of California, which provided for a two-cent license tax for each gallon of motor vehicle fuel sold for use by motor vehicles in the State. This measure provides for a refund of the tax where the motor vehicle fuel is used for purposes other than in motor vehicles.

A "motor vehicle fuel fund" was created.

One-half of the moneys accruing from the two-cent tax remaining in this fund, after the refunds mentioned have been paid, is distributed among the counties to be expended for road purposes by the local authorities. The other half accruing from the two-cent tax is paid into the "State Highway Maintenance Fund," but only for main-

Fuel Tax a Pay-As-You-Go System

(Continued from preceding page)

tenance and reconstruction purposes, and it is so allocated by the Highway Commission.

ANOTHER CENT ADDED

In 1927, realizing that moneys provided by bond issues for the construction of the State highways had become exhausted, the Legislature duly passed two measures, which inaugurated in our State a new era of State highway building on a "pay-as-you-go" basis, and with adequate funds in sight for a complete, coordinated and comprehensive plan of operations covering a period of years.

The first measure was an act providing for an additional one-cent gasoline tax to be used exclusively for the construction of State highways. This measure had no effect whatsoever on the previously existing two-cent gasoline tax, half of which goes to the counties and the other half to the State.

Another outstanding measure passed by the 1927 Legislature is known as the State Highway Classification Law. This has provided for the distribution of the State's share of the receipts from the motor vehicle fuel tax acts, in an equitable manner between the northern and southern sections of the State.

HUGE SAVINGS MADE

Further illustrating the savings effected by a "pay-as-you-go" plan, the cost of new State highway construction budgeted in the 1929-1931 biennium totaled \$27,400,000. If this had been paid from the proceeds of 4½ per cent bonds maturing in 40 years, the cost of the same projects would be \$51,272,250.

It has been aptly stated: "The wisdom of the Legislature of California in proposing and enacting a tax on gasoline, which all users of the highways pay in proportion to their enjoyment of the benefits of these good roads has been amply demonstrated."

The experiment has been so successful, the tax so easy of collection, the fairness of it so universally conceded, and the saving so great over the previous method of financing, it is most improbable that the people of California will ever revert to the issuance of interest-bearing securities for an enterprise of this character, particularly in light of better popular understanding of the facts.

In California, therefore, we feel that we have been quite fortunate in the following accomplishments:

RESULTS ACCOMPLISHED

1. New State highway construction through the three-cent gasoline tax.
2. The application of the budget system to State highway expenditures, through which the public is now informed of the manner in which it is proposed to spend State highway money in advance of and not following such expenditures.
3. The adoption of a definite and orderly policy governing the extensions of the State highway system.
4. The construction of 5575 miles of improved roads out of a total of 7389 miles for the entire system, representing a total investment of \$257,685,620.

Thus we look back 20 years ago to that fine group of highway commissioners who pioneered the first roads in California, and it is our hope and sincere wish that we who have been appointed by Governor Rolph to carry on shall not be found wanting, but shall continue the fine work of those distinguished pioneer road builders, striving always constantly to improve this great highway system which has been given into our charge and keeping.

\$258,000,000 TAX INCREASE

The one-cent per gallon tax on gasoline and various excise taxes on automotive products, provided by the new federal revenue bill will exact approximately \$258,000,000 a year from automobile owners and users of highway transport in the United States, according to the Automobile Club of Southern California. This sum amounts to 23 per cent of the \$1,118,500,000 in new or increased taxes levied by the revenue bill to balance the national budget.

ATTRACTIVE ROADSIDES

Reasons for the growing interest in roadside development work are numerous and practical. Some of the more apparent benefits may be listed at random as follows: attractive roadsides encourage recreational use of highways and the public land and help develop a sense of community pride; roadside control makes travel safer by revealing hazards, eliminating obstructions to vision and reducing fire danger, to name only a few safety benefits; erosion may be eliminated by planting and seeding slopes and embankments.—*Better Roads.*

Striking Feature in Ridge Relocation

(Continued from page 4)

State maintained a power shovel and small crew on this work until June, 1930. The crescent-shaped areas formed by the grading work were paved in several small contracts.

BECOMING OBSOLETE

In the meantime the tiny stream of traffic which started in 1916 became a larger stream, constantly increasing in volume and speed. Curves which were gradual enough for the slow moving traffic of 1916 were too sharp for the fast moving traffic of 1929. Pavements which were considered wide enough and thick enough at the earlier date were inadequate for the greatly increased volume of traffic and loads of the latter time.

The Ridge Route has been a wonderful road and has served its purpose well. It had saved its cost many times over in providing the fastest and most direct highway outlet from northern California and the San Joaquin Valley to southern California.

But standards of highway design and construction were constantly improving. This highway which was modern in design in 1916 was becoming obsolete. It was like comparing the automobile of 1916 with the car of 1932. Your 1916 model was a satisfactory vehicle in those days and served you well, but it could not be compared to the trim, swift, smooth-running automobile of 1932. The design of highways has improved fully as much as the design of motor cars. One could not now be satisfied with the mountain highway of 1916 any more than with the motor car of 1916.

MORE DIRECT ROUTE

It became increasingly evident that the Ridge Route would have to be either reconstructed or replaced. With the increase in revenue derived from the gas tax it seemed probable that a more satisfactory though more costly route could be found.

Several reconnaissance surveys were made, following shorter routes. The one which promised the most permanent location was one which extends in nearly a direct line from Castaic School at the southely end of the present Ridge Route, to Gorman, near the Kern County line. This new line lies to the west of the present Ridge Route the entire distance. In 1929 a survey party started the actual survey and location of the Ridge Route Alternate which is to replace the present Ridge Route. It follows a lower line through Violin Canyon and Piru Gorge.

Following are comparisons of a few features of design of the two routes:

Items	Unit	Old Ridge Route	New Ridge Route Alternate
Length -----	Miles	36.45	26.85
Total curvature -----	Degrees	35141	2492
Highest elevation -----	Feet	4234	3550
Minimum radius of curves -----	Feet	70	1000
Maximum grade -----	%	6%	6% compensated
		uncompensated	for curvature
Total rise -----	Feet	4630	3450
Adverse grade -----	Feet	2220	1040
Roadbed width -----	Feet	21-24	38

Original contract

(Continued on page 26)

Surveys demonstrated that the new route had so many advantages over the old one that all thought was given up of reconstructing the highway on the old route.

Perhaps the most striking features of this comparison are:

1. The new route is 9.6 miles shorter than the old.
2. It has only about 1/14 the total curvature of the old.
3. The new route has a minimum radius of curvature of 1000 feet as compared to a minimum radius of 70 feet for the old route as originally constructed. This high standard of alignment will permit all curves to be safely driven at high rates of speed.

WIDER ROADBED

In addition to the above important features is the wide roadbed of the new route which has been designed to permit widening as future necessity arises. The adverse grade has been reduced by 1180 feet. This is equivalent to a reduction in that much climb on steep grades and sharp curvature along the present highway.

The highest elevation attained on the new road will be 684 feet lower than the highest elevation on the old route. The average elevation will also be considerably less so that interference from snow will be appreciably lessened.

Maximum grade will be six per cent as on the present route except that it will be compensated for curvature and broken by long stretches of minor grade.

In 1929 when the study of the alternate route was being made, the average daily traffic over the Ridge Route was about 2100 autos, 200 trucks and 620 tons of freight. Based on increases in volume of traffic for several years it was predicted that during the next ten years average traffic would conservatively be 175 per cent of traffic at the time the study was made. The average daily traffic for the ten year period was therefore estimated as 3600 autos, 350 trucks and 1100 tons of freight per day.

BIG ANNUAL SAVINGS

Some startling figures on the saving of the new route were derived on this basis. Assuming a cost of 6 cents per ton mile for hauling freight, 4 cents per mile for operating an auto and 25 cents per mile for moving buses and empty trucks, shortening the distance by 9.6 miles, will effect an annual saving of \$867,000 to users of the road.

"Devil of the High Sierras" Discovered in Lava Rock Profile

By E. M. MUSE, Delineator, Highway Department

AT AN elevation of about 8500 feet, jutting from the end of an ancient lava flow near the Alpin State Highway, was found a marvelous freak of nature. Overlooking Capels Creek Canyon and the forbidding volcanic jungle of Hell's Delight, this relic of cosmic upheaval, shown in the adjoining column, is offered by its discoverer as one of the most unique specimens of rock formations ever found.

Climbing among the rocks of the high ridge that rises between Amador and Alpine counties, in making a turn around the nose of a cliff, I came upon his majesty, "Mephistopheles of the Mountains." The demonic ensemble is almost perfect. Note the leering profile, the sinister sneer, the horn on his head, the wart on his nose; all emphasized by the protruding beak, heavy eyelid and set jaw. Note too, the trueness to life in the relative size and proportion of facial features.

As if presiding with fiendish demeanor, here for unknown centuries, he has looked down into the rugged wilderness, through which the undaunted Kitt Carson blazed his trail into California. This Devil's head of black lava measures about seven feet from chin to crown. It can not be seen from the highway and can only be found by a strenuous climb and hike along the crest of the lava ridge to the east of Silver Lake. With the exception of retouching out a dark spot of background beyond the profile, the photo has not been altered.

FOREST FIREBUGS FLOGGED

That the forest incendiary is not a new menace to public welfare is proved by a law promulgated 250 years ago in Pennsylvania says a California Region, U. S. Forest Service report. In 1676 the Duke of York, brother of King Charles II of England, made the penalty for kindling a fire in the woods and permitting it to escape to cultivated land, the payment of all the damages plus one-half more as a fine. If the guilty person could not pay he was liable to receive "not exceeding 20 stripes," or in other words, be publicly whipped.

"Do you want gas?" asked the dentist as he placed the patient in the chair.

"Yes," said the absent-minded professor. "About five gallons—and take a look at the oil."



HERE'S "MEPHISTOPHELES of the Mountains" leering down on Capels Creek Canyon.

Move to Stimulate Highway Employment

"As a stimulus to employment and to effect needed highway improvements as soon as possible, a Construction Congress has been proposed in which all branches of highway activities will be represented," states T. H. Cutler, president of the American Road Builders Association.

"The Congress should lay the foundation for renewed activity in road and street building," said Mr. Cutler. "A somewhat similar conference was held last fall at the call of President Hoover with a view to putting home building on a sound and active basis. Small home building is today one of the bright spots in the construction picture.

At the recent annual meeting of the American Road Builders' Association in Washington, D. C., a spirit of optimism for the future prevailed and the opinion was expressed that the time is ripe to launch a cooperative effort to develop construction."

Seventeen thousand consolidated schools in the United States last year used 49,000 motor buses to transport pupils.

Roads of the Future Being Evolved By Perfecting Discoveries of Ancients

By THOS. E. STANTON, JR., Materials and Research Engineer

A recent newspaper editorial intimates that chemistry has done little, to date, for the building of roads, but that there are indications that new surfaces will be evolved through chemistry that will surpass anything yet produced. The prediction is made that in some common by-product will be found the improved material for the roads of tomorrow.

The basic materials used in building road surfaces today were known and used in building construction over 5000 years ago. They are found so abundantly and cheaply in nature that it is difficult to conceive of any manufactured material, or by-product, which would be available in sufficient quantities to compete economically or to keep up with the current demands for road surfacing materials.

From seventy-five to ninety-five per cent of a standard paving mixture consists of the rock, sand, and earth so generously provided by mother nature. Man's main problem is to find the best cement which can be economically used to bind these basic materials into a strong wear-resisting mass.

RAPID PROGRESS

Having developed a suitable binder, the next problem is one of determining the proper combination of this binder with the locally available aggregates which will result in a high quality and, at the same time, economical product.

Rapid strides have been made during recent years by engineers and chemists in improving the quality of these cement binders, and in the development and understanding of the basic principles governing the correct combination of the various ingredients to give the best results under any given set of conditions.

The solving of these problems, as applied to local materials, as well as the testing of all ingredients for quality, constitutes the principal work of state highway materials and research departments.

The cementing materials commonly used in road construction are the asphaltic and hydraulic cements.

ASPHALT CEMENTS

According to Herbert Abraham, the term "asphalt" may be traced back to Babylonian times. It was later adopted by the Greeks in the form of an adjective signifying "firm," "stable," "secure." The first use of asphalt by the ancients was in the nature of a cement for securing or joining together various objects.

The earliest recorded use of asphalt by the human race was by the pre-Babylonian inhabitants of the Euphrates Valley (about 3000 B. C.). These people, known as Sumerians, were skilled in carving and decorating stone, as evidenced by the varied and interesting specimens of pottery and statuary unearthed in recent years. In certain of these we find shells or bits of stone cemented in place by means of asphalt.

Of all the Babylonian rulers, Nebuchadnezzar, who reigned 604 to 561 B. C., was the most progressive, and is stated to have reconstructed the entire city. The bricks bore inscriptions relating to his work, and several specifically refer to the use of asphalt. One found in the so-called "Procession Street" which led from his palace to the north wall, reads as follows:

FIRST PAVEMENT B. C.

"Nebuchadnezzar, King of Babylon, he who made Esaglia and Ezida glorious—Son of Nebopolassar, King of Babylon. The streets of Babylon, the Procession Street of Nabu and Marduk, my lords, which Nabopolassar, King of Babylon, the father who begot me, had made a road glistening with asphalt and burned brick; I, the wise suppliant who fears their lordships, placed above the bitumen and burned bricks a mighty superstructure of shining dust, made them strong within with bitumen and burnt bricks as a high-lying road. Nabu and Marduk, when you traverse these streets in joy, may benefits for me rest upon your lips, life for distant days, and well being for the body. Before you I will advance upon them, may I attain eternal age!"

This would seem to be the forerunner of the present day pavement composed of stone

(Continued on Page 20)



PORTLAND CEMENT CONCRETE pavement on Golden State Highway through Lodi in San Joaquin County.



ASPHALTIC CONCRETE pavement with traffic lines on the Coast Highway in Santa Clara County.



THE CALIFORNIA type of oil mix surfacing has established its worth as an economical and durable type. It has proven its value on long stretches of mountain and desert roads. This scene is on the Placerville-Tahoe route in El Dorado County.

State Rich in Road Building Materials

(Continued from page 18)

blocks set in asphalt. According to Nebuchadnezzar, his father Nabopolassar (625-604 B. C.) is credited to have laid the first asphalt block pavement of which we have any record. It seems strange that the art should have become lost to mankind, only to be rediscovered in the nineteenth century A. D.

INCAS USED IT

It has been established that the Incas of Peru (sometime before A. D. 1500) constructed an elaborate system of highways, some of which were paved with a composition not unlike modern bituminous macadam.

Although undoubtedly used in a limited way in road and foot path construction throughout the centuries, the first large area of asphalt roadway was constructed in Paris in 1858, followed by a stretch in London in 1869, and in the United States for the first time in 1870.

Although there are a number of local natural asphalt deposits in California, the main source of supply of asphaltic road oils and asphaltic cements is from the crude petroleum with which California is so plentifully supplied.

The commercial crude oils of California are essentially of naphthenic or asphaltic base, with few exceptions.

It is from these crude oils that the road building oils and asphalts are derived after removing part or practically all of the volatile constituents.

The resultant asphaltic residue is a viscous product of a hardness depending on the method of treatment and the degree to which the volatile has been removed.

DECIDED BY TESTS

It is the duty of the Testing Engineer to test these products to ascertain if they comply with certain defined specifications and to then determine, by trial, the best combination of aggregate and asphaltic binder to give the most stable results when compacted into a finished pavement surface.

The asphalt must not be so hard or limited in amount as to cause the pavement to crack and disintegrate, nor must it be so soft or excessive in amount as to cause a rutting and waving under the action of traffic in the

heat of the sun. It must be determined that the aggregate to be used has a greater affinity for the oil than for water so that it is not readily affected by moisture from rains.

While tests of the separate ingredients have become well standardized, tests for the durability and stability of the combination thereof are still very much in the experimental stage. The California Materials and Research Department has been doing its share in the development of stability testing equipment and procedure.

Equipment for the purpose has been designed and built at the machine shop of the Laboratory, and numerous stability tests of good and bad examples of asphaltic pavement surfaces are being made in an effort to devise some means of predicting, in advance, the probable service value of designed pavement mixtures. Although much encouraging progress has been made, there is considerable work to be done before full success can be claimed.

PORTLAND CEMENT CONCRETE

Of equal, if not greater, importance to asphaltic cement as a binder, we have Portland cement, an intimately mixed, burned, and ground combination of lime and silica which has the property of setting up into a hard insoluble product in the presence of moisture.

Unlike asphaltic cement, Portland cement does not occur in nature, but must be specially manufactured for the purpose. To this extent, therefore, Portland cement is a triumph of the chemist, as there does not seem to be any evidence that truly hydraulic cements of the kinds we use now were ever employed by the older Asiatic, Egyptian, or East Mediterranean civilizations.

This class of cement, however, had its counterpart in the remote periods of antiquity, as there is more or less proof that at a very early stage of human progress, say ten thousand years ago, both lime mortars and gypsum plasters were put to use in Egypt and elsewhere.

GROUND CLINKER

Portland cement, now the most important of our cementing materials, was invented in

Chemical Research Perfecting Mixes

(Continued from preceding page)

1825. It is an artificial chemical product of fairly definite composition, containing approximately 60 to 65 per cent lime, 20 to 25 per cent silica, and 5 to 12 per cent iron oxide and alumina. In the manufacture of Portland cement, the various ingredients are first intimately mixed in the proper proportions, then the raw mix must be burned at a very high temperature until it unites chemically and physically as a clinkered mass, after which the clinker so formed is ground very finely. The end result of these processes is the Portland cement of commerce.

In determining the proper combination of the various ingredients, the chemist must make a complete chemical analysis of each. The chemical reactions which take place are complicated and, in many respects, very little understood.

The quality of the cement affects the strength and other qualities of the resultant concrete which is made by mixing the cement with fixed proportions of rock, sand, and water. Through the chemical reactions which take place during the process of hardening, considerable heat is evolved. The amount of heat thus evolved governs, to a certain extent, the rate of hardening and subsequent volumetric changes in the concrete mass as, under the heat of setting, there is an expansion of the concrete with a corresponding shrinkage as the temperature drops, thus causing the concrete mass to form shrinkage cracks, the extent and number of which are governed by the extent of the shrinkage and the strength of the concrete.

TASK FOR CHEMIST

In addition, there must be as complete hydration or hardening of the cement ingredient as possible, otherwise the resultant concrete will lack durability and will not resist the weathering action of the elements in the form of rain, frost, sea waters, and drainage waters with high percentages of alkali and other corrosive agents. This hydration takes place only in the presence of water and it is, therefore, necessary that all fresh concrete be kept moist as long as practicable.

As a further requirement for durability, the concrete must be as dense as possible so that unavoidable corrosive agents may not

penetrate below the surface, thereby promoting disintegration. The rock used must be hard and durable and must not swell or break down when wet, as this swelling or breaking down causes cracks to develop in the concrete mass with subsequent disintegration. The sand must be clean and hard so that the cement may form an intimate bond which will not be subsequently disrupted by pulling loose under tension or by a rupture of the sand particles.

The chemist and concrete technologist have their hands full in overcoming the difficulties outlined above. Constant study and experiment, however, is gradually bringing about a more complete understanding of the subject and the problems are gradually being solved with the result that the average quality of concrete products has been increasing each year.

NEW FORMULAS DEVELOPED

New cements are being developed which evolve less heat in setting and consequent lessened volumetric changes without material sacrifice in early strengths. Other cements are being manufactured which develop a high early strength without most of the objectionable features which, in the past, have been associated with this grade of material. Formulas have been worked out for the designed concrete mixtures which will result in the densest concrete obtainable with a given amount of cement, and methods of manufacturing and compacting concrete masses have been developed to the extent where it is possible to manufacture concrete which will develop strengths several times the average strengths of a few years ago without increase in the cement content.

The California Materials and Research Department has contributed its share to the increased knowledge of this subject, and a considerable part of the time of the laboratory force is spent in studying the materials and combination of materials furnished for each construction project to the end that the best possible results may be secured, thereby saving hundreds of thousands of dollars annually in the increased service and life accruing from high class concrete construction.

Fourteen Major Highway Projects on Schedule for Month's Advertising

COLONEL WATER E. GARRISON, Director of the Department of Public Works, during the month of July, planned to advertise fourteen major projects for construction on State highways at an estimated cost of \$3,300,000.

These projects included ten road jobs and four bridge jobs. The road projects cover work on approximately 88 miles of State highway, amounting to some \$2,850,000, and the four proposed bridge projects will involve the construction of seven bridges at an estimated cost of about \$450,000. The work is distributed well over the State and is located in twelve counties.

The following brief description of a few of the more important projects proposed for July advertising give a conception of portions of the work as it has been planned.

In Los Angeles County the construction of the Ridge Route Alternate is moving forward. The grading on the fourteen and one-half miles covering the southern half of this new mountain highway has been completed from Castaic School to Piru Creek and grading on the northerly half, from Piru Creek to Gorman, is progressing. It is now proposed to advertise a project for placing a thirty-foot Portland cement concrete pavement on the newly constructed roadbed on the southern 14.5 miles. Full details of the new routing of this important connection between southern California and the San Joaquin Valley are given in another article in this issue.

INCLUDES FOUR BRIDGES

As another unit in the construction of this new Ridge Route Alternate it is planned to call for bids during July for the construction of four steel girder bridges across Piru Creek to effect the necessary crossings of this stream in the Piru Gorge. The bridges will be four and five span structures of lengths varying from 280 to 340 feet.

The State highway which leads into the Sequoia National Park from Visalia is to be constructed on new location from Lemon Cove, 19 miles east of Visalia, to the town of Three Rivers. This relocation covers some

8.5 miles of State road in Tulare County and will eliminate a section of sharp curves and broken grades. The total curvature on the existing route is 3798 degrees while the curvature on the new location amounts to only 534 degrees.

ALONG KAWEAH RIVER

There will be a saving of about 1.1 miles in distance by the relocation, as the highway will be constructed along the Kaweah River from a point about two miles easterly of Lemon Cove to the end of the project. The new construction will consist of a 24-foot roadbed with a bituminous treated surfacing 20 feet wide.

Two years ago the 12-mile section of the Ukiah-Tahoe lateral leading eastward from Nevada City was graded. It is now proposed to reinforce the grade where settlement has taken place and surface the entire distance from Nevada City to one mile west of Washington Road with a bituminous surface treatment. This lateral, which connects the Auburn Truckee route across the Sierra Nevada at Emigrant Gap with the Redwood Highway at Ukiah, is rapidly being improved to modern standards.

SURFACING FOR LATERAL

It is also planned to advertise for bids during the coming month for the placing of a similar surface on the roadbed which was graded a year ago on the section of this route from Abbott Mine in Lake County to a point five miles west of Williams in Colusa County. This section of the Ukiah-Tahoe highway leads from the mountains of Lake County down to the floor of the Sacramento Valley.

An important improvement to the heavily traveled Sacramento-Los Angeles artery will be put under way this month with the advertising for the construction of a 1250-foot steel and concrete girder bridge across the Merced River near Livingston in Merced County. This new structure will replace the old 1390-foot steel truss and stringer bridge with its narrow roadway which was built in 1913 by the county.

Work Offered to Bidders in July

The following improvements with an estimated total cost of approximately \$3,300,000 were planned to be advertised for bids prior to August 1. The proposed work includes 14 major road projects totaling 88 miles of State highway, and seven bridges in 12 counties as follows:

DETAILED LIST OF PROJECTS

County	Location	Miles	Type of Surface
Los Angeles	Brea Canyon Road to Pomona	6.2	Port. Cem. Con. Pave.
Alameda	Castro Hill to Stanton Avenue	2.4	Port. Cem. Con. Pave.
Los Angeles	Castaic to Piru Gorge	14.4	Port. Cem. Con. Pave.
Imperial	Sand Hills to Araz Junction	7.9	Asphalt Con. Pave.
Shasta	Canyon Creek to Hat Creek Summit	10.2	Bit. Treat. Crush. Rock
Tulare	Lemon Cove to Three Rivers	8.5	Bit. Treat. Crush. Rock
San Bernardino	Camp Waterman to Arrowhead Spgs.	4.5	Bit. Treat. Crush. Rock
Lake and Colusa	Abbott Mine to 5 Mi. W. of Williams	18.9	Bit. Surf. Treat.
Nevada	Nevada City to Washington Road	11.7	Untreated Crush. Rock and Armor Coat.
Monterey	San Remo Divide to Carmel River	3.7	Graded Roadbed
San Joaquin	Across Paradise Cut	----	Steel Stringer Bridge
Merced	Across Merced River near Livingston	----	Steel and Conc. Br.
San Joaquin- Stanislaus	Across Stanislaus River	----	Conc. and Steel Br.
Los Angeles	Across Piru Creek	----	4 Reinf. Conc. Gir. Br.

SUMMARY

Type	Miles	Amount
Portland Cement Concrete Pavement-----	23.0	\$1,012,700
Asphalt Concrete Pavement-----	7.9	418,400
Bituminous Treated Crushed Rock Surfacing-----	42.1	1,193,900
Untreated Crushed Rock Surfacing-----	11.7	41,000
Graded Roadbed-----	3.7	176,000
Bridges-----	(7)	477,400
Totals-----	88.4	\$3,320,000

New State Building in Los Angeles Dedicated With Impressive Ceremony

WITH massed bands, totaling 1000 musicians playing and 100 airplanes from March Field circling over the heads of thousands of cheering citizens and distinguished guests, including 2 governors of other States, Governor James Rolph, Jr., dedicated the new State Building in Los Angeles with impressive eloquence and ceremony on July 29th.

Taking place on the day preceding the 10th World Olympiad, the event was made more spectacular and colorful by the gala la fiesta spirit prevailing in the southern metropolis and reflected in all the arrangements made by Chairman John G. Mott and his citizens committee representing the 13 southern counties, assisted by Deputy Director of Public Works James I. Herz and State Architect George B. McDougall.

SURROUNDED BY FLAGS

The speakers' stand, accommodating 150 distinguished guests, occupied the center of the Spring Street front of the building facing the city hall and the open areas of the Civic Center. In front of the stand a roped-off area of Spring Street provided space for 1500 invited guests. The massed bands of 1000 instruments occupied the high ground just to the rear of the speakers' stand while 400 flag bearers were grouped behind and around the platform, surrounding it on three sides with myriad waving colors.

The east front of the towering structure was gaily decorated with banners and bunting and massed in front of it was a great throng, filling the space provided for the accommodation of 50,000 people by the closing off of Main Street from First to Broadway and Spring Street from a point between Second and First streets to about Temple Street.

100 PLANES MANOEUVRE

The dedication was preceded by a public luncheon at the Biltmore Hotel under the auspices of the Los Angeles Chamber of Commerce and the Los Angeles Rotary Club, at which Hon. Charles Curtis, Vice President of the United States, and Governor James Rolph, Jr., were the guests of honor. The governors of 2 other States and representa-

tives of 13 southern counties were among the distinguished guests.

On arrival at the State Building the Vice President was accorded a salute of 19 guns by the 160th Infantry, "Los Angeles' Own."

The dedication ceremonies began at 2 o'clock with an exhibition of aerial manoeuvres by the 100 planes from March Field, under command of Col. Henry H. Arnold. The dedication program, beginning at 3.30 p.m., was as follows:

America.....	Massed bands (1000 pieces) —Massed Colors
Invocation.....	Rt. Rev. W. Bertrand Stephens
Address of Welcome.....	Hon. John G. Mott General Chairman
Remarks.....	Hon. John C. Porter Mayor of Los Angeles
Introduction of distinguished guests.	
Presentation Distinguished Flying Cross to Amelia Earhart Putnam by the Hon. Charles Curtis, Vice President of the United States.	
Remarks.....	His Excellency Governor Balzar of Nevada
Remarks.....	Hon. Wm. M. Garland Chairman Olympic Games
Remarks.....	Rabbi Edgar Magnin
Remarks.....	Colonel Walter E. Garrison Director of Public Works
Remarks.....	Rolland A Vandegriff Director of Finance
Dedicatory Address.....	
His Excellency James Rolph, Jr. Governor of California	
Benediction.....	
Rt. Rev. John Cawley Massed Band of 1000—Massed Colors	

\$2,000,000 INVESTMENT

The State Building represents an investment of upwards of \$2,000,000 and is the culmination of many years of effort on the part of the people of southern California to secure an adequate and suitable building in which to house various State department offices in the southern city. There are 25 departmental divisions, bureaus and commissions accommodated in the building.

In addition to these, the building provides accommodations for the Supreme, Appellate and Superior courts, quarters for the Governor and Lieutenant Governor and a large assembly hall.

The building is 13 stories high, monumental in design, of Class A construction,



AN IMPOSING STRUCTURE is the thirteen-story Class A State Building in Los Angeles, formally dedicated by Governor James Rolph, Jr., on July 29 with impressive ceremony, in the presence of a great throng of citizens and distinguished guests, including eleven governors from other States. The occasion was marked by the flight of 200 planes in aerial manoeuvres over the scene while massed bands aggregating 1000 instruments played inspiring music between addresses by notables and officials.

built of reinforced concrete, structural steel, granite and terra cotta. The architects were John C. Austin and Frederick M. Ashley of Los Angeles. It was erected under the direction of Colonel Walter E. Garrison, Director of the Department of Public Works and State Architect George B. McDougall.

SAVES \$85,000 RENTALS

The imperative need for the building grows out of the fact that the State has been paying rentals for very inefficient office space in Los Angeles of approximately \$85,000 annually. The building will just about supply the present needs for floor space.

It is significant that approximately all of the material for the building except the

structural steel was obtained in California and the fabrication of the structural steel was done in the city of Los Angeles.

The history of the new building dates back to the Legislature of 1925 which passed an act later ratified by the people at a general election in November, 1926, authorizing a bond issue including \$1,250,000 for the construction and equipment of a State Office Building in the city of Los Angeles. Subsequently an additional sum of \$607,350 was appropriated by the 1931 Legislature to construct two additional wings made necessary by insistent demands for additional space.

This property was deeded to the State free of cost by the county of Los Angeles and will be a part of the new Civic Center.

Vast Excavation Program Involved

(Continued from page 16)

Elimination of 1180 feet adverse grade, all sharp curvature, stretches of grade exceeding six per cent maximum and excessive superelevation by substitution of the high standards to be secured on the new location is expected to reduce operating expense on the other 26.85 miles at least 1 cent per mile as an average for all vehicles. This will amount to an annual saving in operation of \$392,000.

By providing on the new highway high standards of alignment and grade, from an analysis of recorded prevailing speeds, the average speed should be advanced 50 per cent on all classes of vehicles except the heaviest trucks. Light vehicles will cut an average of three-fourths hour from average time over present routing which will be equivalent to 985,500 hours annually.

TIME SAVINGS HIGH

This element of time can not be valued accurately, but is certainly a decided advantage particularly to business men. To commercial vehicles this time element is given an approximate monetary value. Assuming one-third hour saved for each truck and with driver's salary and rental value of \$3 per hour, there is an annual saving of \$110,000.

Other savings of the new location such as safety, comfort and decreased maintenance of roadway have not been evaluated.

Summing up tangible values we have:

Due to distance reduction.....	\$867,000
Due to lower operating cost on shorter route	392,000
Due to time factor on commercial vehicles	110,000

Total ANNUAL saving over next 10 years

\$1,369,000

The cost of the new route is estimated to be approximately \$2,900,000.

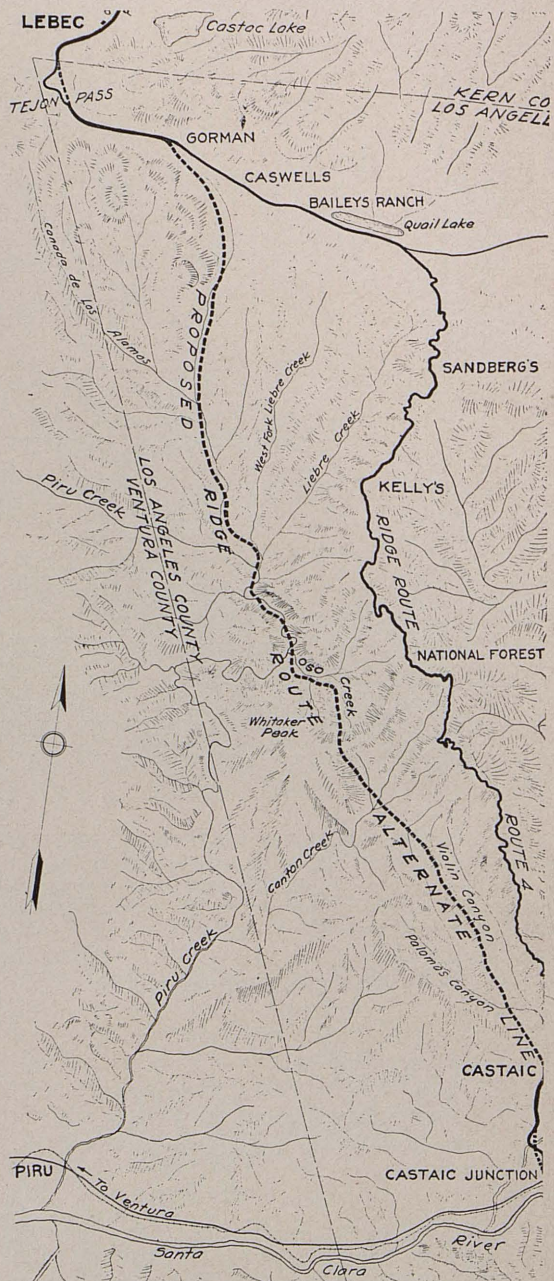
The annual saving capitalized at 5 per cent equals \$27,380,000, which is roughly 9½ times the cost of the new route.

Surveys and plans progressed to a point where the first grading contract on the southerly end of the project was awarded in February, 1930. This covered the grading and drainage structures from Castaic School to Canton Creek, a distance of 7.1 miles. The second grading contract, from Canton Creek to Piru Gorge, a distance of 7.32 miles, was awarded in April, 1931, and the final 12.5-mile grading contract from Piru Gorge to a point on the present Ridge Route near Gorman, was awarded in July, 1931.

VAST EXCAVATION

These three contracts involved the excavation of 3,712,000 cubic yards of earth and rock. On this vast excavation program there have been as many as 10 power shovels working at a time, three shifts per day. A fleet of trucks is required to haul this material to its final location in the highway embankment.

Numerous difficulties have been met and overcome. Channels of some of the creeks have been changed, the creeks being diverted around the highway embankments in concrete lined channels. A great many cul-



MAP SHOWING more direct line of proposed Ridge Route Alternate as compared with present route between Castaic and Gorman.

Ridge Alternate to Open for Traffic by End of This Year

(Continued from preceding page)

verts, slope drains and other structures are being provided to protect the embankments from erosion.

In keeping with modern highway construction practice, embankments are being placed in thin layers, each layer being wet and rolled before the succeeding layer is spread. This results in thoroughly compacted embankments on which pavement can be placed immediately, without waiting for them to settle.

The first grading contract was completed in August, 1931. The other two grading contracts should be completed by next September.

SEVEN BRIDGES

These grading contracts have not included the larger bridges on the route. There are seven of these to be built. A contract has recently been let for constructing three of them—one across Gorman Creek and two across Alamo Creek. It is planned to let a contract in the near future for the remaining four bridges across Piru Creek.

It is impossible to say at this time when the last paving contract will be let or when it will be completed. From present indications it seems probable that the entire Alternate Ridge Route will be paved and opened to traffic in the latter part of 1933.

This improvement, combined with an improved location from Gorman to the Kern County line for which plans are in progress, the new alignment which will eliminate Grapevine Grade in Kern County and the Weldon Canyon cutoff which has already been completed, will form a continuous high speed highway from Los Angeles to the San Joaquin Valley. Perhaps by the end of 1933 or possibly a little later one can drive from Los Angeles to Bakersfield in 2½ hours without exceeding the speed limit.

COMPARATIVE COSTS

Some may wonder why, with such a location as the Ridge Route Alternate possible, it was not built originally in place of the tortuous alignment of the old Ridge Route. The answer is simple when one takes into consideration the limited funds available in 1912 and the improvement in highway construction equipment since that date. The average cost per cubic yard for excavation on the old route was 42 cents; that on the new route 30 cents. There were but 1,023,000 cubic yards of excavation on the old route; on the new there are 3,712,000 cubic yards. The unit cost of overhaul of excavated material in constructing the old route was nearly three times the contracted unit prices on the new. The old route required 393,000 station yards of overhaul; the new route will require 24,324,000 station yards or 62 times more.

The cost of grading and structures alone on a road similar to the Ridge Route Alternate at the contract price paid for the original Ridge Route would be \$2,549,000 or nearly five times what this work cost on the original route. It would have cost a sum equal to nearly 1/7 of the original State highway bond issue which had to be apportioned over the entire State at that time. It is little wonder then that a road was built which came within the funds available and which could serve the public for so many years.

State Aids Fresno in Building Traffic Circle Improvement

(Continued from page 2)

right turns only. No great additional length of travel is necessary for any combination of movements. The traffic is thus required to "weave" across to the intersection desired rather than to concentrate at a direct intersection of traffic flow.

The Kern County Planning Commission had previously acquired valuable data from the East and had proposed the traffic circle as a solution of one of their problems in Bakersfield. Their plan therefor antedates the one at Fresno but this one is the first to be constructed in California.

PROVIDES PARK ENTRANCE

The land occupied by the circle was largely public park and road space, and the improvement provides a more attractive and less dangerous entrance to the park.

Detail work on plans and actual supervision of the construction were under supervision of the city of Fresno, in cooperation with the Southern Pacific Railroad Company. Plans and specifications were approved by the State. Two contracts were required for the project, the traffic circle and connection pavements being awarded to a Fresno company for \$30,929.50 and the subway contract awarded to another Fresno company for \$57,057.25. Additional work not included in the above contracts is the superstructure and placing of tracks by the railroad company, the landscaping and ornamentation of the traffic circle and the right of way costs.

COST OVER \$200,000

The State provided \$70,000 for the improvement; Fresno County \$30,000; the Southern Pacific Railroad Company between \$70,000 and \$80,000 and the city of Fresno the balance, which will probably be about \$40,000.

A plaque will be placed in the traffic circle acknowledging the cooperation of the State.

A formal celebration marking the opening of the improvement was participated in by officials of Fresno City and County, the State, Southern Pacific Railroad Company, civic organizations and the general public.

"I see you're letting your little son drive the car."
"Yes, he's still too young to be trusted as a pedestrian."—*Mouthpiece.*

Narrow Road Took Toll of Accidents

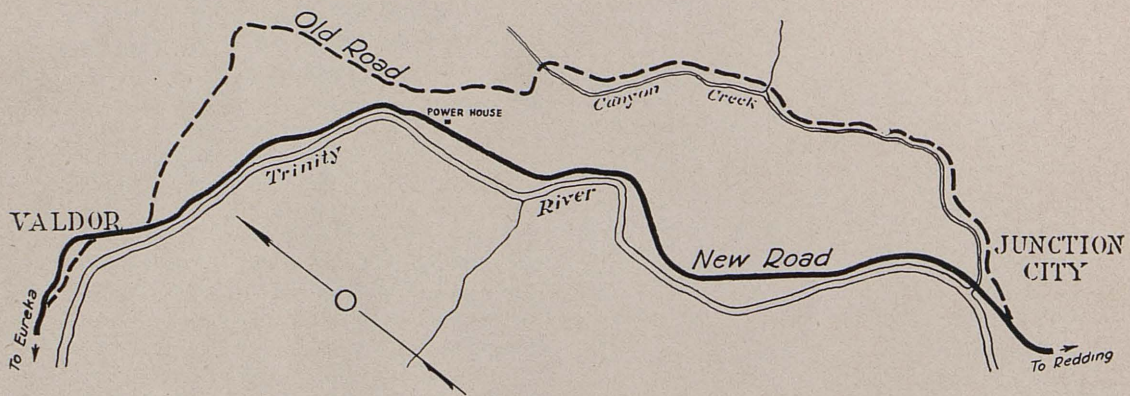
Continued from page 13)

a section 150 feet in length, containing 10,250 cubic yards of solid rock. The height of the formation prohibited the use of down holes with economy, and the use of the coyote method was frowned upon because of the possibility of heavy overbreak.

However, after considerable deliberation and study on the part of the department's engineers and representatives of powder companies, the latter method was chosen as it was desirable to waste as much of the material as possible due to a surplus in the vicinity. Two parallel tunnels were drilled along the gutter lines of the road, three small pockets being

All construction materials were hauled to the work by motor truck from Redding over 60 miles of highway. The improvement of the road between Redding and Weaverville, a distance of 50 miles, was a big factor in cutting transportation costs and increasing speed of delivery. The location of this work was a few years ago a five-hour trip from Redding by automobile, while at the present time it may be covered in two hours by experienced drivers.

The location of the camp for a convict project was ideal. Situated on the Trinity River on a small, wooded flat, inaccessible to



provided in the outer one and five in the inner. Loads were placed in proportion to the volume of rock to be dislodged, nearly six tons of powder being used.

BIG SHOT SUCCESSFUL

The charges were detonated simultaneously with electricity. Approximately two-thirds of the cut was laid clear of the roadway, falling into the Trinity River. Considerably less than the usual amount of overbreak developed, and it is probable, because of the structure of the formation, that any other method would have developed as much.

The work is being prosecuted with a force consisting of 50 convicts and about 12 free men. These forces are also used in the clearing of right of way, construction of drainage structures and other activities which go into the building of a highway. A one-yard Os-good gasoline powered shovel is being used.

motor vehicles, it was necessary first to build a road over which to transport the camp construction materials and equipment. The convicts were removed from contact of any kind with the traveling public, which was unaware until the opening of the new unit, of the existence of such a camp, or even of the construction project, as it was removed from the existing traveled road except at the extreme ends.

An interesting feature of the alignment is the absence of sharp curvature. The minimum radius of curvature is 525 feet and the maximum, 5000 feet. The lineal footage of curvature is exactly one-half of the total length of the project or 2.37 miles. The tabulation below indicates several of the features of the work commented on in the text. It will be noted that the curvature is remarkably easy for mountainous location. Following tabulation gives complete figures:

Mountain "Hydraulicked" Into Stream

(Continued from preceding page)

<i>Radius</i>	<i>Radius</i>	<i>Radius</i>
525' to 850'	1000' to 1800'	3000' to 5000'
9 curves	14 curves	2 curves
370° total delta	299° total delta	24° total delta
4106 feet	6882 feet	1513 feet
Total length of job-----	4.76 miles	
Total length of old road-----	5.06 miles	

HAZARD REMOVED

The opening of this project to traffic hinged upon the completion of the Canon Creek bridge at Junction City which was let under contract by the Bridge Department. Prior to the completion of the structure, a ford in the creek was used by our own forces, but this was not open to public travel. However, upon completion of the bridge on June 25, the section between Junction City and Valdor, which had already been processed with fuel oil as a dust palliative, was turned over to traffic and the necessity of using the old hazard removed.

The scenic attractions on this unit are not of the usual character found in mountainous localities. While the country is rough and rugged, vegetation is not thick or vigorous and does not attract the eye as in the heavily forested areas.

The principal points of interest are the traces left on the face of Mother Nature by the placer mining operations of former years. Great scars and gashes cleave the mountain sides where the gravelly earth has been torn out by the terrific force of hydraulic giants and washed away through sluiceways ingen-

iously devised to trap the precious gold particles hidden there.

The broad cobbly bed of the Trinity River with its widening low water channel is composed of the gravelly waste resulting from these operations and extends along its canyon and tributaries for miles in depths as great as 100 feet. The easterly end of the project is at Oregon Gulch, near the great La Grange mine, one of the largest placers in the world, where a whole mountain was torn away, and discharged into the channel of the gulch.

PARADISE FOR HUNTERS

Fortunes were made in this locality and fortunes lost in the delvings for the precious metal, and in all probability there are fortunes yet remaining, if one but knew where to search.

Route 20 provides access from the Sacramento Valley and from the coast to a veritable paradise for hunters and fishermen. During the hunting season a heavy increase in traffic is noticeable, and during this period one daily sees successful exponents of the rod and gun returning homeward with their trophies. Trinity County provides vacation areas favored by many, and improved highways are gradually making these more easily accessible as well as providing a quick outlet to the coast from the hot interior for week-end vacationists.

Plans to Celebrate Birthday of Nobel

The Institute of Makers of Explosives, New York City, will observe in 1933 the centennial of the birth of Alfred Bernhard Nobel, "the father of high explosives."

The institute points out that "Nobel's discovery of dynamite was one of the greatest boons to the advancement of civilization the world has known since the printing press was invented." He was born in Sweden, October 21, 1833; educated in America and Russia.

The first successfully to manufacture and use nitroglycerine as a blasting agent, he also invented blasting-gelatine, gelatine-dynamite, and a smokeless powder.

Guide—"This is a skyscraper."
Sweet Young Thing—"Oh, my—I'd love to see it work."—*San Joaquin Power Magazine.*

PINES-PALMS HIGHWAY

OPENED WITH CELEBRATION

Opening of the Pines-to-Palms Highway in Riverside County, a cooperative project between Riverside County and the U. S. Forest Service, was celebrated at Keen Camp at San Jacinto Mountain, June 18.

This road, graded to modern standards, leads from the 4800-foot elevation of pine-clad San Jacinto Mountain nearly to sea level of Coachella Valley and the Palm Springs area. It offers a direct route for residents of Coachella and Imperial Valley into the cool recreation land of the San Jacinto Mountains.

The celebration featured a mid-day barbecue, speeches by several prominent road enthusiasts, music and appropriate entertainment, with dancing during the evening.

He (awkward dancer)—"It was nice of you to give me this dance."

She (sweetly)—"Not at all—this is a charity ball."

Highway Bids and Awards for June

AMADOR COUNTY—Between Amador City and Martell, about 4.8 miles to be surfaced with bituminous treated crushed gravel. Dist. X, Rt. 65, Sec. B. Hemstreet & Bell, Marysville, \$15,326; Tiffany, McReynolds & Tiffany, San Jose, \$14,753; Pereira & Reed, Tracy, \$15,073; A. Teichert & Son, Inc., Sacramento, \$14,058; C. W. Wood, Stockton, \$13,945; Granite Construction, Watsonville, \$16,198. Contract awarded to Willard & Biasotti, Stockton, \$12,609.

CONTRA COSTA COUNTY—Dist. IV, Route 14—Between San Pablo Creek and Carquinez Bridge, about 10.6 miles to be graded and paved with P. C. C. and A. C. Kern & Kibbe, Portland, Ore., \$374,669.25; Clark & Henery Construction Co., San Francisco, \$396,545.30; Clyde W. Wood, Stockton, \$371,500.35; Peninsula Paving Co. and J. P. Holl and Inc., San Francisco, \$334,773.45; Frederickson & Watson Construction Co., Frederickson Bros.-Jones and King, Oakland, \$351,596.40; Union Paving Co., San Francisco, \$333,526.85; Hanrahan Co., San Francisco, \$324,333.10; D. McDonald, N. M. Ball and A. Teichert & Son, Inc., \$384,682.35. Contract awarded to Basich Brothers Co., Torrance, \$322,793.10.

DEL NORTE COUNTY—Dist. I, Route 1—Between Crescent City and Madrona Camp, 6.9 mi. to be surfaced with bituminous treated crushed gravel or stone. Pacific States Construction Co., San Francisco, \$62,433.85; A. Teichert & Son, Inc., Sacramento, \$63,807; Hemstreet & Bell, Marysville, \$59,906.95. Contract awarded to Mercer-Frazier Co., Eureka, \$58,028.25.

KERN COUNTY—Dist. VI, Route 57—Between Democrat Springs and Weldon, about 30.6 miles of dust oiling. Hartman Construction Co., Bakersfield, \$12,630; Oilfields Trucking Co., Taft, \$10,871.10; Fred W. Nighbert, Bakersfield, \$10,998. Contract awarded to Western Motor Transfer, Inc., Santa Barbara, \$10,321.20.

MONTEREY COUNTY—Dist. V, Route 56—Monte-rey County, between city limits of Carmel and Carmel River Bridge, about 1.9 miles, portions to be treated with fuel oil and seal coats to be applied over entire length. Contract awarded to Granite Construction Co., Watsonville, \$2,801.55.

MONTEREY COUNTY—Dist. V, Route 2—Monterey County between 2 miles and 9 miles north of Salinas, 5.5 miles to be treated with heavy fuel oil on each side of pavement and 1.4 miles finishing shoulders. Granite Construction Co., Ltd., Watsonville, \$6,412.95; Stewart & Nuss, Inc., Fresno, \$6,213.35; Lee J. Immel, Berkeley, \$6,121.40; Peninsula Paving Co., San Francisco, \$7,165. Contract awarded to Santa Maria Construction Co., Santa Maria, \$6,002.60.

SAN BERNARDINO COUNTY—Between Halloran Summit and Mountain Pass, 16.5 miles to be graded and surfaced with oil treated crushed gravel or stone. Dist. VIII, Route 31, Sec. MN. Fred W. Nighbert, Bakersfield, \$230,522; Dodge Bros., Inc., and A. Teichert & Son, Sacramento, \$227,648; Peninsula Paving Co., and J. P. Holland, San Francisco, \$231,412; Gibbons and Reed, Burbank, \$246,980; Sander Pearson, Santa Monica, \$246,890; Griffith Company, Los Angeles, \$230,252; Isbell Construction Co., Carson City, Nevada, \$279,954; V. R. Dennis Const. Co., San Diego, \$231,439; R. E. Hazard Const. Co., San Diego, \$219,746. Contract awarded to Basich Brothers, Torrance, \$218,690.

SAN BERNARDINO AND RIVERSIDE COUNTIES—Dist. VIII, Routes 26, 59, 43—Between Corona and Orange County line; between Santa Ana River Bridge and Ontario; between junction routes 31 and 59 and L. A. County line, 45.6 miles shoulders and roadbed to be treated with oil. R. E. Hazard Contracting Co., San Diego, \$41,538.40; F. W. Teschke, Hollywood, \$40,113.60; Martin Bros. Trucking Co., Long Beach, \$42,524.80; Kemper Construction Co., Ltd., Los Angeles, \$39,017.60; Miracle Co., San Diego, \$41,867.20. Contract awarded to Southwest Paving Co., Los Angeles, \$38,140.80.

SAN LUIS OBISPO COUNTY—Dist. VI, Route 56—Two steel stringer bridges, about 6 miles south of San Simeon. R. R. Bishop, Long Beach, \$71,103.15; Carl N. Swenson Co., San Jose, \$66,207.80; M. A. Jenkins & J. W. Hoopes, Sacramento, \$66,940.80; Barrett & Hilb, San Francisco, \$74,342.50; Rocca & Caletti, San Rafael, \$77,033.30; Fredrickson & Watson Construction Co. and Fredrickson Bros., Oakland, \$67,855.95; Lord & Bishop, Sacramento, \$70,027.90; Geo. J. Ulrich

Construction Co., Modesto, \$71,994.20; M. B. McGowan, Inc., San Francisco, \$67,459.82; Smith Bros. Co., Eureka, \$74,077.15; Hartman Construction Co., Bakersfield, \$69,005.20; Dodge Bros., Inc., Fallon, Nevada, \$76,847; Oberg Bros., Los Angeles, \$77,781.69; M. J. Bevanda, Stockton, \$66,261.90; Byerts & Dunn, Los Angeles, \$97,233.50; Gist & Bell, Arcadia, \$67,720. Contract awarded to J. W. Terrell, Sacramento, \$63,223.80.

SAN LUIS OBISPO COUNTY—Dist. V, Route 56—Between Cambria and 1 mile north of San Simeon, about 9.7 miles to be graded and paved with bituminous treated crushed gravel or stone. Western Motor Transfer, Inc., Santa Barbara, \$208,681.28; Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, \$170,893.40; M. J. Bevanda, Stockton, \$177,912.65; Hemstreet & Bell, Marysville, \$162,117.55; Eaton Smith, San Francisco, \$205,301.90; Hartman Construction Co., Bakersfield, \$177,179.70; A. Teichert & Son, Inc., Sacramento, \$158,225.30; Clyde W. Wood, Stockton, \$173,005.50; Peninsula Paving Co. and J. P. Holland, Inc., San Francisco, \$164,723.30; Hanrahan Co., San Francisco, \$158,619.90; C. T. Malcom & Tieslau Bros., Walnut Creek, \$201,396.75. Contract awarded to Granite Construction Co., Ltd., Watsonville, \$144,687.30.

SANTA CLARA COUNTY—Dist. IV, Route 2—Between Gilroy and the Pajara River, rock borders to be bituminous surface treated and earth shoulders to be treated with fuel oil as a dust palliative. Lee J. Immel, Berkeley, \$3,925; Granite Construction Co., Watsonville, \$4,190; Tiffany, McReynolds, Tiffany, San Jose, \$4,562.50. Contract awarded to Pacific Truck Service, Inc., San Jose, \$2,958.

SISKIYOU COUNTY—Dist. II, Rt. 3—At Cottonwood Creek, about 0.8 mile to be graded and surfaced with bituminous treated crushed gravel or stone. J. P. Brennan, Redding, \$21,900.05; A. Young, Yreka, \$22,965.38; Dunn & Baker, Klamath Falls, Oregon, \$18,807.35; Milton A. Purdy, San Francisco, \$25,624.50; Tiffany, McReynolds, Tiffany, San Jose, \$16,533.93; Hemstreet & Bell, Marysville, \$18,229.88. Contract awarded to Skeels & Graham Co., Inc., Roseville, \$15,984.04.

VENTURA COUNTY—Dist. VII, Route 60—Between Calleguas Creek and the L. A.-Ventura County line, about 10.1 miles shoulders to be treated with fuel oil. Western Motor Transfer, Inc., Santa Barbara, \$5,232.60; Consumers Oil Co., San Gabriel, \$5,265; E. P. Ferry, Glendale, \$7,263. Contract awarded to Oilfields Trucking Co., Taft, \$5,211.

YOLO COUNTY—Dist. X, Route 6—Between Swingle and Yolo Causeway, about 1.7 miles to be graded and paved with P. C. C. Hanrahan Company, San Francisco, \$60,111.30; Clyde W. Wood, Stockton, \$58,728.30; Bundesen and Lavritzen and Delta Dredging Co., Pittsburg, \$60,260.10. Contract awarded to D. McDonald, Sacramento, \$55,481.55.

JUNE ARCHITECTURAL AWARDS

Pomona Armory—California National Guard, contract for general work to Louis A. Geisler, Huntington Park, \$19,616; for electrical to H. H. Walker, Inc., Los Angeles, \$1,073; for plumbing and heating to Toner & Brooks, Pomona, \$2,235.

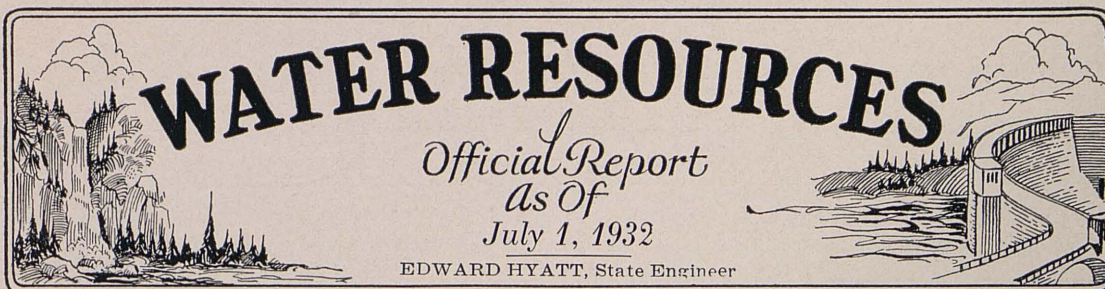
Highway Patrol Station at Merced—Contract for complete work to Oliver S. Almlie, San Francisco, \$5,940.

California School for the Deaf, Berkeley—Contract for improvement to playgrounds to Ariss Knapp Company, Oakland, \$8,600.

Mendocino State Hospital—Fire house, contract to E. T. Leiter & Sons, Oakland, \$10,837.

Stockton State Hospital—Installation refrigeration work in Kitchen and Bakery Building to Oakland Refrigeration and Butcher Supply Company, \$9,447.

The Department of Agriculture estimates farm population at 27,430,000 on January 1, against 27,222,000 in the year previous, the first increase recorded since 1922.



The development and achievements of the irrigation districts of California in the forty-five years since the passage of the act authorizing their organization with details of their operations in 1931, are given in the following report of State Engineer Edward S. Hyatt covering the activities of the Division of Water Resources for the month of June. Approval of plans for the construction of the huge San Gabriel Dam No. 1 by the Los Angeles County Flood Control District is announced. Other matters affecting dams, flood control and water distribution projects, snow surveys and stream flows are detailed in the report which follows:

Bulletin 21-C, a report on California irrigation districts for 1931, has been completed. This is the fourth bulletin of this character issued by the State since 1928, bringing up to January 1, 1932, authentic historical, financial and statistical data on California irrigation districts, and recording such other information of interest as was obtained on irrigation district activities in 1931.

It is noted that in the 45 years since the passage of the Wright Irrigation Act, 167 irrigation districts have been formed in California, 50 of which have been dissolved through legal proceedings. Two districts, the Crescent in Kings County and the Tia Juana River in San Diego County, were dissolved in 1931. There are approximately 4,000,000 acres in the 117 districts still retaining their organizations. Twenty-five of these are inactive, in that they have constructed no works and furnish no water to the included lands. One district, the Empire West Side, Kings County, was organized in 1931.

MAJOR RESERVOIRS

There are 24 major reservoirs, with a combined capacity of 1,413,000 acre-feet, in use by irrigation districts. Water stored for the season of 1931 amounted to 287,500 acre-feet, or about 20 per cent of the total capacity of the reservoirs. Diversions reported were 4,631,204 acre-feet by gravity, 765,560 acre-feet pumped from streams and 297,236 acre-feet pumped from wells. The total is 5,694,000 acre-feet, or about 80 per cent of the amount diverted in 1930.

The districts operated 295 irrigation wells and 252 drainage wells, and for all pumping operations reported an installation of 41,766 horsepower. To supplement the water supply furnished by the irrigation districts, landowners were reported as operating 12,519 irrigation wells. Twenty-one thousand acres more than for the previous year were reported irri-

gated. The districts contain a total estimated population of 324,500.

DISTRICTS VISITED

In connection with feasibility reports, conferences on district affairs and obtaining information necessary to the State Engineer's office, the following districts were visited: West Stanislaus irrigation district, Stanislaus County; La Canada and Palmdale irrigation districts, Los Angeles County; proposed Elsinore and Ladera irrigation districts, Riverside County; Fallbrook, Vista, Ramona, Lakeside, La Mesa, San Ysidro, Santa Fe and San Dieguito irrigation districts, San Diego County; Carpenter, Serrano, Newport Heights and Newport Mesa irrigation districts, Orange County; Buena Vista water storage district, Kern County.

DAMS

To date 810 applications have been received for approval of dams built prior to August 14, 1929; 94 for approval of plans for construction or enlargement and 269 for approval of plans for repairs or alterations.

Applications Received for Approval of Plans for Repair or Alteration.

Dam	Owner	County
Lower Stuarts Fork	La Grange Placers	Trinity
Pope	Lizzie Pope	Modoc
Lake of the Woods	Mr. and Mrs. J. D. Cuddy	Kern
San Carlos	Rancho San Carlos, Inc.	Monterey
Reflection Lake	Cal. Pac. Title & Trust Co.	San Mateo
Forest Lake	Monterey County Water Works	Monterey
Duke Res. No. 2	Royal E. Williams	Modoc
L. Wohlford	Escondido Mutual Water Company	San Diego

Plans for construction were approved for the San Gabriel No. 1 Dam to be built by the Los Angeles County Flood Control District. This is to be a huge rockfill structure 300 feet in height from streambed to spillway crest and having a storage capacity of 68,000 acre-feet at a cost of \$10,000,000. It will be situated in the San Gabriel Canyon about 6 miles northeast of Azusa in Los Angeles County and will be used for flood control and water conservation purposes.

Plans for Repairs or Alterations Approved.

Dam	Owner	County
Puddingstone	L. A. Co. Flood Control District	Los Angeles
McBrien River	McBrien Est. & Mrs. E. G. McConnell	Modoc
Feather River, Lower	Feather River Improvement Co.	Plumas
Lower Stuarts Fork	La Grange Placers, Ltd.	Trinity
Lake of the Woods	Mr. & Mrs. J. D. Cuddy	Kern
San Carlos	Rancho San Carlos, Inc.	Monterey
Cuyamaca	La Mesa, Lemon Grove and Spring Valley Irrigation District	San Diego
South Lambert	The Irvine Company	Orange

Mining Operations Using More Water

(Continued from page 31)

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

The equipment and material assembled at Sutter headquarters is being cleaned, repaired, inventoried and stored. Hand tools are being sharpened and conditioned, for which purpose a power grindstone and emery wheels have been installed. In the warehouse yard the runways are being graveled.

The equipment of four small pumping plants has been installed and the irrigation of the willow planting along the east levee of the Sutter By-pass has been commenced. Also, additional willows are being planted along the west side of the borrow pit.

Repairs to bridges and timber structures in the by-pass have been continued, fire guards have been cut, and small crews have been engaged in cutting thistles. This is all routine work performed each year.

On the levees of the Sacramento By-pass, thistles are being cut, and an area in the by-pass is being grubbed preparatory to leveling, and repairs are being made to a number of washes along the south side revetment.

Sacramento Flood Control Project.

Several trips have been made with the District Engineer of the U. S. Engineer Office by launch, for the examination of the river banks requiring protection. These examinations have covered the Sacramento River from Sacramento to Moulton weir and the Feather River to a point 17 miles above Marysville.

Additional work of clearing has been done in the Yolo By-pass near the Southern Pacific trestle, completing this job.

Reports have been rendered on several applications before the Reclamation Board, and work being done under a number of previous applications has been inspected.

Mokelumne River.

Some channel rectification work has been done on the Howard and Garrison ranches, under Chapter 447, Statutes of 1929, consisting of moving certain trees and installing temporary protection of cabled trees and brush.

Russian River Jetty.

Work was commenced on June 1 at the Russian River, with a crew of eight men. Rock is being placed in the jetty at a satisfactory rate, the track and equipment have been placed in good condition, and the connection between the old work and the new steel trestle will be completed shortly. It is expected to deposit rock in the structure to the full capacity of the equipment.

Flood Measurements and Gages.

The San Joaquin River has remained at a low flood stage during this period and several discharge measurements have been taken. In the office, work of preparing reports covering all flood records from 1913 to date for publication in mimeographed form has continued.

WATER RIGHTS

Applications to Appropriate.

A complete list of the applications to appropriate water received and approved during the month of May will be found elsewhere in this issue. Twenty-four applications were received, 7 were denied and 16 were approved, 5 permits were revoked and 9 licenses were issued.

Activity continues to be particularly noticeable in connection with mining, as two of the larger applications received during the month were for mining purposes; one being by William F. Bickel to appropriate 25 second-feet in Nevada County from tributaries of Yuba River and the other being by Chas. E. Hudson and R. E. Colburn to appropriate 12 cubic feet per second from South Fork of Clear Creek, tributary to Klamath River.

LARGE DEMANDS

Among the more notable applications approved during the month was one by Woodbridge irrigation district allowing appropriation of 300 second-feet from Mokelumne River tributary to San Joaquin River at an estimated cost of \$51,600, for the irrigation of some 24,000 acres; one by Edward S. Moore and Santa Lucia Corp., Ltd., of San Francisco, to appropriate from coastal streams in Monterey County for domestic, recreational and subdivision purposes at an estimated cost of \$500,000; two applications by the Preston School of Industry to appropriate 10 second-feet and 2500 acre-feet per annum and 8.3 second-feet and 2500 acre-feet per annum, respectively, from Sutter Creek in Amador County at an estimated cost of \$75,000 each, and an application by Coronado Water Company of San Diego to appropriate 7.74 cubic feet per second and 614 acre-feet per annum for irrigation purposes from Tia Juana River in San Diego County at an estimated cost of \$508,000.

Inspection of projects under permit preparatory to the issuance of license or revocation continued during the month in Sacramento, San Joaquin, Contra Costa and Solano counties.

ADJUDICATIONS

Shasta River (Siskiyou County). A hearing on an order to show cause will be held before the Superior Court of Siskiyou County on June 24, 1932. The purpose of the order and the hearing thereon is to lay the foundation for entry of findings of fact and judgment in the Shasta River adjudication proceedings in the names of the true owners of the water rights and in accord with changes in interest which have occurred subsequent to entry of the Division's Order of Determination. Copies of the order to show cause were served on some 157 parties concerned with changes in ownership of water rights involved in the proceedings.

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.

River Dropping to Summer Levels

(Continued from preceding page)

Oak Run Creek (Shasta County). The Division's report as referee in the Oak Run Creek case was filed in the Superior Court of Shasta County on May 31, 1932. A proposed decree defining the water rights on Oak Run Creek has been approved by counsel for the parties at interest.

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.

New Pine Creek (Modoc County). The Division's report as referee has been filed in the Superior Court of Modoc County, and a proposed decree defining the water rights on New Pine Creek has been circulated among counsel. The court set June 14, 1932, as the time for hearing exceptions to the report of referee and the proposed decree. There being no exceptions filed, the case is now pending entry of the court's decree.

Eagle Creek (Modoc County). The waters of Eagle Creek were distributed throughout the month in accordance with the plan for trial distribution adopted for the 1932 irrigation season.

South Fork Pit River (Modoc County). Field work on the investigation of the water supply and use of water on the South Fork Pit River was carried on throughout the month.

Cottonwood Creek (Modoc County). Field work on the investigation of the water supply and use of water on Cottonwood Creek was commenced on May 20, 1932.

Pine Creek in Surprise Valley (Modoc County). The suit of Evan R. Gaustad and Della V. Gustad vs. R. E. McCulley, et al., involving the determination of water rights on Pine Creek in Surprise Valley, Modoc County, was referred to the Division of Water Resources by the Superior Court of Modoc County by Order of Reference dated May 24, 1932. Field work on the investigation of the water supply and use of water on the stream system was commenced immediately following issuance of the Order of Reference.

WATER DISTRIBUTION

Burney Creek (Shasta County). Water master service for the 1932 season was commenced on Burney Creek about June 1.

Little Shasta River (Siskiyou County). Water master service for the 1932 season was commenced on Little Shasta River June 15.

Cedar, Davis, Deep, Eagle, Emerson, Franklin, Mill, New Pine, Owl, Pine and Soldier creeks and South Fork Pit River (Modoc County). Water master service on these streams was continued throughout the month.

Pit River in Big Valley (Modoc and Lassen counties). Supervision of diversions from Pit River in Big Valley continued throughout the month.

Hat Creek (Shasta County). Water master service on Hat Creek was continued throughout the month.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Routine field work comprising the measurements of all diversions, return flow, use of water, salinity, etc., throughout the Sacramento-San Joaquin territory, has continued during the past month. In the San Joaquin Valley, recorders were installed and return water measurements started previous to the high water resulting from melting snow. During the recent period of the latter, the return water measurements have been temporarily discontinued and will be resumed when the high water has passed.

It appears that the peak of the Sacramento River run-off due to melting snow was reached some time ago and that the river at Sacramento is now dropping to summer levels.

Within the last two weeks a field party has been engaged in sounding the Sacramento River from Sacramento to Red Bluff to establish the relation between navigable depths and discharge of the river. Sampling at permanent salinity stations in the Upper Bay and Delta region and operation of the tide gages have been maintained. Recent salinity tests show the following:

Salinity Tests, Upper Bay and Sacramento-San Joaquin Delta, June 10, 1932

Station	Salinity in parts of chlorine per 100,000 parts of water
Point Orient	1120
Point Davis	880
Bullshead	76
Bay Point	6
O and A Ferry	1
Collinsville	1
Antioch	1
Emmaton	1
Jersey	1
Central Landing	1
Middle River P. O.	2

In the office, work has continued in completing the report for the 1931 season and the special report on losses in 1931 due to salinity and water shortage.

CALIFORNIA COOPERATIVE SNOW SURVEYS

No snow surveys were scheduled for the latter part of May but at that time there was considerable snow remaining at many of the key snow courses and a number of the cooperating agencies made and reported surveys. In general, for 8000-foot elevation and above, these showed a melting of the April 1st snow pack varying from about 20 per cent to 70 per cent north to south. For the measured courses below 8000 the melting averaged from 40 per cent to 100 per cent.

Routine and special office computations have continued during the past month. These included com-

Santa Clara Progress Report Issued

(Continued from page 33)

putations of natural flow at all stream gaging stations which will best reflect the snow run-off; keeping precipitation station records up to date; preparing the forms, set-up, and tabulation of all basic data needed in forecasting.

A field trip was made to shelter cabins now accessible to gather in equipment and supplies.

WATER RESOURCES

Pit River Investigation (Modoc and Lassen counties.) Work on the report covering the three years investigation of the Pit River was confined to assembling the physical data on several possible storage projects within the Pit River area preparatory to a study of the feasibility of these projects.

Napa Valley Investigation. It is anticipated that field work in connection with this investigation will close on July 1st and assembly of data preliminary to issuance of final report is in progress.

Santa Clara Investigation. Campbell, San Tomas, Berryessa and Penitencia creeks have continued to flow into the valley throughout the month and San Antonio Creek ceased to flow at Los Altos on May 13th. Observation of stages has continued on these creeks throughout the month and progress has been made in the office work in connection with computation of miscellaneous measurements made during the winter and spring.

SURVEY REPORT ISSUED

The progress report covering work of the year October 1, 1930 to September 30, 1931, was completed during the month. It is a mimeographed report of 47 pages and 4 plates dealing with stream flow, percolation and ground water storage in the Santa Clara Valley. The investigation was initiated by the Division of Water Resources in January, 1930, at the request of the Santa Clara Valley Water Conservation district and is of a cooperative nature.

It has as its object a general survey of the water resources of the Santa Clara Valley and was prompted by local apprehension arising out of the continued retreat of ground water throughout the valley, the average depth to ground water having increased from 33.4 feet in 1915 to 63.4 feet in 1921 and to 97.9 feet in the spring of 1930.

The report just released indicates that there was a further recession of 12.1 feet between the spring of 1930 and the spring of 1931. Data with respect to ground water levels is based upon observation of some 256 wells, the readings of the several wells being repeated in the report.

STREAM FLOWS COMPARED

One of the tables of the report shows a comparison of the flow of the principal streams debouching into the valley with the flow of the preceding year. Coyote River near Madrone discharged 1670 acre-feet as compared with 20,100 acre-feet in the preceding year and an average of 54,000 acre-feet for the 25 years of record, whereas the combined flow of Los Gatos Creek, Guadalupe Creek and Alamos Creek

entering the valley measured only 1810 acre-feet as compared with 28,300 acre-feet in the preceding year.

Data in other tables of the report indicate that precipitation at the various observation stations throughout the valley varied between a minimum of 42 per cent and a maximum of 93 per cent of the averages for the periods of record which, of course, accounts for the abnormally low stream discharge.

The report is strictly a progress report and embodies less than three pages of text. It is largely a tabular presentation of basic data collected during the period October 1, 1930, to September 30, 1931, without any attempt to present analyses or conclusions. Only a very limited number of copies of the report were stricken off and these have been distributed among the libraries, governmental agencies, and public offices of the valley where they may be readily consulted by all interested parties.

An agreement is being executed for continuation of the investigation during the fiscal year 1932 and 1933.

VENTURA COUNTY INVESTIGATION

Drilling was resumed on the dam sites in Piru Creek with funds furnished under a cooperative agreement with the Division of Highways. Conflict exists between the utilization of certain reservoir sites on Piru Creek for highways or for storage of water. The new location of the Los Angeles-Bakersfield highway passes directly through the Spring Creek site and partially through the Los Alamos site.

STATE WATER PLAN

The California Water Resources Commission, appointed by Governor Rolph in August, 1931, consisting of nine citizens and six State officials as ex officio members, with Honorable Matt I. Sullivan, former Chief Justice of the Supreme Court of California, as chairman, rendered their report on the water problems of California to Governor Rolph under date of June 21, 1932. The Governor was well pleased and gratified with the report and stated: "This commission has rendered a great public service of which the people of California should justly be proud." The Governor has taken a keen and active interest, a broad, state-wide viewpoint and has exhibited outstanding leadership in evolving a plan for the solution of the State's most important and pressing problem.

Judge (sternly)—Well—what is your alibi for speeding 50 miles an hour?

George—I had just heard, your honor, that the ladies of my wife's church were giving a rummage sale and I was hurrying home to save my other pair of pants.

Judge—Case dismissed.

Driver: "I wasn't going forty miles an hour, nor thirty, nor even twenty."

Judge: "Here, steady now, or you'll be backing into something."

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 JULY, 1932 No. 7

BEAUTIFYING THE HIGHWAY

Among the various side projects that have been carried on during the last few years by the California Division of Highways, in connection with highway improvement generally, is the beautification of the immediate districts traversed by the major avenues of travel. One of the chief items has been the landscaping of the rights of way, including the scientific planting of wild flowers, shrubbery and other native growths.

Although the results have been increasingly apparent with each successive season since the work was started, the exceptionally fine growing weather this year has served to stress the success of the project along the Redwood Highway, particularly in southern Humboldt County. Acres of native California poppies, the lupine, the shrubs and innumerable other types of flora have converted the roadside into a panorama of color.

The department charged with the work is to be complimented upon the intelligence with which the problem has been approached. No attempt has been made to "gild the lily," so to speak, or to make any radical change in the original landscape. Rather, everything has been done with the view of combining the attractions of native and imported species.

One criticism of the Redwood Highway in the past has been directed at the lack of wild flowers along the route at certain seasons of the year. Happily, thanks to the highway people, this criticism can no longer hold true.—*Eureka Standard*.

A recent compulsory inspection of all motor vehicles in Pennsylvania revealed that approximately 85 per cent of the cars being operated on the highways required correction of some sort.

The color scheme of automobile license plates in Arizona for 1932 consists of white lettering on a copper colored background.

List of Intangible and Tangible Good Road Benefits Cited

IT HAS been found that people are strongly moved by intangible benefits from good roads such as comfort, convenience, social intercourse, freedom from mud, and the desire to see the home county a leader.

Intangible benefits may be listed as follows:

(1) Improved social advantages permit better intercourse between city and country, and bring country people closer together.

(2) The growth and prosperity of a section is improved through better transportation.

(3) Mail deliveries are bettered, fire protection improved, recreation facilities provided, healthfulness of the people increased, police protection afforded, home building facilitated, schools are consolidated for better instruction, and medical attention becomes more prompt.

(4) Personal pride in the good roads of a home county leads to loyalty and satisfaction.

Tangible benefits may be summarized:

(1) Increase the value of land. Farm values on improved roads are much higher than on dirt roads because of the better transportation facilities afforded. The highway is part of the farming plant.

(2) Lower motor vehicle costs. The maintenance costs of motor vehicles is much less than on improved roads and the depreciation is reduced. This may amount to several hundred dollars a year saving to each motor vehicle owner.

(3) Fuel costs are reduced. The consumption of gasoline on improved roads is much less than on dirt roads. The saving in fuel offsets the gasoline tax.

(4) Estimate of profit to the public. Estimating a saving of two cents a mile traveled, which is conservative for the saving on surfaced roads over dirt roads, each motor vehicle owner saves \$100 annually if he travels 5000 miles a year. An unimproved road that has 1000 vehicles a day traffic is losing \$7,300 a year in the form of increased operating costs. This is several times the cost of a fine country road. This loss is the "mud tax" paid by all people that travel the road. Good roads pay for themselves in a few years in savings.—

Daily Pacific Builder.

A survey reports that traffic accidents have decreased since the first of the year Could this be attributed to the fact that this is leap year?—*L. A. Journal of Commerce*.

State Expends \$220,699 Annually to Maintain Safety Devices on Highways

By W. A. SMITH, Assistant Maintenance Engineer

THE ANNUAL expense of maintaining safety devices on State highways is nearly five cents out of every dollar expended for upkeep work. A review of expenditures during the year July 1, 1930, to June 30, 1931, shows that \$220,699 was expended for this type of work.

The largest single item in this amount was for the placing of the white traffic stripe. About 3500 miles of stripe is now in place, and requires renewal at least once each year. This includes the painting of the special stripes at grade crossings of railroads, and of "School Slow" signs each side of schools adjacent to the highways.

From expressions received from individuals and organizations the white stripe is regarded as a particularly valuable safety device. It serves to keep traffic, generally, in its own lane and is a well defined guide on mountain roads or in foggy areas during dark nights.

Some of the other safety features which require constant attention are as follows:

ROADSIDE GUARDS

On the highway system there is a considerable mileage of guard rail both of the old standard light two-rail construction, and the heavy 6" by 6" or laminated type. A great deal of this rail has been in place for a number of years, so that replacement is under way at various points each year. Likewise, it is necessary to repaint all the rail every three or four years at least.

On high fills and in mountain country where funds have not been available for standard guard rail construction, posts have been installed to outline the edge of the road. To make this warning effective it is very necessary that the posts be kept painted and in good condition.

Many pipe culverts were installed prior to the present requirement of an 8-foot shoulder width. The gradual widening out of the shoulder thus creates a hazard at such locations. The maintenance forces have accordingly installed posts to warn motor traffic of the danger. The replacement and painting of these posts is required.

LIGHTING UP CROSSINGS

Other safety measures are the red R X R neon signs, the illuminated electric signs, and electric flood lights at the more dangerous grade crossings which require monthly care and expense for electric power.

The most recent installation of this character consists of nine flood lights at grade crossings in the San Joaquin Valley. It was found that lack of illumination at crossings presented a particular hazard due to a long string of box cars which might be moving over the crossing, not being visible in the headlights of an approaching automobile until too late to avoid a serious crash.



W. A. SMITH

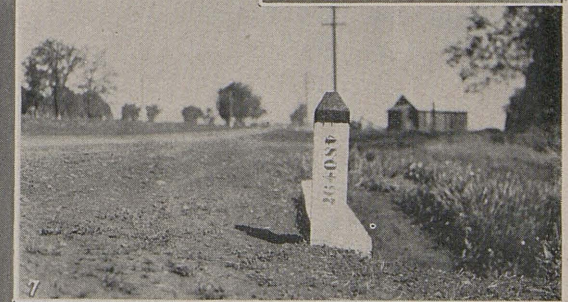
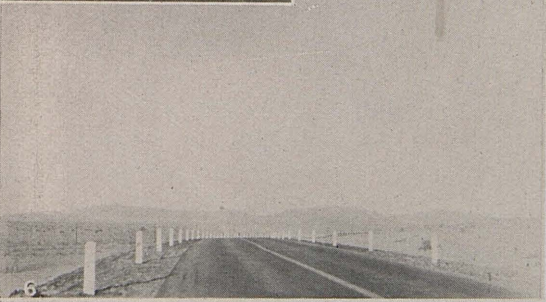
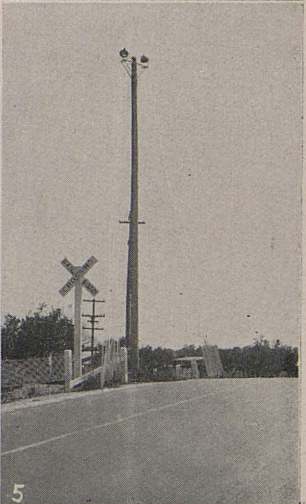
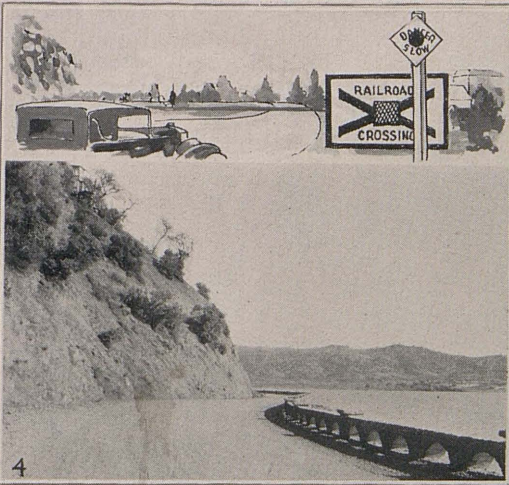
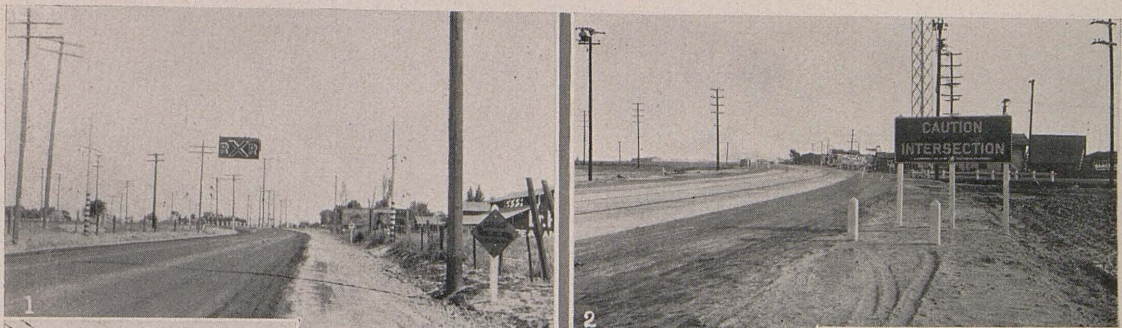
At several grade crossings on which the railroad traffic is light, large reflectorized signs have been installed.

Within the last two years the State has assumed the cost of providing electric power for flasher signals at hazardous locations. These flashers were originally installed by one of the automobile clubs at their own expense.

REFLECTORIZED SIGNS

Designs have been developed for reflectorized directional signs at certain locations.

These signs have been installed by the two larger automobile associations in the north and south, respectively. The expense of the installation is borne by the State.



SENTINELS OF SAFETY are these devices maintained by the State on its highways to guard the motorists who oftentimes react unconsciously to the warnings they convey. No. 1—Neon sign at railroad crossings. No. 2—Reflectorized intersection warning illuminated at night by approaching headlights. No. 3—Railroad crossing warning with red reflectorized center and flasher post signal. No. 4—Standard rock guard rail on sea wall. No. 5—Floodlights to show trains on crossings. No. 6—White wood marker posts on road shoulders. No. 7—Culvert head-wall marker post. No. 8—Night view of neon crossing sign. No. 9—Traffic stripe and guard rails.

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 June, 1932.

LASSEN COUNTY—Rager Dam No. 226. Geo. F. Rager, Ravendale, owner; earth, 5 feet above streambed with a storage capacity of 1000 acre-feet, situated on Cold Spring Creek tributary to Madeline Plains in Sec. 6, T. 35 N., R. 16 E., M. D. B. and M. For storage purposes for irrigation 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 June, 1932.

MODOC COUNTY—Pope Dam No. 165. Lizzy Pope, Canby, owner; buttress and flashboards, situated on Pit River tributary to Sacramento River in Sec. 2, T. 41 N., R. 9 E., M. D. B. and M.

KERN COUNTY—Lake of the Woods Dam No. 733. Mr. and Mrs. J. D. Cuddy, Lebec, owner; earth, situated on Cuddy Canyon in Sec. 33, T. 9 N., R. 20 W., S. B. B. and M.

MONTEREY COUNTY—San Carlos Dam, No. 644. Rancho San Carlos, Inc., Monterey, owner; earth and rock, situated on Garzas Creek tributary to Carmel River in Sec. 18, T. 17 S., R. 2 E., M. D. B. and M.

SAN MATEO COUNTY—Reflection Lake Dam No. 606. California Pacific Title and Trust Company, San Francisco, owner; earth, situated on unnamed stream tributary to La Honda Creek in Sec. 14, T. 7 S., R. 4 W., M. D. B. and M.

MONTEREY COUNTY—Forest Lake Dam No. 642-2. Monterey County Water Works, Pacific Grove, owner; earth, located in El Pescadero Rancho.

MODOC COUNTY—Duke Reservoir No. 2, No. 163-2. Royal E. Williams, Likely, owner; earth, situated on flat tributary to South Fork Pit River in Sec. 16, T. 39 N., R. 13 E., M. D. B. and M.

SAN DIEGO COUNTY—Lake Wohlford Dam No. 834. Escondido Water Company, Escondido, owner; earth and rock, situated on Segern Creek tributary to Escondido Creek in Sec. 5, T. 12 S., R. 1 W., S. B. B. and M.

MODOC COUNTY—Hughes Dam No. 166. H. C. Hughes, Canby, owner; buttress and flashboards, situated on Pit River tributary to Sacramento River in Sec. 30, T. 42 N., R. 10 E., M. D. B. and M.

CALAVERAS COUNTY—San Mateo Produce Co. Dam No. 495. California Lands, Inc., Stockton, owner; earth, located in Sec. 4, T. 3 N., R. 10 E., M. D. B. and M.

FRESNO COUNTY—Meadow Lakes Dam No. 695. Alva E. Snow, Fresno, owner; earth, located in Sec. 11, T. 10 S., R. 23 E., M. D. B. and M.

LASSEN COUNTY—Red Rock No. 1 Dam No. 230. August Anderson, Ravendale, owner; earth, located in Sec. 22, T. 36 N., R. 16 E., M. D. B. and M.

LASSEN COUNTY—Red Rock No. 2 Dam No. 230-2. August Anderson, Ravendale, owner; earth, located in Sec. 3, T. 35 N., R. 16 E., M. D. B. and M.

LASSEN COUNTY—Red Rock No. 3 Dam No. 230-3. August Anderson, Ravendale, owner; earth, located in Sec. 4, T. 35 N., R. 16 E., M. D. B. and M.

CALAVERAS COUNTY—Ross Dam No. 99-3. Emma Rose and Hobart Estate, San Francisco, owner; masonry arch, situated on San Domingo Creek tributary to Calaveras River in Sec. 14, T. 3 N., R. 13 E., M. D. B. and M.

LASSEN COUNTY—Biscar Dam No. 251. Peter Biscar, Karlo, owner; earth, situated on Snow Storm Creek tributary to Secret Valley in Sec. 18, T. 31 N., R. 15 E., M. D. B. and M.

MONTEREY COUNTY—Pacific Grove Dam, No. 642-3. Central Calif. Water Supply Co., Pacific Grove, owner; earth, located in Punta Pinos Rancho.

LASSEN COUNTY—Meadow Brook Dam No. 229. L. R. Cady and Frank Coffin, Susanville, owner; masonry, situated on Baxter Creek tributary to Honey Lake in Sec. 26, T. 29 N., R. 12 E., M. D. B. and M.

LOS ANGELES COUNTY—Saw Pit Dam No. 32-12. Los Angeles County Flood Control Dist., Los Angeles, owner; arch, situated on Sawpit Creek tributary to

San Gabriel River in Sec. 13, T. 1 N., R. 11 W., S. B. B. and M.

LOS ANGELES COUNTY—Johnson Lake Dam No. 19-2. City of Pasadena, Pasadena, owner; earth, situated on a draw tributary to Arroyo Seco.

LOS ANGELES COUNTY—Twin Lakes Park Dam No. 774-2. Twin Lakes Park Company, Los Angeles, owner; gravity, situated on De Los Aliso Creek tributary to Brown's Canyon in Sec. 7, T. 2 N., R. 16 W., S. B. B. and M.

CALAVERAS COUNTY—Salt Springs Valley Res. No. 496. The California Company, Stockton, owner; rock, situated on Rock Creek tributary to Littlejohn Creek in Sec. 16, T. 2 N., R. 11 E., M. D. B. and M.

MODOC COUNTY—Mud Lake Dam No. 129-5. Thomas Raker, C. A. and Iva S. Raker, Alturas, owner; earth and rock, situated on unnamed stream tributary to North Fork Pit River in Sec. 20, T. 43 N., R. 13 E., M. D. B. and M.

PLACER COUNTY—Clover Valley Dam No. 97-16. Pacific Gas and Electric Company, San Francisco, owner; earth, situated on Antelope River tributary to Sacramento River in Sec. 28, T. 12 N., R. 7 E., M. D. B. and M.

AMADOR COUNTY—Henderson Forebay Dam No. 1-11. Preston School of Industry, Waterman, owner; earth, tributary to Sutter Creek, located in Sec. 18, T. 6 N., R. 10 E., M. D. 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 June, 1932.

LOS ANGELES COUNTY—San Gabriel No. 1 Dam No. 32-19. Los Angeles County Flood Control District, Los Angeles, owner; rock, 300 feet above streambed with a storage capacity of 68,000 acre-feet, situated on San Gabriel River in Sec. 6, T. 1 N., R. 9 W., S. B. B. and M. For storage purposes for flood control and conservation 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 June, 1932.

TRINITY COUNTY—Lower Stuarts Fork Dam No. 212. La Grange Placers, Ltd., Weaverville, owner; masonry, situated on Stuarts Fork tributary to Trinity River in Sec. 3, T. 36 N., R. 10 E., M. D. B. and M.

KERN COUNTY—Lake of the Woods Dam No. 733. Mr. and Mrs. J. D. Cuddy, Lebec, owner; earth, situated on Cuddy Canyon in Sec. 33, T. 9 N., R. 20 W., S. B. B. and M.

MONTEREY COUNTY—San Carlos Dam No. 644. Rancho San Carlos, Inc., Monterey, owner; earth and rock, situated on Garzas Creek tributary to Carmel River in Sec. 18, T. 17 S., R. 2 E., M. D. B. and M.

SAN DIEGO COUNTY—Cuyamaca Dam No. 56. La Mesa Lemon Grove and Spring Valley Irrigation District, La Mesa, owner; earth, situated on Boulder Creek in Por. of Lots D, E and G, Cuyamaca Rancho.

ORANGE COUNTY—South Lambert Dam No. 793. The Irvine Company, Tustin, owner; earth, located in Lot 368, Irvine's subdivision.

MONTEREY COUNTY—Forest Lake Dam No. 642-2. The Monterey County Water Works, Pacific Grove, owner; earth, located in El Pescadero Rancho.

SAN MATEO COUNTY—Reflection Lake Dam No. 606. California Pacific Title and Trust Company, San Francisco, owner; earth, situated on unnamed stream tributary to La Honda Creek in Sec. 14, T. 7 S., R. 4 W., M. D. B. and M.

MODOC COUNTY—Duke Reservoir No. 2 No. 163-2. Royal E. Williams, Likely, owner; earth, situated on a flat tributary to South Fork Pit River in Sec. 16, T. 39 N., R. 13 E., M. D. B. and M.

SAN DIEGO COUNTY—Lake Wohlford Dam No. 834. Escondido Mutual Water Company, Escondido, owner; earth and rock, situated on Segern Creek tributary to Escondido Creek in Sec. 5, T. 12 S., R. 1 W., S. B. B. and M.

June 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 June, 1932.

SIERRA County—Application 7275. George McGee, Blairsden, California, for 1.0 c.f.s. from 3 unnamed springs tributary to Howard Creek, thence North Fork of North Fork of Yuba River, to be diverted in Secs. 24 and 25, T. 21 N., R. 12 E., M. D. B. and M. For power and domestic purposes. (25.6 h.p.)

ALPINE COUNTY—Application 7276. State of California, Department of Public Works, Division of Highways, District X., c/o C. H. Purcell, State Highway Engineer, Public Works Bldg., Sacramento, California, for 0.005 c.f.s. from unnamed spring tributary to West Fork Carson River to be diverted in Sec. 31, T. 11, R. 19 E., M. D. B. and M. For recreational purposes. Estimated cost \$250.

EL DORADO COUNTY—Application 7277. United States, El Dorado National Forest, Placerville, California, for 1000 gallons per day from unnamed stream tributary to Upper Echo Lake to be diverted in Sec. 35, T. 2 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$150.

EL DORADO COUNTY—Application 7278. United States, El Dorado National Forest, Placerville, California, for 1200 gallons per day from Indian Rock Creek tributary to Lily Lake and Fallen Leaf Lake to be diverted in Sec. 22, T. 12 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$150.

EL DORADO COUNTY—Application 7279. United States, El Dorado National Forest, Placerville, California, for 6000 gallons per day from Scout Springs tributary to South Fork of American River to be diverted in Sec. 7, T. 11 N., R. 18 E., M. D. B. and M. For domestic purposes. Estimated cost \$3,000.

PLACER COUNTY—Application 7280. Paul H. Norboe, 3920 2d Ave., Sacramento, California, for 250 c.f.s. and 200,000 acre-feet per annum from Middle Fork of American River tributary to Sacramento River to be diverted in Sec. 36, T. 15 N., R. 13 E., M. D. B. and M. For power purposes. (119,319 h.p.) Estimated cost \$18,000,000.

PLACER COUNTY—Application 7281. Paul H. Norboe, 3920 2d Ave., Sacramento, California, for 250 c.f.s. and 200,000 acre-feet per annum from Middle Fork American River tributary to Sacramento River to be diverted in Sec. 36, T. 15 N., R. 13 E., M. D. B. and M. For municipal purposes. Estimated cost \$15,000,000.

SISKIYOU COUNTY—Application 7282. Willis W. Quigley, c/o James D. Fairchild, attorney, Yreka, California, for 1 c.f.s. from Beaver Creek tributary to Klamath River to be diverted in Sec. 31, T. 47 N., R. 8 W., M. D. B. and M. For power purposes. (5.7 h.p.)

SISKIYOU COUNTY—Application 7283. Mark Packard, c/o Allen and McNamara, attorneys, Allen Building, Yreka, California, for 40 c.f.s. from Elk Creek Tributary to Klamath River to be diverted in Sec. 30, T. 15 N., R. 8 E., H. B. and M. For mining purposes. Estimated cost \$158,000.

TEHAMA COUNTY—Application 7284. H. H. Hammer, Red Bluff, California, for 3 c.f.s. from South Fork Cottonwood Creek tributary to Sacramento River to be diverted in Sec. 12, T. 26 N., R. 8 W., M. D. B. and M. For power purposes. (17 h.p.) Estimated cost \$100.

EL DORADO COUNTY—Application 7285. B. W. Stone, room 221, 16 California St., San Francisco, California, 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. 9, T. 12 N., R. 12 E.; Sec. 24, T. 13 N., R. 13 E.; Secs. 11-31-34, 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.

MONO COUNTY—Application 7286. Geo. J. Davlin, 5157 8th Ave., Los Angeles, California, for 100 gallons per day from unnamed stream tributary to Twin Lakes tract, thence Mammoth Creek, Hot Creek and Owens River to be diverted in Sec. 9, T. 4 S., R. 27 E., M. D. B. and M. For Domestic Purposes. Estimated cost \$60.

EL DORADO COUNTY—Application 7287. Geo. W. Shedd, Kyburz, California, for 0.006 c.f.s. from 3 unnamed springs tributary to Pyramid Creek, thence S. Fork American River, to be diverted in section 8, T. 11 N., R. 17 E., M. D. B. and M. For recreational and domestic purposes. Estimated cost \$500.

DEL NORTE COUNTY—Application 7288. Frank Symms, Crescent City, California, for 0.01 c.f.s. from unnamed creek tributary to Smith River to be diverted in Sec. 30, T. 17 N., R. 2 E., H. B. and M. For domestic purposes. Estimated cost \$200.

SANTA CRUZ COUNTY—Application 7289. Theodore J. Hoover, Stanford University, California, for 1800 acre-feet per annum from Waddell Creek tributary to Pacific Ocean to be diverted in Sec. 35, T. 9 S., R. 4 W., M. D. B. and M. For irrigation purposes, (1000 acres.) Estimated cost \$25,000.

MONO COUNTY—Application 7290. Louis A. Smith, Box 53, Mono Lake, California, for 16 acre-feet per annum from Bridgeport Canyon Creek tributary to Mono Lake to be diverted in Sec. 23, T. 3 N., R. 26 E., M. D. B. and M. For irrigation and domestic purposes, (80 acres.) Estimated cost \$500.

SHASTA COUNTY—Application 7291. Wm. L. Harris, trustee, 375 Mills Bldg., San Francisco, California, for 14 c.f.s. from Brandy Creek tributary to Clear Creek and Sacramento River to be diverted in Sec. 19, T. 32 N., R. 6 W., M. D. B. and M. For mining and domestic purposes. Estimated cost \$5,000.

INYO COUNTY—Application 7292. Joseph W. Rossi, Bishop, California, for 0.5 c.f.s. from Crystal Spring tributary to Owens River watershed to be diverted in Sec. 26, T. 7 S., R. 32 E., M. D. B. and M. For irrigation and domestic purposes. Estimated cost \$1,500.

SIERRA COUNTY—Application 7293. Taber Development Company, 928 Bank of America Bldg., Stockton, California, for (1) 15, (2) 35, total 50 c.f.s. from (1) Deams Ravine, (2) South Fork Canyon Creek tributary to (1) Canyon Creek and (2) Yuba River to be diverted in section (1) 7, T. 21 N., R. 11 E., (2) section 12, T. 21 N., R. 10 E., M. D. B. and M. For mining purposes.

ALPINE COUNTY—Application 7294. J. E. Taylor and L. H. Honey, c/o J. E. Taylor, Oakley, California, for 400 gallons per day from spring tributary to Twin Lakes and South Fork American River to be diverted in section 18, T. 10 N., R. 18 E., M. D. B. and M. For domestic purposes. Estimated cost \$400.

PLUMAS COUNTY—Application 7295. State of California, Department of Public Works, Division of Highways, Public Works Bldg., Sacramento, California, for 2160 gallons per day, from Hillside Spring tributary to Spanish Creek, thence East Branch of North Fork of Feather River and North Fork Feather River, to be diverted in section 10, T. 25 N., R. 9 E., M. D. B. and M. For recreational purposes. Estimated cost \$25.

RIVERSIDE COUNTY—Application 7296. Chapman Blackburn, c/o Dr. F. K. Strasser, Kimball and Carmalita, Hemet, California, for 0.025 c.f.s. from spring tributary to Jacinto River watershed, to be diverted in section 30, T. 5 S., R. 1 E., S. B. B. and M. For domestic and stock watering purposes.

SAN DIEGO COUNTY—Application 7297. John R. La Dow, Pala, California, for 0.5 c.f.s. from unnamed stream tributary to San Luis Rey River, to be diverted in section 20, T. 9 S., R. 2 W., S. B. B. and M. For irrigation and domestic purposes. (40 acres.) Estimated cost \$500.

TUOLUMNE COUNTY—Application 7298. State of California, Department of Public Works, Division of Highways, Dist. X, by C. H. Purcell, State Highway Engineer, Public Works Bldg., Sacramento, California, for 5000 gallons per day from Simms Spring tributary to Cascade Creek thence Middle Fork Stanislaus River to be diverted in section 14, T. 5 N., R. 18 E., M. D. B. and M. For recreational purposes. Estimated cost \$250.

SAN LUIS OBISPO COUNTY—Application 7299. Security First National Bank of Los Angeles, c/o First Securities Co., Ltd., Pacific S. W. Bank Bldg., Los Angeles, California, for 0.31 c.f.s. from Salinas River tributary to Monterey Bay, to be diverted in sections 20 and 21, T. 30 S., R. 15 E., M. D. B. and M. For irrigation purposes. (77 acres.) Estimated cost \$5,000.

Applications and Permits Granted

(Continued from page 39)

SISKIYOU COUNTY—Application 7300. William Wike, Sawyers Bar, California, for 2.5 c.f.s. from East Fork Eddy's Gulch tributary to Eddy's Gulch, thence North Fork Salmon River, to be diverted in section 15, T. 39 N., R. 11 W., M. D. B. and M. For mining and domestic purposes.

SAN BERNARDINO COUNTY—Application 7301. J. K. Wilden, Route 1, Box 176, Colton, California, for 0.75 c.f.s. from unnamed drainage ditch tributary to Santa Ana River, to be diverted in section 5, T. 2 S., R. 4 W., S. B. B. and M. For irrigation purposes. (9.27 acres.) Estimated cost \$5.

NEVADA CITY—Application 7302. Relief Hill Mining Company, North Bloomfield, California, for 50 c.f.s. from North Fork of Poormans Creek tributary to South Fork Yuba River, to be diverted in section 9, T. 18 N., R. 11 E., M. D. B. and M. For mining purposes. Estimated cost \$10,000.

DEL NORTE COUNTY—Application 7303. Austin McAfee, Crescent City, California, for 3 c.f.s. from Moores Gulch tributary to Smith River, to be diverted in section 3, T. 16 N., R. 1 E., H. B. and M. For mining and domestic purposes.

EL DORADO COUNTY—Application 7304. Mrs. Eurette Callnon, 3109 E Street, Sacramento, California, for 200 gallons per day from unnamed spring tributary to Bryant Creek and South Fork American River, to be diverted in section 15, T. 11 N., R. 17 E., M. D. B. and M. For domestic purposes.

EL DORADO COUNTY—Application 7305. Alice M. Coughlin, 751 42d Street, Sacramento, California, for 200 gallons per day from a spring tributary to South Fork American River, to be diverted in section 15, T. 11 N., R. 17 E., M. D. B. and M. For domestic purposes.

SONOMA COUNTY—Application 7306. Frank Weaver, c/o A. R. Grinstead, attorney, Sonoma, California, for 1.0 c.f.s. from Sonoma Creek tributary to San Pablo Bay, to be diverted in section 35, T. 6 N., R. 6 W., M. D. B. and M. For irrigation purposes. (12 acres.) Estimated cost \$450.

EL DORADO COUNTY—Application 7307. R. W. Spencer, R. Weldon, E. F. Curtis and Mrs. Hazel Stahl, c/o R. W. Spencer, 3429 Folsom Boulevard, Sacramento, California, for 800 gallons per day from unnamed spring tributary to South Fork American River, to be diverted in section 8, T. 11 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$500.

COLUSA COUNTY—Application 7308. J. L. Brown- ing, c/o Chas. De St. Maurice, Colusa, California, for 12 c.f.s. from Sacramento River tributary to Suisun Bay, to be diverted in section 22, T. 14 N., R. 1 E., M. D. B. and M. For irrigation purposes. (923.6 acres.)

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

YOLO COUNTY—Permit 3903, Application 7232. Rose Vargas Rose, 3709 Bigler Way, Sacramento, California, June 2, 1932, for 0.32 c.f.s. from Sacramento River tributary to Suisun Bay in section 22, T. 7 N., R. 4 E., M. D. B. and M. For irrigation of 26 acres.

SAN MATEO AND SANTA CRUZ COUNTIES—Permit 3904, Application 7005. Humphrey Estates, Inc., 315 Montgomery Street, San Francisco, California, June 3, 1932, for 195 acre-feet per annum from Green Oakes Creek in section 30, T. 9 S., R. 4 W., M. D. B. and M. For domestic and irrigation of 285 acres.

TRINITY COUNTY—Permit 3905, Application 7075. Lee Nafsgar, Del Loma, California, June 4, 1932, for 6 c.f.s. from Langs Creek tributary to Trinity River in section 31, T. 5 N., R. 8 E., H. B. and M. For mining and domestic purposes. Estimated cost \$5,000.

TRINITY COUNTY—Permit 3906, Application 7190. French Bar Mining Company, Del Loma, California, June 4, 1932, for 10 c.f.s. from Big French Creek tributary to Trinity River in section 29, T. 5 N., R. 8 E., H. B. and M. For mining and domestic purposes. Estimated cost \$1,800.

SAN BERNARDINO COUNTY—Permit 3907, Application 6897. Effel Rudy, Fenner, California, June 6, 1932, for 0.025 c.f.s. from underground water in section

28, T. 8 N., R. 18 E., S. B. B. and M. For domestic purposes. Estimated cost \$3,000.

LASSEN COUNTY—Permit 3908, Application 6413. Antonio Saralegui, Reno, Nevada, June 7, 1932, for 600 acre-feet per annum from Long Valley Creek tributary to Honey Lake in section 16, T. 23 N., R. 17 E., M. D. B. and M. For domestic and irrigation of 166.71 acres of alfalfa in sections 10, 11 and 15, T. 23 N., R. 17 E., M. D. B. and M. Estimated cost \$1,600.

PLACER COUNTY—Permit 3909, Application 7239. C. W. Earle, Rocklin, California, June 7, 1932, for 0.10 c.f.s. from Secret Ravine tributary to Dry Creek thence Sacramento River in section 20, T. 11 N., R. 7 E., M. D. B. and M. For irrigation of 8 acres. Estimated cost \$500.

SAN MATEO COUNTY—Permit 3910, Application 6250. Celia Tobin Clark, San Mateo, California, June 7, 1932, for 0.15 c.f.s. and 100 acre feet per annum from Peters Creek and 5 tributaries, tributary to Pescadero Creek in section 28, T. 7 S., R. 3 W., M. D. B. and M. For irrigation, domestic and stock, on 130 acres. Estimated cost \$30,000.

MONO COUNTY—Permit 3911, Application 7170. Elbert E. English, 1132 Pine Avenue, Long Beach, California, June 7, 1932, for 200 gallons per day from Rock Creek tributary to Owens River, in section 33, T. 4 S., R. 30 E., M. D. B. and M. For domestic purposes. Estimated cost \$25.

MONO COUNTY—Permit 3912, Application 7219. United States Inyo National Forest, Bishop, California, June 15, 1932, for 0.006 c.f.s. from unnamed stream tributary to Mammoth Creek, Hot Creek and Owens River in section 9, T. 4 S., R. 27 E., M. D. B. and M. For domestic purposes.

SIERRA COUNTY—Permit 3913, Application 7216. Chas. J. Scanlon, Jr., Camptonville, California, June 15, 1932, for 3 c.f.s. from South Fork of North Fork of Indian Creek and North Fork Indian Creek tributary to Yuba River in section 21, T. 19 N., R. 9 E., M. D. B. and M. For domestic and placer mining purposes.

TRINITY COUNTY—Permit 3914, Application 7060. United Placers, Ltd., 600 S. Madison Street, Pasadena, California, June 15, 1932, for 100 c.f.s. from Canyon Creek, tributary to Trinity River in section 17, T. 35 N., R. 10 W., M. D. B. and M. For mining and domestic purposes. Estimated cost \$150,000.

TRINITY COUNTY—Permit 3915, Application 7067. Buckeye Placer Mines, Inc., Carville, California, June 15, 1932, for 15 c.f.s. from Little Boulder Creek, tributary to Coffee Creek and Trinity River in section 15, T. 37 N., R. 8 W., M. D. B. and M. For hydraulic placer mining. Estimated cost \$12,500.

SAN BERNARDINO COUNTY—Permit 3916, Application 6714. Mary Frances Bird, Victorville, California, June 16, 1932, for 0.25 c.f.s. from Ruby Springs tributary to Mojave Desert in section 5, T. 3 N., R. 1 W., S. B. B. and M. For domestic and irrigation of 20 acres in SW-NW, section 29, T. 4 N., R. 1 W., S. B. B. and M. Estimated cost \$20.

EL DORADO COUNTY—Permit 3917, Application 6992. E. S. Wilson, et al., c/o E. S. Wilson, box 512, Davis, California, June 18, 1932, for 1400 gallons per day from Rocky Canyon tributary to American River in section 7, R. 11 N., R. 17 E., M. D. B. and M. For domestic purposes.

SAN DIEGO COUNTY—Permit 3918, Application 7038. United States Cleveland National Forest, 310 Federal Bldg., San Diego, California, June 18, 1932, for 0.066 c.f.s. from surface water of Vallecitos Spring No. 2, tributary to Vallecitos Spring and Salton Sea in section 34, T. 14 S., R. 5 E., S. B. B. and M. For domestic purposes. Estimated cost \$2,000.

EL DORADO COUNTY—Permit 3919, Application 7070. George E. De Golia, 5960 Contra Costa Road, Oakland, California, June 18, 1932, for 200 gallons per day from unnamed stream tributary to South Fork American River in section 24, T. 11 N., R. 16 E., M. D. B. and M. For domestic purposes.

HUMBOLDT COUNTY—Permit 3920, Application 7211. Fred Bair, Standard Bldg., Eureka, California, June 20, 1932, for 0.062 c.f.s. from Bair Creek tributary to Humboldt River in section 36, T. 10 N., R. 4 E., H. B. and M. For domestic purposes and irrigation of 5 acres in section 36. Estimated cost \$500.

STATE OF CALIFORNIA
Department of Public Works

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

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COLONEL WALTER E. GARRISON-----Director

JAMES I. HERZ-----Deputy Director

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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

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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
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C. A. HENDERLONG, Assistant Mechanical Engineer
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RIGHTS OF WAY**

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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

