California Highways and Public Works

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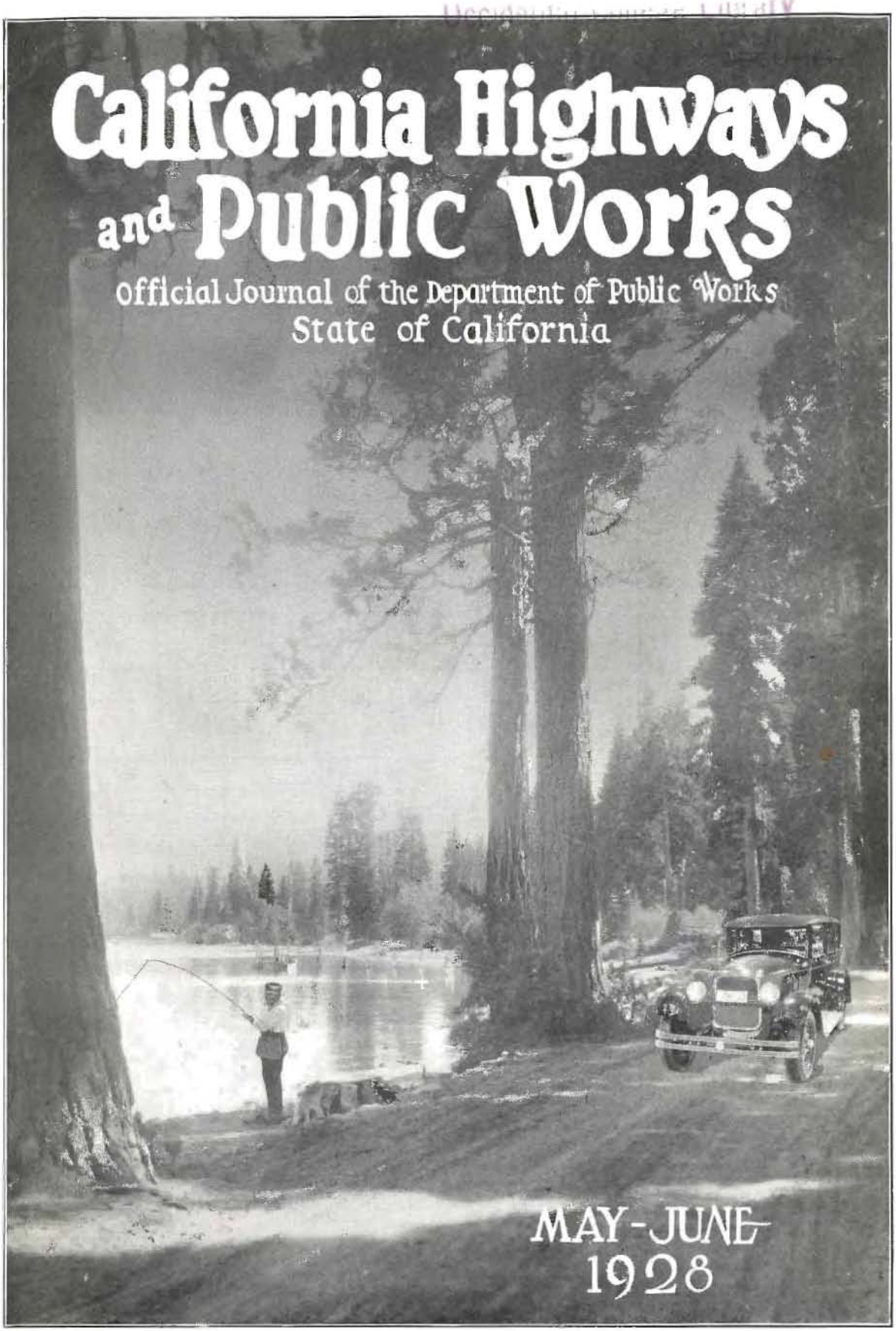

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Superior Highways are Making Californians a Superior People

By JOSEPH M. SCHENCK, Member of the California Highway Commission.

A DISTINGUISHED French savant penned the statement many years ago that forms of government depend upon forms of people.

At that time forms of government were much more important than forms of people. Happily this situation is reversed today. The acid test now of every institution, whether it be governmental, social or commercial, is whether it makes for building better forms of people.

If the words of the French philosopher might be rephrased in terms of modern thought, it can be said that today forms of people largely depend upon forms of highways.

This is true because the characteristics of any group of people are determined by the convenience of their transportation facilities, and the highway is the great transportation institution of our generation.

Provincialism with the narrow and ill-featured attributes of jealousy, suspicion and of backward looking standpatism is the outgrowth of too much "in-living."

Cosmopolitanism with its broader and more kindly outlook on life, its greater grace and happier optimism comes with the wider acquaintanceship and more intimate knowledge of how other people live and think that travel gives. It is the result of "outgoing" rather than "in-living."

Hence it is that forms of people today are influenced and molded by their highway systems. If their roads encourage travel, the people of any section are broadened; if their roads restrict travel, both people and highways are restricted.

For some years my work has made it necessary for me to be constantly alert in looking both for types of individuals and forms of people. The thing that has most impressed me is the extent to which isolation, which in turn means a lack of convenient transportation, is reflected in the characteristics of communities.

Conversely the fact is true that geography has little to do with the nature of a people, where isolation is not a factor in their lives.

We have a very distinctive type of mountaineer in the mountain districts, where roads are either very poor or where travel depends upon trails.

JOSEPH M. SCHENCK

The same is true of the plainsmen. It is again true of the city dweller. All develop certain virtues and certain defects of character.

Isolation, however, tends to transform even those attributes that are good into traits, that if not evil, are at least ugly. Thus strength becomes stubbornness; tolerance is changed into intolerance; frank friendship is warped into suspicion and fear of strangers.

In business isolation and stagnation are first cousins, and always are found dwelling together.

To paraphrase another axiom, it can be said that when Isolation goes out of the window, Progress comes in through the door.

The Dark Ages ended after Western Europe traveled en masse to the Holy Lands. These crusades ended a stagnation that had continued for centuries. They constitute but one of many instances proving that travel has been the biggest and most potent factor in the onward march of civilization.

The great thing that the highways of today are doing is to make it possible for people to move easily and en masse. Travel is no longer a monopolized luxury of the rich. It is a privilege that everybody enjoys and practices, and in whose reward of a fuller and richer life all share.

Improved highways have stripped every community, be it village or city, of the strait-jacket in which isolation encased it. Nowhere else in the world is this so true as in California. There is a world of meaning in the fact that the capita ownership of automobiles is larger in California than in any other place on this globe.

The history of civilization reveals the fact the traveler tends to take to himself the better characteristics of the people he meets and to lose the more unkindly traits of his own character.

Intolerance through travel becomes tolerance. Rudeness is transformed into courtesy. The fear of new ideas and unfamiliar ways is lost, giving place to an attitude of open minded receptivity to thought or practices that at first may be strange.

As we have in California every type of topography, so we have every kind of people. Traveling back and forth from mountain to desert, and from the sea to the forests, the whole people intermingle freely. The beneficent influence of travel can not but have a mass reflection.

California is destined to develop a people such as the world has never before known. The process of this development is now well under way.

The rugged strength of the mountaineer is found combined with the urbanity of the city dweller. To the dwellers in the city is coming the greater sincerity that first-hand knowledge of the great outdoors gives, a sincerity that the more artificial life of the city tends to destroy.

The philosophy that life on the desert engenders is melding with the industry that living on the plains promotes. The love of art and culture that is first found in the commercial cities of the coast is being freely shared with the hinterland.

California's good roads are the biggest thing in the state.

Superior highways are making a superior people.

And the end is not yet.

Peggy—"Daddy, what did the Dead Sea die of?"

Daddy—"Oh, I don't know, child."

Peggy—"Daddy, where do dreams go when you wake up?"

Daddy—"I don't know."

Peggy—"Daddy, why did God put so many bones in the fishes?"

Daddy—"I don't know that either."

Peggy—"Goodness, daddy, who made you an editor?"—*Watchman Examiner.*

13¾ Billion Miles Traveled in 1927 By State Autoists

How many miles did the motorists of California travel in 1927?

The answer is 13,738,693,500.

These interesting figures are given by the American Road Builders Association.

The consumption of gasoline by California motor vehicles during 1927 was 1,071,681,000 gallons. The average consumption of gasoline is estimated at 13.5 gallons. That makes the total mileage traveled by California motorists but slightly under 13¾ billion miles.

It is interesting to note that California was first in the amount of gasoline used. New York ranked second with 892,800,000 gallons. The average national consumption per motor vehicle was approximately 550 gallons. The total number of miles traveled estimated on a basis of 13.5 miles per gallon was placed at more than 150,000,000,000 miles.

The average motorist during 1927 used 550.9 gallons of gasoline and traveled an average of 7437 miles.

The average per capita consumption in California was 642 gallons and the average mileage traveled, 8667 miles.

The highest per capita consumption was in Georgia, the 260,079 vehicles averaging 739 gallons during the year, while the lowest was in Minnesota, the 607,725 vehicles using an average of but 359 gallons, or slightly less than half the per vehicle consumption in Georgia.

"Many things contribute towards the wide variation in the amount of gasoline used per vehicle in the various states," according to J. Borton Weeks, president of the association. "In the wide difference between the amount consumed by the average motorists in Minnesota and Georgia, the primary reason is climatic conditions. In Georgia automobiles are used the year around, while in Minnesota they are restricted. Again roads in Georgia are not as good as those in the northern states and hence the gasoline consumption is higher."

"The ratio of good roads to gasoline consumption is not as marked as one would suppose, for the reason that in states where roads are good the mileage is more per gallon, and in most instances the states that have good roads are wealthy and one of the unique angles of per capita gasoline consumption is that in the wealthy states, where many owners own two cars, the per capita consumption is lowered by virtue of this fact," President Weeks points out.

"This is particularly true of California, which has excellent roads and an all-year motoring climate. With these two factors one would suppose the per capita gasoline consumption there would be the highest, however, with a per capita gasoline consumption of 642 gallons California ranks fourth on the list. Following Georgia, Louisiana ranks second with 721 gallons and Alabama third with 697 gallons.

"Additional factors accounting for the variations, is that of population, gasoline consumption being heavier in thickly populated areas such as cities and industrial centers, while tourists account for a high per capita consumption. As an example, in the District of Columbia—where there is a large annual tourist movement—the average is 79 gallons above the general average."

Present Status of State Highway Development in California

By C. H. PURCELL, State Highway Engineer.

THE first state highway activity in California was the legislative act road known as the Tahoe wagon road, Statutes of 1895. California inaugurated the state highway system by the bond act of 1909, which was voted in 1910 and funds made available on January 1, 1912. A total bond issue revenue of $74,112,243 has been available. In 1921 the first gasoline tax measure was proposed in the legislature and defeated. In 1923, however, a 2-cent gasoline tax was passed, 1 cent of this going to the counties and 1 cent to the state. The state was restricted in the use of its share of this tax to widening and reconstruction activities. At the same time, the legislature amended the horsepower tax, making a straight charge of $3 on machines and a graduated charge on trucks. The legislature of 1927 enacted a 1-cent gasoline tax to provide funds for new construction. The funds available have been augmented by the various federal aid highway appropriations and forest funds. However, the forest funds have been largely expended off the state highway system.

C. H. PURCELL.

Each bond issue added additional mileage to the state highway system and we find the mileage increasing with each bond issue, until the total mileage in the state highway system at the present time is 6589 miles.

TOTAL EXPENDITURES

The total expenditure upon the California highway system up until the time the pay-as-you-go plan was adopted was $158,236,000. Of this $22,520,770 was federal aid money received or applied for, and $4,632,611 was forest funds expended or obligated on the state's system. The federal aid money represents approximately 711 miles of road and the forest funds 152.7 miles.

TRAFFIC INCREASE

During the time of the various bond issues and gasoline tax measures, motor transport had a rapid development. We find 28,600 motor vehicles registered in California in 1909; in 1914, 123,516; in 1919 the number increased to 505,180. For the calendar year 1927 vehicle registration totaled 1,736,767. It will be noted that at the inception of this highway development, there was one car to every 83 persons. California now has one car to every $2\frac{1}{2}$ persons.

CONTROL POINTS

Each road added to the system under the bond issues had certain control points, no doubt many of them placed there due to the necessity of securing the proper support for such measures. These control points in many instances still exist and some of them are located on heavy traffic highways. No doubt the engineers of the past realized that some of these control points would be troublesome in the future. However, they could not have pictured such an enormous increase in highway transport.

LOCATION FACTS

A study of the situation today indicates that some sections of highway on the state system do not as well serve state traffic as more direct routes that have been developed by counties. While this is by no means general, there are several startling examples where county roads, if brought to a comparable standard of improvement to the state highways, would supersede them as state arteries. However, the highway system as originally planned and developed, has more or less successfully carried the motor transport of this most rapidly developing state.

RECONSTRUCTION PROBLEMS

Various reports indicate that highway traffic increased so rapidly that there was a period between 1920 and 1923 when reconstruction of the improved highways and the maintenance thereof became a serious problem. There were no funds available, and much of the constructed mileage was rapidly depreciating. Prior to this condition, mileage had been the big factor, and the pressure for highways in the presence of a rapidly growing motor transport led to large mileages of narrow 15-foot thin type pavement.

BETTER INFORMATION

The highway officials of the present time have better traffic facts to assist them in solving their problem of highway standards and order of improvement. Engineers now generally agree that the 10-foot traffic width is the correct one for single line movement. With these established facts and the knowledge that motor transport will increase henceforth more closely with the population, the location and design of the various sections of highway can be determined upon on a better economic basis.

PRESENT PROBLEMS

Reconstruction, involving thickening, widening, relocation and maintenance of highways is provided for by the reconstruction fund, derived from the 2-cent gasoline tax and the motor license fees. The estimated revenue for the present biennium from this source is $27,100,000 for the biennium. The pressure for this type of construction will probably continue for many years. A situation similar to that of 1920 will not again develop if highway engineers use the knowledge now available in the designing and planning of our reconstruction work. The very rapid growth of the metropolitan areas of this state has produced a reconstruction problem to care for traffic that is still acute. Roads of this type frequently take the form of city streets. In connecting large centers of population it is clear that the highways become such important traffic arteries that traffic can not economically follow the devious, indirect routings which were satisfactory for the original county highways. The development of the highway system is parallel to the development of a railroad system, where the crooked, light roads of the early days have given way to realignment, heavy construction, long tunnels and other engineering developments, all designed to make transportation more economical and reduce mileage.

BUDGET SYSTEM

The present administration of the state is operating under the budget system. The first detail budget of highway funds was submitted to the Governor and passed for the fiscal years 79 and 80. The basis of this budget was necessarily largely preliminary estimates, some of them only guesses as to the amount necessary for a proposed improvement, no definite final plan of the improvement having been made. However, estimates have been revised and the present contracts are being let as near as possible to carry out this budget program.

PREPARING NEXT BUDGET

The district engineers have submitted a tentative construction budget for the fiscal years 81 and 82. Authority will be given on projects which will be considered at the time of preparing the budget for surveys and plans, to be prepared to at least the stage where a sufficiently accurate estimate can be made to insure adequate funds for construction without allotting an excess. In other words, definite surveys wherever possible will be made the basis of our construction budget. In line with this, an estimated anticipated revenue from all sources has been prepared. This applies to both the reconstruction fund, derived from the 2-cent gasoline tax, and the new construction fund, derived from the 1-cent gasoline tax.

STATE HIGHWAY DATA

At the present time, the state highway system has an unimproved mileage of 2369; and an improved mileage, (various stages of improvement) of 4220. Out of funds available during the present biennium, 79th and 80th fiscal years, it is expected that the following improvements will result:

	Paved	*Graded*	*Total*
Construction	20	265	285
Reconstruction	130	58	188
Total	150	323	473

Available for new construction in addition to the reconstruction and maintenance fund is the 1-cent gas tax which will produce a total revenue of $15,100,000 this current biennium.

We expect to put under contract by July 1st approximately $7,500,000. Further contracts will be let approximately at the rate of $2,000,000 a month after that date.

RESEARCH WORK

While engaged in this intensive construction program, it is the plan that research

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Progress Made on Pavement Construction During the Year 1927

By EARL WITHYCOMBE, Assistant Construction Engineer, Division of Highways.

SMOOTHNESS of the pavements constructed during 1927 maintained the same high standard set by the 1926 construction record. With the use of mechanical means of spreading asphaltic mixtures on one entire project and on portion of another, the average of roughness on this type of pavement was reduced.

Strength of concrete has been materially increased over previous records. The field men have acquired a more thorough understanding of the principal factors contributing to the strength of concrete. The average mixture of this year was a much more plastic and workable mix than during 1926.

Following is a detailed review of the 1927 California state highway paving projects.

CONSTRUCTION METHODS

Portland Cement Concrete. Finishing of concrete followed the same general method as outlined in the 1926 summary.

During the latter part of 1927 it was decided to adopt the use of marginal steel for the purpose of preventing corner breaks at contraction cracks within the slab panels. Adoption of dowels has minimized the corner breaking at expansion joints.

Standardizing on the provision for one-half inch expansion joints at intervals of sixty feet, with two intermediate transverse weakened plane joints, has broken the slab into 20-foot panels of 10-foot width. It is expected that this type of construction will practically eliminate uncontrolled contraction cracking. Such construction is not yet of sufficient age to draw definite conclusions, but early results appear very favorable.

The increased number of joints presented difficulty in construction to secure a smooth riding surface and only through careful supervision and constant vigilance of the resident engineers and their assistants was this roughness kept down to a very slight increase over the previous year's record.

ROADS OPENED EARLIER

A marked change has been made in the time of opening concrete pavements, which has proven a great convenience to the traveling public. The watering period has been cut to eight days, after which the earth blanket used in curing is removed and the pavement is permitted to dry until opened. During the progress of placing concrete, beams are cast at half-mile intervals and, after curing, are broken in a portable machine designed at the suggestion of C. S. Pope, Construction Engineer, by C. L. McKesson, Materials and Research Engineer. The time at which the pavement is opened to traffic depends upon the strength developed in the beams.

This procedure has saved the traveling public many thousands of dollars in motor vehicle operating costs in addition to convenience, by permitting the early use of pave-

HIGHWAY CONSTRUCTION RECORDS MADE IN 1927

The following jobs established records during 1927:

Smoothness of Pavement

With respect to smoothness of pavement Contract M-139 in San Bernardino County, Sam Hunter, contractor, E. R. Brown resident engineer, is pronounced as smooth as any Portland cement concrete pavement yet laid in California. In asphaltic concrete, Contract 96FC1, Kern County, Force, Currigan & McLeod, contractors, P. L. Wilcox, resident engineer, has the record for smoothness for machine spread pavement, and Contract DM-253, Los Angeles County, Southwest Paving Company, contractor, J. M. Lackey, resident engineer, has the record for hand spreading.

Compressive Strength

Exceptionally high average compressive strengths were obtained on Contract 525 in Orange County, Matich Brothers, contractors, R. D. Kinsley, resident engineer, and on Contract M-168 in Alameda County, H. M. Ball, contractor, F. C. Fosgate, resident engineer.

Production

Contract M-151, in Ventura County, J. F. Knapp, contractor, C. N. Ainsley, resident engineer, has the record for daily yardage in concrete placed for any work to date on the California system of highways. Contract M-161, in Merced County, Allied Contractors, Inc., contractor, H. B. LaForge, resident engineer, was the record job for asphaltic concrete production in 1927.

ments that might otherwise be kept closed for an arbitrary period under ordinary specifications.

No marked change has been made in equipment for this type of construction. Concrete mixers have been universally standardized at a cubic yard capacity, and all other units brought up to this output.

ASPHALTIC CONCRETE

Improved methods of spreading are responsible for the increase in smoothness of asphaltic concrete construction. During the past year and a half, experiments were carried on within the department to eliminate the imperfections resulting from hand spreading. The methods worked out with crude hand and horse-drawn implements were incorporated on one of the mechanical finishers used ordinarily on concrete work, and the machine was tried out on two asphalt concrete projects during 1927.

Where mechanical means of spreading were not available, a marked improvement has been made on hand work by following up with a five-foot, long-handled lute operated transversely across the uncompressed surface. This method tends to eliminate the sharper irregularities remaining in hand-raking.

SMOOTHER PAVEMENT

On contract 96FC2 in Kern County, three methods of spreading were employed with the following results: 0.9 mile of hand work averaged 24.2 inches of roughness per mile, 4.41 miles of hand work followed by a lute averaged 18.6 inches per mile, and 3.32 miles of machine finish averaged 16.4 inches per mile. It can be said, in support of the machine, that this portion of the work was performed during cold weather and would necessarily be rougher than work performed under more favorable conditions.

On contract 96FC1, again in Kern County, where machine finish was used throughout, the average roughness of the entire job was 13.9 inches per mile. On the three miles constructed in summer weather, the average was 12 inches of roughness per mile, while the remainder of the job built in comparatively cold weather, averaged 14.7 inches.

OTHER IMPROVEMENTS

After a year of experimenting, the high filler content mixture has been adopted as the standard and all but two of the projects constructed this season were of this type. This mixture is a modification of the original experiments by Abson of Chicago along the same line.

The surface finish accomplished by rolling asphalt coated screenings into the freshly compacted surface, has been adopted as standard California practice. Apparently, the larger the screenings, the better the results, and material passing $\frac{1}{2}$-inch and retained on $\frac{1}{4}$-inch sieve is now used for this purpose.

Other than the mechanical means of spreading, no radical changes have been made in equipment in use on asphaltic concrete pavement this season.

RESULTS OF LABORATORY ANALYSES

Portland Cement Concrete. The average compressive strength of pavement concrete this season was 4508 pounds per square inch, the average for shoulder concrete was 3494 pounds and the general average of concrete strength for both pavement and shoulders was 4440 pounds per square inch, an increase of 295 pounds over 1926 construction.

Pavement concrete varied in average strength on individual contracts from 3740 pounds to 4944 pounds, a total variation of 1204 pounds. The total variation in 1926 was 2160 pounds, indicating that much more uniform results were secured in 1927 construction.

Asphalt Concrete. Voids in pavement mixtures varied from 7.4 to 1.8 per cent as found by relative specific gravity determinations. This density is somewhat lower than the 1926 results and is due, to a large extent, to the high filler content. Experiments have shown that this mix, although more stable

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"C-A-L-I-F-O-R-N-I-A" TELLS THE WHOLE STORY ON AUTO LICENSE PLATES

CHARLES A. WHITMORE in Visalia *Times-Delta.*

The automobile license plates of Idaho are shaped like the famous Idaho potatoes, while Massachusetts is in the form of the much lauded Massachusetts cod fish. A Wisconsin newspaper man suggested the dairy cow be honored on Wisconsin plates. Another newspaper writer suggests that drivers found hogging the road should be given a plate stamped in the form of a large fat hog. And so the suggestions continue.

It would be difficult for California to adopt any plate that would typify all of the resources and attractions of this state. Fortunately there is no need for our doing this. The word "California" tells the whole story and the whole world knows what it means.

Breaking the Newhall Bottleneck

By S. V. Cortelyou, District Engineer, Los Angeles

THE survey for a new entrance road to the San Fernando Valley from the north has been completed. While financial and legal phases of the project are yet to be determined, the survey has shown that this will relieve the many traffic jams that have occurred in the past between Saugus and San Fernando.

The survey is for a new road over that portion of the route lying outside of the city limits of Los Angeles. The survey and preparation of plans for sections within city territory will be ready soon.

State, county and city engineering departments and the Automobile Club of Southern California have been working on a traffic congestion relief plan through the Newhall Pass for more than a year. This plan is declared to be the most logical yet devised.

DISTANCE REDUCED

The new road will leave the "Ridge" road about midway between Castaic and Saugus and extend southeasterly into and through Gavin and Weldon canyons to a junction with the San Fernando road just south of the viaduct over the Southern Pacific Railway at Tunnel Station. In addition to improved alignment and the elimination of a dangerous grade crossing for San Joaquin Valley travel, the new road will shorten the distance between the points mentioned about 1.2 miles.

From a point on the San Fernando road just north of the viaduct over the Southern Pacific Railway at Tunnel Station, it is the intention to extend a new road along the northerly side of the railway tracks to a point a short distance below the Cascades on the aqueduct. From this point the road will continue easterly to a connection with the state highway at the north city limits of San Fernando.

SOUTH ROUTE PLANNED

From a point on the south roadway near the Cascades it is proposed to extend a new highway south through the San Fernando Valley and the Santa Monica mountains to the west coast; there to connect with the state coast highway extending from Oxnard to San Juan Capistrano.

Contracts for the widening and repaving of San Fernando road between Tunnel Station and San Fernando and between San Fernando and Burbank have recently been awarded; also, the state is planning extensive improvements in the present road through Newhall tunnel and pass.

These improvements, when completed, will enable travel to enter the metropolitan area of Los Angeles from the north with a minimum of interference and will permit of a distribution of travel from the upper end of the San Fernando Valley direct to points of destination without the inconvenience and annoyance of passing through already congested districts. This improvement will be of inestimable value to southern California.

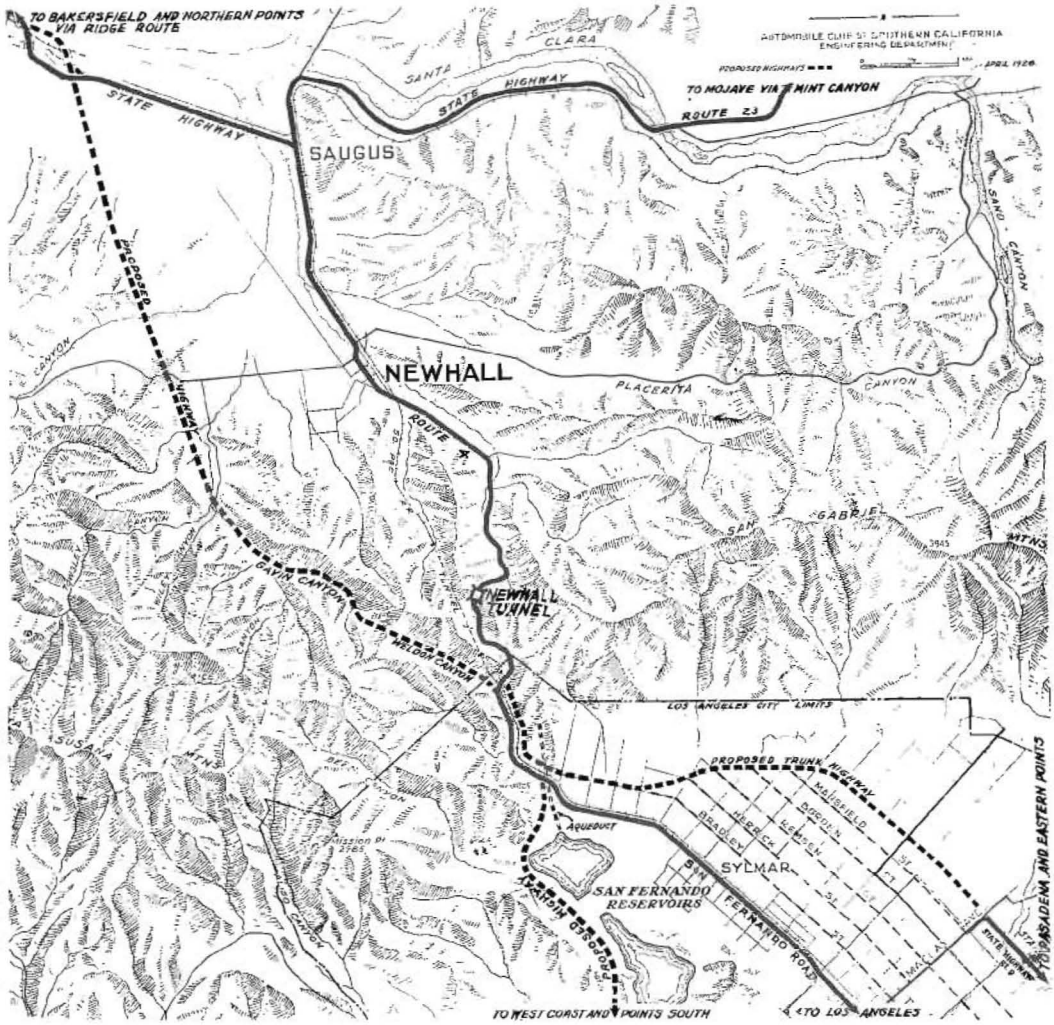
The improvements noted above will be constructed by the state and city and county of Los Angeles. The state work will be confined to that portion lying without the city limits, and the city and county to that portion within the city. The two divisions of the work, however, are inseparable and the state will not expend money upon its section until definite assurance has been made that the city and county will carry out their part of the plan, for travel would still be "bottlenecked" at and below Tunnel Station.

Walled in as it is on three sides by the San Gabriel, Santa Susana and Santa Monica mountains and the Pacific Ocean, Los Angeles County is vitally concerned in maintaining adequate entrance roads. Entrance from the north is confined to the Cajon and Newhall, and from the west to the Santa Susana and Calabasas passes.

The Newhall Pass is of particular importance to the south. Since that memorable day in December, 1854, when Phineas Banning, seated on the box of a Concord stage drawn by six mustangs, drove over the old pack trail to the summit and "nose-dived" down the north slope, this route has been the only direct connection between Los Angeles and the San Joaquin Valley.

Fort Tejon was established in 1854, and following Banning's adventure the merchants of Los Angeles were quick to see the trade possibilities in this route and set about to raise, by public subscription, funds to construct a wagon road over the Newhall Pass. By February, 1855, the road had been improved and in that month the first wagon train, forerunner of a mighty commerce, passed over the new road en route to the fort and the Kern River country.

From 1910 to 1913 the present road and tunnel were constructed by Los Angeles



MAP SHOWING LOCATION OF SUGGESTED HIGHWAY

County through a bond issue. That part of the road lying between Saugus and the north city limits of Los Angeles was made a part of the state highway system in 1916 and is maintained by the state. The original improvement, however, remains as constructed by the county.

In 1910 when Los Angeles County started the improvement of the Newhall Pass, there were registered in California, 44,132 automobiles. The population of Los Angeles County in that year was 504,131.

In 1927, Los Angeles County registered 689,902 automobiles and the population of the county was estimated to be more than 2,250,000 people.

A traffic census taken for a 24-hour period in August, 1920, by the Automobile Club of Southern California, showed a total of 1207 vehicles using the San Fernando road between the north city limits and Saugus. A recent traffic check on this section shows a total of 23,150 vehicles during a 24-hour period.

It will be noted that the plan contemplates the ultimate extension of the principal streets of San Fernando westerly to an intersection with the proposed trunk highway. This will enable travel to filter into San Fernando and points along the northerly side of the Southern Pacific tracks along more direct lines. It is coming to be generally recognized that congestion on business streets tends to depreciate property values and encourages the development of business centers in less congested localities.

New Construction Problems

By C. S. Pope, Chief Construction Engineer, Division of Highways.

THE Division of Highways is confronted at this time with the task of planning and executing under contract, highway projects which will require an expenditure in excess of thirty million dollars for the biennial period beginning July 1, 1927, and ending June 30, 1929.

C. S. Pope

The task may be visualized in the statement that there have so far been programmed in excess of 150 major projects, not counting bridge projects o grade separations.

These major projects range in estimated cost from $50,000 to $60,000 to more than $800,000 allotted to a single project. In addition, some 250 to 300 minor projects ranging from $10,000 to $50,000 will be carried out during the biennium.

The construction problems involved in the proper handling of these projects are twofold.

On the one hand we have the problem of designing the physical details of the project in the best possible manner and, on the other, the securing and training of a personnel of engineers and inspectors competent to supplement the experienced and trained men already in the employ of the Division of Highways.

A brief statement of present practices may be of interest.

MATERIALS SURVEY

At the present time, all highway projects are given a most thorough engineering examination before plans are undertaken. Material surveys are conducted showing the character of the soil and its proper treatment, also the location and availability and quantity of construction materials of all kinds.

A traffic survey is maintained at uniform intervals of time from which predictions of future traffic may be made with reasonable accuracy.

An accurate system of costs of maintenance of different sections of highway is of great value in determining the details of construction which should be specified especially on reconstruction work.

The determination of types of pavement to be used on both new construction and on reconstruction offers a fertile field for both study and argument.

GENERAL PROBLEMS

The general problems with which the department is confronted offer a great variety of unusual conditions to be met. Three projects may be cited showing the diversity of obstacles to be overcome and their importance to the success of highway construction.

One project which we have in contemplation is the construction of a section of highway from Soda Springs westerly on the transcontinental route from Auburn to Reno. This road is located in the snow country at elevations of 6000 to 7000 feet, and the problem is to design a road which will not only adequately serve traffic as to grade, alignment and scenic features, but will also offer the greatest freedom from obstruction during period of snow fall. So insistent is public demand that roads be kept open at all times that there is a constant pressure for large expenditures for snow removal on roads which are relatively unimportant. The problem on the road in question will be met by keeping the grade as high as possible, avoidance of heavy cuts and a tendency towards widening all cuts as much as possible with ample drainage facilities. The removal of trees which shade the roadbed is also important since it will save the state large sums of money if we do not have to remove caked ice from the highway. Also, it is necessary to provide eventually, a hard surfaced road for the full width of the graded section in order to secure proper support for the operation of snow removal machinery.

A second problem is the protection of the road from Santa Monica to Oxnard against the erosion of the sea. This is a road of great importance and also great scenic beauty but its location is such that the expenditures for shore protection may become very serious. Experimental structures in the way of groins, riprap, concrete slope paving or other devices are all receiving attention in the hope of working out an economical and successful type of structure for this location.

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Santa Ana River Bank Protection Work

THE Division of Highways recently completed the construction of 2000 lineal feet of protection work along the east bank of the Santa Ana River, at the State Highway Chapman avenue bridge in Orange County.

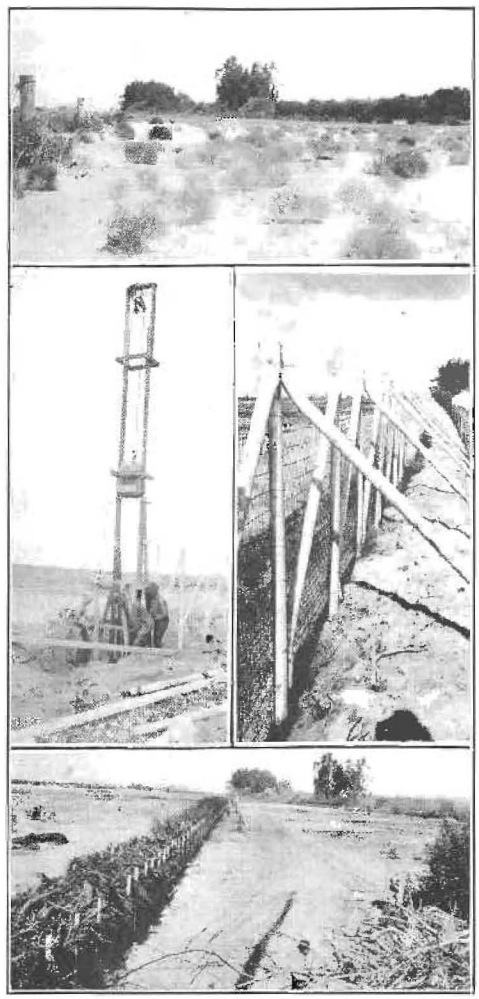
Flood waters of February, 1927, cut out a large area of land along the east side of the river channel just north of the state highway bridge and inundated the highway for about a mile, closing the road to traffic for nearly a day, and flooded residences and places of business. Serious cutting occurred at the east approach to the bridge, where the embankment was menaced for several hours.

A timber pile and wire revetment, constructed by local interests, which extended along the east river bank from the bridge abutment 2000 feet upstream to a grove of eucalyptus trees was washed away by the flood. The wooden piling had rotted at the ground line and was broken off by the force of the flood water.

As it was necessary to replace the revetment which had been washed away, in order to safeguard the state highway bridge and prevent the recurrence of the flooding of the highway as well as private property along the east bank of the river, a plan was proposed by District Engineer S. V. Cortelyou which was accepted by the Olive and West Orange Protection District, in whose territory the flooded area was located. The cost of the work was shared equally by the state and the protection district.

Work consisted of the construction of 2000 lineal feet of double fence of pipe posts and woven wire and brush, bank protection. In addition to the 2000-foot line, two 50-foot wing offsets were constructed at the upstream end to serve as a second line of defense against the entrance of the stream behind the protection work.

The protection work was constructed along a straight line extending from a point 2000 feet upstream to the east abutment of the Chapman avenue highway bridge. Posts, which were spaced 6 feet on centers both longitudinally and transversely, consisted of 3¼-inch O.D. tubing galvanized. The posts were approximately 20 feet long and were driven into the ground 13 or more feet and projected above the ground surface 6 feet.



Top view shows bank destruction: center views, pile driver and fence; bottom view, completed revetment.

Diagonal braces made of the same size tubing were placed on the front line or river side in each panel, and were used on each alternate panel transversely from the front line of posts to the back line of posts, affording rigid construction. Galvanized ⅝-inch bolts were used to fasten the braces in place.

Along the row of posts on the river side there was placed 8 feet of Ellwood Type "I" fencing, which was composed of two 58-inch widths of the fencing which were lapped 20 inches at the ground line, where the

(Continued on page 25.)

Keeping Books on the Highway Budget

By E. Roy Higgins, Chief Accountant, Department of Public Works.

THE PLANNING of an accounting system broad enough to meet present and future fiscal and statistical needs presents a continuous problem. Methods of highway financing have undergone a radical transition during the past few years. The policy of building roads from funds provided by bond issues has almost universally been abandoned, and we find that generally throughout the country highway construction is being financed from current revenues provided by gasoline taxes and motor vehicle fees. The effect of this change has been to emphasize the importance of the budget as an essential instrument in the administration of highway departments. In the accounting system of the California Division of Highways budgetary principles have been applied so as to provide through a comprehensive system of budgetary accounts the maximum of executive control over activities and expenditures.

E. Roy Higgins.

WHAT THE BUDGET DOES

The budget which at the outset is merely a tentative financial plan based upon estimates of revenue and expenditures, becomes upon its adoption the definite authorized administrative program for the biennium. It allocates from the funds that it is estimated will be available, definite sums for the several functional activities of the Division of Highways. In connection with the allotment that is made for construction projects, a detailed statement of the specific projects to be undertaken is included. Besides providing funds for the various activities of the Division, the budget limits the expenditures to the amounts provided, and it is, therefore, necessary to incorporate the final approved budget into the accounts, and to record therein the effect of subsequent transactions.

HOW EXPENDITURES ARE AUTHORIZED

Authority to expend funds under the budget is extended to the various district offices of the Division of Highways through the medium of work orders, which are issued by headquarters with the approval of the State Highway Engineer and the Director of Public Works. They are drawn against the main functional allotments provided in the budget and constitute specific authority to the districts to incur expenditures for the purposes stated therein. The issuance of work orders is limited by the amount of the budgetary allotments, and district offices are not permitted to incur expenditures in excess of the individual work orders. There is, therefore, no possibility of the Division of Highways as a whole expending funds in excess of budget provisions.

SYSTEM OF ACCOUNTING

The accounting for expenditures of the Division is accomplished through a decentralized system of accounts which places responsibility for the accumulation of details upon the district offices. Monthly reports of accumulated transactions for the fiscal year to date are required from the districts, together with journal entries necessary to set up the monthly entries to the control accounts in central office. After giving effect to the journal entries accompanying the monthly reports, the expenditure controlling accounts in central office are in agreement with the corresponding controlling accounts in the respective districts, and reports of administration, construction, and maintenance provide the detailed analysis of these accounts.

BOOKKEEPING MACHINES

Bookkeeping machines are used in the distribution of expenditures to the analysis records of administration and maintenance, and to the construction ledger sheets under construction, as well as in the preparation of the monthly reports. As the volume of detail is very great, the adoption of machine bookkeeping has provided for the handling of transactions somewhat more rapidly than is possible by hand methods, and at the same operation mechanical proof of the accuracy of the work is obtained.

A decentralized system of accounts similar to that described above is used in connection

with equipment department accounting, the detail of which is kept in the various shop offices. Bookkeeping machines are again used to good advantage in the posting of the subsidiary stock and equipment ledgers, employee's time cards, labor cost sheets, shop invoices, and in the preparation of monthly reports.

CALIFORNIA SYSTEM APPROVED

Expenditures of the various state highway departments in the United States have increased phenomenally during the past ten years, and highway accounting has had to keep pace with this rapid growth. The natural result is that systems have developed in the various states independently of each other, and the statistics which are compiled for administrative purposes and for the information of the public, are in many cases not comparable, being based on entirely different policies in the accumulation of costs. As a step toward correcting this condition a subcommittee on accounting was apopinted by the American Association of State Highway officials, meeting at Denver, October, 1927. This committee in its report stressed the need for a uniform system of accounts in all state highway departments, and made various recommendations as to procedure, organization, accounting methods, and the compilation of reports and financial statements. There is considerable satisfaction in knowing that the organization and system of the California Division of Highways appears to follow very closely the uniform system outlined in the report of the subcommittee on accounting, which was recommended for adoption in all of the states of the Union.

Highway Crew Aids In Tehama Rescue

E. L. Stump, resident engineer for the California State Highway Commission reports that a crew of his men aided in the rescue of E. D. Simpson, of Tehama, who nearly lost his life, Monday night, at the Cone Ranch near Red Bluff when his machine became stalled in the water pouring across the highway. Simpson's car was washed from the road and it was with considerable difficulty that he and the car were dragged from a perilous position when his car became lodged in debris in deep water. A 5-ton truck of the highway department was used in the rescue work.

Tells Progress in Separation of Grade Crossings

During the year 1927 the Transportation Division of the State Railway Commission passed on twenty-three applications involving grade separations. Two other separation proceedings were applied for and were pending at the close of the year.

In line with the commission's policy to remove traffic hazards at important grade crossings as speedily as possible, grade separations, or the elimination of grade crossings, were authorized and were constructed during the year at the following places: Between Alberhill and Corona, Riverside County, on the Corona and Santa Fe Railway; at Pico boulevard, Longwood avenue and Tremaine avenue in the city of Los Angeles on the line of Pacific Electric Railway; at Beverly boulevard, two miles east of Montebello on the Los Angeles and Salt Lake Railroad at Harbor boulevard; Pittsburg, Contra Costa County, on The Atchison, Topeka and Santa Fe Railway; and at Ben Ali, Sacramento County, on the Southern Pacific Railroad.

The following grade separations were authorized by the Commission on the recommendation of the Transportation Division but have not yet been completed, at the following locations: At Rio Oso, Sutter County, on The Western Pacific Railroad Company's line; at Murray avenue near La Mesa, San Diego County, on San Diego and Arizona Railway; on state highway at Galivan, Orange County, on Atchison, Topeka and Santa Fe Railway Company; at First street, city of Los Angeles, on Atchison, Topeka and Santa Fe Railway, Los Angeles and Salt Lake Railroad, and Pacific Electric Railway; near Rincon, Santa Cruz County, on Southern Pacific Railroad; at Mossdale, San Joaquin County, on the Southern Pacific Railroad; at Forty-seventh street, city of San Diego, on San Diego and Arizona Railway Company; at Serra, Orange County, on The Atchison, Topeka and Santa Fe Railway; private road at Spadra, Los Angeles County, on Los Angeles and Salt Lake Railroad; pedestrian subway near Marysville, on Southern Pacific Railroad; at Oceano, San Luis Obispo County, on Southern Pacific Railroad; at Stinson Beach road, Marin County, on Mt. Tamalpais and Muir Woods Railway.

December, 1927, was the coldest December in Minnesota since 1886 and had more snowfall than any December since 1891, according to the St Paul weather bureau. The cold weather was general throughout the state. The snowfall varied, some places having more than the 28.5 inches recorded in St. Paul and some having less. All except a few small sections of the state, however, had a very heavy snowfall, accompanied by high winds. In spite of these unusual conditions, trunk highways in Minnesota were kept 90 per cent open during the month, a bulletin from the State Highway Department states. Only on two days, when heavy storms were in progress, were a majority of the highways closed. After both storms two-thirds of the routes were opened within three days, and all but two or three of the sixteen maintenance districts reported all routes opened within a week. Some of the districts which had heavy spowfall, but less wind, had all routes open within twenty-four hours after each storm.

100 Years After Jedediah Smith

Retrailing on State Highways the Route That Daring Pathfinder Found Century Ago

By T. E. STANTON, Assistant State Highway Engineer.

THE YEAR 1928 marks not only an important milestone in the development of California's state highway system but also the 100th anniversary of the famous trip made by Jedediah Smith northerly through the Sacramento Valley and along the coast in northern California and southern Oregon.

T. E. STANTON.

We frequently overlook important anniversaries unless something occurs to jog our memories.

On a recent trip through northern Humboldt and Del Norte counties the writer was mentally reviewing the fact that bids had just been opened for grading the last unconstructed section of state highway in Del Norte County connecting Crescent City with the south.

A COMPARISON IN COMFORT

Realizing the ease and comfort with which it will be possible to make the trip by auto along the coast before the end of 1928, he was reminded of the hardships suffered by the small band of pathfinders under the leadership of Jedediah Smith just 100 years ago when they blazed a trail through unexplored territory down the Trinity and Klamath rivers to the coast near Requa and thence northerly to the Umpqua River, Oregon, where all but three of the party were massacred by Indians.

DIARIES TELL STORY

Fortunately, both Smith and one of his party named Harrison Rogers, left letters and diaries describing the route followed by the party through California. These letters and diaries have been edited with copious footnotes by Harrison Clifford Dale, Professor of Political Science in the University of Wyoming and published by the Arthur H. Clark Company, Cleveland, in 1919, in a volume titled "The Ashley-Smith Exploration and the Discovery of a Central Route to the Pacific." Professor Dale has been quite freely quoted in this article describing the route taken by Smith and his party through California.

THE FIRST TRIP

Smith made the trip from the vicinity of Salt Lake to southern California over the Santa Fe Trail in August, 1826.

His route is difficult to follow from his confused and inadequate directions. It is over 100 miles from the point where Smith seems to have struck Sevier River, up that stream, and across the divide to the headquarters of the Virgin, which he named Adams River. According to Dale this river was subsequently named Virgin, presumably for Thomas Virgin who accompanied Smith on his second expedition.

Dr. Herbert E. Bolton, Director of the Bancroft Library at the University of California, believes that Dale is mistaken in his assumption that the Virgin River was named after Thomas Virgin but thinks that it was probably named by the Spanish after The Virgin.

Smith reached the Colorado which he recognized as the Seedskedee, or Green River, by October 5th. There is now a ferry across the river at this point.

He crossed the Colorado at Needles and followed, presumably, the present route of The Atchison, Topeka and Santa Fe Railroad, identical with what was to be the Santa Fe-Los Angeles Trail. He entered California via the Cajon Pass.

The expedition arrived at Mission San Gabriel, November 27, 1826. Upon his arrival in California Smith was looked upon with suspicion and was compelled to appear in the presence of the Governor of the Californias, residing at San Diego, where, with the assistance of some American gentlemen, he was enabled to obtain permission to return with his men by the route he came and purchase such supplies as he needed.

THE TRIP NORTH

He then started north early in 1827 and crossed the Tehachapi Range into the San Joaquin Valley. After traveling 300 miles they reached a river where they made a small hunt, attempted to cross the mountains, failed, returned to the valley and established a camp. Then Smith started again across the mountains with two men on May 20, 1827. He succeeded in crossing the Sierras in eight days, having lost two horses and one mule. Smith states that he found the snow on top of the mountain from four to eight feet deep, but it was so consolidated by the heat of the sun that the horses sunk only from half a foot to one foot deep.

ROUTE INDEFINITE

The location of Smith's route is impossible to determine with accuracy. Warner states that he followed up the American fork of the Sacramento. Richman takes him to the Mokelumne River and Chittenden to the Merced. According to Dale it seems more probable that he followed the Stanislaus, starting eastward

Inscription on Monument.

along the route followed in the opposite direction by the Bartelson-Bidwell party of 1841. The evidence for this is the fact that he named the stream the Wilmiches from the tribe of Indians dwelling on it. The Wilmiches live north of Kings River but certainly not as far north as the American fork of the Sacramento, which was north of the northernmost limit of the Mariposan group to which the Wilmiches belong. On the Stanislaus River he was in the midst of a Mariposan area and he was not far north of Kings River. Again, orders were issued in October, 1827, to bring into San Francisco the trappers on the Rio Estanislao. (Governor's Orders of August 3, September 14, October 1 and 16 in Departmental Records Mss., Vol. V, 78, 88, 94, 102.) In the third place, Smith states that he traveled north 300 miles from San Gabriel, which would bring him approximately to the Stanislaus.

Assuming that, in continuing his journey, he followed up the middle fork of this river, he would pass to the south of Mt. Stanislaus (11,202 feet) (his Mt. Joseph), and on the other side of the Sierras would strike the upper reaches of the West Walker River, following down into the plains of the east, presumably passing to the north of Walker Lake without visiting that body of water.

RETURN TO CALIFORNIA

Smith returned to California over the Santa Fe Trail with additional men in the winter of 1827, and rejoined the remainder of his original party.

During Smith's sojourn in California he and Harrison G. Rogers, the clerk of the company, kept a record of daily occurrences. Rogers' journal has been preserved. He was killed July 14, 1828, with eleven others of Smith's men, at the massacre of the Umpqua. Two of his journals, both of them fragments, have survived. The first covers the period from November 27 to December 20, 1826, and from January 1 to January 13, 1828. The second runs from May 10 to July 13, 1828. What became of the remainder of these journals is unknown.

With Smith's return in the winter of 1827, and the resumption of the journey northward in the spring of 1828, Rogers continued his diary. Day by day, during the tedious and dangerous march through northern California and southern Oregon, he diligently recorded the distance made and the direction pursued, taking pains to make his log as perfect and accurate in detail as the difficulties of an unnamed and unknown wilderness would permit.

After two years of almost constant danger, they were within easy distance of the friendly Kallipoo Indians, the Willamette River, and Fort Vancouver, the Hudson's Bay Company's post at its mouth, when Rogers and all of the company save three were brutally massacred by the Umpqua Indians, into whose hands fell all the property of the little band, including the furs, the outfit, and the journals themselves. Three refugees only, Smith, Black and Turner, made their way amid terrible hardships to Fort Vancouver, where they secured assistance from the British in securing their property.

Rogers made the last entry in his journal on July 13, 1828.

DIARIES PRESERVED

For many months the journals were in the Indians' possession. Why they did not destroy them is a mystery. Perhaps they regarded them as an unknown and powerful medicine. Finally recovered, however, they were brought out by Smith from the mountains in the fall of 1830. The following summer, after having eluded constant danger and even having escaped the massacre on the Umpqua, Smith was at last shot down by Indians on his way to Santa Fe.

Ashley, who had been made executor of his will, took possession of his papers including the Harrison G. Rogers journals. Instead of returning them to Smith's relatives, who perhaps would scarcely have appreciated their value, he retained them. At his death they passed to the administrator of his estate and so to the hands of Mrs. Benjamin F. Grey of St. Louis, Ashley's grandniece, by whom they were deposited with the Missouri Historical Society where they are now preserved.

REACH SACRAMENTO RIVER

When Smith returned to California in the winter of 1827 he rejoined the remainder of his original party and, together with the recruits brought with him on his second journey to California, the party, then 21 men strong, moved slowly up the Bonadventure (Sacramento) River. Moving slowly, and at the same time passing the winter, until the 13th of April, 1828, when by examination and frequent trials he found it impossible to cross a range of mountains (Sierras) which lay to the east, he then struck off northwest, leaving the Bonadventure (Sacramento) and worked across the Coast Range until on May 10, 1828, he had reached a point on the main branch of the Trinity River, not far above the mouth of the south fork, near Burnt Ranch, Trinity County, California.

It is at this point that the second journal of Harrison G. Rogers begins, namely while the party was still in the mountains between the Sacramento Valley and the ocean.

The Jedediah Smith Monument.

ON TRINITY RIVER

Between May 10th and 26th Smith and his party proceeded down the Trinity River, called, by Smith, Indian Scalp River, making one or two attempts to cross to and follow the coast.

The first account of the interesting Hupa Indians, of Athapascan stock, who were not encountered by the whites again till 1850, is contained in Rogers' journal. The Hupas occupied the Trinity River from its mouth to Burnt Ranch. They were a powerful and important tribe, whose language was the lingua franca among most of the tribes of northern California.

Smith and his party crossed the Trinity above Klamath and encamped on the eastern bank.

BEACH THE KLAMATH

On May 27th they reached the Klamath not far above its confluence with the Trinity. The party then made its way down the Klamath with considerable difficulty and at last on Sunday, June 8, 1828, after several days of hard traveling, they reached the sea, camping north of Requa. On June 11th, following north a short distance back from the shore, they reached Wilson Creek. On June 13th, they managed to reach a point just south of Crescent City where they encamped. On the 14th, a mile from camp they struck the long neck of land called Point St. George and encamped on the side facing the open sea. On the 16th, proceeding along the point, they camped on its northern extremity near Lake Earl. On the 17th they advanced a couple of miles but, finding the ground in the vicinity of Lake Earl swamp and impassable, they returned to the higher prairie and encamped. On the 18th the same obstacles were encountered that had been encountered on the day before. On the 19th, the Smith River was discovered and on the 20th they struck Smith River some distance above its mouth, fording the stream six or eight miles from the sea. Then following the coast and crossing the numerous streams and rivers in Oregon the party reached the Umpqua River in Douglas County, Oregon, on Friday, July 11th. On the 12th they crossed the Umpqua probably above the mouth of Smith River and then proceeded in an easterly direction toward Winchester Bay. On Sunday, July 13th, they traveled east along the north bank of the Umpqua River.

This date, July 13, 1828, is the last entry in the Journal of Harrison G. Rogers.

Map of Jedediah Smith's Exploration.

INDIAN TROUBLES

Up to this point the general attitude of the Indians towards the little party had been friendly. Smith had made every effort to keep on peaceful terms with them. By the 13th of July the worst of their journey was over. Fifteen or twenty miles of easy traveling would bring them to the Willamette Valley, whence lay an open road to the Columbia. The Umpqua Indians, moreover, seemed singularly friendly. Two days earlier, it is true, one of them had stolen an axe, which he gave up only after Smith had tied a rope around his neck. The following day the incident seemed to be forgotten for fifty or sixty Indians came into the camp to trade.

The night of July 13th, their attitude apparently changed, or else from the first Smith, despite his experience with the Indian character, had been deceived by their seeming friendliness. With their usual precautions, the men had pitched camp Sunday evening near the river. Monday morning, leaving the rest of the party still in camp, Smith after breakfast, set out on foot to find the road for the day, just as he had done many times before. The party had already crossed the Umpqua but had found the traveling on the north side of the stream unusually difficult chiefly on account of the heavy rains.

Returning from his reconnaissance, he suddenly met John Turner running frantically toward him through the underbrush. He related how soon after Smith's departure, the entire band of Indians, at the instigation of the chief who had stolen the axe a couple of

(Continued on page 23.)

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.

BERT B. MEEK ..... Director
GEORGE C. MANSFIELD ..... Editor

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

Vol. 5 MAY-JUNE, 1928 Nos. 5–6

ATTORNEY GENERAL RULES ON CONTENTS OF JOURNAL

Attorney General U. S. Webb has ruled that specific legislative consent must be obtained for the publication in CALIFORNIA HIGHWAYS AND PUBLIC WORKS of matter pertaining to the activities of the Division of Engineering and Irrigation, the Division of Water Rights, the Division of Architecture, and the Division of Ports, all being divisions of the Department of Public Works.

Such legislative sanction has already been given for the publication of information concerning the work of the Division of Highways.

In accordance with this ruling and until such time as express legislative approval may be secured for the inclusion of articles relating to the divisions first referred to, CALIFORNIA HIGHWAYS AND PUBLIC WORKS will be confined to the publication of matter relating to the Division of Highways.

It might be well to republish in this connection the thought back of CALIFORNIA HIGHWAYS AND PUBLIC WORKS as expressed by Mr. B. B. Meek, director of the Department, in the initial issue of this journal. He wrote:

> CALIFORNIA HIGHWAYS AND PUBLIC WORKS in announcing its birth would also announce the reason of its being.
>
> We believe that there is need in a state department spending many millions of the people's money for an authoritative source to which the people can go to learn officially of the projects, policies, and expenditures of such department. We plan to be such an official record for the California Department of Public Works.
>
> There is also need in a department embracing a wide and varied scope of activities, some means through which the combined judgment and experience of the entire department can be brought to bear on problems that arise within its divisions.
>
> We believe also that where large sums of public money are expended as is the case in this Department of Public Works that there should be a clearing house through which knowledge of developments of new methods, announcements of the results of experiments and matters of a like character may be made easily available to county and city officials in particular and the public in general.
>
> That is why we are here. We plan to serve honestly, helpfully, loyally. We want to help you, and we want you to help us.

CONVICT LABOR ON STATE HIGHWAYS

BOARD OF SUPERVISORS
Tehama County
California

March 29, 1928.

B. B. Meek,
Director of Public Works,
Sacramento, California.

DEAR SIR: There has been quite a little unfavorable comment in regard to using prison labor on the Inskip Grade and Mr. A. N. Montgomery the chairman of our board of supervisors, requested me to write you for a statement in regard to the matter, so that we could give out some kind of a statement to our newspapers. We would like to get the information why prison labor is used and the compensation that they receive and a general statement in regard to the matter.

Trusting you will comply with this request, I am

Yours very truly,

H. M. KOPPLIN, Clerk.

Mr. Meek's reply follows:

This will acknowledge receipt of your letter of March 29th relative to the use of convicts on the Red Bluff-Susanville lateral of the state highway system.

The employment of convict labor in road construction has been a policy in force continuously in California since 1915, when the first law instructing the California Highway Commission to utilize convict labor in highway work was enacted.

The obligation to use this labor is still imposed upon the Division of Highways. The extent to which it shall amount so appropriated for the present biennium is $600,000. This money must be used for the payment of wages to convicts, and for no other purpose.

The total state highway expenditures for the biennium are estimated at $50,000,000. With the exception of the $600,000 appropriated by the legislature for the payment of wages to convicts working upon state highways, the remaining portion of the $50,000,000 will go to free labor, either directly in the form of wages or indirectly in the payment for material, supplies and equipment produced or manufactured by free labor.

It may interest you to know that but 20 cents out of each dollar goes to convicts on these so-called convict camp jobs. The remaining 80 cents is spent for superintendence, engineering and other free labor used in connection with such work; for supplies and equipment necessary thereto, and for bridges and drainage structures on these projects, which will be built by contract.

During the past winter the number of convicts employed on road work was kept at a low figure. The total number of convicts in the three small camps maintained during the winter was at its largest in December and then only 227 prisoners were so employed. The convict camp on the Red Bluff-Susanville lateral will use about 60 prisoners.

Over a period of years the cost of road construction by convicts and by free labor is about the same. The fact, however, that the convicts are self-supporting while at work on the roads relieves the state of the burden of supporting them in prison. The saving thus affected to taxpayers of the state on the basis of the employment of 850 men is estimated at more than $200,000.

The convict camp work has been a very important factor in the reformation of prisoners, who through this work have been given an opportunity of accomplishing the change from prison to free life by gradual process. The hope that prisoners may be assigned to road work has been a very potent factor in making for better discipline among the inmates at San Quentin.

The history of convict road work in California is that the prisoners have built excellent roads without menace, peril, or annoyance to the communities in which convict camps have been located.

There are a number of counties now asking that convict camps be established on their roads. It is not the policy of the Division of Highways to force a convict camp upon a county, unwilling to receive it. If this should be the case with your county, please advise us of your thought in this matter. You should understand, however, that if it is deemed advisable to remove the camp from your county, the work laid out there for the convicts, of necessity, must go over at least until the next biennium as we haven't the money to finance a camp of free men on this project at this time.

A young bride asked her husband to copy a radio recipe she wanted. He did his best but got two stations at once, one of which was broadcasting physical exercises and the other the recipe. This is what he took down:

"Hands on hips, place one cup of flour on the shoulders, raise knees and depress toes, and mix thoroughly in half a cup of milk. Repeat six times. Inhale quickly one-half teaspoonful of baking powder, lower the legs and mash two hard-boiled eggs in a sieve. Exhale, breathe naturally, and sift into a bowl.

"Attention! Lie flat on the floor and roll the white of an egg until it comes to a boil. In ten minutes remove from the fire and rub smartly with a rough towel. Breathe naturally, dress in warm flannels, and serve with fish soup."

Flood Destroyed Portion of Desert Highway Rebuilt

By ALMON COONROD.

MARCH 13th of this year marked the completion of a 2.1-mile state highway grading project on the San Diego to El Centro highway at the foot of Mountain Springs grade, destroyed by a flood on December 16, 1926.

This sudden and unforseen deluge of water was the result of heavy rains over the large barren drainage area above. It was only one of a number of similar floods which occurred over the desert areas in this section. The earth embankments supporting the pavement crumbled and were carried away by the heavy current, and the pavement settled to the floor of the wash in large broken slabs.

The Wreck of the Old Road; the New Highway.

This flood occurred without loss of life or serious damage to property other than to the highway. Fortunately traffic was not delayed long for the water subsided after the storm and travel was resumed over the moist sand in the bed of the wash. Oil was later applied to the sand and this has served pending the completion of the reconstruction project. The new grade has been built on the hill side above the wash. It can now be used if the oiled road in the wash is destroyed by further floods, but it will not be thrown open to traffic until paved unless further floods in the wash make this necessary.

True to the history of every disaster affecting a thrifty population, the ruined highway is now replaced. Though still unpaved, the foundation is established for a better road than the old one. The new road has been relocated and built to the standards required by present day traffic; provision has been made for a grade separation at a railroad crossing, and protection work has been provided to baffle the floods which may sweep down the wash in the future.

State's Attitude Toward Contractors Told in Manual

The manual of instructions on construction work governing all construction procedure of the Division of Highways of the Department of Public Works of the State of California, contains the following instructions relating to public attitude and relations with the contractor:

"Relations with the public should be courteous but business like and always governed by common sense. Public discussion of the policies of the Highway Commission should be avoided. Remember, always, that you represent the State of California, and that the state and the people of the vicinity will hold you responsible for seeing that the work is accomplished in such manner as to afford greatest benefit and least inconvenience to the public at large.

"Relations with the contractor and his employees should be agreeably maintained. Surliness or an overbearing attitude will not be tolerated. Be friendly to all, but familiar with no one.

"Anticipate the contractor's difficulties. Advise, but do not try to force him arbitrarily to a certain course of procedure where the specifications permit more than one method.

"An engineer usually enforces his commands through personality. Be sure your judgment is cool, fair and impartial and your knowledge of the work so thorough that you command respect and obedience. Never argue. Refer disputed questions to your superior, and, until you hear from him, use your best judgment.

"An erroneous method, once allowed to start, is hard to stamp out. Similarly, the reputation of being slack or easy, though it is quickly attained, is difficult to overcome.

"Instructions or formal orders shall be given directly to the contractor or his authorized representatives, only. In case of minor importance, however, this rule may be modified to fit the occasion."

Motor vehicles registered in all of Russia totaled 21,035, as of July 1, 1927, according to figures furnished the U. S. Department of Commerce, 78 per cent being state owned, 7 per cent cooperatively owned, and 15 per cent privately owned. Figures compiled by the American Motorists Association show that this is one motor vehicle to every 6723 inhabitants in Russia, compared with one automobile to every five persons in the United States.

Grade Crossing Accident Report Issued by State Railroad Board

Having for its object the study of causes and conditions favoring accidents at grade crossings and on railroads and street railways, other than at grade crossings, the transportation division of the engineering department of the Railroad Commission has prepared a comprehensive report on such accidents occurring in the State of California during the years 1926 and 1927. The report has been submitted to President Leon O. Whitsell of the Commission by Mr. J. G. Hunter, chief of the transportation division, who was assisted in compiling the report by Assistant Engineer John E. Cooper, and Service Inspectors W. F. Lemon and H. L. Engelhardt.

GRADE CROSSING ACCIDENTS

As was the case in railroad accidents, discussed above, the grade crossing accident situation appears to have been more serious during 1927 than in 1926. There were 1740 accidents of this class in 1927, as compared with 1217 in 1926. The number killed in these accidents was 194 in 1927, as against 139 in 1926. There were 763 injured in 1927, and 629 injured in 1926. The majority of the killed and injured were passengers in vehicles, there being 135 killed, and 572 injured in this class during 1926, and 189 killed and 726 injured during 1927. Two of the classes of accidents listed deserve special comment, these being listed as : First, "Drove behind passing train and struck by train traveling in opposite direction." Second, "Ran into standing train." Both of these classes present peculiar conditions which the present means of protection does not seem to meet. Special study is being devoted to reduce the number of accidents under both classifications. There were 25 accidents of the first nature during 1926, in which three persons were killed and 10 injured, and 61 accidents during 1927, in which six persons were killed and 28 injured.

Under the second category where vehicles ran into trains occupying the crossing, the accidents occurred almost entirely during times of poor vision. In some cases the view of the wig-wag was obstructed by the train. The clear view under cars makes such trains rather difficult to see at night, as the automobile headlights, if properly adjusted, tend to light up the road under the car and not the car itself when it is at the grade crossing. There were 48 accidents in 1926 resulting from vehicles running into standing trains, with one killed and 27 injured, and 272 accidents in which vehicles ran into moving trains, with 15 killed and 114 injured in 1926. Under this classification there were 62 accidents involving standing trains in 1927 with 40 injured, and 319 accidents involving moving trains, with 25 killed and 139 injured.

It is interesting to note that 90 per cent of the accidents at grade crossings occur on the Southern Pacific, the Santa Fe and the Pacific Electric railroads.

Approximately 80 per cent of the total accidents covered by the report occur in city streets. The greater number of crossing accidents occur at crossings protected by crossing signs only. While this may reflect, to some extent, the lack of protection, it is probably largely due to the greater number of grade crossings falling within this group. The comparatively large number of accidents occurring at crossings protected by wig-wags and by flagmen, 299 in 1926, and 599 in 1927 at the former; and 103 in 1926, and 98 in 1927, at the latter, is no doubt because these include the heavily traveled crossings, and those that, due to certain physical conditions, present unusual hazards, and not because of the failure of this type of protection.

Los Angeles County, with 422 grade crossing accidents in 1926, and 759 in 1927, with 47 killed and 314 injured in 1926, and 64 killed and 294 injured in 1927, led the list of counties. Alameda County was second, with 207 accidents in 1926, with 10 killed and 79 injured, and 293 accidents in 1927, with 20 killed and 129 injured.

The New York state highway department spent $18,000,000 for new construction and $21,000,000 for reconstruction during 1927, according to figures recently released. The construction contracts covered 315 miles and reconstruction contracts 359 miles. The average contract price on new construction was $52,000 per mile and the average on reconstruction was $55,000. Many of New York's highways were laid out and improved before the present standards of alignment, grades and widths had been adopted. The cost of relocation and building bridges to do away with grade crossings also enters into the reconstruction.

District One Pays Tribute to Retiring Chief T. A. Bedford

By I. G. THOMAS, Assistant District Engineer.

DISTRICT I employees learned with the most sincere regret that their chief, T. A. Bedford, had tendered his resignation as District Engineer to accept a position with the Kaiser Paving Company in Cuba.

When, three days later, Mr. Bedford left, it was with regret that those who served under his guidance, saw him board the train and leave the service of the state which he has served for sixteen years. It was as though a big prop had been taken from beneath the District I organization.

T. A. BEDFORD.

All those who worked with him marveled at his keen judgment, his rare analysis of human nature, and enjoyed and respected his kindly supervision.

He left Eureka honored by all those who worked with him and a friend to all who knew him.

He left District I on Friday, April 13th, just 20 years since coming to California. Sixteen years of that time has been spent as District Engineer for the California Highway Commission, eleven years of which he pioneered the work in District II and the last five years in District I.

District I employees all wish for Mr. Bedford the best of all that he expects in his new venture.

PROGRESS MADE ON PAVEMENT CONSTRUCTION DURING THE YEAR 1927

(Continued from page 6.)

than the normal mix, is more difficult to compact.

FIELD COMPARISONS

Portland Cement Concrete. Roughness as determined by the vialog average 7.8 inches per mile, an increase of 0.6 inches over the 1926 record. Considering the fact that in the majority of 1927 projects, the normal amount of joints was trebled, this is an enviable record.

Cement control varied from 0.98 per cent to 5.26 per cent and averaged 1.6 per cent. The general average in 1926 was 1.49 per cent.

The average daily output of pavement concrete for all jobs was 201.8 cubic yards as compared to 186 cubic yards in 1926. This increase in daily averages was accomplished with but a slight increase in labor required.

ASPHALT CONCRETE

Surface roughness for 1927 averaged 22.1 inches per mile as compared to 24.1 inches in 1926.

Daily output averaged 277.1 tons in 1927 and 270 tons in 1926.

SURFACE ROUGHNESS, ALL TYPES

The average roughness has been consistently decreased since the first year in which measurements were taken. The averages in 1924 were 22.2 inches of roughness per mile; in 1925, 18.8 inches; in 1926, 15.0 inches; and in 1927, 14.2 inches.

In determining pavement roughness in the past, the Division of Highways has used an instrument known as the "vialog," developed in New York state. Recently, however, the United States Bureau of Public Roads has

RECORD OF PAVEMENT

District	County	Route	Section	Location	Miles	Contract No.	Contractor
							PORTLAND CEMENT
III	Sacramento	3	B	At Ben Ali Subway	0.37	93EC4	C. W. Wood
IV	Alameda	5	B	Livermore-Dublin	8.90	M-168	N. M. Ball
IV	San Mateo	2	A	Colma-Cypress Lawn Cemetery	1.58	94EC1	Hanrahan Co.
V	Santa Barbara	2	H, J	Between Montecito and Summerland	1.42	95FC1	Sam Hunter
V	Santa Barbara	2	H, J	Carpinteria-Summerland	4.48	M-142	Sam Hunter
VII	Los Angeles-Orange	2	D & F	Michigan Ave., Whittier, to Mirada St.	3.77	M-139	Geo. Herz & Co.
VII	Orange	2	B	1 mile N. of Galivan—6.7 miles N. of Galivan	4.91	97FC3	Geo. Herz & Co.
VII	Orange	2	C	Through Tustin	1.63	M-147	Griffith Co.
VII	Orange	60	B, C	Through Laguna Beach	1.54	519	United Conc. Pipe & Const Co.
VII	Orange-Los Angeles	60	A & E	Bet. Naples and Anaheim Bay Bridge	1.50	525	Matich Bros.
VII	San Diego	2	A	At Del Mar	0.38	97FC1	Jahn & Bressi
VII	San Diego	12	A, B	La Mesa-El Cajon	3.69	M-163	Geo. Herz & Co.
VII	San Diego-Imperial	12	H & A	Top Mt. Springs Grade—Myers Creek Bridge	6.80	515	Jahn & Bressi
VII	Ventura	2	D to G	Ventura-Benham Subway	13.04	M-151	J. F. Knapp
							PORTLAND CEMENT
VI	Merced	4	A	Athlone to S. Boundary	4.51	M-161	Allied Contractors, Inc.
VI	Merced	4	A	Merced—Southerly Boundary	5.48	M-141	Allied Contractors, Inc.
VIII	Riverside	26	E, F	Indio-6 miles S. of Coachella	8.99	M-133	Southwest Pav. Co.
							ASPHALTIC CON
III	Sacramento-Placer	3	B & A	Sylvan School-Roseville	3.06	93EC2	J. C. Compton
IV	Marin	1	B	Through Ross and Larkspur	2.50	M-144	Pacific States Const. Co.
VI	Kern	4	E	Lerdo-1 mile N. Famosa	8.79	96FC1	Force, Currigan & McLeod
VI	Kern	4	F	1 mile N. Famosa-1 mile S. of Delano	9.03	96FC2	Valley Paving & Const. Co.
VI	Merced	4	A	Merced-Southerly Boundary	6.04	M-141	Allied Contractors, Inc.
VI	Merced	4	A	Athlone-Southerly Boundary	4.51	M-161	Allied Contractors, Inc.
VII	Los Angeles	23	F	Sierra Madre Ave.-15th St., Lancaster	1.00	DM-253	Southwest Paving Co.
VIII	Riverside	26	E-F	Indio-6 miles S. of Coachella	8.99	M-133	Southwest Paving Co.

*Laid in 10-foot widths.

perfected a much more sensitive and accurate instrument called the "Roughometer," and after extensive trials and comparisons, the latter instrument has been definitely adopted for future work.

OUTSTANDING PROJECTS

Portland Cement Concrete. With respect to smoothness, Contract M-139, S.B-2-H & J, is as smooth as any pavement yet measured in California. This project was constructed by Sam Hunter under the supervision of resident engineer E. R. Brown, now city engineer of Santa Barbara.

Exceptionally high average compressive strengths were obtained by assistant resident engineer R. D. Kinsey on Contract 525, in Orange County, and by resident engineer M. C. Fosgate on Contract M-168, in Alameda County. These projects were constructed by Matich Bros. and N. M. Ball, respectively.

From the standpoint of production, Contract M-151, in Ventura County, constructed by J. F. Knapp, under the supervision of resident engineer C. N. Ainley, has the record for daily yardage of concrete placed for any work to date on the California system of highways.

Asphaltic Concrete. For smoothness, Contract 96FC1, Ker-4-E, constructed by Force, Currigan and McLeod under the supervision of resident engineer P. L. Wilcox, has the record for machine spread, and Contract DM-253, in Los Angeles County, constructed by Southwest Paving Company under the supervision of assistant resident engineer J. M. Lackey, was the record job for hand spreading.

Contract M-161 in Merced County, constructed by Allied Contractors Inc., under the supervision of resident engineer H. B. LaForge was the record job for production in 1927.

CONSTRUCTION, 1927

Resident Engineer	Average strength of concrete at 28 days, pounds per square inch	Average yardage or tonnage laid per day	Average daily variation in cement used, per cent	Average interval of designed joints, feet	Average interval of joints and cracks, feet	Viahog index of roughness, inches per mile	Average relative specific gravity in per cent	Type of equipment used: Mixer	Type of equipment used: Finisher	Remarks	District
CONCRETE PAVEMENT											
J. L. Piper	3,812	124.22	1.31	19.9	19.9	5.6	.....	*Foote 37 E	Ord	Wooden headers.	III
M. C. Fosgate	4,944	235.97	1.10	20.1	20.1	7.6	.....	*Koehring 27 E	Ord	Wooden headers.	IV
H. S. Payson	4,679	226.23	1.14	19.9	19.9	13.2	.....	*Koehring 27 E	Hand	Wooden headers.	IV
C. M. Butts	4,680	159.12	1.06	49.0	49.0	8.2	.....	*Foote 21 E	Ord	Steel headers	V
E. B. Brown	4,451	197.75	1.83	45.8	42.6	4.1	.....	*Foote 21 E	Ord	Steel headers	V
A. N. George	4,835	220.88	1.08	46.9	46.9	11.3	.....	*Foote 26 E	Ord	Wooden headers.	VII
A. D. Griffin, C. P. Montgomery	4,194	241.60	1.01	20.3	20.3	7.6	.....	*Koehring 27 E	Ord & Lakewood	Wooden headers.	VII
J. B. Hodges	4,618	215.56	0.98	47.4	47.4	5.6	.....	*Koehring 27 E	Ord	Wooden headers.	VII
A. D. Griffin	4,875	221.97	1.45	48.7	48.7	6.2	.....	*Foote 27 E	Lakewood	Wooden headers.	VII
R. D. Kinsey	4,951	159.67	1.44	20.0	20.0	4.9	.....	*Rex 27 E	Lakewood	Wooden headers.	VII
W. D. Eaton	4,192	159.66	5.26	20.2	20.2	7.7	.....	*Koehring 27 E	Lakewood	Wooden headers.	VII
C. P. Montgomery	3,740	218.25	1.52	20.6	20.6	12.9	.....	*Foote 27 E	Ord	Wooden headers.	VII
W. D. Eaton	4,066	202.78	2.08	40.2	40.2	8.5	.....	*Koehring 27 E	Lakewood	Wooden headers.	VII
C. N. Ainley	4,376	241.95	1.13	26.8	26.3	6.7	.....	*Foote 27 E	Ord & Lakewood	Wooden headers.	VII
CONCRETE SHOULDERS											
H. B. LaForge	3,729	168.99	0.60	.....	.....	.....	.....	Geiger A. C. plant (1 ton)	Hand work	Wooden headers.	VI
H. B. LaForge	3,272	105.97	0.65	.....	.....	.....	.....	Geiger A. C. plant (1 ton)	Hand work	Wooden headers.	VI
H. O. Ragan	3,472	124.03	2.52	.....	.....	.....	.....	Rex 21 E (5 sack)	Hand work	Wooden headers.	VIII
CRETE PAVEMENT											
F. R. Baker	.....	214.71	.....	.....	.....	25.0	95.6	Geiger (¾ ton)	Hand work	Wooden headers.	III
W. A. Rice	.....	185.53	.....	.....	.....	55.2	96.7	Geiger (1 ton)	Hand work	Wooden headers.	IV
P. L. Wilcox	.....	342.58	.....	.....	.....	13.9	92.8	Geiger (1 ton)	Ord (modified)	Wooden headers.	VI
H. B. LaForge	.....	353.39	.....	.....	.....	18.1	92.6	Geiger (1 ton)	Ord and hand	Wooden headers.	VI
H. B. LaForge	.....	345.84	.....	.....	.....	22.6	96.7	Geiger (1 ton)	Hand work	Wooden headers.	VI
H. B. LaForge	.....	363.87	.....	.....	.....	20.2	95.3	Geiger (1 ton)	Exper. rake and strike-off	Wooden headers.	VI
J. M. Lackey	.....	132.42	.....	.....	.....	17.6	.....	Madsen (¾ ton)	Hand work	Wooden headers.	VII
H. O. Ragan	.....	275.76	.....	.....	.....	50.8	98.2	Madsen (1 ton)	Hand work	Wooden headers.	VIII

"Gas Tax" Future Said to Depend On How Handled

"The future of the gasoline tax rests with the discretion of the state legislatures," is the conclusion reached by F. G. Crawford, Professor of Political Science in Syracuse University, in a study of "Administration of the Gasoline Tax in the United States," which assembles information that will be useful to citizens of New York and Massachusetts, whose legislatures are considering gasoline tax bills in their current sessions, and of other states where changes may be proposed next year.

The matter is reviewed in a recent issue of the *Christian Science Monitor*.

Commenting on how the gasoline tax plan has in eight years been adopted in 46 of the 48 states, Professor Crawford says this record is unprecedented in the annals of taxation. He warns, however, that legislatures may "go too far with increases and bring a rather violent reaction to a most successful tax. There is already some tendency in this direction."

"It's success," he finds, "rests upon the low cost of collection, the diffusion of the burden on the tax bearer, and the fact that no important group has had a real economic or social motive for opposition. As a rule, the motorist is more in favor of better highways than he is opposed to the collection of this tax."

COLLECT $225,000,000 IN 1927

The states collected a total of $225,000,000 in gasoline taxes in 1927, according to an estimate quoted by Professor Crawford. This is approximately $30,000,000 more than in the pervious year, and is the peak of an uninterrupted increase in collections from less than $5,000,000 in 1921, when only 13 states had the tax.

"The increase in revenue from this tax in those years is little short of phenomenal," says the investigator. "Even where the rate has remained constant the gross amount has increased steadily. Increases in rates have caused corresponding increases in yield. This, in part, answers those critics who believed increases in rates might result in evasions. The amounts collected are in themselves a reason why state legislatures have raised the rates. The query may well be raised as to how far the states will go.

"An interesting sidelight is the fact that as gasoline taxes have increased no serious change has been made in the motor vehicle tax. Apparently there is no connection and the gasoline tax is not regarded as a substitute for, but rather an addition to, motor vehicle taxes.

COMPLEXITIES IN HANDLING TAX

"A striking absence of uniformity is shown in methods of collecting the tax and in formulas for distributing and applying the money it raises. In any state which has worked out a well integrated fiscal program, this tax ought to be collected by the same authority which collects the other taxes."

The cost of collecting the gasoline tax is very low, he finds, especially where the collection is made from the wholesalers. In all the states except three in which the collection is made from retailers, the cost is less than one per cent of the revenue. An increase in the amount of the tax is found to reduce the percentage of collection costs. Complicated problems have been encountered, however, in the matter of making exemptions and refunds.

"Distribution of the gasoline tax has caused more discussion than any other single phase of the problem," Professor Crawford remarks, and shows that six different methods are in use in twenty states which return some portion of the receipts to local communities.

"Although the amounts that have been returned to the localities have increased from 1924 to 1926, the percentage of the whole amount, taking into account increases in rates and increases in collection, has actually decreased," he says. "The tendency is apparently in the direction of state control and administration of gasoline tax money."

PRESENT STATUS OF STATE HIGHWAY DEVELOPMENT IN CALIFORNIA

(Continued from page 4.)

work necessary to develop sound highway engineering standards and improvements in methods will be carried on as in the past. California's highway department has always held a high place in this branch of the work. The integrity of the construction encountered in California is a monument to the honesty and ability of the engineering organization which carried on this work. It it expected that California's engineering organization will continue to occupy the high place that it has maintained in the past.

Michigan Sets California Right of Way Example

The state highway department is acquiring land for a right of way width of 400 feet through timber land in the Northern Peninsula. The purpose is twofold, being to provide recreational areas and to preserve snow-drift-preventing stands of timber.

Automobile registration during 1927, totaled 23,125,000 cars and trucks. Comparing the registration to the miles of surfaced highways, the figures show that there are 40.2 cars and trucks in the United States for every mile of surfaced road. The total mileage of highways, including secondary roads, according to figures compiled by the American Motorists Association aggregate 3,006,081 miles. Primary highways total 575,000 miles.

The construction of an international highway, linking the United States with Central and South America, is provided for under the terms of a bill just introduced in the senate by Senator Tasker L. Oddie of Nevada. The purpose of the highway, which is sponsored by the American Motorists Association and other organizations, would not only be for better highway facilities and communication between the countries, but would be conducive of good will, Senator Oddie declared in introducing the bill.

Driver (to sweet young thing) : "I can see that I'm only a pebble in your life."

S. Y. T.: "That's all. But I wish you were a little boulder."

100 YEARS AFTER JEDEDIAH SMITH

(Continued from page 15.)

days before, rushed on the encampment. Turner and Black were the only ones to escape.

REACH VANCOUVER

Smith and Turner decided to make no effort to recover the property and set out at once up the Umpqua in the direction they would naturally have pursued. After severe hardships, finally, in the month of August they reached the shelter of Fort Vancouver, where to their surprise they found Arthur Black, who had arrived only the night before.

THE NAMING OF SMITH RIVER

There seems to be no doubt but that the Smith River in Del Norte County was named after Jedediah Smith. Evidence of this is to be found in the "Journal of the Expedition of Colonel Redick McKee, United States Indian Agent, Through Northern California, Performed in the Summer and Fall of 1851" published by authority of Congress in 1860 (see archives of aboriginal knowledge, by R. Schoolcraft, LL.D., Vol. III, pages 136-7).

On Monday, September 29, 1851, McKee's party reached the junction of the Trinity and Klamath rivers. Quoting the Journal from this point we find that—

"The Klamath River is here, during its lower stages, about fifty yards in width, and very swift. Its course, in fact is obstructed at short distances by rapids throughout its whole length, till within ten miles of the sea, the descent from the source to the ocean being very considerable. There are, however, no falls of any height; the largest, which is a few miles below the forks, being little more than a rapid. Much error has existed in maps relating to this river; its mouth having by many (among others, Captain Wilkes and Col. Fremont) been placed in Oregon, about 42° 35' N. L. and it was for a long time supposed that Rogue's River, which actually empties about that latitude, was a branch of the Klamath. The distinctness of the two streams has since been ascertained, but the source of the mistake is nowhere noticed. The manuscript map of Oregon and California by Jedediah S. Smith, which was, till lately the best source of information as to this part of the country, although in general singularly accurate, considering the extent of the region traversed and laid down by him, gave rise to it. Smith in 1828, ascended the Sacramento Valley, and crossing the mountains, struck on what was apparently the South Fork of the Trinity. This he followed down to its junction with the Klamath, and to the mouth of the latter; thence pursuing his route up the coast to Rogue's River, and the Umpqua, and over into the Willamette Valley. Supposing Rogue's River, or the Too-too-tutins, to be the one which headed in Klamath lake, he so represented it on his map; and to the Klamath he gave the name of Smith's River, by which it is yet called upon all the English sea-charts.

Smith's map, it is believed, was recently purchased in Oregon by the Joint Commission of Army and Navy Officers, and is probably now in Washington.

The name of 'Smith's River,' which as a matter of tradition, has been bandied from pillar to post, shifting from Eel to Rogue's River, has recently vibrated between a stream running into Pelican Bay, and another, called by some Illinois River, and supposed to be the South Fork of Rogue's River."

Thus it would appear that Smith left a map on which he gave to the Klamath River the name of Smith's River, not being aware at the time that it was the outlet of the river known at its source in southern Oregon as the Klamath. After the discovering of the real outlet of the Klamath the name of Smith's River was evidently transferred to the next major stream to the north.

Unfortunately Smith's map appears to have been lost as it has never been found in the archives at Washington.

Grade Crossing Costs Formally Allocated

Authority has been granted by the Railroad Commission to California Highway Commission to construct the relocated state highway between Truckee and Tahoe City at grade across the Tahoe Branch of Southern Pacific Company at Tahoe City and to construct the highway under the main line track of that company at a point near Truckee, Nevada County, and over the tracks of the Tahoe branch at separated grades at a point about five miles north of Tahoe City. The Commission ordered the State Highway Commission to pay 70 per cent of the cost of the proposed undergrade crossing and Southern Pacific Company to pay 30 per cent, and ordered Southern Pacific Company to pay $10,000 toward cost of the proposed overhead crossing. The Commisison also ordered the Highway Commission to pay the entire cost of constructing four grade crossings at Tahoe City, which shall be protected by automatic flagmen, but Southern Pacific Company was directed to pay the cost of maintaining said flagmen or wigwag signals, after their installation.

1927 Auto Registrations

Four states in the Union last year showed a loss in registrations. The greatest decrease was indicated in Florida with 10.4 per cent less registrations than in 1926. The greatest gain of any section was in the District of Columbia with 17.5 per cent. The average increase throughout the country was 5.9 per cent and California was slightly under this with 5.5 per cent.

The total registration for the nation last year was 23,579,002, which is said to be some 80 per cent of all the motor vehicles in the world.

California leads the country in density of auto population with approximately two cars to the family. The Nation's ratio is one car to the family and there are 7.9 cars per square mile of country.

NEW CONSTRUCTION PROBLEMS

(Continued from page 9.)

The construction of desert roads has been successfully solved by paying attention to the elevations of the road in relation to the desert surface, providing proper width, analyzing the grading of the materials available for surfacing and lastly, by the use of a mixture of oil and road materials which has given a sound, high speed road entirely satisfactory as a temporary expedient. Provision for protection against cloud-bursts is an important matter.

GRADING

Studies are continually being carried on to increase the efficiency of grading operations both in cuts and fills. A very definite attempt is being made to train resident engineers to an appreciation of the slopes which are necessary to use in cuts of different heights and of different kinds of material. The construction of fills is receiving more attention, and on any fills where it is practical to do so, the material is brought up in lifts and consolidated by tamping rollers. Drainage structures, especially culverts, have been the subject of an extensive study during the past three years, not only as to the type of culverts which are in use but also as to their design. It is believed that the studies have brought out many points of installation which should be given a great deal more attention. It is very important, for instance, that all culverts should be installed so that complete drainage will occur at the end of any period of flow due to rainfall. Also, great attention must be paid to the foundations where reinforced concrete culverts are installed. It seems desirable that such culverts should be constructed in sections instead of monolithic throughout, as has been the common practice.

Metal culverts have shown a rather surprising record of usefulness.

MACADAM

The construction of bituminous macadam has never been extensively used in state work on original construction, but as a reconstruction and repair material it has always occupied an important position.

The recent introduction of emulsified asphalts in this state has led to a revival of interest in the possibility of using bituminous macadam for the salvaging of old waterbound or gravel roads. It is quite likely that this method of construction will be the next step in preservation of the large mileage of oil roads constructed by the oil mix method.

ASPHALT CONCRETE

The advance in this type of construction has been along the lines of providing a nonskid surface, a surface which would not become rough with traffic, a surface which is smoother than has heretofore been laid, and a construction which could be produced at a less cost than has heretofore been necessary. Through changing the mixture by which the amount of asphalt has been greatly decreased, the amount of fine material or filler greatly increased and the type of surface changed, a surface which is nonskid for a considerable time has been obtained. It is thought that stability has also been somewhat increased due to the high dust content of our present roads.

The state has interested itself in the perfection of a finishing machine for spreading, raking and finishing this type of surface, and the results have been extremely successful. Not only are the roads much smoother than it is possible to obtain through hand work, but there has been a great saving in material due to truer cross-sections and a decrease in cost of laying due to the almost unlimited capacity of the machine to handle the material brought to it. Formerly, the spreading operations were limited by the number of men who could be handled on a narrow stretch of road, whereas now it is simply a question of handling the transportation that brings the material to the road.

PORTLAND CEMENT CONCRETE

Concrete pavements are under constant study to standardize and increase the efficiency of the methods used in their construction. There has been no change within the last two years in the methods of handling concrete, but we have made some change in our methods of handling steel.

Our standard practice at the present time is to place 2½-inch bars on the margin of our slabs which are constructed 10 feet in width and divided at intervals of 60 feet by an expansion joint made of cork and asphalt. At intervals of 20 feet, dummy joints are constructed across the pavement to localize cracking. Dowels are used across all expansion joints and transverse reinforcement at the end of each 60-foot panel. The state uses what is known as the standard Illinois section of 6-inch thickness at the center and 9-inch thickness at the edge. This type of construction has enabled us to secure concrete pavements practically free from corner breaks. We have also largely overcome the tendency of pavements to crack between joints.

Examination of the pavement constructed at Oxnard, in which experimental lengths of slab were laid to determine the proper length to prevent cracks, showed the following results at one year:

2 panels	60′ length,	5 cracks,	100%	cracked
466 panels	50′ length,	112 cracks,	20%	cracked
476 panels	25′ length,	6 cracks,	1%	cracked
744 panels	20′ length	0 cracks,	0	cracked

We have made numerous experiments with different types of processes designed to increase the efficiency of concrete pavements.

We have used Celite to increase the fluidity of concrete; we have used calcium chloride to supplant water curing where water is scarce and also to increase early strength where necessity demands an early opening; we have used the Hunt process of curing by coating with a water-proofing surface of Trinidad asphalt; we have experimented with the Monolite process by placing the concrete on a water-proofing layer of tar paper to secure curing through the use of the water originally introduced in the mixing process. We have used and probably will use in the future, numerous other processes and methods which the proponents claim will be advantageous to various types of construction.

We feel that it is our duty to be informed first hand on all improvements or alleged improvements in construction methods. So far, we have found a number of these methods have a useful place in construction, but that their general adoption is entirely unnecessary on our work.

PERSONNEL

Training of the personnel to handle the construction work is a matter which requires considerable attention. Our resident engineers and their assistants are obtained through the Civil Service but we make it

our business to supervise the placing of men who seem destined to rise in the organization.

For some time we have, in periods of stress, placed men on jobs in what we call "student positions;" that is, they may have been men engaged in other kinds of engineering work but are placed under the direction of an experienced resident engineer for a short time to learn some particular branch of the work before being assigned as a more or less independent assistant.

All the work of the Construction Department is covered by the Construction Manual which is practically a textbook for the resident and assistant resident engineers. After they become thoroughly familiar with the details of the work as outlined in the specifications of the manual, this, with their practical education in the field, enables them to do satisfactory work. In many lines of work we have been able to set up a standard of competition by which men would be able to judge themselves in comparison with other men engaged on similar work, and this has stimulated a most healthy spirit among the field employees. They are made to realize that they are being watched from headquarters and that those who show particular fitness will be advanced as rapidly as conditions permit. They are constantly urged to increase their knowledge by study and by the observation of whatever work may come up in their district. We often send them from one district to another to observe a new operation so that the construction methods in various parts of the state may be as uniform as possible. A rather unusual condition is the fact that men with college training have not in the past been particularly attracted to highway work. It is hoped in the future to make this class of work more attractive to the college-trained men, as it is my belief that they are capable on the average of advancing further than those not so trained.

We have many noncollege men in the organization who have shown exceptional ability. However, it is my opinion that with proper coordination of the college work with the practical experience in highway construction, a field of endeavor is opened to college men which will be better for the highways and for the engineering profession in general.

District Engineer Given High Honor

Colonel Jno. H. Skeggs, District Engineer, San Francisco District, was recently honored by being elected a National Director of The Society of American Military Engineers, for a three-year term beginning January, 16, 1928.

The officers of the association are, president, Brigadier General Chas. G. Dawes; vice president, Colonel Lytle Brown; secretary, Captain L. R. Lohr, all residents of Washington, D. C.

Nevada is launched on a program of highway construction for 1928 which calls for the expenditure of $1,701,088. This sum includes Federal aid funds, county funds, state motor vehicle fees and a portion of a state bond issue. The highway development program includes the building of 100 miles of new highway and the reconstruction of an equal amount of existing roadway.

SANTA ANA RIVER BANK PROTECTION WORK

(Continued from page 10.)

wear is the greatest. The upper width of fencing came to within 18 inches of the top of the posts and extended 4 inches below the ground surface, while the lower width of fencing extended 42 inches below the ground surface.

One 58-inch width of Ellwood Type "I" fencing was fastened along the back row of posts and extended 10 inches below the ground surface, with 4 feet above the surface. This type of fencing has a 2-inch mesh and is woven with two-strand No. 12½ cables and No. 14 cross wires. The fencing was stretched tight and securely fastened to the pipe posts with tie wire.

When all fence wire was in place, the 6-foot space between the two parallel lines of fence was filled with brush, walnut tree limbs and rock to weight it down.

At the upstream end of the 2000 lineal feet of protection work, two wings each 50 feet long and constructed at an angle to the 2000-foot line ran back into the river bank and into a grove of eucalyptus trees. The wings were constructed the same as the main line of protection work, one being placed at the end of the protection work and the second 80 feet back from the end.

The cost of constructing the bank protection work per lineal foot is as follows:

Labor (equipment, supplies, etc.)—	
Setting posts and braces	$0.546
Stretching fence fabric	0.099
Cutting brush, hauling and placing	0.412
Excavate to let fabric into ground and remove trash and old concrete encountered	0.328
Materials—	
¾-inch O.D. galv. posts and braces on job	2.124
Fence fabric, delivered to job	0.353
Tie wire	0.004
Bolts	0.037
Total cost per lineal foot	$3.903

The average cost of driving the 712 posts 12 or more feet into the ground was $1.44 each, while the average cost of fitting and bolting the braces in place was 22 cents each.

Powderman Killed

On Tuesday, April 24th, Joseph Watson was killed by explosion of blasting material at a point on the Kern River Highway about 40 miles east of Bakersfield. This regrettable accident occurred through Mr. Watson's efforts to save the store of powder which was menaced by a brush fire which had gotten beyond control. He was employed as powderman with a gang engaged in widening the state highway in this location.

Picturesque Desert Highway Employee is Killed in Accident

Acquaintances and friends of William A. (Bill) Magee will learn with sorrow of his death near his beloved Sand Hills on the Yuma road. His death occurred on April 22d as a result of an automobile accident which occurred while he was driving to Holtville.

Bill has no known relatives, but his genial patience and rough and ready ways made many friends for him among the traveling public. For seven years he drove a team of horses that helped clear the sand

"Bill" Magee at work.

from the old plank road and towed cars back on the planks when they wobbled off.

His motoring friends will remember him as the stalwart highway employee who stood 6 feet 2 inches in height. Bill never wore a hat. He faced the desert sand storms and blazing sun bareheaded. His hair stood vertical on his head and his complexion was that of tanned leather.

With the completion of the fine wide pavement across the Sand Hills in 1927, his responsibilities were lessened, but he was still the same picturesque figure working along the road. The drifting sand will soon cover every physical trace of Bill's work, but he has left a more lasting and permanent mark in the memory of the motorists he helped.

Granted Time Extension

California Highway Commission has been granted an extension of time by the Railroad Commission until June 25, 1928, in which to construct two state highway crossings under the tracks of the Atchison, Topeka and Santa Fe Railway Company at Serra, Orange County.

Two highway planning commissions, one to lay out systems for metropolitan areas, the other for planning rural systems, were advocated by the Secretary of Agriculture, W. M. Jardine, in an address, before the National Automobile Chamber of Commerce in New York City.

Watching through clear plate glass with both the naked eye and the photographic camera, the Bureau of Standards is experimenting with a specially constructed apparatus to determine how and why the treads of automobile tires wear and the effect of axle-load and air pressures.

Average Gasoline Tax in Nation is 3.23 Cents Gallon

Taxes per gallon on gasoline in force January 1, 1928, are outlined in the February issue of *Vermont Progress* as follows:

Amount per gallon; states; number of states.

Five cents—Arkansas, Florida, Kentucky, New Mexico, South Carolina—five states.

Four and one-half cents—Virgina—one state.

Four cents—Alabama, Arizona, Georgia, Idaho, Maine, Maryland, Mississippi, Nevada, New Hampshire, North Carolina, South Dakota, West Virgina—twelve states.

Three and one-half cents—Utah—one state.

Three cents—California, Colorado, Delaware, Indiana, Iowa, Michigan, Montana, Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee, Vermont, Wyoming—fourteen states.

Two cents—Connecticut, Illinois, Kansas, Louisiana, Minnesota, Missouri, Nebraska, New Jersey, North Dakota, Rhode Island, Texas, Washington, Wisconsin, District of Columbia—thirteen states and the District of Columbia.

Average tax in force in forty-six states, 3.2391 cents.

HOW FAST DO YOU GO?

Here is the distance you travel every second when you are doing the following number of miles per hour:

Miles per hour	Feet per second	Miles per hour	Feet per second
10	14.66	35	51.33
15	22.00	40	58.66
20	29.33	45	66.00
25	36.66	50	73.33
30	44.00		

Sixty-six feet per second— that is the distance you are traveling every second if you are doing forty-five miles.

That is exactly the distance across the road from fence to fence.

If you have brakes on two wheels only you can't expect to stop, according to the best records, short of 187 feet—three times the distance across the road.

If you have four-wheel brakes you may be able to stop in 124 feet—twice the distance across the road.

COLORADO—The famous 18-mile highway scaling the summit of Pike's Peak has been deeded to the U. S. Government by the toll company owning it, with permission to continue private collection of tolls until 1935.

State Highway Work in the Counties

ALAMEDA COUNTY

The work of grading and reconstructing the state highway through Dublin Canyon between Dublin and Hayward is of much interest to San Francisco and East Bay people.

Contractors Ariss Knapp Co. of Oakland have been at work on this section of state highway since last fall and have made steady rate of progress, weather conditions permitting.

A visit to the work today will show that a considerable portion of the grading has been completed, especially the Castro Valley Hill and the Bulmer Hill. These two particular sections were graded and rocked early last winter in order that the road may be kept open to one-way or eastbound traffic. The contractors are at present grading a large line change in the vicinity of Palomares School and at points near Canyon Inn. Considerable effort is now being made toward placing the rock surfacing, especially on the east end in the vicinity of Dublin where it is planned that the contractor shall complete the entire road for traffic and work westerly as fast as possible.

Contractor E. B. Skeels is making rapid progress on the three bridges within this section of road. The Hollis Creek Bridge is completed and backfill is now under way. The structures at Palomares Creek near Canyon Inn and across Cull Creek near Hayward are rapidly nearing completion after which it will be possible to complete the heavy grading work over these channels.

The Allied Contractors, Inc. of Omaha have completed their contract for reconstructing 4.36 miles of state highway from Warm Springs Junction to Milpitas. The work consisted of widening the old state highway with 11 foot by 7 inches Portland cement concrete shoulder along the easterly side and resurfacing the old pavement with asphaltic concrete with an average of 2½ inches thick at the center line. The total width of reconstructed pavement is 29 feet. A small portion of the old road near Milpitas was resurfaced with 1½ inches asphaltic concrete only as it lies in that portion of the highway where it is planned to make a grade separation with the Southern Pacific and Western Pacific Railroad tracks, which improvement it is hoped can be made in the next biennium. The reconstruction is drawing much favorable comment from the traveling public as it is now the first section of widened state highway constructed between Oakland and San Jose and is a part of a program of widening which will be carried out in the future as traffic requires. This section of state highway also was of much interest to engineers and contractors as the Allied Contractors used a mechanical finisher in placing the asphaltic concrete surface and much experimenting was done in using this type of machine as a means of obtaining a higher type of asphaltic surface. The mechanical finisher for asphaltic concrete surface will in the future play an important part in this type of pavement. It has many points in its favor, especially the regulation of quantities to a minimum of over-run and obtaining a smoother wearing surface over the hand finishing method.

BUTTE COUNTY

Work is under way for the grading and graveling of 6.7 miles of road between Butte Creek and the Cherokee Canal on the Willows-Oroville lateral. The present roadway is adobe soil, having never been graveled, and in its present condition is impassable during the wet season and dusty and rutty during the summer months. The improvement of this portion of the road will complete the link between the west and east side highways. The grading is being done by state forces, the gravel surfacing to be followed by contract work later in the year.

COLUSA COUNTY

A contract was let on April 14, 1928, to E. F. Hilliard for oil processing on 5½ miles of road in Colusa County, Freshwater Creek to Williams. The contract provides for scarifying the existing road metal and for the application of 1920 barrels of fuel oil.

CONTRA COSTA COUNTY

Tieslau Bros. have completed the grading and surfacing of approaches to Wildcat Creek Bridge near Richmond in the state highway between Oakland and the Carquinez Bridge. This short stretch of state highway has made a marked improvement in alignment as it obviated two sharp curves in the old road.

DEL NORTE COUNTY

From south county line to about 3½ miles north, J. E. Johnston, contractor, has been constructing culverts, clearing and grubbing and has commenced grading work with two steam shovels now in operation.

Between Klamath River and Wilson Creek. Right of way purchases have been arranged for contracting grading and surfacing of this section of the Redwood Highway. Bids are to be opened April 18th.

Between Wilson Creek and Crescent City, work of widening highway at sharp turns is progressing satisfactorily and is money well spent.

H. W. Webber Construction Company, were awarded the contract for surfacing this section of highway and have started work.

Contract for construction of Smith River bridge on Redwood Highway will be let during April.

Bids for surfacing and oiling the Redwood Highway from the Oregon line southerly 35 miles, are to be opened April 18th.

EL DORADO COUNTY

The construction of 0.49 mile of graded roadbed, between Shingle Springs and El Dorado was begun March 14, and is well under way. Nate Lovelace is the contractor.

Location surveys are under way for work proposed through the upper American River Canyon, between Strawberry and Riverton.

FRESNO COUNTY

Several bridges have been built on the old road west of Coalinga on the Sierra-to-the-Sea Lateral. Mostly on the locations where old fords existed, which were impassable during floods. Widening and straightening is also prgoressing satisfactorily under Foreman O. D. Gaston and considerable favorable comment is being received concerning the improvements.

A reconnaissance survey of the Kings River Canyon in Fresno County is being made by S. A. Cobb.

GLENN COUNTY

Construction work is now under way for improving 6.2 miles of road between Orland and Hamilton City. The work consists of placing corrugated metal pipe culverts, nad constructing one concrete box culvert, widening and raising the grade and placing standard road surfacing mixed with oil. The furnishing and delivering of unscreened gravel is under contract to L. G. Kipp, and the furnishing and delivering of standard road surfacing is under contract to Force, Currigan & McLeod. The placing of the culverts and finishing of the road surface will be done by state forces.

The road under improvement is a part of the lateral connecting with Route 3 at Chico and Route 7 at Orland, commonly known as the Chico-Orland lateral.

HUMBOLDT COUNTY

On the Hauser contract between Orick and the county line work has been resumed, clearing up slides caused by winter rains. One shovel is being operated.

On Engelhart's contract small culvert work has practically been completed and contractor is preparing to resume grading and surfacing operations.

The contract for the construction of reinforced concrete bridges across Prairie and Lost Man creeks near Orick was awarded to E. B. Skeel of Roseville, California.

INYO COUNTY

The contract for grading on new alignment of the road from Coso Junction to Olancha, has just been completed and though as yet unsurfaced, has brought forth many favorable comments. The new road is practically straight and 24 to 30 feet wide, whereas, the old road was a series of kinks with undulating grades conforming to the country and was very indirect and narrow.

During June, bids will be received for grading and oil-treated surfacing from Diaz Lake, three miles south of Lone Pine to Alabama Gate, about 5.5 miles north of Lone Pine. Bids will also be received about the same time for surfacing with oil treatment that portion of the main Owens Valley road from Tinemaha Dam to a point two miles south of Big Pine, a distance of about seven miles.

During the summer about 33 miles of the main highway will be oil-treated by state forces which when completed will give, with the mileage in the above contracts, an oiled surface from the top of Sherwin Hill, in Mono County, to Diaz Lake, a distance of about 84 miles. This improvement will be welcomed by the local residents and tourists as it will eliminate the very trying dust nuisance and corrugated road surface encountered in the past during the heavy summer travel.

Request for funds has been approved for widening and alignment improvements between Big Pine and Oasis, a much needed improvement in lieu of a relocation, which is of expensive construction and not warranted for many years to come.

Preparations are being made for additional office space at the District Headquarters, occasioned by organization expansion.

IMPERIAL COUNTY

The Jahn and Bressi Construction Company have started work on their new contract on the San Diego-El Centro highway between El Centro and Seeley. The work will consist of correcting bad drainage conditions, and widening and resurfacing the existing pavement. The contract time will not expire until January 12, 1929 thus allowing sufficient time for the contractors to lay the asphaltic pavement during the cooler season.

KERN COUNTY

The state forces have just completed the grading of portions of the Walker Pass road from Weldon to the summit of the Walker Pass. Widening and alignment changes and the installation of culverts now makes this road a comparatively easy and fast entrance to the Owens Valley from points in the vicinity of Bakersfield and, during the time when the northern passes are closed by snow, from points north of that town. Especially will this be so, when the section on the east side of the summit will be graded on new alignment to a connection with the main highway near Freeman, which work has been started by state forces.

A new approach from the north on the main highway leading into Mojave, will soon be surveyed and when completed will provide a much better entrance and will permit the building of the Mojave maintenance yard which the present highway crosses.

An additional allotment has been provided to continue the work of widening, being done in the Kern River Canyon. A power shovel and outfit is making much-needed improvements on the old county road.

A good deal of favorable comment is being received on the work being done by day labor on Route 10, west of Coalinga, the Sierra-to-the-Sea lateral. The road is being widened, curves eliminated, and bridges built.

Work in the Kern River Canyon is in progress by state forces. The road is being straightened and widened and the drainage system perfected.

LAKE AND COLUSA COUNTIES

Approximately 42½ miles of location surveys were recently completed between Upper Lake in Lake County, and Williams in Colusa County. The road located will, when completed, provide an outlet to the Sacramento Valley and to San Francisco for the rapidly increasing summer population in the vicinity of Upper Lake and along the east shore of Clear Lake. Plans and estimates in connection with this work are about 75 per cent complete.

LAKE COUNTY

The maintenance forces of District IV have done wonderful service to Lake County in widening and daylighting the existing traveled road from the Napa County line toward Middletown. What previously was a one-way road is now widened to a two-way highway. Many of the sharp points have been removed, curves have been daylighted to permit of longer vision and a portion of the road surfaced with local material. In addition to the grading work two dangerous bridges across St. Helena Creek have been replaced by timber deck trestles of ample width to care for the heavy trucking and vehicular traffic over Route 49.

LOS ANGELES COUNTY

Work is now under way on the reconstruction of Foothill Boulevard between Monrovia and Azusa. All buildings, irrigation lines, poles and pipe lines have been moved in accordance with the plans for the new highway which provides for a 40-foot asphaltic concrete pavement with 8-foot bituminous macadam shoulders.

Placing of oil treated crushed stone surfacing on a 12-mile stretch of the Coast Highway through the Malibu Ranch is now well under way. All grading work on this job has been completed.

The construction of a 21-mile pipe line along the coast from Los Angeles city limits to Nicolas Creek on the Malibu Ranch has been completed. This line will furnish water to be used in connection with highway construction and maintenance.

MADERA COUNTY

The Callahan Construction Co. are grading and setting up an asphalt plant for the resurfacing of a 6-mile section of Route 4, south of Madera, between Herndon and Arcola School. P. L. Wilcox is Resident Engineer.

The Carl Peterson Company of Fresno were low bidders for the construction of a bridge at Herndon over the San Joaquin River on the new location on the west side of the Southern Pacific tracks.

MARIN COUNTY

Bids are now being advertised, to be received May 23d, for reconstructing a portion of the existing state highway from Ignacio to Gallinas Creek, about 1⅞ miles north of the city line of San Rafael. Ignacio is the junction of state highway routes I and VIII. The traffic between Ignacio and San Rafael is very heavy it being the only through road available for traffic in this section of Marin County.

The new improvement will provide a 20-foot second-story Portland cement concrete pavement with rock borders and a widened graded roadway.

The portion from Gallinas Creek to San Rafael, upon which plans are now under preparation, will be advertised for bids during the coming summer in order that this work may be continuous and the entire state highway completed between San Rafael and Ignacio during the present year.

MARIPOSA COUNTY

The work of widening and straightening on the Yosemite All-year Highway by the convict crew, has received an added impulse by the purchase of a Diesel-powered shovel. Hairpin turns are rapidly being eliminated on this heavily traveled recreational road.

A new shovel powered with a Diesel engine has been purchased by the Equipment Department to continue the work of widening and line changing on the Yosemite All-year Highway. This will be assigned to the convict camp in charge of W. B. Albertson.

MERCED COUNTY

Contractor H. C. Whitty is making good progress in widening all of the old narrow bridges on the Golden State Highway through Merced County.

The multiple box culvert recently installed on the Pacheco Pass Lateral functioned during the spring floods as evidenced by the attached picture and considerable damage to roadbed, as has occurred in the past, was avoided.

The contract for resurfacing 6.5 miles of Route 4, Tharsa to Arcola School, has been awarded to the Callahan Construction Company of Los Angeles. Construction work is to be started at once. P. L. Wilcox is to be resident engineer on the job.

MONO COUNTY

The roads in Mono County for the first time in several years have been traversible all winter, due to the comparatively light snowfall. Maintenance crews are now established in their summer camps and the main road to Bridgeport and Coleville from Bishop has been placed in good condition for the summer travel which is starting already.

A contract for the grading of portions of the main road from Dogtown to Point Ranch, located about five miles south of Bridgeport will probably be advertised early this month.

As soon as the receding snows will permit, maintenance crews will open up the Tioga and Sonora Pass roads to travel and considerable betterment work will then be done to make these roads safer for travel.

Two narrow crossings of Rock Creek on the main road will be widened this summer from 16 feet to 30 feet.

The Sherwin Hill Grade, at the southerly end of the main road, has been resurfaced, and will be oiled before the heavy summer travel begins, which should relieve considerably the long strenuous pull up this four-mile grade.

MONTEREY COUNTY

Preparation for the beginning of convict construction on the Carmel to San Simeon highway is practically completed. A large camp has been constructed just north of Salmon Creek and the first convicts are expected to arrive at the camp early in April.

In preparation for this construction a new survey has been run extending for a distance of 7.5 miles northerly from Salmon Creek, terminus of the present constructed highway near the southerly boundary of Monterey County.

A contract has been let to Theo. M. Maino for the construction of a timber bridge across Salmon Creek. This bridge will form a portion of the completed highway, and will permit easier access both to the camp and to the entire new construction work than is possible by the present method of fording the stream.

The various portions of the San Lucas to Coalinga lateral have been constructed to state highway standards either by the state or by the counties concerned, except for the Mustang Grade which crosses the high ridge separating Peach Tree Valley from Priest Valley. State forces are now commencing work on the improvement of this grade. This work will include the widening of the roadbed to make it safe for two lines of traffic throughout, and the placing of sufficient surfacing to make it possible to travel the road at all times of year.

Contractor Charles W. Wimmer has recently completed the reconstruction of 1.9 miles of road immediately north of Salinas, extending from the northerly city limits to Santa Rita road. This has been graded to a wide section and paved with Portland cement concrete.

A location survey party is at work projecting a new location for a portion of the highway between Carmel and Big Sur which will eliminate the long climb that the present county road makes over Sierra Hill, north of the Little Sur River. The construction of the road now being located will serve to make the Big Sur country much more easily accessible.

NAPA COUNTY

The Mt. St. Helena road or that portion of Route 49 one mile north of Calistoga to the Lake County line, is being dragged and worked over preparatory to placing an oil surface on this scenic mountain highway. District IV maintenance department has a large oiling program to carry through during the present spring and early summer at which time it is planned to oil treat the surface of practically all our water-bound broken stone roads.

ORANGE COUNTY

Construction of the link which will connect the Coast Highway through Huntington Beach and Laguna with the Los Angeles to San Diego Highway at Serra is almost complete. Grading work, culverts and two new under grade crossings of Santa Fe Railroad have been completed. The placing of the concrete pavement, and the slope paving adjacent to the under pass crossings is in progress.

Work is in progress by a maintenance crew on the enlarging by deepening and extension, of a large concrete box culvert near Irvine. Traffic will continue to use the highway while the work is in progress.

PLACER COUNTY

The work of crushing and stockpiling of material between Baxters and Shelter House Number 1, which was suspended during the winter months, has been resumed and will be completed at an early date.

Preliminary surveys are under way for a re-routing of Route 37 along the Bear River.

RIVERSIDE COUNTY

The Maintenance Department has recently installed a set of truck scales along the Los Angeles-Imperial Valley highway about a mile east of Banning. This work was done in response to a request by the Division of Motor Vehicles wherein it was pointed out that there were not sufficient weighing facilities for efficient patrol of the highway. Until the present time, there were no scales between the San Bernardino-Riverside County line and Indio. This road carries a great deal of heavy trucking between Imperial Valley and Los Angeles. The public as well as a large majority of the trucking companies will welcome enforcement of the legal weight limits along this highway. Prevention of the ruinous and destructive effect of improper heavy loads will prolong the usefulness of the pavement and the saving in meantime will help finance widening and other improvement.

SACRAMENTO AND PLACER COUNTIES

The contract for constructing 3.1 miles of graded roadbed and asphalt concrete pavement on the reconstruction work between Sylvan School and Roseville was completed March 19, 1928. J. C. Compton was the contractor.

SAN BERNARDINO COUNTY

Foothill Boulevard. The first reconstruction project on the Foothill Boulevard has advanced well toward completion. The existing 18-foot cement concrete pavement has been widened and resurfaced with asphaltic concrete and the contractor's operations are now confined to miscellaneous grading and shoulder work. The work has been conducted with the least possible interruption to traffic. The highway has been closed only during working hours and for the shortest possible distance at a time.

This project covers the first 9.3 miles west from San Bernardino. Preparations are being made to let a second contract to extend the improvement to the San Bernardino-Los Angeles County line.

Redlands to the Riverside County Line. The reconstruction of 4.8 miles of the Los Angeles-Imperial Valley highway is almost complete. The existing pavement consisted of approximately one mile of 16-foot Portland cement concrete and 3.8 miles of oiled macadam. Under the present project the existing cement concrete pavement has been redecked and the oiled macadam surfacing has been torn up and replaced with new Portland cement concrete pavement 20 feet wide. The contractor is now constructing macadam borders using material salvaged from the old macadam surfacing. Several line and grade changes were made and the curves were superelevated, thereby improving the road to meet present day standards.

SAN DIEGO COUNTY

Excellent progress is being made on the reconstruction of 2 miles of highway between Pine Valley and Buckman Springs. The present roadway is being widened and realigned. A new bridge over Cottonwood Creek is under construction.

The reconstruction of the state highway between La Mesa and the east city limits of San Diego is nearing completion. Grading and culvert work has been completed and the placing of the asphaltic concrete surface is in progress. The cost of the work all of which is under state inspection will be shared by the county and the state.

SAN JOAQUIN COUNTY

On account of the dry season, District Six is making preparations to start at once on an extensive oiling program throughout the San Joaquin Valley.

SAN LUIS OBISPO COUNTY

A contract has recently been awarded to Mr. J. F. Collins for the construction of a line change two miles north of San Luis Obispo, which change will eliminate three sharp curves and constitute a splendid improvement in the line and grade of this portion of the road. The construction will involve a major change in the channel of San Luis Obispo Creek.

The reconstruction of the highway from Pismo to San Luis Obispo, J. F. Knapp, contractor, has progressed to the point where the majority of the rough grading is now completed, and paving operations are about to start. It is planned to divert northbound traffic over county roads from Pismo to San Luis Obispo by way of Edna during paving operations. The diverting of this one line of traffic, combined with the fact that the contractor has planned to use an industrial railway for the hauling of his aggregates, will result in very little inconvenience to traffic durng the paving operations.

A new camp is being constructed for the California National Guard about four miles northwest of San Luis Obispo and the Division of Highways has just let a contract for the construction of 1.6 miles of road within the camp area.

A maintenance foreman's cottage is being constructed at Shandon where the maintenance station is located for maintaining the easterly portion of the Cholame lateral in San Luis Obispo County.

SAN MATEO COUNTY

Contractors Granfield, Farrar and Carlin are making good progress on their contract covering grading and the placing of a waterbound broken stone surface on that portion of the Bayshore Highway from South San Francisco underpass to Broadway, Burlingame. The work consists of bringing to subgrade the existing roadway surface over a total width of 60 feet and the placing of a 40-foot crushed stone surface 8 inches in thickness. The work is progressing satisfactorily, there being about one-half mile of rock to be placed at the southerly end near Broadway, Burlingame.

That portion of the road from South San Francisco to the San Francisco Airport at Mills Station has been completed. The roadway surface was treated with two applications of asphaltic oil and screenings by the maintenance forces of the district. The heavy traffic to the airport is utilizing this completed portion and very favorable comment is heard due to the completion of this road which has been in the public eye for a number of years.

Bids were received on April 25th for constructing a new portion of the Bayshore Highway from Broadway to Fifth street, San Mateo. The low bid submitted was received from C. W. Wood of Manteca in amount of $133,370.

The work will consist of grading a 60-foot roadway and placing thereon a 40-foot by 8 inches waterbound crushed stone surface. This three-mile section is a most important link in the Bayshore Highway as its completion will permit of through traffic from San Francisco to San Mateo over a new route and will materially aid traffic; especially on holidays and Sundays when the Peninsula Highway is overtaxed. It is expected the contract will be awarded early this month to permit of summer construction work.

SAN MATEO, SANTA CLARA AND SANTA CRUZ COUNTIES

A contract was recently awarded by the Director of Public Works to Twohy Bros. and J. F. Shea of Oakland for constructing a portion of the Skyline Boulevard from La Honda Summit to Saratoga Gap, a distance of 13.8 miles.

Twohy Bros., bid for this work was $652,238.

The work to be done will be the heaviest grading work yet encountered on the Skyline Boulevard involving over 900,000 cubic yards of excavation. Upon the completed roadway will be placed a 20-foot by 8 inches waterbound crushed stone surface. This important section of the Skyline Boulevard is a connecting link as its completion will permit of through traffic between San Francisco and Santa Cruz via Boulder Creek. To date but 33 miles have been constructed and opened to traffic between San Francisco and La Honda Summit and is used only by local traffic to La Honda.

From a scenic standpoint the completion of this road will offer to the traveling public one of the most beautiful highways in California. The completed road will wind through virgin redwood forests and along the crest of the San Mateo Mountains from which wonderful views may be obtained of the Pacific Ocean and the San Francisco bay region.

There remains approximately 14 miles of the Skyline Boulevard upon which no construction has commenced. This portion lies along the Castle Gate Ridge from Sanatoga Gap to Schultheis Pass at Woodwardia at a junction with the paved state highway from Los Gatos to Santa Cruz.

SANTA BARBARA COUNTY

The Santa Maria River, which crosses the highway just north of the city of Santa Maria, has been the cause of considerable bridge work at various times owing to the large volume of water carried by it during flood and its ability to change its channel. The Bridge Department completed last year the construction of a concrete bridge to replace the wooden trestle which was constructed in 1914 across the new channel formed by the stream at that time. The older channel is still spanned by a steel bridge, the wooden approaches to which have been rapidly deteriorating. Work is just being completed on replacing the northerly approach by an embankment surfaced for the present with waterbound macadam and protected with concrete slope paving.

Contractor J. F. Collins is just completing the construction of 24 miles of rock borders along the highway through the northerly part of Santa Barbara County, extending from Orcutt to Zaca.

TULARE COUNTY

State forces now have two outfits oiling shoulders along the Golden State Highway in Tulare County.

Automobile fatalities for the 52 weeks ending December 3d totaled 6969, according to figures just announced by the U. S. Census Bureau. This is an increase of three per cent over the 52-week period last year when 6658 persons were killed by automobiles. Figures compiled by the American Motorists Association show that this year there were 21.1 persons killed per 100,000, against 20.07 per 100,000 killed last year. The figures cover only the 77 largest cities in the United States.

Teacher: "Norman, give me a sentence using the word 'diadem.'"

Pupil: "People who drive onto the railroad crossing, diadem sight quicker than those who stop, look and listen."—*Georgia Motorist.*

County Figures Show Increase in Motor Vehicle Registration

The following statement shows the growth in comparative motor vehicle registration in the various counties of California for the years 1914 and 1927:

Counties	*1914*	*1927*
Alameda	8,449	125,381
Alpine	9	51
Amador	165	2,032
Butte	1,019	13,378
Calaveras	155	1,975
Colusa	425	4,384
Contra Costa	930	21,191
Del Norte	56	1,417
El Dorado	154	2,422
Fresno	4,488	56,360
Glenn	490	4,877
Humboldt	994	13,581
Imperial	1,515	19,593
Inyo	187	2,788
Kern	2,521	33,903
Kings	870	9,251
Lake	168	2,625
Lassen	181	3,830
Los Angeles	43,099	689,902
Madera	343	5,573
Marin	686	9,499
Mariposa	44	1,047
Mendocino	463	7,158
Merced	634	11,689
Modoc	136	1,743
Mono	12	344
Monterey	892	14,737
Napa	687	7,065
Nevada	169	2,919
Orange	3,761	43,660
Placer	437	8,419
Plumas	98	1,954
Riverside	2,128	27,345
Sacramento	3,419	42,925
San Benito	328	4,309
San Bernardino	3,198	40,584
San Diego	5,665	66,351
San Francisco	12,081	135,729
San Joaquin	2,500	35,366
San Luis Obispo	661	9,875
San Mateo	1,258	19,013
Santa Barbara	1,796	20,497
Santa Clara	3,941	48,885
Santa Cruz	986	13,497
Shasta	340	4,803
Sierra	64	726
Siskiyou	379	7,925
Solano	848	11,570
Sonoma	1,913	24,011
Stanislaus	1,791	23,505
Sutter	333	5,842
Tehama	428	5,154
Trinity	30	547
Tulare	2,412	28,431
Tuolumne	248	3,079
Ventura	1,410	17,727
Yolo	798	8,850
Yuba	324	4,751
Totals	123,516	1,736,765

Record of Bids and Awards

DIVISION OF HIGHWAYS

AMADOR COUNTY—East of Jackson 1.35 miles of grading. Dist. X, Rt. 34, Sec. C. Engineer's Est. $6,493. Bids opened May 3d as follows: G. D. Contoules, San Francisco, $7,160; G. E. Finnell, Sacramento, $6,953.50. Contract awarded to G. E. Finnell.

COLUSA COUNTY—Between one-half mile of Freshwater Creek and Williams, 5.5 miles of existing crushed gravel surfacing to be treated with oil road mix. Dist. III, Rt. 15, Sec. E. Engineer's Est. $6,284.63. Bids opened April 11th as follows: J. C. Compton, Roseville, $12,015; A Teichert & Son, Sacramento, $6,805; J. F. Collins, Stockton, $8,017; E. R. Hilliard, Sacramento, $6,542.50; Geo. E. Finnell, Sacramento, $7,050; M. J. Bevanda, Stockton, $7,758; C. W. Wood, Stockton, $8,250. Contract awarded to E. F. Hilliard for $6,542.50.

DEL NORTE COUNTY—A steel cantilever bridge across Smith River about 8 miles east of Crescent City. Dist. I, Rt. 1, Sec. C. Engineer's Est., $159,799. Bids opened April 4th as follows: R. Johnson, Glendale, $195,815; J. J. Badrann, Portland, Oregon, $175,534; Jas. S. Hickey, Portland, Oregon, $179,863; Parker-Schram Co., Portland, Oregon, $170,479; Mercer-Fraser Co., Eureka, $206,042; Holdener Construction Co., Sacramento, $197,173. Contract awarded to Parker-Schram Co., for $170,479.

DEL NORTE COUNTY—Between California-Oregon line and 0.7 mile south, distance to be graded and surfaced with crushed gravel or stone. Dist. I, Rt. 1, Sec. B. Engineer's Est. $16,357.75. Bids opened May 16th as follows: Holdener Const. Co., Sacramento, $14,818.75; Smith Bros., Eureka, $17,806.75; Washburn & Hall, Portland, $15,864; J. T. Logan, Grants Pass, $17,476.50; John R. Hill, Harbor, Ore., $13,821. Contract awarded to John R. Hill.

DEL NORTE COUNTY—Between Crescent City and 0.7 of a mile south of the Oregon line, 21.6 miles of surfacing with crushed gravel or stone. Dist. I, Rt. 1, Sec. A-B. Engineer's Est. $61,800. Bids opened May 16th as follows: Holdener Const. Co., Sacramento, $46,486.10; Smith Bros., Eureka, $71,176.80; Washburn & Hall, Portland, $67,502.80; Wren & Greenough, Portland, $59,897.50; J. T. Logan, Grants Pass, $74,350; Webber Const. Co., Crescent City, $57,219; William C. Elsemore, Eureka, $57,790. Contract awared to Holdener Construction Co. for $46,486.10.

DEL NORTE COUNTY—Between Smith River and the Oregon line, 35.2 miles of surfacing with crushed gravel or stone oil treated. Dist. I, Rt. 1, Sec. C-D-E. Engineer's Est. $169,990.50. Bids opened May 16th as follows: Holdener Const. Co., Sacramento, $153,461.50; Kaiser Paving Co., Oakland, $191,146; Guy F. Pyle, Eugene, Ore., $190,875.50. Contract awarded to Holdener Const. Co.

DEL NORTE COUNTY—Between Klamath River and Wilson Creek about 7.3 miles to be graded and surfaced with crushed gravel or stone, and construction of four timber bridges. Dist. I, Rt. 1, Sec. A. Engineer's Est. $278,281. Bids opened April 18th as follows: Holdener Const. Co., Sacramento, $216,308; J. E. Johnston, Stockton, $271,642; Henry J. Kaiser, Oakland, $282,071; Wm. Von der Hellen & Co., Medford, Oregon, $260,257; S. H. Palmer Co., San Francisco, $288,397; Mercer-Fraser Co., Eureka, $342,245. Contract awarded to J. E. Johnston for $271,642.

EL DORADO COUNTY—Between Eagle Falls and Meek's Bay, 3.3 miles to be graded. Dist. III, Rt. 38, Sec. B. C. Engineer's Est. $59,583.50. Bids opened May 2d as follows: Nate Lovelace, Oakland, $51,551.50; Tieslau Bros., Berkeley, $51,975.50; Holdener Const. Co., Sacramento, $53,214.90; G. D. Contoules, San Francisco, $35,663.30. Contract awarded to Contoules.

EL DORADO COUNTY—Between Fresh Pond and ¾ mile east of Riverton, 6.2 miles in length, crushed gravel or stone to be produced and stockpiled. Dist. III, Rt. 11, Sec. F&G. Engineer's Est. $17,500. Bids opened April 25th as follows: A. Teichert & Son, Inc., Sacramento, $25,200; Harold Smith, St. Helena, $16,030; Immel & Seidel, Berkeley, $18,900; Monfort & Armstrong, Sacramento, $18,130; C. A. Failing, Tres Pinos, $22,400; C. W. Wood, Stockton, $23,800; Tieslau Bros., Berkeley, $20,580; Hemstreet & Bell, Marysville, $21,000. Contract awarded to Harold Smith of St. Helena for $16,030.

FRESNO AND MADERA COUNTIES—Bridge across San Joaquin River (Herndon Bridge) 1 mile north of Herndon. Dist. VI, Rt. 4, Sec. C&A. Engineer's Est. $206,052. Bids opened April 18th as follows: Keller-Gist, Inc., Los Angeles, $218,456; M. B. McGowan, San Francisco, $207,959; R. E. Mieth, Portland, $195,516; Ben C. Gerwick, Inc., San Francisco, $222,142; Butte Const. Co., San Francisco, $198,767; Carl H. Peterson, Fresno, $188,734; A. W. Kitchen, San Francisco, $218,063; Rocca & Caletti, San Francisco, $229,617; C. E. Green & L. Worel, Los Angeles, $218,262; Chas. & F. W. Steffgen, San Diego, $198,183; Holdener Const. Co., Sacramento, $214,136.35; J. F. Knapp, Stockton, $207,634. Contract awarded to Carl H. Peterson of Fresno for $188,734.

GLENN COUNTY—Through Orland, grading and Portland cement concrete paving 1.1 miles. Dist. III, Rt. 7, Sec. C. Engineer's Est. $34,824. Bids opened May 9th as follows: M. J. Bevanda, Stockton, $39,316; C. W. Wood, Stockton, $36,691. Contract awarded to C. W. Wood.

HUMBOLDT AND MENDOCINO COUNTIES—Furnishing crushed gravel or stone, graded, in designated stock piles on state highway between Myers and Laytonville. Dist. I, Rt. 1, Sec. J-K. Engineer's Est. $13,530. Bids opened May 24th as follows: Smith Bros. Co. of Eureka, $13,860; Tieslau Bros., Berkeley, $14,784; Wm. C. Elsemore, Eureka, $15,510. Contract awarded to Smith Bros. Company.

INYO COUNTY—Between Diaz Lake and Alabama Gate, 8.5 miles of grading and surfacing with crushed gravel or stone, oil treated. Dist. IX, Rt. 23, Sec. L. Engineer's Est. $87,187.20. Bids opened May 31st as follows: Tieslau Bros., Berkeley, $84,478.50; M. Blumenkranz, Los Angeles, $97,142.40; Nighbert-Carnahan, Bakersfield, $93,873.60; Southwest Paving Co., Los Angeles, $79,112.90; G. E. Finnell, Sacramento, $80,770.30; Geo. French, Jr., Stockton, $99,020.50. Contract awarded to Southwest Paving Company.

INYO COUNTY—Between Tinnemaha Dam and Big Pine, 6.8 miles surfaced with oil-treated crushed gravel or stone. Dist. IX, Rt. 23, Sec. B-C. Engineer's Est. $42,120. Bids opened May 31st as follows: Tieslau Bros., Berkeley, $42,875; M. Blumenkrantz, $47,485; Nighbert-Carnahan Co., Bakersfield, $49,855; Harry Wilson, $34,640; Southwest Paving Co., Los Angeles, $37,040; Montfort & Armstrong, Sacramento, $32,809.50; Geo. French, Jr., $44,304. Contract awared to Montfort & Armstrong.

LOS ANGELES COUNTY—Between Monrovia and Azusa, 3.5 miles to be graded and paved with asphalt concrete. Dist. VII, Rt. 9, Sec. G. Engineer's Est. $189,779. Bids opened April 11th as follows: Gibbons & Reed Co., Burbank, $150,615; Geo. H. Oswald, Los Angeles, $165,938; George R. Curtis Paving Co., Los Angeles, $170,821; Jahn & Bressi Const. Co., Los Angeles, $208,292; Ed. Johnson & Sons, Los Angeles, $170,248; Hall-Johnson Co., Alhambra, $160,711; Griffith Co., Los Angeles, $163,756; C. E. Osborn, Pasadena, $154,159. Contract awarded to Gibbons & Reed for $150,615.

LOS ANGELES COUNTY—Between Arroyo Sequit and Los Alisos Creek, 1.5 miles to be graded. Dist. VII, Rt. 60, Sec. A. Engineer's Est. $63,791.50. Bids opened April 18th as follows: Jahn & Bressi, Los Angeles, $53,333; Roche-Axman Co., Glendale. $59,087; McCray Co., Los Angeles, $66,955; S. J. Hales, Santa Ana, $46,717; G. L. Ritchey, Los Angeles, $58,609; Kuhn-Lang Co., Los Angeles, $66,733; C. G. Willis & Sons, Inc., Los Angeles, $81,944; Geo. J. Bock, Los Angeles, $57,833; James Martin, Los Angeles, $73,992; Sander Pearson, Los Angeles, $63,222; Francisco & Ellington, Inc., Los Angeles, $58,793; Matt S. Ross, Los Angeles, $63,516; Grunwald & Tudor, Los Angeles, $63,687; S. W. Gleim, Los Angeles, $49,231; Geo. Mitchell Co., Huntington Park, $70,636; John J. Dann, Portland, $64,848; Bert Calvert, Los Angeles, $61,512; Fred W. Nighbert, Bakersfield, $57,332. Contract awarded to Lewis Construction Co. for $44,652.

LOS ANGELES COUNTY—Bridge across Santa Anita Wash at Arcadia. Dist. VII, Rt. 0, Sec. E. Engineer's Est. $34,193. Bids opened April 25th as follows: J. C. Butler, Los Angeles, $26,601; Engstrum Const. Co., Los Angeles, $21,669; Ross Const. Co., Los Angeles, $24,705; Franklin B. Gridley, Pasadena, $26,220; Paul M. White, Santa Monica, $32,450; Byerts & Dunn, Los Angeles, $30,000; Whipple & Secord, Los Angeles, $24,661; H. G. Klusman, $30,511; Geo. Mitchell, Huntington Park, $38,892; Ignace P. Lipp, Hollywood, $28,345; Geo. J. Ulrich Const. Co., Modesto, $27,157; Sidney Smith, Contractor, Los Angeles, $30,967; W. M. Ledbetter & Co., Los Angeles, $31,216; Keller-Gist, Inc., $26,545. Contract awarded to Whipple & Secord for $24,661.

MARIN COUNTY—Between Ignacio and Gallinas Creek, 4.9 miles to be graded and paved with Portland cement concrete. Dist. IV, Rt. 1, Sec. A. Engineer's Est. $241,405. Bids opened May 23d as follows: C. W. Wood, Stockton, $237,054; Kaiser Paving Co., Oakland, $279,718.70; J. V. Galbraith, Petaluma, $242,062.50; Hanrahan Co., San Francisco, $215,662. Contract awarded to Hanrahan Co.

MONTEREY COUNTY—Between the easterly boundary and Camphora, (portions) 5 miles to be surfaced with bituminous macadam. Dist. V, Rt. 2, Sec. AB&C. Engineer's Est. $33,380. Granite Const. Co., Watsonville, $32,643; Fred W. Nighbert, Bakersfield, $31,940. Contract awarded to Fred W. Nighbert.

ORANGE COUNTY—From Galivan to 1 mile north, 0.9 mile grading and oil treated crushed gravel or stone surfacing. Dist. VII, Rt. 2, Sec. B. Engineer's Est. $50,113.20. Bids opened May 16th as follows: Dimmitt & Taylor, Los Angeles, $63,012; Bert Calvert, Los Angeles, $44,899.50; Watson & Sutton, San Diego, $52,553.70; Kuhn-Lang Co., Los Angeles, $61,-889.70; E. J. Davis, Venice, $56,913.40; C. G. Willis & Sons, Inc., Los Angeles, $63,737.90; M. Blumenkranz, Los Angeles, $61,736; Mathews Construction Co., Sacramento, $60,530; Jahn & Bressi, Los Angeles, $59,352.60; Steele Finley, Santa Ana, $53,751; George J. Bock, Los Angeles, $52,812. Contract awarded to Bert Calvert.

PLUMAS COUNTY—Grading and surfacing 6.2 miles from western boundary to 2½ miles southwest of Chester. Dist. II, Rt. 29, Sec. A. Engineer's Est. $106,905.20. Bids opened May 9th as follows: C. T. Malcom, Walnut Creek, $133,428.40; Holdener Construction Co., Sacramento, $118,283.70; Kaiser Paving Oakland, $120,838.25; Chas. Harlowe, Jr., Oakland, $101,694.70; Nate Lovelace, Oakland, $108,466.60. Contract awarded to Chas. Harlowe, Jr., $101,694.70.

PLUMAS COUNTY—Two reinforced concrete girder bridges across Rock Creek and Bailey Creek. Dist. II, Rt. 29, Sec. A. Engineer's Est. $13,529. Bids opened April 18th as follows: James R. Head, Chico, $13,822; M. A. Jenkins, Sacramento, $12,291; Holdener Const. Co., Sacramento, $14,832; C. F. Herziger, San Francisco, $9,986; R. B. McKenzie, Gerber, $13,865; Coolidge & Scott, Minden, Nevada, $13,429; J. P. Brennan, Redding, $12,034; C. B. Glendenning, Los Molinos, $12,304. Contract awarded to C. F. Herziger for $9,986.

PLUMAS AND LASSEN COUNTIES—Between Chester and Devils Corral, 12.4 miles of surfacing with crushed gravel or stone. Dist. II, Rt. 29, Sec. A-B. Engineer's Est. $38,225. Bids opened May 16th as follows: Tieslau Bros., Berkeley, $36,903; C. A. Failing, Tres Pines, $31,900; Montford & Armstrong, Sacramento, $31,773; E. B. Bishop, Sacramento, $28,825. Contract awarded to E. B. Bishop.

SACRAMENTO COUNTY—Five reinforced concrete girder bridges on line change between Galt and Arno. Dist. X, Rt. 4, Sec. A. Engineer's Est. $50,403. Bids opened May 16th as follows: George J. Ulrich, Jr., Modesto, $39,425.50; E. B. Skells, Roseville, $48,837; P. F. Bender, North Sacramento, $50,913.75; Holdener Const. Co., Sacramento, $46,661.20; Immel & Seidel, Berkeley, $46,349.75; Nelson Bros., Escalon, $49,-917.75; M. A. Jenkins, Sacramento, $48,990.50; Frederickson Bros., Stockton, $51,734.50; McDonald & Maggiora, Sausalito, $54,873.50. Contract awarded to George J. Ulrich, Jr.

SAN BERNARDINO COUNTY—Between San Bernardino and Redlands, constructing a timber bridge across San Timoteo Creek. Dist. VIII, Rt. 26, Sec. A. Engineer's Est. $3,079. Bids opened May 29th as follows: E. G. Perham, Los Angeles, $3,416.42; L. Worel, Alhambra, $3,498.95; P. W. Kranz, Los Angeles, $5,017; R. Johnson, Glendale, $4,036; Mercereau Bridge & Const. Co., Los Angeles, $3,900; Wm. M. Ledbetter, Los Angeles, $3,497. Contract awarded to E. G. Perham.

SAN JOAQUIN COUNTY—Removal present timber approaches and dolphins and construction of new timber approaches to drawbridge. Dist. X, Rt. 53, Sec. A. Engineer's Est. $13,860. Bids opened May 14th as follows: M. A. Jenkins, Sacramento, $11,321; B. C. Gerwick, Inc., San Francisco, $11,224. Contract awarded to B. C. Gerwick.

SAN LUIS OBISPO COUNTY—Reinforced concrete bridge across S. L. O. Creek. Dist. V, Rt. 2, Sec. E. Engineer's Est. $34,868. Bids opened May 9th as follows: Paul M. White, Santa Monica, $36,172.75; C. C. Gildersleeve, Pittsburg, $34,999.90; R. B. McKenzie, Gerber, $34,089; Holdener Const. Co., Sacramento, $36,555; J. C. Butler, Los Angeles, $33,585; Chas. and F. W. Steffgen, San Diego, $29,427.50; A. W. Kitchen, San Bernardino, $34,326.14; Frederickson & Watson Construction Co., Oakland, $39,324; Bent Bros,, Inc., Los Angeles, $36,930; Theo. M. Maino, San Luis Obispo, $34,497.55. Contract awarded to Chas. and F. W. Steffgen, $29,427.50.

SAN MATEO COUNTY—Between La Honda road and Saratoga Gap, 13.8 miles to be graded and surfaced with crushed gravel or stone. Dist. IV, Rt. 55, Sec. D. E. & A. Engineer's Est. $747,967. Bids opened April 11th as follows: Twohy Bros Company and J. F. Shea Co., of Oakland, $652,238; A. Guthrie & Co. Inc., Portland, Oregon, $892,745; Wren & Greenough, Portland, $844,584; D. McDonald, Sacramento, $847,738; Bechtel & Kaiser Rock Co., San Francisco, $774,323; W. H. Rohl Co., Los Angeles, $678,116; The Utah Construction Co., San Francisco, $675,067; Marsh Bros. & Gardenier, Inc., San Francisco, $772,786; J. F. Knapp, Stockton, $651,381; D. A. Foley Construction Co., Los Angeles, $1,083,728; George Pollock Co., Sacramento, $893,222. Contract awarded to Twohy Bros. Co. & J. F. Shea Co. of Oakland for $652,238.

SAN MATEO COUNTY—Between Broadway Station and 5th avenue, 3 miles to be graded and surfaced with crushed stone. Dist. IV, Rt. 68, Sec. B-C. Engineer's Est. $169,032. Bids opened April 25th as follows: Granfield, Farrar and Carlin, San Francisco, $134,726; Crescent & Grading Co., San Francisco, $178,649; J. P. Holland, Inc., San Francisco, $181,029; Stanley Const. Co., Palo Alto, $134,444; C. W. Wood, Stockton, $133,370; J. F. Collins, Stockton, $144,605; Granite Const. Co., Watsonville, $133,974. Contract awarded to C. W. Wood of Stockton for $133,370.

SHASTA COUNTY—Across Boulder Creek, reinforced concrete bridge. Dist. II, Rt. 3, Sec. D. Engineer's Est. $17,532. Bids opened April 11th as follows: R. B. McKenzie, Gerber, $20,790; Noble Bros., San Jose, $17,960; H. C. Whitty, Sanger, $19,985; George I. Warren, San Francisco, $19,905; A. Young, Yreka, $202,250; R. Johnson, Glendale, $18,525; J. P. Brennan, Redding, $18,275; E. B. Skeels, Roseville, $18,620; Holdener Const. Co., Sacramento, $18,740; Kern & Kibbe, Portland, $138,095. Contract awarded to Noble Bros. of San Jose for $17,960.

SHASTA COUNTY—Between Conant and northerly boundary, 6.3 miles to be graded and surfaced with crushed gravel or stone. Dist. II, Rt. 3, Sec. D. Engineer's Est. $270,649.90. Bids opened April 11th as follows: R. Johnson, Glendale, $262,365.80; S. H. Palmer Co., San Francisco, $301,653; Parker-Schram Co., Portland, $279,011; Nevada Const. Co., Fallon, Nevada, $305,565; Geo. Mitchell Co., Huntington Park, $333,271; J. T. Logan, Medford, Oregon, $278,644; C. W. Wood, Stockton, $278,405; Holdener Const. Co., Sacramento, $273,009; Kern & Kibbe, Portland, $283,133. Contract awarded to R. Johnson for $262,365.

SHASTA COUNTY—Between Montgomery Creek and 2 miles west of Burney, 17 miles to be surfaced with crushed gravel or stone. Dist. II, Rt. 28, Sec. C. Engineer's Est. $47,375. Bids opened May 2d as follows: A. Milne of Portland, Ore., $33,750; Chas. Harlowe, Jr., Oakland, $48,000; J. P. Brennan, Redding, $38,387.50; Wren & Greenough, Portland, $46,600; E. B. Bishop, Sacramento, $44,200; J. F. Collins, Stockton, $41,850; Tieslau Bros., Berkeley, $47,450. Contract awarded to A. Milne for $33,750.

YOLO COUNTY—Between Yolo Causeway and 1½ miles east, 1.5 miles grading and rock borders, oil treated. Dist. X, Rt. 6, Sec. C. Engineer's Est. $23,077. Bids opened May 31st as follows: C. T. Malcom, Walnut Creek, $22,126; Larsen Bros., Sonoma, $16,462.50; D. McDonald, Sacramento, $14,252.50; Mathews Const. Co., Sacramento, $17,371; A. Teichert & Son, Inc., Sacramento, $18,203. Contract awarded to D. McDonald for $14,252.50.