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Holiday Greetings To All!

By B. B. MEEK, Director of Department of Public Works, State of California.

The holiday number of CALIFORNIA HIGHWAYS AND PUBLIC WORKS furnishes proper occasion to extend greetings to those who have been engaged in building and maintaining the highways of California during the past year.



I particularly appreciate the loyalty and devotion to the work that the year has evidenced. It has been a year of strenuous endeavor, and had it not been for the splendid and unselfish cooperation of those associated together in it, the very substantial program of highway construction now under way could never have been launched.



One of the most pleasing features of my connection with the work has been the opportunity that it has given me to become acquainted with the splendid body of men and women upon whom its chief burden rests.



I feel that a great service has been done for California in the past year. The coming year offers opportunity for even greater service.



May the Christmas season bring to all of you the happiness that lies in the consciousness of a work well done.



And may the New Year bring to all of us an increasing sense of the worthwhileness of our work and the importance of our task. May we prove by the merit of our accomplishment the truth of the adage "There is honor in public service."



Hogging the road

vs.

Every auto in its right place.

Give Thanks for Our State Highways; A Message to all of California

By J. P. BAUMGARTNER, Member California Highway Commission.

THE CITIES, the improvement districts, the counties and the State of California cooperatively are constructing the finest system of highways in the world. That is, of course, taking into consideration all the elements of a fine system of highways, such as proportionate mileage, comprehensiveness in proportion to population and assessed valuation, variety of climate and scenery, and commercial, industrial and recreational service rendered.

And one wonders how many Californians, on Thanksgiving Day, gave due thanks, whether in word or thought, for our good roads and all their connotations. Not that we should magnify, in our thanksgiving, the material things of life, but that we should realize how and to what extent the material is the expression of the spiritual, and in turn feeds and fosters the spiritual, and carries it on to greater heights.

In cultural standards, California has few peers and no superiors among the congregation of commonwealths which make up this great country of ours; and it is at least no exaggeration to say that our magnificent and extensive system of highways is one of the prime factors of our aesthetic exaltation—in large measure, both cause and effect of an exceptionally high standard of citizenship.

Can you think of any of the imponderable blessings or virtues or felicities to which good roads do not contribute largely—such as health, pleasure, beauty, education, sympathy, understanding—yes, and religion?

Over our thousands of miles of broad, smooth-surfaced highways you can almost literally float, at a high rate of speed, along

the seashore, through the valleys and over the mountain tops, enjoying an almost infinite variety of scenery and a wide range of climatic conditions, all in a few hours' time, at any season of the year. And beauty and majesty and power, in the hand-writing of God himself, are scattered lavishly all along the way. Your tired mind is rested, your taut nerves relaxed, your body exhilarated, your spirit exalted but reverent.

Considered merely in a material sense, Californians have reason to be thankful for their highways; for it is doubtful if our state has any greater source of material wealth. This statement, of course, is empirical, for there is no way in which exact computation can be made of the actual, much less the potential wealth produced, or induced, by our highways. But, however, empirical it may be, the statement that our highways, in the last analysis, are, perhaps, our greatest source of material wealth, will bear the most crucial statistical test to which it can intelligently and fairly be subjected. The good roads factor, in computing the present and potential wealth of California, is so big and all pervading, and mathematically progressive in such ever increasing ratio, as to be almost limitless. It staggers the imagination.

To have as our inheritance "Just California, stretching down the middle of the world," is enough to prolong our Thanksgiving Day throughout the whole year and all the years; but to have its beauty and beatitude spread before us as at a banquet table, by our fine system of highways, is enough to lift up our hearts in continuous songs of thanksgiving and praise to Him "from whom all blessings flow."



J. P. BAUMGARTNER.

The State Highway Construction Program

How the Biennial Program is Built Up, and How the Projects Included In It Are Determined

By C. H. PURCELL, State Highway Engineer.

A HIGHWAY construction program involving the expenditure of over \$50,000,000 in the two-year period from July, 1929, to July, 1931, will be submitted to the legislature when it meets in January.

There are few subjects in which the public is more vitally interested than in its highway program. Accordingly it will be of interest to know just how a highway construction program is built up, how the projects that go into it are determined, who participate in the deliberations that precede the final formation of the program, and where final approval vests.

Let it be said in the beginning that the formation of a state highway program is a long and involved process. This is true by reason of the fact that California is a large state with highways radiating all over it, and the importance to California of the orderly and intelligent development of its highway system requires thorough accumulation of engineering facts and a careful analysis of them. The basis of any proper program must be a knowledge of facts, determined by the most careful study. This study must be of twofold character.

First, it must show the importance of projects with reference to local needs.

Second, it must also show their importance with reference to state necessities and the ultimate development of the state road system.

The importance that the Division of Highways attaches to the importance of a complete and careful study of the highway situation, both in its local and state aspects may be seen in the fact that although the program for the biennium of 1929-1931 has just been completed, instructions are already out to district engineers to begin their study of projects to be recommended for approval in the program of the 1931-1933 biennium.

There are certain legal requirements that are fundamental in the preparation of a state highway program. The Breed bill determines on a percentage basis the allocation of money between the northern and southern groups of counties and between primary and secondary roads. The program must meet the percentage requirements of that enactment.

Of necessity the amount of money available for construction is also a determining factor. This requires a careful estimate of probable collections under the two gasoline tax laws and other revenue bills.

With these exceptions, problems connected with the formulation of a highway construction program are largely of an engineering nature. And it is with the engineers that the work begins.

Incidentally it should be noted that the work not only begins with the engineers, but it begins with the district engineers, the men in charge of the geographical districts into which the state is divided. We begin on the ground and work up.

Each district engineer upon the completion of the study of his own district submits a list of projects with estimates of each, based at least on preliminary surveys, which he recommends for inclusion in the construction program for the coming biennium.

The recommendation of the district engineers must also indicate whether the project is best adapted for summer or winter construction, and if approved, the approximate date when it will be ready for advertisement. The right of way situation as it affects the individual projects must also be analyzed. This analysis must indicate any possibility of construction being hampered by right of way delays. New construction and reconstruction projects must be listed separately.

The recommendation of the district engi-



C. H. PURCELL.

neers must then run the gauntlet of the headquarters staff, the State Highway Engineer and the Director of the Department of Public Works. The latter bring to the problem knowledge not only of local needs but a broader view of state necessities than it is possible for district engineers to have. They have also before them information gleaned from road associations and local bodies and from conferences held with representatives of localities all over the state.

The work of whipping the recommendations of the district into a highway construction program now begins.

The projects recommended by district engineers must be pared to meet available funds with a proper reserve for safety.

The yardstick of the Breed bill must be applied.

The list of projects recommended by the district engineers are given careful study by the State Highway Engineer and his headquarters staff, and the list of projects revised to meet the funds available and the plan of ultimate development of the state road system, due consideration being given to the coordination of the construction and reconstruction programs with the maintenance of the state highways.

The district engineers are then invited to sit in conference on a review of the modified list of projects and further revisions are made until practical agreement is reached.

Each project, before being given a place in the program, must justify itself against other projects proposed as alternates and substitutes. There are adjustments and readjustments, changes and amendments, before the program is approved by the State Highway Engineer for submission to the Director of Public Works.

The program is then submitted by the State Highway Engineer to the Director of Public Works and a further conference follows attended by Director, State Highway Engineer and staff engineers and it is again thoroughly analyzed and such further changes are made as seem advisable.

But the program is not yet complete. The program goes from the Director of Public Works to the California Highway Commission, the members of which have very definite ideas as to plans for highway procedure. The Director of Public Works must justify his recommendations to that body. After their approval of the program as recommended or amended to meet the judgment of the members of the California Highway Commission, the program goes to the Department of Finance and the Governor for approval and

for recommendation by the Governor to the state legislature for adoption by that body.

The budgeting of highway funds is a new departure in highway procedure in California, a departure inaugurated by Governor Young. Let it be remembered that a budget is but another name for a program. The budget or program plan for state highway building has more than justified itself in California. Its virtues may be designated as follows:

1. It necessitates the most careful study of the highway problem both in its parts and as a whole in advance of any formulation of a highway building program.

2. It permits sectional interests to be fully heard in advance of decisions, but reduces sectional influence as a determining factor in making such decisions.

3. It correlates expenditures with income more closely than was possible when programs were largely determined upon a month to month plan.

4. It permits programs to be developed which avail themselves of seasonal advantages that different sections of the state offer for work, which not only reduces costs but aids in reducing unemployment during the winter season.

5. It permits the distribution of the work to proceed in an orderly and equitable manner, which in its turn will mean the earlier completion of the highway system.

6. It permits road planning over a long period of years, with a consequent large decrease in final road costs.

Adopts Gas Tax

A two-cent gasoline tax will go into effect in Massachusetts January 1. This leaves New York the only state in which a gasoline tax has never been adopted. Illinois adopted a two-cent tax in 1927 but the law as drawn in that state was held unconstitutional. This leaves the status of the gas tax as follows:

5 cents.....	Six states
4 cents.....	Twelve states
3½ cents.....	One state
3 cents.....	Fourteen states
2 cents.....	Thirteen states
No tax.....	Two states

Four provinces in Canada have a 5-cent gas tax, namely, British Columbia, Nova Scotia, Prince Edward Island and Quebec. Five provinces, Alberta, Manitoba, New Brunswick, Ontario and Saskatchewan, have a 3-cent gas tax.

The average rate in the states is now 3.11 cents and in the provinces 3.88 cents a gallon.

An exchange says: "The ideal situation will be attained when a car is in reach of every man, and every man out of reach of a car." But ideal conditions are hard to attain in this world.

How Highway Bridges Are Inspected

By F. W. PANHORST, Construction Engineer, Bridges, Northern Section.

OLD, OR EXISTING, bridges are inspected to insure safety for the traveling public; new bridges, or bridges under construction, are inspected to insure the incorporation of satisfactory materials and methods in the assembling of the new structure. All bridges on the state highway system of California are inspected



F. W. PANHORST.

—both existing bridges and bridges under construction—by engineers of the Bridge Department. Existing bridges are, in addition, under the continual inspection and maintenance of the Maintenance Department.

Although these engineers are not heroes, they are nevertheless unsung. The object of this short article is not to attempt to give these engineers a place in the spotlight, but to attempt in a short and general way to give those who are interested an idea of how and why bridges on the state highway system are inspected. The traveling public places, unconsciously, implicit faith and confidence in the various engineers of the Highway Commission—not only those inspecting bridges. A car rushes at night down a smooth but strange road, seldom, if ever, does the driver stop to think that there might be an obstacle in his way—a deep chuck hole, a fallen tree, a large rock, or what not. When he comes to a bridge, even though he may be on an overloaded truck, he rushes across with never a thought as to whether it is safe. They all take for granted that the road beyond the reach of the headlights' gleam is safe, although they may not be able to stop within that distance, and that the bridge which they do not see until they are upon it is sufficiently strong to safely carry them over. Fortunately, due to the watchfulness of the Maintenance and Bridge Departments, the driver's assumptions are usually correct.

FORTY-TWO MILES OF BRIDGES

There are, in general, two main divisions of bridge inspection, that for old or existing structures, and that for new bridges, or bridges under construction. The inspection of existing bridges is primarily to insure safety to the traveling public. There are, on the highway system, approximately 1600 bridges with a total length of 42 miles.

A complete exhaustive and minute inspection of all bridges on a state highway system has perhaps not been made in any state. This applies also to California. However, a "Bridge Survey Crew" is now making such a survey in this state. All of the bridges have been inspected in a general way for safety with regard to structural strength and handling of traffic. The bridges are then to be carefully and completely inspected and records and reports compiled. The reasons and necessities for this are numerous and important.

DETERMINING LOAD LIMIT

The load limit of each bridge can be determined. Frequently it is desired to move unusually heavy loads across a certain bridge, or bridges, in a certain locality. From the results of the inspection now under way it will be possible at a moment's notice to tell if the bridge, or bridges, in question will safely carry the load. This is of particular importance in transporting contractors' and state's heavy equipment from place to place on the highway. From this report it will also be possible to determine which bridges are not of sufficient strength to carry the normal traffic of the particular community and the kind and cost of repairs can be determined along with the probable remaining service life of the bridge. It will be possible to tell which bridges should be rebuilt first, in what order, and when, which will be especially useful in preparing budgets, both for the immediate and distant future.

TRAFFIC PROBLEMS

Of almost equal importance with the strength of the bridge is the traffic consideration, location and alignment. Although a bridge may be of sufficient strength to carry normal traffic, it may be too narrow to carry the traffic of that particular location, or the alignment of the highway adjacent to the bridge may be of such a dangerous nature

that it is advisable to construct a new bridge to overcome this danger. These are but a few of the uses to which the inspection report will be put and it is easy to visualize its great value.

One trip of the doctor does not always permanently cure the patient. Due to the effects of annual high water, rusting of metal, decay of wood, etc., periodic inspections are necessary. Such inspections cover not only the deck, or riding surface, but the entire structure, especially the foundations. Frequently, in times gone by, when a bridge, especially a timber bridge, was about to breath its last, a new deck was laid and the railing painted. Traffic then crossed with a sense of security, feeling that a new bridge was theirs. Or a steel span may have rusted away 50 per cent of its strength to be repaired by the addition of a bright colored paint over the rust scales. Thorough bridge inspection is intended to prevent such and to insure safe and sane repairs when required.

DECEPTIVE APPEARANCES

To the casual observer a bridge may appear to be in a precarious condition structurally, whereas, in fact, it may be excessively strong and safe. For example, the piling to a bridge may appear in a weakened and dangerous condition on account of apparent decay, whereas only the sapwood for an inch or more has decayed and a good, firm and safe heartwood remains. Again a steel span may have rusted, as they have a great habit of doing, and thick rust scales make the bridge appear that most of the metal has rusted away. A very thin layer of steel will make a very thick rust scale and all that the steel may require is sand blasting and painting, with a resultant negligible loss of strength. But bridges which appear dangerous are not always safe.

A quick and careless inspection may show a bridge to be in a satisfactory condition, whereas, in truth, the opposite condition exists. Such an inspection is worse than none. For example—a timber truss may appear in the best of condition, well set off by a fresh coat of paint. The surface of the timber may appear, feel and sound firm, well preserved throughout its life. This is one case where you may save the surface but not save all.

The interior of the timber, such as the chord of a heavy timber truss, may be nothing but dry rot, the original heavy timber now being but a shell and deceiving in appearance. The condition of the interior of a large timber or pile is examined by means of an increment borer, a hollow wood drill by means of which a core about one-fourth inch in diameter may be secured. This drill furnishes a sample core of the timber similar to a diamond drill core from rock.

Many other conditions of a bridge may be different from what they appear to be from casual inspection. As for example, piling in a trestle may appear sound and in good condition, whereas, at the ground line, they may be rotted through. A pier may appear in good condition down to the water line while the base may be undermined. These are but a few of the many conditions which an inspector must investigate if the inspection is to be of value, and for these reasons it is essential that the inspector be an engineer of experience that he may know what to look for and what to do with it when he finds it.

INSPECTING MATERIAL

Inspection of materials and workmanship that enters into the construction of a new bridge is of equal importance

with that of inspection of existing structures. As no chain is stronger than its weakest link, so no bridge is stronger than its weakest detail or member. Bridges are designed to carry a certain predetermined maximum load, the weight of which is determined by the kind of traffic that is to cross the bridge. This load having been decided upon, all parts of the bridge are designed to be of relative strength, otherwise there would result an uneconomical design. The duties of the field inspectors are to see that proper materials are incorporated in the structure so that the bridge as built is the same as the bridge designed.

All materials and workmanship that enter into the construction of a new bridge are inspected and tested. Some of this work is done at the bridge site and some must of necessity be done at the point of manufacture. For example, take the structural steel that is to form a truss over some remote mountain stream. Before fabrication the steel is

When you approach a bridge along the state highways, you feel no necessity of slackening, nor do you have any thought of danger.

This article tells the story of how the bridges along California's highways are constantly tested and continually inspected.

This is no small job as there are approximately 1600 bridges with a total length of 42 miles along the highway system.

Highway Commission Asks Abatement Of Signboard Menace Along Roads

The following resolution was passed by the California Highway Commission at its November meeting in Sacramento:

WHEREAS, Advertising signs and billboards in proximity to the public highways destroy the scenic value and, in many places, particularly on curves, menace the safety of such thoroughfares, and

WHEREAS, The California Highway Commission has by constant vigilance prevented the placing of advertising signs and billboards within the right of way limits of the state highways, but no law has yet been enacted in California which effectively suppresses the erection of advertising signs and billboards on private property outside the boundary of and adjacent to the public highways, and

WHEREAS, The Commission is of the opinion that outdoor advertisers are proceeding under a misconception of the economic benefits to them of a system which is rapidly defacing the famed landscapes of California and seriously detracting from the enjoyment of its citizens and its tourists,

Be It Resolved, That the Commission, on behalf of the Department of Public Works of the State of California earnestly urge all concerns, such as oil, automobile and tire companies, banks, hotels, cafes and business enterprises of all kinds, to remove their signs from private property bordering on the public highways, and cooperate with the public authorities to the end that the natural beauty of California may be preserved and the public highways may be the mediums through which such beauty may be observed, and

Be It Further Resolved, That civic organizations throughout the state be encouraged to join in a campaign to induce outdoor advertisers in their respective communities to discontinue the present practices which are becoming so increasingly objectionable to the public at large.

Development Association Would Save Beauty of Scenic Highways

At a joint meeting of the Statewide Highway Committee and five regional highway committees of the California Development Association held in San Francisco on October 18th, the following resolution was adopted:

"It is recommended that the board of directors of the association request all Regional Advisory Councils to consider, through their highways committees, the state and county highways in their region to be designated as scenic boulevards, and that this consideration be given with dispatch, so that the Statewide Highway Committee of the association may be in a position to consider legislation or other means designed to prevent the devastation of our scenic highways by unsightly vending stands and poorly-placed signboards."

The published minutes of the association give the following account of the discussion:

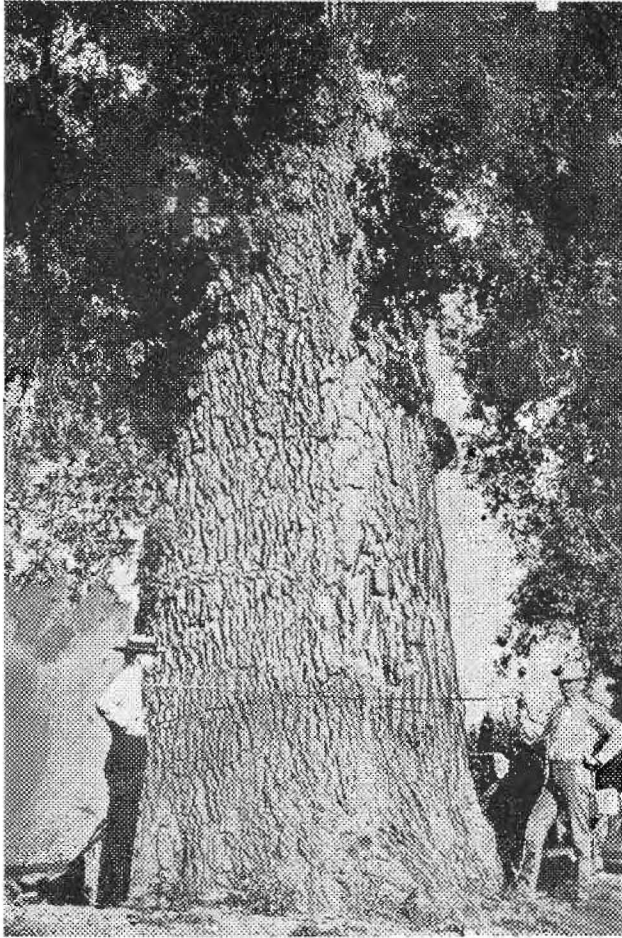
Mr. Edward Landels, attorney, of Oakland, spoke at the request of the chairman. He explained the

law governing county planning commissions and discussed the subject in its relation to the efforts of the highway committees to control poorly-placed billboards and vending stands on scenic highways and the securing of additional right of ways for highways. Mr. Landels stated that courts as yet had failed to uphold most laws aiming to regulate signboards and vending stands along right of ways, but expressed the belief that there will be a change and that the courts would tend to follow public opinion when it became strong enough on this subject. He stated that the only effective remedy at present seemed to be the adoption of a constitutional amendment, authorizing the state to pass legislation to regulate the objectionable features. This itself, Mr. Landels stated, may be of doubtful constitutionality. Planning commissions can be of direct usefulness in protecting and providing right of ways for highways because they can zone the county in accordance with an established plan.

SCENIC HIGHWAYS

Mr. Wishon explained that the Regional Highway Committees had taken up the matter of protecting

Majestic Oak Is Signally Honored



The Hutchins oak.

The interest of the California Highway Commission in the preservation of outstanding features of unusual charm and public interest was evidenced by the passage of the following resolution at its November meeting:

WHEREAS, The members of the California State Highway Commission are very much interested in the preservation of the natural beauties of the state, and

WHEREAS, There is on the Thomas A. Hutchins farm in the Central House District immediately east of the Feather River on the Oroville-Gridley county road, in Butte County, one of the largest oak trees in the state, known as the "Hutchins Oak," which tree is a fine example of the productivity of the soil and climate of Butte County, now therefore be it

Resolved, That this Commission takes the liberty of suggesting to the honorable board of supervisors of Butte County that they take the necessary steps to acquire ownership of said oak tree and sufficient land about it, in order that the tree may receive the proper "surgical" aid and care and be preserved as long as possible as one of the marvelous products of Butte County.

This tree, locally known as the "Hutchins Oak," is one of a triuavirate of three world-famous trees in Butte County. The others are the Hooker Oak, near Chico, and the Mother Orange tree, at Bidwell Bar, near Oroville. The latter two trees are already publicly owned.

The Hutchins Oak is 120 feet high, and still is growing.

scenic highways of the state from the inroads of poorly-placed signboards and disreputable looking vending stands, and asked Mr. Willett to present the above recommendation sponsored by the Central Coast Committees.

Mr. Meyer of the North Coast Council expressed opposition to the idea of limiting the activity to certain designated "scenic highways" and urged that all highways in the region be protected in the same way from billboards and unsightly erections.

Mr. Roth of the Central Coast stressed the importance of designating the highways to be worked on in order to limit the job to a reasonable task.

Mr. Shaffer of the San Joaquin Council voiced objection to certain signboards placed at the entrances to cities such as Modesto, on the grounds that such signboards caused economic damage to communities.

Mr. McNeill of southern California, manager of Foster & Kleiser, stated that his company had a definite and broad policy of cooperating with every reasonable effort to protect scenic spots and highways, but he felt that outdoor advertising was a legitimate and established business and that locations for signs

FEED HIGHWAY "CONS" POTATOES FROM HOME IS PLEA TO STATE

Here is a letter that came to the state purchasing agent a short time ago, the writer being a California business man:

"Dear Sir:

"When in need of potatoes to feed your convict gang working on _____ road, we would like very much to make a bid. At this season of the year we get our potatoes from Oregon and Washington in carloads and will quote very low price. And besides, a lot of these Cons are from Washington or Oregon and they prefer Washington or Oregon potatoes, and I am sure you want to please them."

at the entrance of cities and commercial areas was no more of an economic damage to a city than any other business structure, such as the buildings.

Improved Highways Aid Development at Lake Tahoe

By F. W. HASELWOOD, District Engineer.

THE INCREASING popularity of Lake Tahoe is manifested by the intensive development in progress in the area surrounding the lake, by the unprecedented patronage of the resorts and by the volume of traffic on the highways. And coincident with this increasing popularity and development, and one of the contributing causes thereof, is the improvement of the traffic service on the roads leading to and around the lake.

The State of California, through the Division of Highways, is engaged in the business of furnishing a traffic service to its citizens. The erroneous idea sometimes prevails that its chief function is to construct and maintain roads, but while the actual activity of the division is evidenced by the mileage of roads constructed or reconstructed, or the quality of the maintenance, these construction and maintenance activities are merely the means by which the division presents to the citizens of the state its finished product, namely, the highest quality of traffic service that the finances and the skill of its organization can produce.

The Lake Tahoe region is fortunate in being well served with state highways. Two main highways reach the lake from the Sacramento Valley, one the state's first venture in roads, the "Lake Tahoe Wagon Road" via Placerville and the summer home area along the American River, and one via Auburn and Truckee. From the Nevada line near Brockway around the north, west and south of the lake are 53 miles of highway serving all of the area adjoining the lake in California.

Although the lake has been accessible by road since the early fifties, it is only in recent years that strict attention has been given to the improvement of the service rendered by these roads. Not until 1913, after the roads in the lake area had become state roads, was it possible to drive through on the west side of the lake. This was made possible by the construction of a road from McKinneys to Meyers, traversing the difficult and scenic country at the head of Emerald Bay. Continually as traffic developed the Placerville

and Auburn roads and the roads around the lake have been improved. The greatest impetus has been in the last few years, and coincidentally the greatest traffic increases have been recorded in that time.

Improvement in traffic service has been accomplished by two methods, construction or reconstruction of units of these roads and more intensive maintenance work on the unconstructed portions.

Two units of highway have recently been completed near the lake. Between Tahoe City and the state line at Brockway, a distance of 12 miles, the oil mixed rock surface was completed in the spring of 1927. During 1927, the road between Tahoe City and Meeks Bay, 11.3 miles, was graded and rock surfaced, and early in the summer of 1928 the rock surface was oil treated by the mixing method. During 1925, 1926 and 1927 grading was in progress on 10 miles between Meeks Bay and Emerald Bay. This year a contract was let for grading 3 miles, which will complete this unit.

Another unit of construction of great importance to the Lake Tahoe area is the 14 miles along the Truckee River between Tahoe City and Truckee. This road has been under construction for 3 years. The grading and rock surfacing have been completed, and early next season will see the completion of a bridge across the Truckee River and the Southern Pacific Railroad, and a subway under the Southern Pacific Railroad at Donner Creek near Truckee, and the oil treatment of the rock surface.

In 1927 both the Placerville and the Auburn roads were treated with oil, and made dustless. This treatment was repeated in 1928, and extended along the west side of the lake to provide a dustless trip from Sacramento by one route and return by another.

The effect of these improvements on the volume of traffic is measured by the census as shown in the following table for corresponding days in the respective years. The census was taken at Tahoe City, and shows the number of vehicles in 16 hours on the road south toward Meyers, the road east

At Majestic Lake Tahoe



Views on Lake Tahoe road. *Upper*, Emerald Bay; *middle views*, road scenes on the way to Lake Tahoe; *lower*, along the edge of the lake.

toward Brockway, and the road north toward Truckee.

	1924	1925	1926	1927	1928	1924	Increase over
South -----	436	715	1,685	1,703	3,213	730%	
East -----	352	526	651	1,474	3,401	967%	
North -----	162	280	800	803	2,452	1,530%	

The development of the lake area is evident in many ways. Lake front property is changing hands at fabulous prices. Following the oiling of the rock surface between Tahoe City and Brockway, much activity in new subdivisions or disposal of older inactive tracts developed. This year in the subdivided area between Tahoe Vista and Brockway, 5 miles of paved streets are being constructed. This season the area traversed by the road between Tahoe City and Meeks Bay is the scene of much activity. Many expensive private residences are being constructed. Resort owners are expanding their facilities, and greatly improving the quality of accommodations offered. They state that this year they have to turn away many visitors, and that their business has been from 50 to 100 per cent better than ever before.

A notable change on the lake itself is the advent of the gasoline launch and the speed boat. The lake is no longer quiet, but resounds to the put-put of these boats, which are rapidly increasing in numbers.

The roads around the lake are recreational. They are closed by snow for from 5 to 6 months during the year. The principal traffic occurs during the three

(Continued on page 25.)

Making The Highways of California Safe

The following address was given by B. B. MEEK, Director of Public Works, over Station KPO, San Francisco, Monday, December 3.

MAKING HIGHWAYS SAFE is a controlling factor in modern road construction, and to this end millions of dollars are being expended annually in California and in other states where this all-important feature is recognized.

It is rather amazing that streets and roads laid out and built for horse-drawn vehicles have been so comparatively easy to remodel to take care of modern traffic requirements. The remodeling has consisted largely of flattening curves, vertical as well as horizontal, super elevating of curves to compensate for the curvature, widening grades, maintaining smooth and dustless surfaces, painting stripes on pavement to define traffic lanes, eliminating railroad grade crossings by realignment or by constructing grade separation structures and installing signs and signals warning the motorist that he is approaching a dangerous curve, steep grade, railroad crossing, slippery pavement or school; and the installation of arterial stop signs and signals against cross traffic.

WIDTH OF PAVEMENT

We are continuously raising our standards in California on our state highway system. Our minimum width of pavement has been fixed at 20 feet, giving us two 10-foot lanes. Our minimum width of grade has been fixed at 36 feet, which provides for an 8-foot shoulder on either side of the 20-foot pavement, thus giving the motorist ample room to stop his car with all four wheels off the pavement.

ELIMINATING DANGEROUS CURVES

Our maximum grade for steepness is 6 per cent. We are, as rapidly as finances will permit, eliminating dangerous curves all over the state highway system. Our experience has been that if a particular road has a high standard of alignment, with the exception of one short stretch, that one short stretch is a menace to the safety of the motorist and will cause numerous accidents. Therefore, we are striving to bring all roads to the same degree of alignment so that all sections of the particular road will be equally safe.

OVERCOMING DUST

Realizing the hazardous as well as annoying features of dust conditions on our natural soil

and gravel roads, we have, during the past two years, made some 1500 miles of these roads dustless by the application of light oils. During the coming year we expect to increase this mileage very appreciably, particularly so that the public may fully enjoy the recreational roads.

WHAT THE STRIPES DO

We have demonstrated that defining traffic lanes by white or colored stripes is not only a safety measure but actually increases the capacity of the highway. Because of our experience last year we are very greatly increasing our investment this year in this new safety device. Our coming biennial budget will provide for the striping of 1400 miles of our highway system.

While the zoning of pavements is admittedly an aid in the control and regulation of traffic, much of its benefit can be lost through the careless disregard of its tenets by slow-moving traffic usurping the inner or fast lanes. Again on multiple-zone pavements traffic peaks in either direction may require and should have the right to use all lanes not required by the opposing traffic. These, however, are points involving regulation which will surely follow a better understanding of the traffic-flow problem.

WARNING SIGNS

Warning signs are placed at all railroad grade crossings and curves where the vision is impaired or change in direction abrupt. The signals in vogue at these crossings include their illumination, the alternate heavy diagonal white paint stripe and the words "Railroad Crossing" spaced on the pavement at 50-foot intervals for 300 feet on each side of the crossing, the electric or gas-operated flashing signal, and the particularly effective large illuminated sign suspended either side of the crossing, some 14 feet above the pavement, bearing the notation "RXR." In addition to these, many wigwag signals have been installed by the railroad companies upon our representation.

At curves the standard warning consists of either a 6-inch or 8-inch diameter red bullseye or a battery of nine of 3-inch diameter, both types of which are readily visible some 600 feet distant. These signs are undoubtedly an aid to the careful driver, and to insure their

(Continued on page 25.)

Reducing Accidents on State Highways

IN ORDER to get authoritative information from the various states as to what they are doing to prevent highway accidents, a letter was sent by the Florida Highway Commission to each state highway department with the request that they write a letter summarizing the work they are doing in this regard. Thirty-one states replied, each denoting interest in this great problem, and with the exception of one or two states plans for accident prevention were described in detail. The presentation of this data will be more or less a summary of what these 31 states have indicated they are doing toward the prevention of highway accidents.

This report is divided as follows: Engineering, dealing with all the physical features of the highways, including construction and maintenance; legislation, pertaining to the laws controlling the construction and use of the highways; operation, dealing with the use of the highways; education, dealing with the user of the highways, and enforcement, with operation and use of the highways.

ENGINEERING

There is a striking similarity in the programs of all states. Practically all engineers and commissioners recognize that the construction of highways in such a way that they may be devoid of any hazard is an essential to highway safety.

SIGNS AND MARKINGS

It is almost universally accepted that the proper signs and markings are now essential for highway safety.

Traffic stripe on curves is very generally practiced. In some states the center stripe is used the entire distance of the highways, especially on heavy traffic roads. In at least one state a special color stripe is used on all curves or grades that are especially dangerous. This special color, probably yellow, also indicates that cars can not pass at these particular locations.

Practically every state is installing guide and precautionary signs for the benefit of the highway user, if they have not already done so. In most instances the signs are those recommended by the American Association of State Highway Officials. Several of the states at the present time are practicing the installation of a white cross wherever there has been

a fatal accident. This has been practiced for many years by a few of the states, but now it seems to be more or less a universal practice.

Traffic is required to stop before entering the trunk highways in some states, and in the case of trunk highways intersecting, semaphores or "stop and go" lights have been installed for the purpose of taking care of the traffic. In one state intersections of state highways are constructed with curves of 500-foot radius and no obstructions are allowed on the inside of the curve.

GRADE CROSSINGS

The elimination of grade crossings is one of the great features contributing to highway safety, and all states have programs for this work in proportion to funds available. Where there are not sufficient funds to eliminate grade crossings, warning devices are erected to call the danger of the crossing to the attention of traffic.

VISIBILITY

Visibility is commanding considerable attention. It was referred to by many of the states. Minimum visibility is not less than 300 feet, and many of the states are attempting to get a visibility of 500 feet. Some states are attempting to get visibility of 500 feet on vertical curves and 350 feet on horizontal curves. Most of the states are cutting brush and removing other obstacles on highways or right of way that in any way impair the visibility of the drivers of vehicles.

GUARD RAIL

Guard rail is another important detail of construction that can be considered under engineering. In some states this item is regulated in proportion to the funds available for road work, but as nearly as possible guard rail is constructed on all fills over 4 feet in height and at dangerous curves, or other places which should require special treatment for the safety of the driver.

EMBANKMENTS

Several of the states are constructing embankments with 4:1 slope so that vehicles in time of necessity can run down the slope without turning over.

One state refers to the construction of wide ditches with flat slopes. These are termed

(Continued on page 28.)

California Contribution to Highway Building Lauded by U. S. Engineer

By DR. L. I. HEWES, Deputy Chief Engineer, United States Bureau of Public Roads.*

THE ENGINEERS of the Division of Highways in the California Department of Public Works, during the fall of 1926 and the summer of 1927 have achieved results for dustless, smooth roads which are remarkable. Starting with old principles they have developed a method of incorporating light asphaltic oil with fine crushed stone and gravel surfaces that is an improvement on any past methods.



DR. L. I. HEWES.

A similar method was used by the Wisconsin State Highway Commission in 1923, but it was not developed as the California engineers have now developed it. In brief, the method is characterized by the blading back and forth over the surface of material

about two and one-half inches in depth to which a light asphaltic oil has been added. The scientific study given this work and the perfection to which the process has been advanced is an achievement for the California engineers.

REMEDY FOR DUST NUISANCE

It has completely eliminated the dust nuisance and produced a surface which bids fair to be enduring and of cheap maintenance, and it has compelled the attention of road builders throughout the west. Assistant State Highway Engineer Stanton presented an outstanding paper on this subject at the Denver meeting of the American Association of State Highway Officials. The matter has also been carefully presented in "Public Roads" for September, by McKesson and Frickstad.*

This type of surface has been variously designated, but the term "oil-mixed top" is becoming current. The road is remarkably smooth. Some sections have shown a roughometer reading of about ten inches per mile, which compares with the best higher type sur-

faces. The wearing surface resulting from the oil-mix process is from two to three inches of dense material quite similar to asphaltic concrete.

For success the oil-mixed process, like other surfaces, requires a firm base. It is not a method of road building, but a method of producing a wearing top, dustless and smooth. Where the fine-crushed surfaces have been successful the oil-processed top is successful.

BEST RESULTS

The best results are obtained where the material of the top is not of greater maximum sizes than three-fourths inch and where the grading of the material in the top is sufficiently complete through the smaller sizes. For success with the oil-processed top it is not necessary that the top two inches of the road be tight or solid, but the base must be hard.

In fact the oil-processed top was developed in the Imperial Valley because the ordinary surface penetration method would not work on account of the looseness of the top of the roads in this dry area.

There are a great many miles of fine metaled roads that still have sufficient depth of material to permit oil processing with economy and success. If the roads are washed or rough they are first given a preliminary treatment to make them smooth and uniform. Afterward they are uniformly scarified or broken up to a depth of two or three inches.

It is at once apparent that a road on which only from two to four inches of metal remains is not a good road for success with this method. There must be a hard layer under the processed top for success, but there should be no layer of untreated material between the base and a processed layer when complete. Roads that show a tendency to break through or with soft subgrades will not be successful.

ROAD "LOSSES" IN WEST

In the western states there are several thousand miles of fine crushed roads on which the annual loss of material varies from a negligible amount in the moister areas, particularly in the forests, to an extraordinary amount in the open arid areas with high winds, possibly

*This article first appeared in *The National Motorist*.

one and one-half inches per year where the travel exceeds four hundred vehicles.

INDIANA GRAVEL ROADS

Research in Indiana indicates a loss on gravel roads for three consecutive years averaging about 290 cubic yards per mile per year. With a loss from one-half inch to one inch per mile per year, or from 130 to 260 cubic yards per mile per year, the money loss at \$3 per cubic yard is from \$390 to \$780. The oil-processed top has completely stopped such losses.

METHODS EMPLOYED

As stated above, the road is scarified and then light asphaltic oil (usually fuel oil known as 60 to 70 per cent asphalt) is applied by mechanical distributor. The oil need not be hotter than 200 degrees F. It is applied at a rate not exceeding one-half gallon to the square yard per application.

Right behind the spreading truck follows a train of disc harrows, and sometimes also a spring tooth harrow. The harrows partially mix the loosened top with the oil. Usually there are two or three half-gallon applications with separate harrowing for each. Also usually one-half the road is worked first, with travel turned on the other half.

After the harrowing, a blade machine drawn by a tractor or other adequate power begins manipulation for the final mixing of oil and crushed material. On the first trip the big blade usually moves the full depth of the top toward the center for half the road width. It is essential that the blade cut through to the hard surface beneath the partially mixed oil and fine material, but it is equally important that the blade move only the loosened material and not scrape any new material from the bottom.

The amount of blading to get all material to a windrow in the center will depend upon the power and size of blade, width of road, etc., but when it is done travel can operate on the bared lower surface and the other half of the road may then be treated with oil. In fact usually treatment of the other half of the road has already begun because by this oil-mixing method there is no harm to the travel by spattering oil. The oil on the loosened surface simply does not spatter and the wheels of vehicles can not harm the processing.

After both sides have been bladed to the center, the blades then separate the windrow and move the material back to the edges and repeat the process until all is of a uniformly brown color. The road is then carefully

UNITED STATES DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE

Crater Lake National Park
Medford, Oregon

Office of the Superintendent

October 16, 1928.

Mr. C. H. Purcell,
State Highway Engineer,
Sacramento, California.

Dear Mr. Purcell:

Mr. T. R. Goodwin of your organization, whom we borrowed from you in June, left today to return to Sacramento and I want to thank you for loaning us his services.

Mr. Goodwin brought us out of dusk into daylight on this "California Mix" work and as a result of his efforts we have nearly 18 miles of splendid dustless highway including the unpaved portion of the Medford and Klamath Roads and the main stem from Anna Spring to the Lodge. The results of his work have sold us on this type of finish and we expect to continue it indefinitely.

Mr. Goodwin has been really splendid; in addition to his value to us technically he has contributed a fine spirit and an enthusiasm that has been a great help in sustaining the morale of our outfit. Everyone at the park not only respected but liked him and a letter from the Yellowstone—to which park we let him go for about three weeks to help them similarly—reveals that he made good in the same way there.

We are much indebted to you for his services, indeed.

Cordially yours,

C. G. THOMSON,
Superintendent.

smoothed to a true crown by skilled operators, and traffic does the rest.

SUCCESS NOW ASSURED

This all seems a simple process, but there has been constant development since it began in the fall of 1926. The amount of oil has been controlled, the amount of mixing has been ascertained, the measurements of both are known from the color, and a "stain test" has been used with success to gauge both the oil and the mixing.

The road surface developed seems to be about two to two and one-half inches in thickness and it is tight and homogeneous and the road does not corrugate and seldom ruts. It is as smooth as good pavement. There are excellent examples of this work on the road from Briceburg to El Portal, from Victorville to Barstow, and from Emigrant Gap east to the Nevada state line.

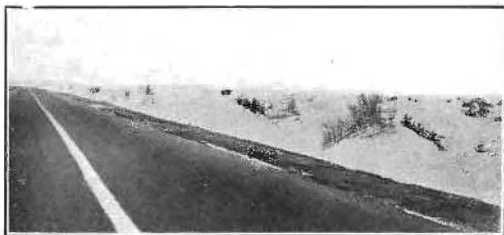
The entire cost of oil and mixing is from \$1,000 to \$1,300 per mile for an 18-foot road.

(Continued on page 27.)

The Sand Hills Road

By E. Q. SULLIVAN, District Engineer.

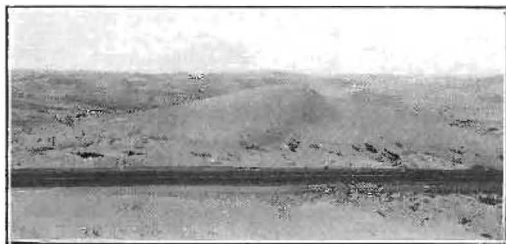
AFTER TWO YEARS of use, the highway across the great sand dunes near Yuma is a proven success. The road has now been through four windy seasons, the spring and fall of each year, and no trouble has been experienced. The road has always been clear of drifting sand and the sand fills supporting the pavement have not been disturbed by wind action.



Multitudes of small sand dunes approaching the highway.

A single track plank road was built across the dunes in 1916, and for many years was considered the only possible type because of the shifting sand. It was kept open for use by digging out the planks after each storm and then raising or lowering them to fit the new sand dunes that move along with each wind.

Five years ago intensive engineering study was undertaken to solve the problem of constructing a more satisfactory highway across these shifting sand dunes. After a great deal



Great sand dunes marching toward the highway.

of study and the consideration of innumerable plans, it was finally concluded that a successful road could be built. Elaborate experiments were carried out in attempting to control the shifting sand dunes, but thought of their control was finally rejected. Other plans considered were those of constructing a

better road surface that could be raised and lowered in a manner similar to the old plank road. All these plans were also finally rejected.

The final plan adopted was that of constructing a standard pavement on high sand fills, higher than fast moving sand dunes. It was found that only the small sand dunes move fast. Those over 30 feet high move very slowly. The movement of the dunes that are 200 to 300 hundred feet high is scarcely perceptible. The new road was built up on sand fills to be level with the top of dunes as high as 30 feet. In order to keep the high sand fills of the new road from blowing away, these fills were oiled. The road was located to avoid the very high slow moving dunes.

Previous to the construction of the new road, the old plank road was kept open to traffic only with the greatest difficulty during wind storms. In spite of the heroic efforts of



The old and the new. The old plank road can be seen on the left, paralleling the highway.

the maintenance men, it was often closed for hours at a time during a stormy day and during the darkness of a stormy night the men many times had to give up in despair.

The smaller sand dunes now march up to the highway and blow over above the pavement in great white sand streamers. The oiling of the high sand fills of the new road has proven a complete success and the wind has never disturbed them. There has not been a moment of interruption to traffic for the past two years.

Burning and clearing operations on state highways planned to aid in the prevention of fires have been greatly extended this year. A total of 661 miles of highway right of way has been burned under the direction of state highway maintenance forces. The cost to the state for the season has been \$37,851, or an average of about \$57 per mile.

The Crest Drive

Rapid progress is being made by the contractors in constructing the new road into the San Bernardino Mountains. There are two contracts under way and the road is beginning to appear along the face of the mountains. It can be seen from all of San Bernardino Valley and the blasting operations of the contractors can be heard in the city of San Bernardino. The contractors are working night and day and the lights of the power shovels twinkle on the side of the mountain at night.



Upper right, one stretch of highway is now open to travel; Center, winding road; Lower left, the present narrow steep is congested with traffic.

This road leads into the Big Bear Lake region and connects with the Lake Arrowhead resorts. The existing road has grades as high as 20 per cent. It is narrow and the countless short turns are the terror of motorists. The new road will be truly a high-gear road and the accompanying pictures of the parts of the road already completed illustrate the sweeping curves that will replace the sharp turns.

The present work is a cooperative project between the federal government and the State of California. The $4\frac{1}{2}$ miles of road now completed near Running Springs Park was a state day labor job.

Highway Through Heavy Redwood Timber in Humboldt County Completed

By M. H. HUSS, Resident Engineer.

THE completion of the Hauser and Englehart contracts, from Orick, Humboldt County, to the Del Norte County line, eliminates 15 miles of rough, winding road through dense Redwood forests and cuts one hour from the driving time between Eureka and Crescent City.

A 24-foot crown width road, increased to 30-foot crown width in the low country, surfaced with crushed gravel 20 feet wide, was constructed at a cost, including the heavy clearing, of approximately \$600,000.

The Englehart Paving and Construction Company was awarded the contract for clearing and grubbing the 15-mile project, consisting of 65 acres of trees, stumps and down logs which were larger than 12 inches in diameter.

All trees, stumps and logs under 12 inches in diameter were included in the grading contracts, which were awarded to W. H. Hauser, Oakland, California, from Orick to Russ

Grove, 8.5 miles and the Englehart Paving and Construction Company, Eureka, California, from Russ Grove to the Del Norte County line, 6.5 miles.

HEAVY CLEARING

Practically all of the project lay in dense redwood forests almost impenetrable, with immense down logs, heavy underbrush and redwood trees up to 14 feet in diameter.

The falling of these large trees, the blasting of the stumps and their removal from the construction limits was a problem made more difficult by the litter of down logs, some of which had lain for hundreds of years partly buried, while trees 6 feet in diameter had grown on top of them.

The falling was done by 16 choppers working in sets of two to each tree. The choppers were followed by the buckers, or sawyers with drag saws, who cut the logs into merchantable lengths suitable for handling. The buckers were followed by the powdermen who blasted the stumps. The logs and stumps were then removed by the blocking crew.

Six months were required by four crews of blockers, 10 men per crew, to complete the removal of 1900 trees from 65 acres.



1. The old road. 2. Clearing the way for the new highway. 3. Mammoth stumps that were removed. 4. The new highway.

Each crew was made up as follows:

Blocking:

- 1 9x11 spool donkey (steam).
- 1 Donkey operator.
- 1 Spool tender.
- 2 Riggers.
- 4 Hook tenders.
- 1 Wood buck.
- 1 Water buck.

Felling:

- 16 choppers.
- Bucking up.
- 4 Sawyers.
- 2 Drag saws.

Stumping:

- 1 Powder man.
- 7 Helpers.

Clearing cost, including material and equipment:

Falling	\$9,250 00
Bucking up	5,658 00
Stumping	18,974 00
Blocking	50,122 00

Total cost..... \$84,004 00

The average total cost per acre was \$1,292.37.

The average cost per tree was \$45.15, or \$7.11 per thousand board feet of standing timber.

The number of trees separated into sizes and their average approximate cost per tree is as follows:

	Average cost per tree
486 trees 12" to 20" diameter.....	\$16 65
416 trees 21" to 30" diameter.....	26 35
288 trees 31" to 40" diameter.....	38 10
328 trees 41" to 60" diameter.....	52 85
124 trees 61" to 80" diameter.....	74 30
118 trees 81" to 100" diameter.....	93 70
101 trees 101" to 220" diameter.....	171 65

Forty tons of powder were used in blasting the stumps at an average cost of \$6.45 per stump, or an average of 15 cents per inch diameter of tree.

Many of these stumps were from 10 to 20 feet in diameter at the ground.

GRADING

The material on the northern half of this project, (The Englehart Contract) contained clay, which, due to continuous fogs, never completely dried out, and the contractor was confronted with the problem of hauling the material away from his shovels over practically impassable roads.

Five-yard dump trucks were quickly discarded as too heavy. Ford 1½-yard trucks were used with some success, but they quickly cut ruts requiring continuous maintenance in order to haul at all.

Fordson 1½-yard iron mules were then used and proved very successful. The wide wheels ironed out the spongy subgrade and little maintenance work was necessary. Four of these iron mules were sufficient to keep one shovel going, hauling from 300 to 1000 feet and handling from 300 to 350 cubic yards per shift.

SURFACING

Rain falls in this part of Humboldt County 11 months out of 12, making the construction of a suitable subgrade a difficult and expensive problem. Heavy fogs kept the subgrade in a wet condition between showers. In some cases suitable material for decking was obtained for placing on the worst places but this

decking material was scarce, and as a rule it was a matter of fighting the mud. Surfacing operations were suspended for five months during the winter.

Underground water was encountered on the northern portion and the subgrade at these places was drained by tile drain placed at the side of the road, parallel to center line and 3 feet below the subgrade. About 4000 feet of 6-inch tile drain was placed.

TRAFFIC CONDITIONS

One of the most important problems involved was that of "carrying traffic through construction without interruption."

While traffic is much heavier on many other highways throughout the state, few, if any, suffered the congestion which occurred on this 15-mile stretch of one-way road, with widely separated turnouts and frequently blocked by construction operations. Four hundred to five hundred machines was the daily average during the months of June, July and August, requiring a force of seven traffic officers.

These men were appointed by the Motor Vehicle Department but worked under the supervision of the resident engineer.

Two strings of cars, each in charge of two traffic officers, left each end of the job simultaneously, passing at a designated point about half way. Two officers acted as flagmen at each end and the seventh patrolled the road directing and giving assistance to such stragglers as had dropped out of the line on account of tire or motor trouble.

Dust at times became bothersome to the drivers in the long strings of machines and it became necessary to sprinkle the road, which required two water wagons 8 hours per day each. Long lines of machines cut the road up badly, which made frequent blading necessary.

The cost of handling traffic, including this maintenance work, was \$13,200 or about 3½ cents per cubic yard of excavation, and about 10 cents for each car conducted through the work during the existence of the control system.

A MILE OF CONCRETE

The editor of *Michigan Roads and Pavements* is authority for the following figures:

A mile of concrete 18 feet wide and 7 inches thick is equivalent to 2000 cubic yards of mixed concrete. It covers 2¼ acres of ground.

Contains 3400 barrels of cement which is 17 car loads.

1100 cubic yards of sand or 32 car loads.

1600 cubic yards of crushed stone—46 car loads.

300,000 gallons of water—38 tank car loads.

The total weight of the mile of concrete is approximately 4000 tons.

To burn the cement required for a mile of road it requires 340 tons of coal and to sack it 13,600 sacks are required. To make these sacks 13 bales of cotton are used.

When we add to this the engineering and construction costs, it is not difficult to understand that it takes money to build real roads.—*Nation's Highways*.

War Department announces that a man, no matter how far he may fall through space, can not fall faster than 118 miles an hour. Well, not being much of a speed fiend that would be plenty fast enough for us, but it seems as though something should be done about it for the benefit of those who like to travel fast.—*Albany Knickerbocker Press*.

State Crew Praised for Fire Fight

OFFICIAL REPORT of G. H. Cheeseman, maintenance foreman, in regards to the work done by the maintenance crew during the recent fire from Guatay to Buckman Springs:

The fire started Friday p.m. at about 1.30 near Sta. 781+00, Sec. D. As we were hauling granite from the Hoor Pit, it was nearly 2.30 p.m. by the time we arrived at the fire. Two men were dispatched at once, one to keep ahead of the fire and another to follow up to warn the traffic and to also stop the traffic when it was unsafe to go through on account of smoke or flames. The balance of the crew followed up, putting out fires that were burning telephone poles and trees. As the foresters were handicapped for men they were not putting the tree fires out, but trying to check the brush fire. The maintenance crew worked until 8 p.m., Friday, August 31. As everything looked O. K. we came in for the night.

We went out again at 4.30 a.m. Saturday, September 1. The forest service had got some men during the night, and the district ranger wanted some of my men for crew leaders. I released four of our men and he gave me men in exchange.

The fire burned so fast Saturday, the 1st, that we could not keep up with our putting the fires out in the various trees. I had to have one truck go ahead with the danger signs—putting them wherever there was danger of trees or limbs falling across the traveled way.

Five of us stayed out until 8.30 Sunday morning when we came in for two hours sleep and some eats. We were back in the fire line at 11 a.m. and stayed until 10 p.m. Sunday. We were pretty well caught up with the fire by this time and the boys needed the rest bad, so they were told to show up at 7 a.m. Monday, the 3d. With the exception of cleaning up behind the fire, taking down barricades, throwing limbs off the traveled way, there

was not much to do as far as the highway was concerned, but the wind had shifted and was taking the fire towards Corte Madera. The District Ranger appealed to me for trucks to take the men to Long Valley near Corte Madera. We made two trips with men and helped with the back firing until about 7 p.m. Tuesday, 11th. All but two of the men were back on the granite hauling. Two of us patrolled the road in case any more fires came near the highway.

By Tuesday night the fire was under control. We hauled approximately 2000 gallons of water in putting out the fires. We used a 5-gallon

force pump of the burning limbs and in many cases where trees were burning inside we had to shovel dirt to close the lower opening, as it was impossible to battle the flames while there was such a draft. The following is the approximate hours the traffic was halted by our men: 3 to 4 p.m. Friday, August 31; 2.30 p.m. to 5.30 a.m., Saturday, September 1st and for 10- and 15-minute intervals both September 2d and 3d.

**DIVISION OF HIGHWAYS
DISTRICT VII
Sun Finance Building
Los Angeles, California**

Mr. C. H. Purcell,
State Highway Engineer,
Sacramento, California.

Dear Sir:

Our maintenance crew at Guatay in San Diego County did some very excellent work during the recent forest fire along Route 12 in San Diego County. I heard of this on one of my trips through this route, and instructed Foreman Cheeseman to submit a report.

Attached hereto is a copy of this report, dated September 28th, and from what I have heard on the outside, Mr. Cheeseman has rather minimized the good work done by himself and his men during this emergency.

I would particularly call your attention to the excellent judgment shown by Mr. Cheeseman in the saving of the large trees along the state highway. With all of the rest of the area burned off, the value of these remaining trees along the highway is increased several fold.

In such a time of rush and hurry there are not many men who would think out the situation as clearly as did Mr. Cheeseman, and direct his efforts so as to be of maximum benefit to the highway and to the public.

Yours very truly,

S. V. CORTELYOU,
District Engineer.

An Unusual Culvert Job; Details Told of Unique Project

By E. T. SCOTT, Assistant District Maintenance Engineer.

South of Irvine on the Los Angeles to San Diego Highway a double 10-foot by 6-foot reinforced concrete box culvert was recently enlarged by deepening the existing barrel 6 feet. The culvert was inadequate to handle storm waters so its capacity was almost doubled. In addition to deepening the structure it was lengthened to allow for a clear width of roadway between headwalls of 50 feet by extending 13½ feet on each end.

As it would have been difficult and expensive to have detoured traffic while work was in progress, all vehicles were permitted to proceed as usual over the



How the job was handled.

pavement. In fact, there was but little evidence from the traveled way that the work of deepening the old culvert was in progress.

The deepening of the existing double 10-foot by 6-foot concrete box culvert to 12 feet was done in four sections approximately 7 feet each in length and extending the full width of both barrels of the culvert, the total length of the barrel of the culvert being 27.9 feet. Work was started on a 7-foot section at one end of the structure and completed before excavation on the section at the opposite end of the structure was commenced. A lapse of time of a few days, work being shifted to the extension outside the old



The old culvert.

HIGHWAY WORK ALONG KLAMATH IS COMMENDED

Sacramento, California,
November 6, 1928

H. S. Comly, Dist. Engineer,
Calif. State Highway Commission,
Redding, California.

Dear Mr. Comly:

I have just returned from a six-weeks vacation spent at my place at Thompson Creek on the Klamath River. I have made several trips a year down the Klamath for the past twelve years, in fact, when part of the road was not much better than a cow trail.

I want to compliment you on the wonderful improvement made on this road, particularly during the past year. I believe this work is under the supervision of a Mr. Guy McMurtry, whom I have not had the pleasure of meeting, but whom I believe must be very capable to get such wonderful results from such a small force of men and equipment.

I spent six years at engineering before going to college to take up my present profession, and can realize how you must have had to stretch your allowance to the utmost to accomplish all this.

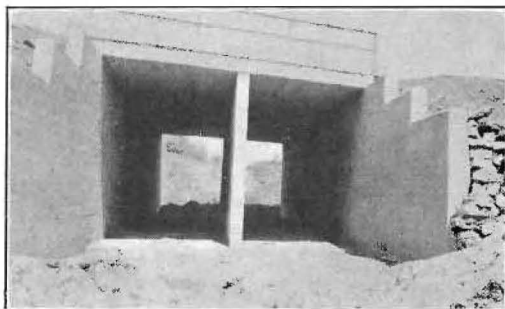
Hoping for a continuance of the good work, I am

Sincerely yours,
C. E. Brown.

culvert, was required between the placing of the two inner 7-foot sections to allow the concrete in the first inner section placed to cure.

While all work of undermining the old culvert was in progress, the structure was well shored up with heavy timber. No caving of the undercutting or settlement of the old structure occurred.

The cost of the 220 cubic yards of concrete placed in the deepening and lengthening of the culvert was \$18.90 per cubic yard and the unit cost for structure excavation was \$1.40 per cubic yard. It cost \$6.20 per cubic yard to break out the concrete bottom of the old structure by hand. The job was too small and isolated to import a compressed air outfit to break out the old concrete.



The new structure.

Excavation by Means of Tunnel and Trapping

By B. H. HENRY, Superintendent of Convict Camp No. 12.

ON NOVEMBER 1, 1927, operations were actively resumed on the construction of the new highway between Greenhorn Mine and Buckhorn Summit, thus translating the vision into practical results in the way of connecting the long needed and much sought for lateral connecting the Pacific Highway with the Coast Route, into a reality.



B. H. HENRY.

At the time operations were started on this road there was a company of approximately 120 San Quentin convicts employed.

Equipment being limited and having only one $1\frac{1}{4}$ -yard gas shovel, it was decided to handle this moving of material, which in most

places consists of decomposed granite, by a less expensive method than by hand.

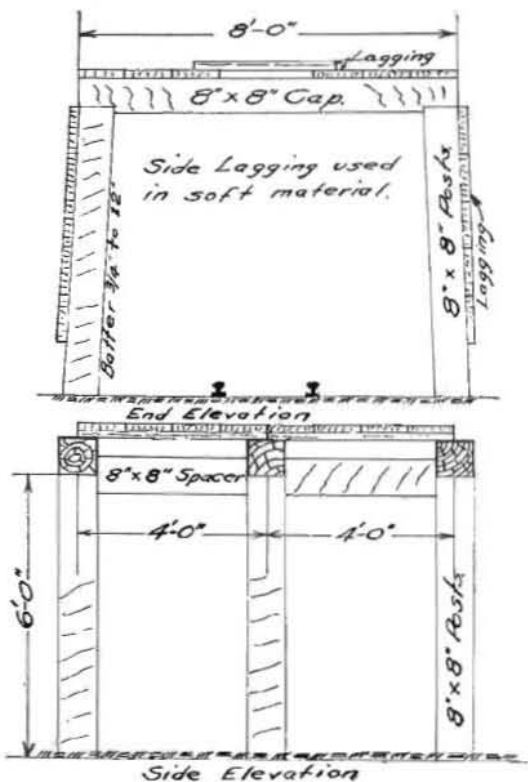
The method decided upon was by tunneling and trapping, the method being sometimes known as by Swede tunnel; therefore, tunnels were constructed in the manner used by miners, namely timbering with lagging and caps, a trap being placed in the roof of the tunnel, through which the muck was run into Swede cars, which were pushed and dumped by man power, a track having been placed from within the tunnel to the end of the fill to be made. See illustration No. 1. Very gratifying results were obtained by this method. Where the grades were steeper and the hauls longer, a horse was used for propelling the cars.

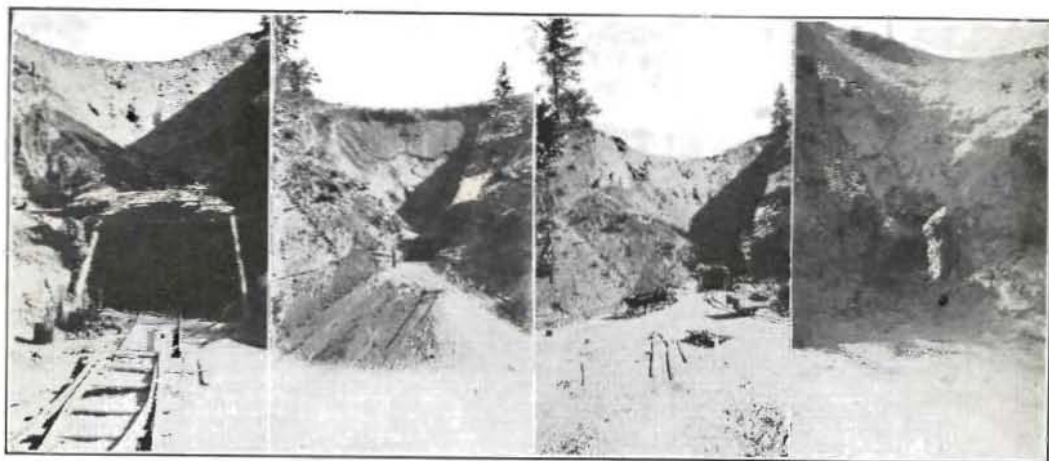
Illustration No. 2 shows a cut being put through by this method, and shows where the muck has slid down to the top of the trap, which it readily does, especially in dry weather, when it runs like sugar. The material is loosened with very light shots, to avoid possible damage to the tunnel, and also bringing down too much material at one time.

Illustration No. 3 shows the men at work pulling down material and keeping it running to the trap; sloping is done at the same time.

Illustration No. 4 shows a cut, half of which has been removed by the trap method, the tunnel timbers and trap from this work having been salvaged for use in a tunnel which is being driven in from the opposite end of this cut. When the work from the opposite end meets the work shown in the picture, the cut will be complete except for a small amount of clean up work, which will be handled with a power shovel. Generally speaking, the slopes will be completed to within approximately 15 feet of grade, and this material near the bottom of the cut, that has to be handled with a shovel, only amounts to from three to nine yards per foot.

Following are some interesting facts relative to the tunneling and trapping methods, which will show the relative cost of operations per cubic yard of material moved, which covers the cutting and handling of lagging and timbers, cost of driving tunnel, and cost of





Views illustrating methods of procedure.

trapping operations for one of the cuts put through on this job.

The tunneling and trapping system was first inaugurated about March 1, 1928, and there have been about four crews of approximately nine men to the crew at this work since that date, with an average of about $12\frac{1}{2}$ cubic yards per man-day.

The quantity of powder used in connection with this operation averages about one-quarter pound to the cubic yard of material.

Cutting and Handling of Lagging and Timbers, 129.5 Lineal Feet Tunnel.

Free labor.....	-----	
Convict labor.....	-----	\$92.40
Equipment.....	-----	
Gas and oil.....	-----	
Material.....	-----	
Total cost.....	-----	\$92.40
Unit cost.....	-----	\$0.713

Driving Tunnel 129.5 Lineal Feet.

Free labor.....	-----	\$25.63
Convict labor.....	-----	189.00
Equipment.....	-----	16.50
Gas and oil.....	-----	1.65
Material.....	-----	36.68
Total cost.....	-----	\$269.46
Unit cost.....	-----	\$2.08
Total cost of driving tunnel per lineal foot.....	-----	\$2.793

Trapping 13,620 Cubic Yards.

Free labor.....	-----	\$325.12
Convict labor.....	-----	2,281.67
Equipment.....	-----	28.86
Gas and oil.....	-----	15.34
Material.....	-----	567.76
Total cost.....	-----	\$3,218.75
Unit cost.....	-----	\$0.2628

Actual cost.....	-----	\$0.2628
Overhead.....	-----	0.658
Inventory.....	-----	0.015
Distributable.....	-----	0.045
Total cost (per cubic yard).....	-----	\$0.3868

Los Angeles, Cal.,
October 15, 1928.

California Highway Commission,
Sacramento, Cal.

Gentlemen:

In the maze of complaints which you get from all over the state regarding conditions, from taxpayers who are self-constituted advisers, it must be a delightful experience to have an epistle which commends a policy or an employee.

And so I am writing you to call your attention to a service given me, outside of his official duties, by your superintendent of maintenance at Crescent City, Mr. N. Underwood.

Some time last summer, while on a trip from Crescent City to Grants Pass, we left a child's silver drinking cup at one of the service stations near the Oregon mountains.

We did not discover the loss until some time later at a distance removed from the place to make it impracticable to return for it. On my return to Los Angeles I wrote the Oregon Highway Commission asking their good offices in the cup's recovery, thinking the loss had occurred in the state of Oregon, and they kindly forwarded the letter to Mr. Underwood.

Yesterday's mail brought the cup and a letter from Mr. Underwood, which I am acknowledging.

I could not let the occasion pass, however, without writing you a letter also calling your attention to Mr. Underwood's kindness. I am sure you have not made a mistake in having a man of his thoughtfulness in charge of the maintenance work of the district.

Sincerely yours,

ROY A. McMILLAN.

2340 Prosser Ave.,
Brentwood Heights Sta.,
Los Angeles, Cal.

WYOMING—In estimating annual state road maintenance requirements fifteen dollars a mile is assigned for cleaning culverts, based on an average of ten culverts to the mile.

To Save Trees-Shrubs Along State Roadsides

No unnecessary cutting of trees and shrubs along the state highway system.

This is the edict that has been issued to highway forces generally by B. B. Meek, Director of the Department of Public Works, and C. H. Purcell, State Highway Engineer.

The instructions against unnecessary and promiscuous cutting of shrubs and trees are a part of the campaign inaugurated by Director Meek, to preserve the natural beauty of highway borders, which he declares is equally as important as making the highways beautiful.

The "Keep the Highways Beautiful" instructions issued by State Highway Engineer Purcell to all district engineers follow:

The following measures are set forth for your guidance and close observance, not only as an aid in improving the appearance of our roadsides, but the preservation of their natural beauty as well:

1. In daylighting the road, brush or trees shall not be cut on the upper side of the road where the cut bank itself prevents visibility. Exception is made to locations of heavy rainfall where accompanying winds might dislodge trees, causing damage to roadway or hazard to traffic.

2. Trees on the lower side of road shall be cut only when pruning will not give the desired visibility. Undergrowth, interfering with visibility, should be removed, the extent of this removal to be limited to a minimum.

3. All tree and brush cutting to be done in the late fall or during the period of least traffic, and the slash burned in time to allow new growth to come up the following spring, covering both the scars of cutting and site of burning.

4. When necessary to cut a tree, the cut should be made flush with the ground. Existing stumps, except redwood and others of large diameter, should be treated in a similar manner.

5. Ferns, flowers and moss growth on the cut bank and along the highway, except where they present a distinct fire hazard are to be disturbed as little as possible.

6. Trees, shrubs, and where conditions and facilities permit, wild flowers, common to the locality, shall be planted along the fence enclosure of each highway maintenance station as an illustration of the state's desire for beautifying the highways.

7. The trimming and pruning of trees and brush in each district shall be laid out and supervised by a responsible man, instructed to the work in hand by the headquarters arboriculturist.

8. That as soon as practical a section, representing average conditions, one mile or less in length, shall be selected in each district and treated as outlined above. On completion, this section to be reviewed as an object lesson by the various maintenance foremen in that district.

9. Where a distinct fire menace exists, the traveled way, to a point on the out bank two feet above the gutter line, should be cleared of all dry vegetation.

Roadside Clean-up Campaign Progressing

Progress is reported in the clean-up and beautify the roadsides campaign, launched under the leadership of the Automobile Club of Southern California some months ago. This response from the various communities indicates that a decided improvement will be noted in the coming months by tourists and motorists generally.

In some communities the definite job of removing untenanted, dilapidated shacks, old signs, dead trees, dumps, and similar wayside disfigurements has been placed in the hands of civic organization committees. Chambers of commerce are realizing their responsibilities and planning programs that not only will clean up the roadsides but keep them clean.

It is noted as the campaign progresses that in many instances the municipal government itself is responsible for permitting city dumps, automobile graveyards and similar eyesores to exist. In other communities ordinances are being especially framed, to improve the situation.

Service clubs are aiding in the campaign and motorists generally are urged to do their bit by keeping the roadsides free from litter and refuse.

Trees Along State Highway are Saved

[From the *Red Bluff Times*.]

Only one tree shading the east side highway will be cut down, according to word received here yesterday by Elmer Stump, resident engineer for the California State Highway Commission.

Removal of several fine trees that border the road had been asked by certain interests, but public opinion expressed to the Commission prevented the act. The tree in question stands about five miles north of Los Molinos, and is considered too close to the highway, already forcing up the pavement.

Other trees within six feet of the highway are to be posted with flashing red signs.

MICHIGAN—Electric lights now aid night motorists on 375 miles of highways outside of cities and towns, it is reported.

ILLINOIS—Among the state paving and bridge contracts let during June and July are fifteen at more than \$150,000 each, the largest being for \$344,000.

CLEVELAND—A regional highway plan anticipating a traffic growth of 73 per cent in ten years has been prepared. It includes 125 miles of new and 468 miles of reconstructed routes, 55 grade eliminations and 18 bridge projects. The cost is estimated at \$63,000,000.

State Highway Officials of Nation Express Views on Highway Policies

CALIFORNIA was represented this year at the National Association of State Highway Officials, held in Chicago in November, by C. H. Purcell, State Highway Engineer; C. S. Pope, Construction Engineer, and T. E. Stanton, Materials and Research Engineer, all of the Division of Highways, Department of Public Works.

The discussions covered a wide range of subjects pertaining to state highway policies and affairs. The conclusions of the association were embodied in a series of resolutions printed below and dealing with the following subjects:

- Toll bridge legislation;
- Regulation of motor buses and trucks;
- Road funds for national parks;
- Concentration of federal funds on federal-aid system;
- Federal funds for roads through federal lands;
- Advertising signs on highways;
- Cooperation from states in geological surveys.

A resolution eulogizing the memory of A. B. Fletcher, former State Highway Engineer of California, was also passed.

Mr. Purcell was selected as a member of the Executive Committee of the association.

Following the conclusion of the session of the convention, Mr. Pope and Mr. Stanton spent some time in the east, studying highway development in various states there.

TEXT OF RESOLUTION

The following resolutions were adopted:

Needed Toll Bridge Legislation.

WHEREAS, Private financial interests are undertaking to commercialize and exploit the traffic on the roads of the state and federal aid highway systems by the construction and operation of toll bridges at points where traffic is concentrated as a result of the vast expenditure of public funds on the construction of these free highways, and

WHEREAS, These interests in order to further their own schemes have actively opposed construction and financing bridge programs of properly constituted public authorities; now, therefore, be it

Resolved, That the American Association of State Highway Officials in convention assembled at Chicago, Illinois, on November 14, 1928, is unalterably opposed to privately owned and controlled toll bridges on the state and federal aid systems of highways, but is not opposed to publicly constructed, owned and operated toll bridges where adequate public funds are not available for the immediate construction of the free bridges needed to complete the interstate and intrastate highway systems as planned; and be it further

Resolved, That this association recommend a thorough investigation of the entire toll bridge situation by

the Committee of Congress handling federal highway legislation to the end that suitable remedial legislation may be promptly enacted; and be it further

Resolved, That this Association recommend to the Committee on Interstate and Foreign Commerce of the Congress of the United States that it withhold its approval of any measure authorizing or consenting to the construction of a privately owned toll bridge on the state or federal aid highway systems unless after a thorough investigation the committee has determined that there is a lack of financial resources or intention of the proper political subdivisions to finance and construct a free or publicly owned toll bridge; and be it further

Resolved, That this association recommends that there be included in every congressional authorization or consent for the construction of privately owned toll bridge on the state or federal aid highway systems, a provision that the bridge when completed may be acquired by the public at any time by the payment of an amount not greater than its original cost, less reasonable depreciation due to use and the cost of replacement of faulty construction and design.

Regulation of Motor Buses and Trucks.

WHEREAS, The use of the highways of the United States for commercial motor bus and truck interstate traffic is rapidly increasing, and

WHEREAS, No definite national policy has been adopted providing for the regulation of such interstate traffic over such highways,

THEREFORE WE RECOMMEND, That authority to delegate interstate highway traffic be vested in the states with such national legislation as may be enacted providing for the central government as arbitrator of disputes that may arise between the states.

WE FURTHER RECOMMEND, That before any legislation is enacted by congress that a thorough investigation be made of all modes of interstate traffic by state and federal agencies already established.

Increased Federal Funds.

WHEREAS, That rate of progress of construction of federal aid highways is not keeping pace with the increase of motor vehicle traffic, and

WHEREAS, There is an economic necessity for making greater progress in the building of the federal aid highway system; therefore, be it

Resolved, That we urge the congress to increase the federal aid highway appropriation to \$100,000,000 for each of the fiscal years 1930 and 1931 and that the appropriation for forest roads be increased to \$10,000,000 annually in order to make possible the early completion of the entire system.

Road Funds for National Parks.

WHEREAS, The completion of arterial highways through national parks and monuments is of prime importance; now, therefore, be it

Resolved, That the association go on record as favoring the continuation of federal appropriations of \$5,000,000 per year for construction, reconstruction and improvement of roads and trails in national parks and national monuments until modern, high standard roads and adequate trail systems are provided therein.

Concentration of Federal Funds on Federal Aid System.

WHEREAS, There is an effort now being made to increase the mileage of the federal aid system of highways, and

WHEREAS, The records show that less than 47 per cent of the mileage of the federal aid system is surfaced with gravel or a higher type; therefore, be it

Resolved, That this association recommend that the federal funds be concentrated on the present federal aid system.

Federal Funds for Roads Through Federal Lands.

WHEREAS, The progress being made in the construction of the United States forest highway system and

the roads across other unappropriated public lands in the various states is lagging behind that being accomplished on other portions of the federal aid highway systems in such states; and

WHEREAS, The complete improvement of said United States forest highway system and the roads across other unappropriated public lands, many sections of which are important interstate transcontinental links would not be accomplished under present appropriations until many years after the completion of the balance of the federal aid highway systems in such states; and

WHEREAS, A resolution was passed at Denver, Colorado, by this association in 1927 calling the attention of congress to the above conditions and urging that increased monies be appropriated by congress to the end that the completion of the United States forest highway system and roads across other unappropriated public lands might be accomplished at approximately the same time as the balance of the federal aid highway systems in such states and result in a continuous improved system of highways with no weak links, and

WHEREAS, Pursuant to the above resolution, legislation was introduced in the congress to carry out these purposes; and

WHEREAS, Said legislation known as the Colton-Oddie bill passed both the Senate and the House but failed of complete enactment; and

WHEREAS, The comparative rates of progress being made on the two systems are as they were in 1927 and the appropriations are the same as heretofore; therefore, be it

Resolved, That this association affirm our support of the principles incorporated in the Colton-Oddie bill and urge its enactment into law.

Advertising Signs on Highways.

WHEREAS, Advertising signs along highways not only destroy the scenic beauty but create as well a serious traffic hazard by distracting the attention of drivers; therefore, be it

Resolved, That we reaffirm the position previously taken by this association against the encroachment of advertising signs and that in the interest of safety and promotion of scenic beauty we urge the several states which have not already done so to bar all advertising signs from the highways and vicinity thereof by legislation prohibiting such advertising signs within a distance of at least 500 feet (500') of the rights of way of all highways.

States Should Cooperate in Geological Surveys.

WHEREAS, The United States Geological Survey has an appropriation enabling it to make topographical surveys for states which will share equally in the cost; and

WHEREAS, Such surveys would be of great value to the public in general and to the several state departments, including the highway departments.

WE THEREFORE RECOMMEND, That the states avail themselves of this cooperation of the federal government, so that these surveys may be completed as early as possible, and

WE FURTHER URGE, That the federal government complete the topographical surveys of the public lands at its own expense.

In Memory of Austin B. Fletcher.

WHEREAS, Austin B. Fletcher, one of the charter members of the American Association of State Highway Officials passed away at Washington, D. C., on March 9, 1928, and

WHEREAS, Mr. Fletcher was one of the notable highway engineers of the United States, embodying in himself both the high ideals of his profession and its outstanding service to state and nation; therefore, be it

Resolved, That the American Association of State Highway Officials extend to the relatives of Mr. Fletcher in their great sorrow the heartfelt sympathy of its members; and expression be given to the sorrow that the members of this association feel in the loss of a personal friend and a most honored and able member of their profession; be it further

Resolved, That a copy of this resolution be spread upon the minutes of the association as a lasting tribute both to a life well lived and to a career, a monument to which are better highways the nation over.

WASHINGTON, D. C.—The streets and boulevards of the National Capital are lined with 105,123 well kept shade trees, a census shows. A recent appropriation will add 3500 more.

STATE CREW PRAISED FOR FIRE FIGHT

(Continued from page 18.)

The trees were pine trees, Sta. 837+00, Sec. D; oak, Sta. 18+50, Sec. F; oak, 28+00; oak, 136+00; oak, 143+00; oak, 133+00; oak, 184+00; oak, 188+00. In several cases we cut underbrush from the tree and kept the fire from getting started in a tree, or back-fired from a clump of trees. There were several that first had a burning limb, that we cut off or used the force pump and did not take much time. But the above trees would have burned down to the ground. The boys all put up a good fight, and the district ranger was very much pleased with the results obtained, thanked us for use of equipment and men for crew leaders.

Two of our employees tried to be as stubborn as the fire while the cabins were on fire in Pine Valley, and they had to be carried out. A bucket of water and plenty of fresh air brought them out in short order.

THE ROAD HOG.

There is a creature that is allowed to run loose on the highways of every state, who has probably been the cause of more oburgation on the part of motorists than any other one thing in Motordom. It thinks that the United States Government, the State Highway Commission and all other road-building agencies have expended millions of dollars to construct highways for its own personal use. This creature is known as the Road Hog. It has the human form but none of the characteristics usually attributed to those above the lower animals.

It travels along the middle of the highway usually in a heavy car but sometimes in a car not so heavy and nothing short of fear of hurt to its own thick hide will cause it to give the proper share of the road to others.

It has been known to go to a headlight adjusting station, have the lights on its car properly adjusted, receive a certificate for his protection and then deliberately change the focus and tilt of the lights so that they will blind an oncoming motorist and force him off the road.

If traveling towards you it will try to bluff you into giving way for him and if you are overtaking it, no amount of honking on your part will cause it to get over one iota.

Just a word of warning. Sometimes particularly on a narrow road, you think the other fellow is hogging when you are doing it unconsciously. This is particularly apt to be so if you are driving a car to which you are not accustomed. A slight change in the elevation of your eyes or of the contour of the road is very apt to cause you to misjudge your distance from the right hand edge of the road. Be sure to keep well over to your own side of the road in passing.

—Berkeley Traffic Safety Commission.

IMPROVED HIGHWAYS AID DEVELOPMENT AT LAKE TAHOE

(Continued from page 9.)

vacation months of June, July and August. As a recreational road through a scenic area the location and construction call for a sacrifice of some of the engineering principles used on a high-powered commercial road in order to protect and display the scenic beauties of the country traversed. It is necessary, however, to adhere to those principles of location and construction that affect the safety of the road, for experience indicates clearly that even through a scenic country a fair per cent of the traffic moves at high speed. While it may become desirable or necessary to restrict by law the speed of traffic in the recreational areas, it will never be wise to let down on the standards by which safety is built into the roads. However, the necessity of saving distance, or of eliminating unnecessary rise and fall is not so important; therefore, the locator may exercise considerable latitude in laying out the road to take advantage of strategic points where the most magnificent views will be available to the traveler. In general in the Lake Tahoe area the principal restriction to getting the best to be had from a scenic point of view is the fact that private ownership makes any movement of the road from the position of the rather meandering route of the old road a difficult problem. An unfortunate event in the history of Lake Tahoe has been the acquisition of all of the land fronting on the lake by private owners, and the designation by these owners of the location of the road across their property as most suited their convenience. The result was a rather haphazard road, from which departures could be made to a limited extent only. By retaining the old locations of the road at the strategic places such as along the lake front, or where the best views could be obtained and modifying the intervening location as much as practicable, a road has been secured that will present to the traveler beautiful vistas of the lake through the trees, close-up views along the beach, and magnificent panoramas of lake and mountain from the higher elevations. Easy curves through wooded areas have been used in preference to tangents, and the display of a straight gash through the forest has been avoided. Wide roadside areas are being provided for parking where the best views are to be obtained. All standing or fallen dead timber and brush is being removed from the 80-foot right of way and burned. Cutting of live trees is restricted to the area needed for roadway. The effect of this preservation of timber and roadside clean-up in added attractiveness is remarkable, for new vegetation springs up that could not thrive before, and the roadsides present the appearance of a beautiful natural park.

The character of work done to date in this area will be continued until all of the highway around the lake is completed. The next units for improvement will undoubtedly be a 5-mile section from the Meyers-McKinney road to the state line at Lakeside, and a section of about 1.5 miles at the head of Emerald Bay. This latter unit will constitute one of the most scenic roads in California overlooking, as it does, Emerald Bay and Lake Tahoe with a background of Mt. Tallac and other rugged peaks.

The people of California have been given a demonstration of how traffic service can be improved by new construction and by better maintenance. They have responded with an increase in traffic that calls for a continuation of the construction and for constant

vigilance on the unimproved roads to equal or better the standard of maintenance that has been set. It is the aim of the employees of the Division of Highways to see that they are not disappointed.

HOW HIGHWAY BRIDGES ARE INSPECTED

(Continued from page 5.)

inspected while being made. Then pieces of steel from each unit of manufacture are given a physical and chemical test. When the steel is fabricated, or put together to form parts of the truss, it is again inspected to see that proper sizes and length of materials are used. Before shipment the steel is given a shop coat of paint prior to the two additional coats which are applied in the field after erection. This paint is subjected to a chemical test before application and the application closely watched to insure that no dirty or rusty steel is covered and to see that all parts are thoroughly painted to guard as much as possible against the ravages of rust. The steel as assembled is then weighed in the presence of the inspector before shipment. Payment is based upon these weights. Then, when the steel arrives at the bridge site the erection is inspected to see that it is properly built in place. When riveted, each rivet is tested after being driven to see that it is tight that it may function properly as designed. Great care is then taken to see that the steel work is properly painted for in this case when you save the surface you save all.

CONCRETE TESTED

Concrete is similarly tested except that concrete differs from steel in that it is manufactured on the job. The cement is tested at the cement mill before it is allowed to be shipped to the bridge site. The aggregate is inspected and tested for strength and grading. Proper proportions to be used are determined by the engineer in the field. The water that is used is subjected to a chemical test and the amount used in the concrete is inspected. The mixing and placing of the concrete is then inspected by the engineer.

All the other materials are likewise inspected and tested—timber, piling, reinforcing steel, bronze expansion plates, machinery, electrical apparatus, etc.

The intent of the foregoing is to describe in a general way the "what and why" of bridge inspection. Necessity and sufficient funds are prerequisite to a bridge; plans and specifications follow. Competent bridge inspection then insures efficient and economical bridges and for existing structures insures safety for the traveling public.

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.

B. B. MEEK Director
 GEORGE C. MANSFIELD Editor

Address communications to California Highways and Public Works, P. O. Box 1163, Sacramento, California.

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 Eleventh and P Streets, Sacramento, California

Would Adorn State Roads With Outside Christmas Trees

The cover for this issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS features the movement for OUTDOOR CHRISTMAS TREES which is sweeping California. Not only are there outdoor trees being urged for homes, but each community is being asked to have a Christmas tree, properly decorated somewhere along the state highway that serves that particular city.

It is urged that these outside Christmas trees will not only radiate the cheer of the holiday season, but will also advertise to the world California's salubrious Christmas climate.

The drawing for the cover was made by E. M. Muse of the Division of Highways.

Select Model Areas For Roadside Beautification

The Maintenance Department of the Division of Highways is now conducting a survey of state highway roadsides upon which to base a "clearing and cleaning up" program for the coming year.

In each of the ten highway districts of the state, a portion of road is being selected to serve as a model section for roadside beautification. These sections will be planted with trees and shrubs suitable for each locality, and having regard both to soil and climatic conditions that prevail there. It is thought that these sections will serve as typical examples and guides of proper and practical methods to follow in roadside betterment and beautification, and will benefit both the highway organization and county and community organizations.

STOP, LOOK, LISTEN

He heard the toot, but tried to scoot

And beat the choo-choo to it.

The poor galoot new twangs a lute;

Take heed that you don't do it.

—Georgia Highways.

NEBRASKA has built 3246 miles of gravel highways in the past four years. Their annual maintenance cost has averaged \$405 per mile. On twenty-two of the most heavily traveled routes this figure is \$570, not including major repairs and resurfacing. Cost of resurfacing has averaged \$873 per mile.

U. S. May Lend Road Engineers to Neighbor Nations

The Pan American Union has expressed hope for the enactment of a bill which will come before the U. S. Senate during the next session and which would authorize the President to detail engineers from the Bureau of Roads to assist Latin-American governments in highway matters.

This bill, which was introduced by Senator Oddie of Nevada, was considered by the Senate Committee on Post Offices and Post Roads during the last session and was reported to the senate with the committee's approval. It retains its parliamentary status on the legislative calendar and will come up for consideration at the next session.

DR. ROWE SUPPORTS BILL

A letter from Dr. L. S. Rowe, Director General of the Pan American Union, addressed to Senator Oddie, expresses the hope of the Union for favorable action on this bill as follows in full text:

"I understand that the measure providing for the appointment of highway engineers for service in those Latin-American countries that may request the assistance of such engineers will shortly come before the committee.

"I hope that this measure will receive the favorable consideration of the committee and that it will also receive the approval of congress. The Pan American movement rests on the basis of mutual helpfulness and cooperation between the Republics of the American continent and on the principle of having the benefit of the experience of each placed at the disposal of all the Republics. I feel that the adoption of this measure will constitute a real service to the cause of Pan Americanism, inasmuch as it will place at the disposition of all the other Republics the experience of the highway engineers of the United States."

COMMITTEE EXPLAINS BILL

The senate committee's report recommending enactment of the bill explains the purposes of the measure and cites a statement of President Coolidge in his last annual message to congress as favoring such legislation. That part of the report follows in full text:

This bill would authorize the President of the United States, upon application from the foreign governments concerned and whenever in his discretion the public interest renders such a course advisable, to detail engineers of the Bureau of Public Roads of the Department of Agriculture to assist the governments of the Republics of North America, Central America and South America and of the Republics of Cuba, Haiti and Santo Domingo in highway matters.

The present law provides that the President may detail officers of the United States Army, Navy and Marine Corps to assist the Latin-American Republics in military and naval matters. This bill is drawn with the exact wording and authorization as that with respect to officers of the Army and Navy. (See senate hearings before Committee on Post Offices and Post Roads, March 30 and 31, 1928, pp. 4-9.)

The President in his message to congress on December 6, 1927, called the attention of the congress to the situation and to the advisability of authorizing him to have the same power with reference to engineers in highway matters as he possesses with respect to the

CALIFORNIA CONTRIBUTION TO HIGHWAY BUILDING LAUDED BY U. S. ENGINEER

(Continued from page 13.)

The maintenance cost is not yet completely known, but it is not expected to exceed the cost of maintenance by other less effective methods. It will consist in patching and possibly reworking some sections that are either too lean or too fat.

There is no reason that the new oil processing can not be applied to new construction as well as existing older roads. It will be necessary to have the lower layer thoroughly compacted by travel, say for a depth of four or five inches. With a minimum amount of scarifying, the top layer of fine material may then be processed.

Whether or not the oil-processed top can take the place of good penetration macadam remains to be seen. The best penetration macadam or bituminous macadam, six inches thick, can now be built in the west at a cost of from \$1 to \$1.25 per square yard. The bureau is doing fifty-three miles for which the average cost for six inches is \$1.20, and is regarded as high due to scarcity of surfacing stone and high freight.

The oil-processed roads complete with a processed top of two inches, on a four-inch compacted base, will cost about 84 cents per square yard, with comparable prices for stone. With an apparent difference of from 25 to 40 cents per square yard in the cost of the two types, the item of relative maintenance costs becomes important.

Nevertheless the oil-processed top has arrived in point of time and is going to stop forthwith a great annual loss on many miles of fine crushed roads in the west.

officers of the Army and Navy. The President's message relating to this matter contains the following:

"While the advantage of having good roads is very large, the desire for improved highways is not limited to our own country. It should and does include all the Western Hemisphere. The principal points in Canada are already accessible. We ought to lend our encouragement in any way we can for more good roads to all the principal points in this hemisphere south of the Rio Grande. It has been our practice to supply these countries with military and naval advisers, when they have requested it, to assist them in national defense. The arts of peace are even more important to them and to us. Authority should be given by law to provide them, at their request, with engineering advisers for the construction of roads and bridges."

REDUCING ACCIDENTS ON STATE HIGHWAYS

(Continued from page 11.)

locally "in and out ditches," indicating that a vehicle can drive in the ditch in case of necessity and still come out without accident.

PAVEMENTS

Engineers have recognized the value of wider pavements for the purpose of eliminating accidents. It is now almost universal practice to super-elevate and widen all curves and this has been recognized as an important contribution to highway safety. There is no reference made to different types of surfaces in connection with highway safety.

LEGISLATION

In some of the states elaborate measures have been passed or are being passed by legislatures for the purpose of regulating traffic and pedestrians and to assist in the prevention of highway accidents.

LICENSING DRIVERS

One detail of legislation referred to by many of the states is that of licensing drivers of vehicles after passing examinations showing they are able to drive such vehicles. The examination would require knowledge of the rules for the use of the highways, speed limits, as well as the ability to satisfactorily operate an automobile.

SPEED LIMITS

Speed limits vary widely in the different states, ranging from practically a limitless speed to 15 or 20 miles per hour.

TRAFFIC PATROL

Traffic patrol systems have been adopted by many states, and are advocated by many others.

ENFORCEMENT

In certain states we find that the prescribed legislative traffic regulations are enforced, while others do not take them seriously.

A few of the states have referred to the enforcement program which will take place following the educational campaign. They feel that the highway commissions should first construct the roads in a manner that will remove from the highways the maximum number of hazards. The user of the highway should then be regulated in such manner as to guarantee safe passage for himself and other users of the highway when the proper legislative requirements are respected.

EDUCATIONAL WORK

Several states have actually commenced educational campaigns for the purpose of instructing drivers and pedestrians how best to use the roadways and have the least number of accidents. In some of the states elaborate educational campaigns are being carried on.

NEW YORK—The Westchester County park system, which has been developed to beautify the region and relieve traffic north of New York City, has been provided with 146 miles of new boulevards and nearly 200 grade separations. Highway bridges have been given notable architectural treatment.

Roadside Planting To Improve Main Highways

The act, passed at the last session of congress, which permits the federal government to pay half the cost of wayside planting along federal-aid highways, will give considerable impetus to the movement long fostered by women's clubs and other social organizations, and its effect will quickly be evident in an improvement of the appearance of the main interstate roads, according to the Bureau of Public Roads of the United States Department of Agriculture.

Latest available figures show that 25 states have no laws governing tree and shrub planting along highways. A few of the remaining 23 have good laws, but the majority have indifferent ones.

The Massachusetts Department of Public Works, and the highway and forestry departments of other states, have already demonstrated how much can be done at small cost to beautify the roadsides by judicious planting of native trees, shrubs, and perennial flowers.

The Massachusetts Department is empowered by law to make roadside improvements, the work including such planting, replacements, and care as may be necessary. When a road is laid out as a state highway, it is generally made sufficiently wide to provide an area on each side of the traveled portion for roadside improvement. No tree, shrub, or plant within such a highway can be cut, removed, or new ones added without a permit from the highway department.

The work of roadside improvement in Massachusetts is done by the maintenance division. The cost is included as a part of the regular maintenance expenditure of the state. The state has a nursery at Palmer, where trees and shrubs are propagated and where the highway landscape supervisor trains men in the care of trees and roadside beautification.

Public acquisition in all states of suitable tracts of land along the highways for state parks, for purposes of recreation and conservation of timber and animal life, and the acquisition of small road-bordering strips and plots for development of parkways and parklets, says the bureau, would enhance considerably the appearance of the roadsides.

California Leads In Increase In Gas Consumption

California is leading all states in the Union in the increase of gasoline consumption by motorists, according to reports of the U. S. Department of Agriculture. These show that during the first six months of the present year the state showed a gain of 39,000,000 gallons in gasoline consumption by motorists, which is approximately an 8 per cent increase over last year. Texas ranks in second place and Ohio is third.

The revenue collected in gas tax the country over for the first half of the year passed the \$140,000,000 mark, which is some \$39,000,000 more than collected in gasoline taxes the first six months of last year. Nearly every state in the Union showed a gain in consumption.

The average tax the country over is 3.02 cents, compared with the average of 2.55 cents during the first six months of last year. Of the \$140,000,000 collected all but \$5,630,000 will be used in the construction and maintenance of state and local roads.

MAKING THE HIGHWAYS OF CALIFORNIA SAFE

(Continued from page 10.)

effectiveness and observance are placed only at points of actual necessity.

ARTERIAL STOPS

While it is true the installation of arterial stops has in some instances perhaps been overly ambitious, the soundness of this safety measure is best confirmed by its general observance. Early in 1927 the Division of Highways undertook to interest the various counties in these installations at important roads intersecting the highway, as a means of safely expediting the traffic. County officials were advised of the roads to be signed and provided with copies of statutes governing their adoption. The response has been general and has done much to improve the condition and safety of traffic.

PROTECTING THE SCHOOL CHILDREN

During the past year "School Slow" signs have been painted on the pavement either side of all school buildings fronting our highways. This single measure has done and will continue to do much for the protection of school children.

GUARD RAILS

Guard rails along narrow grades and steep embankments and at other critical points are installed. A very strong guard rail has been developed by our engineers, consisting of 8 by 8 inch posts and three 2 by 6 planks laminated. These guard rails are placed securely in the ground and are painted white. This particular design is but little more costly than other types and has proved more effective than any of them. In addition to this guard rail, culvert ends are marked by 6 by 6 inch posts painted white so that motorists are aware of the usable road width.

Furthermore we have learned that the psychology of the motorist causes him to keep away from a rail and therefore, in order for our bridges and other drainage structures to have the same capacity as the highway, they must be wider than the travelable area. These narrow bridges are responsible for numerous accidents, as shattered glass and mutilated bridges will testify. We are widening these structures out just as fast as it is possible to do so, making them a minimum of four feet wider than the highway itself and designing them so that when the highway is widened the structure can again be widened. There are in the state certain bridges with wooden decks which in winter become frosty with conse-

quent danger to traffic. During the past year the surfaces of many of these bridges have been made nonskid by the addition of coarse rock, and the bridge decks of future construction under similar conditions will be made of concrete.

SANDING SLIPPERY PAVEMENT

During the past year many slippery pavements were sanded in the early morning hours by highway crews. Where this condition could be remedied by planing the surface, it has been attended to during the past summer.

CHANGING ROAD CROWNS

The old dangerous high-crowned roads are not permitted in modern highway construction and the sections remaining in the California highway system are being rapidly replaced by crowns so low that the crown is not perceptible to the motorist. At the time of construction efforts are also made to import material so that the deep borrow pits adjacent to these pavements are filled or at least graded to a very flat slope.

GRADE CROSSINGS

The elimination of railroad grade crossings is a very important and definite part of our highway building program. Twenty-six dangerous grade crossings have been eliminated during this current biennium, and this program will be extended during the next biennium. In the meantime, we are, in cooperation with the railroads and the Railroad Commission, having installed improved warning signals.

LIMITING WIDTH OF LOADS

There are, however, certain features, the adoption of which will do much to promote safety on our highways. I have in mind the limitation of the maximum width of load which may be moved over our highways with reference to the available width of travel way. Under no circumstances should overwidth loads be permitted on important highways which would leave less than one traffic lane on paved or surfaced travel way available for the public travel.

A more definite limitation should also be placed on the lengths of loads which may be hauled over our highways based on the grade and alignment of the road to be traveled.

PARKING PROBLEMS

Promiscuous and unregulated parking should also be corrected. With pavements and travel way now being improved in excess of 20 feet, the present law permitting parking, provided it leaves a clear and unobstructed

width of not less than 15 feet upon the main traveled portion of the highway, opposite such standing vehicles, is clearly hazardous to traffic.

USE OF HIGHWAY ROADSIDES

Another feature adding much to the confusion and hazard to traffic is the soliciting or vending of wares along the highway roadsides. A close runner-up for this nuisance is the erection of sign boards along the highways and at important road intersections. Both aim to distract the attention of the motorist and the hazard is in direct proportion to their success in this endeavor.

WOMEN ARE HELPING

Through the California Development Association, two hundred and seventy thousand organized women of California are carrying on a statewide program of education in an effort to reduce accidents and deaths by automobiles, and with their splendid aid these features will no doubt be taken care of, as the public appreciate their importance.

All this is only a part of our program to make our highways in California safer and the best evidence that we are doing this is the fact that deaths attributable to improper construction are steadily being reduced.

Maps Are Prepared Of Federal-Aid Roads

The first series of uniform scale maps ever made showing the status of improvement of the federal-aid system of highways is completed with the exception of California and Texas, and is ready for distribution, it has just been stated by the Bureau of Public Roads of the Department of Agriculture.

The statement follows in full text:

Maps of the two states will be finished in a short time. The maps show the status of improvement of the federal-aid highways system in each state regardless of whether the construction has been done with the aid of the federal government, by state, by county or by township. A system of symbols indicates the type of improvement of all roads and whether the work was done with or without the assistance of the federal government.

The maps which are called progress maps and are to be published periodically to register any change in improvement of the highways, are prepared on sheets of uniform size, some states requiring two, and are so bound that they may be punched and placed in a loose-leaf binding.

UTAH—The longest highway tunnel in the world—more than a mile—is being constructed as part of the new Zion-Mt. Carmel Highway in southern Utah.

Methods Discussed To Protect Roads Against Landslides

AS RESULT OF a study of landslides and their relation to highway building, the Bureau of Public Roads, Department of Agriculture, has concluded that preventive measures, particularly drainage, should be substituted for retaining structures. The study was made in sections of West Virginia, Ohio and southwestern Pennsylvania.

The full text of the conclusion of the report, prepared by George E. Ladd, associate geologist, follows:

The most important conclusion resulting from the study of slides in this district is that, generally speaking, preventive measures should be substituted for retaining structures.

Usually a certain load is unavoidable. The nature of the detrital material is such that it is unstable when wet, the tendency toward instability depending on the fineness of the material and the clay content.

The normal load and nature of the material can not generally be changed, but it is usually possible to eliminate the third factor causing slides, namely, water. It is not necessary to eliminate all moisture, but the content must be kept below the critical point at which it makes the mass unstable.

This may be done, according to the nature of the problem, by surface protection from penetration by rainfall, by surface drainage, or by underground drainage which reaches the source of seepage or flow. Side fills and through fills can be protected from penetration by rainfall where necessary.

It is also possible to isolate them from underground water in most cases. Masses of overhanging detritus can generally be sufficiently drained to prevent movement.

Only sporadic attempts at drainage control have been made. A case at Morgantown, W. Va., has been described where drainage of underlying shale solved a serious problem.

Small-size open-joint tile has been occasionally used in soft spots in a road and French drains have been placed beneath inside ditches. Some surface drainage has been undertaken for the purpose of removing water from pockets of overhanging, old-slide detritus.

Such work, however, has been neither systematic nor thorough. Lack of emphasis on prevention is common to most human experience and we spend money on landslides largely after they have occurred.

It is believed that this district needs more trenching machines, and fewer steam shovels and piles; that drainage will be found to be cheaper and more permanent than any control method now employed, and that it must be undertaken with knowledge of local geological conditions.

Detrital areas, which are traversed by roads must be studied from a geological standpoint. Water seepage must be traced to its source, and water volume determined following rainfalls of varying intensity. Test holes or other means of interior exploration will answer this purpose.

If detrital material has been undisturbed for a considerable time, fine clay may have been washed downwards and accumulated below as in the formation

of subsoils. Therefore, where slide material has been at rest for some time, the greater part of the underground water will be found comparatively near the surface—that is within three to five feet of it.

In one case observed after a heavy rainfall, where a cut had been made in a thick mass of detritus, water was escaping in almost a solid sheet, along a plane about five feet below the top of the cut.

Before fills are placed it is vitally important to observe whether the location is on ground which is wet not only during but for some time after rains. When wet spots are found, the source of the moisture must be located.

Frequently it is in detritus on the hillside and after a fill is placed, water enters from the side or end contact. The use of wet materials in building a fill, especially at or near its base, has been demonstrated to be a dangerous practice.

A number of illustrations of sidehill failures are presented because they constitute the most serious phase of the slide problems in this district. Most of them can be prevented by drainage on the inside of the road, or, better, by drainage installed before the road is graded.

The annual damage resulting from the slides and subsidence is so enormous that systematic preventive experiments and study of relative costs and permanency of results is obviously justified.

It is believed that the solution of a very large proportion of the cases which arise, and this includes evidence of danger as well as slide movement, lies in the direction of drainage.

Improvement Made In Road Machinery For Removing Snow

IMPROVEMENT in road machinery has resulted in marked progression in removing snow from highways throughout the United States, the Bureau of Public Roads announced November 5.

The full text of the Bureau's statement follows:

In 36 states, where snowfall is heavy, 111,645 miles of main highways were cleared during the winter of 1927-28.

TRUCK PLOWS FAVORED

Ever since the practice of removing snow from highways began in 1921-1922, there has been a steady improvement in machines and equipment available, with an increased amount of equipment every year. In the six years, the use of truck plows has grown from 184 to 5412; the number of tractor plows from 281 to 1275. Since both types multiplied more than elevenfold, and since road mileage cleared increased only about fourfold, indications point to a greater completeness of snow removal. The use, during the past season, of less than half the number of graders employed in the previous year indicates that the grader has been found less effective than the truck and tractor plows.

In 17 of the states, all snow-removal work was done under the supervision of the state highway departments. In 15 states, the work was done by both states and counties or other local governments. In only four states was the work done solely under local control.

Suggest Zoning as Means of Preserving Beauty of Highway

(From the *Burlingame Advance*.)

The city of Burlingame faces a problem on the Bayshore Highway. The problem lies in the new road link's beautification and the keeping of unsightly buildings from its borders.

The State Highway Commission has petitioned Burlingame officials to preserve the road borders for lawns, shrubs and flowers.

And that brings the officials face to face with the problem. As the situation stands today, the lands adjacent to the Bayshore Highway are unrestricted. They are not even zoned. Owners of the lots can dispose of the land for any purpose, factories, residences, hot-dog stands or anything they choose. Burlingame has but one control over the land and that is through a fire ordinance. This jurisdiction, according to officials of the city is questionable.

City Treasurer Frank Bloom suggests a remedy. This remedy is in the form of a petition signed by many people so that it will bear weight with the council. This petition should request the council to immediately zone the lands immediately touching the highway as first class business property. This zoning will automatically bar cheap and unsightly structures.

Indications of what might be in store in the future is the fact that already a tract of land adjoining the shore road, is offered for industrial purposes.

One parcel of land has already been designated residential but not officially so. No ordinance can regulate the type of construction.

This is an important matter and citizens should act upon it immediately or a beautiful bit of road may rapidly become an avenue of advertising sign boards and unattractive cheap buildings for commercial gain.

An honest speeder had just hit a dog and had returned to settle his damages, if possible. He looked at the dog a moment and addressed the man with a gun.

"Looks as if I'd killed yer dog."

"Certainly looks that way."

"Very valuable dog?"

"Not very."

"Will five dollars be enough?"

"Well—I guess so."

"Sorry to have broken up your hunt," said the motorist pleasantly as he handed the owner a crisp five-dollar bill.

"I wasn't going hunting—jest going out in the woods to shoot the dog."—*Towney Kat*.

Work on the widening and straightening of the Mount Baker highway, Washington, probably will be started in the early spring. Preparations are being made by the state highway department to ease a number of dangerous curves and to build two new bridges over the Nooksack River, one at Nugent's Crossing and one at Warnick.

"Have you some of that gasoline that stops knocking?"

Service Station Attendant—"Yes."

"Then give my wife a glass."—*Los Angeles Azuride*.

Progress Reports From the Counties

ALPINE COUNTY

The survey for the new route between Markleeville and Coleville is progressing satisfactorily. Arrangements have been made to have the work in District IX handled by this District. Mr. W. B. Thompson is chief of party.

It is planned to build a new bridge and grade approaches across Markleeville Creek at Markleeville. The work will be advertised so that it may be done early next spring.

The widening of the Alpine Highway along the famous Carson Spur is nearing completion under the direction of Grant Merrill, Maintenance Foreman.

Widening of the present road at Kinneys Reservoir is well under way and is under the direction of Foreman Merrill.

Authority has been granted for surfacing and grading between Woodfords and Markleeville, and the work will start soon under Foreman Grant Merrill's supervision.

AMADOR COUNTY

Location survey on the Mother Lode Highway is being made under the direction of Chief of Party R. J. Munro, between Amador City and Martell.

The right of way is being secured for the construction of the new location between Drytown and Amador City. This is on the Mother Lode Highway.

Work has just started on the construction of drainage ditches and the placing of drain tile to adequately protect the oil surfacing between Sacramento County line and Central House, and also between Ione and Jackson by the maintenance forces under H. S. Clark.

The line change and improvement on the Silver Lake grade on the Alpine Highway between Kays Resort and Plasse's Turnout is nearing completion under the direction of Frank Walker, Maintenance Foreman.

The oil retreatment of oil surfaced gravel between the railroad crossing east of Ione and a point 2 miles easterly has just been completed by W. H. Martin, Maintenance Superintendent.

BUTTE COUNTY

A contract has been awarded to L. C. and W. E. Karsteadt to gravel surface, 20 feet by 6 inches, the highway between Butte Creek and Biggs road. This work is 90 per cent complete. At the same time, the floors of Butte Creek and Cherokee Canal bridges are being reconstructed in anticipation of heavier travel, which the improved road surface will encourage.

Harts Mill grade, between Oroville and Berry Creek, is being widened, and road drainage ditches are being built.

CALAVERAS COUNTY

Authority for construction of drainage ditches to adequately protect the oil surfacing has been granted, and work will start at once under the supervision of J. H. Gates, Maintenance Foreman.

Oil retreatment on certain sections of the oil surfaced gravel road between the San Joaquin County line and Valley Springs is about completed under the direction of W. H. Martin, Maintenance Superintendent.

Authority has just been granted for the clearing, grubbing, grading and drainage on the Black Springs line change. The clearing is about completed and the work of grubbing and grading will be rushed to completion under the supervision of Foreman Gates.

COLUSA COUNTY

Portions of the present highway from the westerly county limits to Mountain House are soon to be surfaced by gravel. This will permit of through yearly traffic from Williams to Clear Lake.

DEL NORTE COUNTY

The Holdener Construction Company, which has the contract for oiling and surfacing 35 miles of the Redwood Highway from the Oregon line southerly have practically completed the work, there being only a short stretch which it will be necessary to complete during next spring.

Protection work along portions of the road being surfaced by the Holdener Construction Company is in progress by the Bureau of Public Roads. Temporary exceptions have been made in the Holdener Construction Company work during the progress of the Bureau of Public Roads operations.

The contract on 21 miles of the Roosevelt Highway north of Crescent City for placing approximately 16,000 cubic yards of crushed rock surfacing has now been completed.

John R. Hill, who has the contract for grading and surfacing on the Roosevelt Highway from the Oregon line southerly 7 mile, is now placing surfacing, and should be completed in a short while.

The Webber Construction Company was recently awarded a contract for placing 5996 cubic yards of standard crushed rock surfacing on the newly completed state highway from Elk Valley to Smith River Bridge on the Redwood Highway, and this work has just recently been satisfactorily completed, and the new roadway will be ready for use as soon as the bridge is completed.

J. E. Johnson, contractor for the grading and surfacing of the highway between the Klamath River and 7 miles northerly, has not yet completed his grading operations, but is rushing his surfacing as fast as possible in order to get out as much surfacing as possible before high water in the Klamath River forces a shutdown of the work.

Mr. Johnson's contract for the grading and surfacing of 3.5 miles from the southerly Del Norte County line northerly was practically completed when the winter's storms came. The heavy storms caused considerable damage and many large slides, and will make the road practically impassable for a good share of the winter, and will necessitate the contractor removing the slides and repairing the damage before the finishing work can be completed.

EL DORADO COUNTY

A 24-foot graded roadway, between Eagle Falls and Meeks Bay, is being built under contract by G. D. Contoules. The sharp curves, narrow roadway, and steep grades, now existing, will be eliminated when this project is completed, which is expected to be toward the end of November of this year.

Daylighting of cuts and widening of roadway have been made at points along the road to permit of observation points from which travelers may enjoy the excellent scenic views along this highway.

FRESNO COUNTY

Concrete work on the substructure of the bridge over the San Joaquin River at Herndon is nearing comple-

tion and Contractor Carl H. Peterson is assembling steel for the superstructure.

Work is being started at once on oil-mixing the road from Coalinga to the Monterey County line on the Sierra-to-the-Sea Highway. This road has recently been widened and partially resurfaced by day labor.

A location party under S. A. Cobb is making a survey in the Kings River Canyon. This work is attracting a great deal of attention and hearty support from the San Joaquin Valley.

The survey party in the Kings River Canyon, under S. A. Cobb, was caught by the first heavy snow of the season and a relief party was necessary to bring them out. The survey will be continued next spring.

GLENN COUNTY

Widening of the present roadway between Logandale and Willows is under way by D. McDonald. The highway is open for traffic as the widening is all on the west side of the existing pavement. W. E. Shaw is the resident engineer on this work.

HUMBOLDT COUNTY

The Engelhart Paving and Construction Company have completed their contract for grading and surfacing the 6.8 miles southerly from the northerly Humboldt County line except for the placing of 3 inches of additional crushed rock surfacing over the roadway where reinforcement was necessary.

On that portion of the highway from Orick northerly to Russ Grove, bids were recently received for placing an additional 3 inches standard crushed rock surfacing over $6\frac{1}{2}$ miles of the roadway. The Engelhart Paving and Construction Company were the low bidders on the work, and if the contract is awarded to them, it is expected that surfacing operations will start immediately.

W. H. Hauser has completed the construction of 2.1 miles of the Redwood Highway between Fortuna and Fernbridge except for the placing of approximately 600 cubic yards of crushed rock surfacing. The entire length of the contract is being used by the traveling public.

A line improvement at the southerly approach to the North Scotia bridge has been satisfactorily completed by Smith Brothers, and the road open to traffic.

Contractor W. C. Elsemore is placing additional crushed rock surfacing over 1.4 miles of the Redwood Highway in the vicinity of Pepperwood. His work is just a little more than half complete at the end of November.

INYO COUNTY

State forces have now completed oiling, or reolling by the road-mix method all of the road on the main highway from the northerly county boundary to Independence, with the exception of portions previously improved or under contract. The oiling through the town of Independence and between there and Alabama Gate will be completed soon.

The grading of certain line changes on the road between Big Pine and Tinemaha Dam by state forces has been completed and the surfacing, oil-treated, has been recently completed by Montfort and Armstrong, between those points.

The Alabama Gate-Diaz Lake section, which includes the town of Lone Pine, under contract to the Southwest Paving Company, is now shaping up and a portion has been opened to traffic. The placing of the crushed rock base course is about completed and the placing of the top course is to start at once.

Work on the Olancha-Cottonwood Creek portion of the main highway, also under contract to the Southwest Paving Company, is just started; a $\frac{3}{4}$ -yard gas shovel, trucks, etc., are at work on the grading and the timber bridges are under way.

A new reinforced concrete bridge across the city of Los Angeles aqueduct, near Cowan Station was recently opened to travel eliminating a rough stretch of the old road.

The district office at Bishop has been enlarged by the addition of two wings. One of these wings is

devoted entirely to a drafting room and blueprint room, and the other given over to offices. This is a muchly needed improvement and required by the expansion of the district organization.

The furnishing of surfacing for 3 miles south of Tinemaha Dam is advertised for bids to be received at the district office on November 9th.

The portion of road from Diaz Lake to Cottonwood Creek, being the 10 miles between the two Southwest Paving Company's contracts, is advertised for bids to be received on November 21st. This work covers the grading and surfacing (oil-treated) of this section of road to new alignment and grade and will eliminate one of the poorest sections of road between Mojave and Bishop, so far as alignment and grade are concerned.

KERN COUNTY

A crew has completed the survey from Mojave to Cinco on the main highway, obtaining information for the preparation of plans and advertising of this section of road this year. They are now working from a point 5 miles north of Ricardo to Freeman for the same purpose.

The new road graded by state forces from the main highway near Freeman to the Walker Pass Summit, is now completed. To those who have traveled the old winding one-way road, this newly graded section will be a pleasant surprise.

The contract for grading and paving Wasco to Famosa on Route 33 has been awarded to G. A. Graham. Construction work is now under way.

Kern County is financing a survey over the Tehachapi from Bakersfield to Mojave. This work will be put under way at once.

A survey over the Tehachapi from Bakersfield to Mojave has been started by a party under S. A. Cobb. This work is being financed by Kern County.

The Valley Paving Company of Visalia has started grading work on their contract from Famosa to Wasco on the Cholame Lateral.

KINGS COUNTY

The California Construction Company is starting work on widening and resurfacing from Hanford west to the county fair grounds. J. F. Knapp has charge for the state.

The 30-foot pavement from Hanford west on the Sierra-to-the-Sea lateral is nearing completion by the California Construction Company. J. F. Knapp is resident engineer on this work.

LAKE COUNTY

The state, using convict labor forces, is constructing a graded roadway between Lucerne and Abbott Mine. W. L. McFadden is the present resident engineer. January 1, 1929, is the estimated completion date.

Bids will be opened on November 21st of this year for grading and surfacing with oil treated crushed stone the highway between Lucerne and Clear Lake Oaks. It is expected that the work will extend over 11 months.

LOS ANGELES COUNTY

Work has been completed by the Lewis Construction Company on the grading of 1.5 miles between Arroyo Sequit and Los Alisos Creek on the Malibu Ranch. Premixed California type surfacing was placed by the contractor.

A contract has been let for the reconstruction of about seven-tenths mile of highway between the northerly city limits of Los Angeles and Newhall Tunnel. The roadway, which will be constructed along a revised alignment, will be 40 feet wide, paved with 24 feet of bituminous macadam.

Grading and the placing of culverts are in progress on the reconstruction of 1.4 miles of Foothill boulevard between Glendora and La Verne.

MADERA COUNTY

Hanrahan Company are setting up an asphalt plant at Berenda for the resurfacing of Route 4 from Madera to Berenda. Paul L. Wilcox is resident engineer for the state.

A contract for building bridges over Ash and Berenda sloughs on the Pacheco Pass Highway has been awarded to A. W. Kitchen of San Francisco.

Contractor A. W. Kitchen of San Francisco has started work on bridges over Ash and Berenda sloughs on the Pacheco Pass Highway. Foundation work is well under way and it is expected to have the bridges finished ahead of the spring floods.

Grading work on Hanrahan Company's contract from Madera north is being rushed and paving will start at once.

The contract for grading, bridge approaches and paving between Herndon and Tharsa, to connect with the new bridge over the San Joaquin River has been awarded to the Hanrahan Company of San Francisco.

MARIPOSA COUNTY

Basich Bros. of Los Angeles, who have the contract for grading and rock surfacing a portion of the Yosemite all-year-highway are making rapid progress on structures and grading work. W. T. Rhodes is resident engineer for the state on this job.

The convict camp near Mariposa has been discontinued and the work is being carried on by day labor under Superintendent Carl Nelson. Some important revisions of line have been built and surfaced and very satisfactory progress is being made.

All of the Yosemite Highway is in excellent shape for the winter traffic.

MERCED COUNTY

The bridge over the San Joaquin River near Los Banos on the Pacheco Pass Highway is being repainted and redecked by Stephenson Construction Company of San Francisco. New approaches are also being built. This work will be completed by November 30th.

MONO COUNTY

The contract for grading about 3 miles of the main highway near Bridgeport, which work was under contract to Coolidge and Scott, of Nevada, is completed and will afford a much better road for the winter travel.

State forces have been working with very satisfactory results widening certain of the narrowest portions of the Tioga Grade. This work will continue until weather conditions interfere which may be rather soon, as four inches of snow recently fell near the summit.

The Sonora Pass road has also been greatly improved this summer by state forces; a compressor and jack hammers, together with the judicious use of powder has removed many of the rocky points heretofore dreaded by the automobile tourist.

The surveys are now complete on the main highway above Bridgeport and down the Walker River to Coleville.

Many favorable comments on the oiled surface on the Sherwin Hill grade have been received and many a car now goes over "in high" that never could brag of that accomplishment before.

Rids will be received on 1.6 miles of grading to new alignment, at Hilton Creek in Long Valley, on November 21st.

NEVADA COUNTY

Between Indian Springs and Soda Springs a graded roadway is being built, under contract, by The Callahan Construction Co., Inc. This is a particularly

heavy piece of grading work, involving 200,000 cubic yards of earthwork, or at a rate of 20,000 cubic yards per mile. The work is now 20 per cent complete, and is expected to be completed by August of next year. A. R. McEwen is resident engineer.

The highway between Donner Lake and Truckee is being regraded and resurfaced, under contract, by Mathews Construction Company.

ORANGE COUNTY

The grading and paving, with California type surfacing, of the approaches to the Galivan overhead crossing of the Santa Fe Railway tracks have been completed. Traffic is using the new stretch of highway, which has eliminated the dangerous grade crossing at Galivan.

All grading work has been completed and paving is in progress on the reconstruction of the state highway between Anaheim and Fullerton. The new pavement will be of Portland cement concrete 5 1/2 feet wide between curbs.

A contract has been let and work is in progress on the grading and paving of 0.2 mile of highway on improved alignment, on the coast highway just west of San Clemente.

PLACER COUNTY

Between Andora subway and Lincoln, the highway is being reconstructed. This work was recently let by contract to Fredrickson & Watson Construction Co. and Fredrickson Bros.

The work will consist of revision of alignment and grade, utilization of that part of the present 20-foot pavement that is of sound construction, constructing new pavement over the existing 15-foot pavement, and, where regrading and realignment is necessary. The final construction will be a 20-foot continuous pavement with a 36-foot over all roadbed. J. D. Greene is resident engineer on this work.

From Sheridan to the northerly boundary of Placer County, E. F. Hilliard is constructing, by contract, a bituminous macadam surfacing over the existing concrete pavement and newly placed and existing rock borders.

This will result in a 20-foot bituminous macadam surface pavement with a 26-foot over all roadbed.

SACRAMENTO COUNTY

A reconstruction project is under way between North Sacramento and Del Paso Park. The work consists of realignment, revised grade, widening and thickening of present pavement. The wearing surface will be asphaltic concrete. The contractor, Clark and Henery Construction Co., is comfortably ahead of the construction schedule, and is expected to finish much sooner than the completion date, January 4, 1929. C. W. Rust is resident engineer on this work.

Enclosed are two photo views of the Ord Spreading & Raking Machine used on this work.

Good progress is being made on the grading and subgrade for the concrete paving to go between Galt and Arno, Fredrickson Bros. and Fredrickson & Watson Construction Company, contractors. C. M. Butts is the resident engineer.

The oil treatment of the crushed gravel surfacing between 1 mile south of Arno and 1 mile north of Arno has been completed and is now open to traffic. The work was done under the direction of W. H. Martin, Maintenance Superintendent.

Authority has been granted for the repair, creosoting and painting of the timber section of the Rio Vista Bridge. Materials are now on hand and work is starting under the direction of G. E. Marshall, Maintenance Foreman.

SAN DIEGO COUNTY

Good progress is being made by the Hauser Construction Company on the reconstruction of 7.2 miles

of the San Diego to El Centro highway between Viejas Creek and Guatay Creek. Four steam shovels are at work grading the 36-foot roadbed.

Easterly from the Hauser Construction Company's job, between Guatay Creek and Pine Valley, the Nevada Contracting Company has work under way on the improvement of the alignment and widening of the roadbed to 36 feet.

SAN JOAQUIN COUNTY

The concrete paving job between Mossdale and French Camp is practically complete. Fredrickson Bros. and Fredrickson & Watson Construction Company are the contractors. C. M. Butts is resident engineer.

Widening with earth of the grade of the Cherokee Lane for about 5 miles between Cherokee Lane and Live Oak on the route between Stockton and Lodi is nearly complete. D. McDonald is the contractor, under the direction of R. H. Lapp, resident engineer.

Splendid progress is being made by contractors Gannon and McCarty on raising the grade north of the Stockton Diverting Canal. This is on the new entrance to Stockton from the north. Mr. Hubbard is acting resident engineer.

The work of surfacing the Mokelumne River bridge with rock and asphalt has been completed under the supervision of W. H. Martin, Maintenance Superintendent.

Two "Slow" signs have been erected at the reverse curve on the Hogan Road, and a service agreement has been issued to cover their wiring and proper illumination. Superintendent Martin is directing this work.

Oil retreatment of certain sections of the oiled surfacing between a point 1.3 miles east of Clements and the Calaveras County line is nearing completion under the supervision of Superintendent Martin.

SOLANO COUNTY

The contract under Larsen Bros. for grading and surfacing the line change back of Cordelia is progressing satisfactorily. This is on the main route between the Sacramento Valley and the Carquinez Bridge, also to Napa and the Redwood Highway. J. W. Cole is resident engineer.

Bids will be opened on October 17th for widening grade and oil mix borders for the piece of road between Fairfield and 5 miles north.

STANISLAUS COUNTY

Contractor C. W. Wood has finished the new south approach to the Stanislaus River Bridge, near Ripon and between Manteca and Modesto.

SUTTER COUNTY

From the end of pavement, south of Sutter City, to the end of pavement at Tarke, an asphalt seal on 1 inch of new surfacing has been applied to the highway.

TULARE COUNTY

The Valley Paving and Construction Company are making a high early average on their paving contract from Goshen Junction to Tulare. H. B. La Forge is resident engineer for the state on this job.

Paving between Tulare and Goshen, on the Golden State Highway, is being rushed to completion by the Valley Paving Company of Visalia, who have the contract for the work.

TUOLUMNE COUNTY

The premixed oil surface placed on about 9 miles of highway between Keystone and Jamestown on the Sonora lateral has been completed. A very fine looking job and pleasing riding surface has been obtained. Mankel and Staring are the contractors. A. K. Nulty is resident engineer.

Day labor forces under Superintendent S. E. Harris have been busily engaged in improving the famous Sonora Pass Road between the first and second crossings of Deadman's Creek. Work has been progressing rapidly. Most of the excavation has been in solid granite. Due to the early snow storm of recent date this work will be held up through the winter, contemplating an early completion in the spring.

The construction and repairs to maintenance camp at Baker's Station is about 75% completed and will be held up through the winter and completed in the spring. This work is under the supervision of Superintendent S. E. Harris.

Authority has been granted for the extension of the culverts between the Stanislaus County line and Jamestown. Materials have been ordered shipped and it is expected the placing of these culverts will start upon delivery. The work will be supervised by L. T. Robinson and L. P. Laird, maintenance foremen.

VENTURA COUNTY

Along the new coast highway southeasterly from Oxnard, side forms are being placed and subgrade prepared for the Portland cement concrete pavement. The job, which includes 11.6 miles of 20-foot concrete pavement with rock borders, 170,000 cubic yards of excavation, drainage structures, etc., is being done by Jahn & Bressi, contractors.

YOLO COUNTY

The new guard rail on the timber portion of the Yolo Causeway is nearing completion. P. F. Bender is the contractor. H. S. Marshall is the resident engineer.

Bids were opened October 10th for widening grade and placing premixed oil shoulders and surfacing for about 1 mile west of the Yolo Causeway. The contract was awarded to the low bidder, the firm of Fredrickson Bros. and Fredrickson and Watson Construction Company.

The work of oil mixing the rock borders between the M Street Subway and a point 2 miles west has been practically completed under the direction of W. H. Martin, maintenance superintendent.

PERSONNEL

Mr. C. J. Temby, who has been associated with the California Highway Commission for about 14 years, and who has been serving as office engineer for the past 2 years, is being transferred to Central Office, Department of Surveys and Plans. District X wishes him well.

Mr. B. W. Booker, who has served the state for about 7 years with this department, is being transferred to District X from District I. Mr. Booker has been appointed office engineer of District X, and District X hopes that he will enjoy his work in the new position.

Mr. Bert A. Reber, formerly associated with Districts III and X, but who for the past 14 months has been with the Alleghany-El Dorado Gold Mining Company, is now back with District X.

LOUISIANA—The state highway department spent \$254,000 to help fight the Mississippi Flood in 1927, and \$529,000 to repair or rebuild highways and bridges.

California's Rank Among States In Auto Fee Costs

Figures showing the ranking of the various states of the Union in total motor vehicle, license and gas revenue per vehicle for 1927 appear in the October number of *American Highways*.

Here is California's 1927 rank, among the states:

First—In revenue from gasoline tax (\$22,467,083).

Second—In automobile and truck registration (1,693,195).

Thirteenth—In gross receipts from auto license fees (\$8,796,348).

Twenty-fifth—In average gas receipts per motor vehicle (\$13.62).

Forty-fourth—In average motor and gas receipts per motor vehicle (\$18.81).

Forty-eighth—In average motor license per vehicle (\$5.19).

Record of Bids and Awards

CONTRA COSTA COUNTY—Between Richmond and San Pablo Creek, about 1.3 miles in length to be graded and paved with asphalt concrete. Dist. IV, Rt. 14, Sec. A. Engr's Est. \$66,858.25. Warren Construction Company, Oakland, \$49,544.10; California Construction Co., San Francisco, \$67,608.60. Contract awarded to Warren Const. Co.

DEL NORTE COUNTY—Between Elk Valley Road and Smith River, furnishing and spreading crushed stone surfacing 3.64 miles long. Dist. I, Rt. 1, Sec. C. Engr's Est. \$14,500. Webber Construction Co., Crescent City, \$12,750; Holdren Construction Co., Inc., Sacramento, \$14,500; Engelhart Paving and Construction Co., Eureka, \$18,000; Parker Schram Co., Portland, Ore., \$13,150; E. B. Bishop, Sacramento, \$14,250. Contract awarded to Webber Construction Co.

FRESNO-MADERA COUNTIES—Const. 20-foot Portland cement concrete pavement from Herndon to Tharsus, length 1.82 miles. Dist. VI, Rt. 4, Sec. C-A. Engr's Est. \$120,691.50. Fredrickson & Watson Construction Co., Oakland, \$92,986.50; C. W. Wood, Stockton, \$87,689; Force-Currigan & McLeod, Oakland, \$92,291.50; John Jurkovich, Fresno, \$92,066; A. J. Grier, Oakland, \$89,182; Hanrahan Company, San Francisco, \$85,709.20; N. M. Ball, Porterville, \$84,611.50. Contract awarded to Hanrahan Company.

IMPERIAL COUNTY—Between 0.7 mile S. Kane Sprs. and Arroyo Salada Wash, 13.5 miles grading and asphalt concrete surfacing. Dist. VIII, Rt. 26, Sec. D-C-D. Engr's Est. \$274,904.50. Charles U. Heuser, Glendale, \$296,008; Force-Currigan & McLeod, Oakland, \$365,202; V. R. Dennis Const. Co., San Diego, \$284,502; Steele Finley, Santa Ana, \$229,258; Griffith Co., Los Angeles, \$315,623; R. E. Hazard Contracting Co., San Diego, \$217,814.50; Southwest Paving Co., Los Angeles, \$266,685; A. Teichert & Son, Inc., Sacramento, \$233,273; Geo. R. Curtis Paving Co., Los Angeles, \$254,185. Contract awarded to R. E. Hazard Construction Co.

KINGS COUNTY—Between the County Fair Grounds and Hanford, about 0.7 miles in length, to be graded and surfaced with asphalt concrete. Dist. VI, Rt. 10,

Sec. C. Engr's Est. \$23,937.80. California Const. Co., San Francisco, \$25,536.88. Contract awarded to California Const. Co.

LAKE AND COLUSA COUNTIES—Between Abbott Mine and Mountain House (Venado), loading, hauling and spreading of bit run gravel and broken stone. Dist. III, Rt. 15, Sec. C-C & D. Engr's Est. \$5,277. E. B. Bishop, Sacramento, \$5,956; Albert G. Ralsch, San Francisco, \$6,204.40; Hemstreet & Bell, Marysville, \$5,828. Contract awarded to Hemstreet & Bell.

LOS ANGELES COUNTY—Between northerly city limits and Los Angeles and Newhall Tunnel, about 0.7 miles in length to be graded and surfaced with bituminous macadam. Dist. VII, Rt. 4, Sec. E. Engr's Est. \$34,156.25. Geo. Mitchell Co., Huntington Park, \$42,878.50; George R. Curtis Paving Co., Los Angeles, \$63,238; A. J. Grier, Oakland, \$43,739.60; Nighbert & Carnahan Co., Bakersfield, \$47,806.50. Contract awarded to Geo. Mitchell Co.

MADERA COUNTY—Across Ash Creek about 9 miles west of Califa, a timber bridge consisting of thirty-nine 19-foot spans on pile bents. Across Berenda Slough about 3 1/2 miles west of Califa, a timber bridge consisting of twenty-two 19-foot spans on frame bents with conc. pedestals. Dist. VI, Rt. 32, Sec. A. Engr's Est. \$55,927. Ben C. Gerwick, Inc., San Francisco, \$55,916; Fredrickson & Watson Construction Co., Oakland, \$54,303.40; George J. Ulrich Const. Co., Modesto, \$56,387.75; Stephenson Const. Co., San Francisco, \$53,342.95; Lambert & Wood, Fresno, \$60,780.70; E. K. Angle, Dos Palos, \$65,043.15; John P. Williams, Fresno, \$68,645.50; Butte Const. Co., San Francisco, \$52,365.40; A. W. Kitchen, San Francisco, \$51,422.73; Otto Parler, Tulare, \$52,997; Paul M. White, Santa Monica, \$55,824. Contract awarded to A. W. Kitchen.

MARIN COUNTY—From San Rafael to San Quentin, 3.01 miles of 20-foot and 40-foot bituminous macadam pavement. Dist. IV, Route 1-69, Section C-A. Engr's Est. \$139,569.25. Dutton-Dredge Company, San Francisco, \$146,514; J. P. Holland, Inc., San Francisco, \$118,341.50; J. V. Galbraith, Petaluma, \$152,588.55; George Pollock Company, Sacramento, \$155,069; Jack Casson, Hayward, \$123,861.50; C. T. Malcolm, Walnut Creek, \$149,415; J. F. Collins, Stockton, \$136,698.50; Mathews Construction Company, Sacramento, \$158,718; Force, Currigan & McLeod, Oakland, \$132,896.50; Von der Hellen Pierson and Logan, Medford, \$136,941.50; Allied Contractors, Inc., Omaha, \$119,576.50; A. J. & J. L. Fairbanks, Inc., So. San Francisco, \$151,712.75; Grausfeld, Farrar and Carlin, San Francisco, \$193,827.50; Ariss Knapp Co., Oakland, \$149,599.50. Contract awarded to Grausfeld, Farrar and Carlin.

MODOC COUNTY—Bridge across Ash Creek, three 43-foot girder spans, bridge across Dry Creek double 6-foot by 8-foot conc. box culv., bridge across Butte Creek, two 24-foot girder spans. Dist. II, Rt. 28, Sec. A. Engr's Est. \$50,205. Coolidge & Scott, Adin, \$53,717; J. P. Brennan, Redding, \$49,694.84; Dunn & Baker, Klamath Falls, Oregon, \$51,144; Butte Const. Co., San Francisco, \$75,336.50. Contract awarded to J. P. Brennan.

MONTEREY COUNTY—2 1/2 miles south of Greenfield, about 1.1 miles in length to be graded and portions surfaced with waterbound macadam base, Type "B." Dist. V, Rt. 2, Sec. E. Engr's Est. \$22,852.50. Tiffany, McReynolds, Tiffany, San Jose, \$20,501.50; W. A. Dontanville, Salinas, \$19,587; Granite Construction Co., Watsonville, \$16,021. Contract awarded to Granite Construction Co.

MONTEREY COUNTY—3.3 miles south of San Lucas, about 0.4 miles to be graded and surfaced with waterbound macadam base, Type "B." Dist. v, Rt. 2, Sec. 6. Engr's Est. \$9,823. W. A. Dontanville, Salinas, \$8,342; Chas. W. Wimmer, Santa Barbara, \$10,028; Granite Const. Co., Watsonville, \$8,374. Contract awarded to W. A. Dontanville.

ORANGE COUNTY—West of San Clemente 0.2 miles grading and P. C. concrete pavement. Dist. VII, Rt. 2, Sec. A. Engr's Est. \$9,485. Steele Finley, Santa Ana, \$7,267.20; H. E. Cox & Son, Pasadena, \$10,864; Gritton & Stephenson, Santa Ana, \$9,538.05. Contract awarded to Steele Finley.

ORANGE COUNTY—A reinforced concrete and steel girder overhead crossing over tracks at A. T. & S. F. Ry. at Irvine. Dist. VII, Rt. 2, Sec. B. Engr's Est. \$71,295. John Simpson & Co., Los Angeles, \$58,109; De Waard & Son, San Diego, \$64,286; Mitty Bros. Const. Company, Los Angeles, \$65,915; Fredrickson & Watson Const. Company, Oakland, \$67,185; McWilliams & Ritchey, Los Angeles, \$67,154; Butte Const. Company, San Francisco, \$70,640; Linderman & Dueker, Inc., Harbor City, \$475,235.80; Oberg Bros., Los Angeles, \$68,130.60; Charles & F. W. Steffgen, San Diego, \$76,466; Ryerts & Dunn, Los Angeles, \$61,916; Martin Green, San Bernardino, \$77,833; Wil-

Ham J. Shirley, Los Angeles, \$78,880; Whipple Engineering Co., Monrovia, \$61,990; E. S. Johnson, Pasadena, \$72,715; A. V. Perkinson, Inc., Los Angeles, \$60,792.60. Contract awarded to John Simpson & Company.

ORANGE-SAN DIEGO COUNTIES—A reinforced concrete girder bridge across Prima Deshecha Canada. A reinforced arch culvert across Segunda Deshecha Canada. A reinforced concrete girder bridge across Las Encinas Creek. Dist. VII, Rt. 2, Sec. A-B. Engr's Est. \$36,347.20; Linderman & Dueker, Inc., Harbor City, \$44,201.23; Ross Const. Company, Los Angeles, \$44,852; Oberg Bros., Los Angeles, \$32,340.25; Byerts & Dunn, Los Angeles, \$43,931.60; De Waard & Son, San Diego, \$42,772; Paul M. White, Santa Monica, \$34,411.80. Contract awarded to Oberg Brothers.

PLACER COUNTY—From Roseville to Rocklin about 2.9 miles to be graded and surfaced. Dist. III, Rt. 17, Sec. A. Engr's Est. \$58,042. W. J. Taylor, Palo Alto, \$58,974; J. E. Johnston, Stockton, \$47,092; J. V. Galbraith, Petaluma, \$48,113.03; C. W. Wood, Stockton, \$52,466.50; Pacific States Const. Co., San Francisco, \$54,020.30; E. B. Skeels, Roseville, \$52,026.55; Fredrickson & Watson Const. Company, Fredrickson Bros., Oakland, \$64,351.80. Contract awarded to J. E. Johnston.

PLACER COUNTY—Between Andora Subway and Lincoln 7.6 miles grading and 7.6 miles grad. & P. C. Pav. Dist. III, Rt. 3, Sec. A. Engr's Est. \$78,288.50. W. J. Taylor, Palo Alto, \$72,707; C. W. Wood, Stockton, \$63,638; E. B. Skeels, Roseville, \$71,594.50; J. V. Galbraith, Petaluma, \$68,037.90; Fredrickson & Watson Const. Co. & Fredrickson Bros., Stockton, \$50,569.90. Contract awarded to Fredrickson & Watson Const. Co. & Fredrickson Bros.

PLACER COUNTY—Overhead crossing of Southern Pacific Railroad near Magra. Dist. III, Rt. 37, Sec. C. Engr's Est. \$14,465; Geo. J. Ulrich Construction Co., Modesto, \$14,867.50; Butte Construction Co., San Francisco, \$16,933.95; C. C. Gildersleeve, Felton, \$14,997; Mathews Construction Co., Sacramento, \$19,520; C. A. Bruce & Sons, Pleasanton, \$17,689; Edgar Noble, Marysville, \$15,137.45; E. B. Skeels, Roseville, \$17,435. Contract awarded to Geo. J. Ulrich Const. Company.

SAN BERNARDINO COUNTY—Between Daggett and 4 miles east of Hector 21.3 miles grading & C oil treated crushed gravel or stone surfacing. Dist. VIII, Rt. 58, Sec. F-G. Engr's Est. \$297,672.90. Dillon & Boles, Los Angeles, \$264,235; E. J. Davis, Venice, \$299,666.10; Ken. Hodgman, San Marino, \$321,420.80; J. C. Compton, McMinnville, Oregon, \$332,364.80; J. W. Breedlove, Corp., Los Angeles, \$310,762; George R. Curtis Paving Co., Los Angeles, \$349,302.80. Contract awarded to Dillon & Boles.

SAN BERNARDINO COUNTY—Between Needles and Topoc, 5.4 miles grading. Dist. VIII, Rt. 58, Sec. P. Engr's Est. \$38,970. James W. Martin, Los Angeles, \$39,952.90; Charles U. Heuser, Glendale, \$28,752.20; Bert Calvert, Los Angeles, \$25,975.30; Martin Green, San Bernardino, \$29,842.90; Steele Pinlay, Santa Ana, \$34,375.30; L. G. Singletary, Riverside, \$36,424.20; Greemore Bros., Bakersfield, \$53,459.90; Roy Skousen, San Bernardino, \$29,124.10; Triangle Rock & Gravel Company, San Bernardino, \$32,495.70; Jones & Stacey, Mineral, \$45,146.40. Contract awarded to Bert Calvert.

SAN BERNARDINO COUNTY—From 1½ miles N. E. of Yermo to 1½ miles S. W. of Dunn 29.78 miles of oil treated crushed gravel 20 feet wide. Dist. VIII, Rt. 31, Sec. H-J. Engr's Est. \$302,015.40. E. J. Davis, Venice, \$254,161.65; J. J. Hales, Santa Ana, \$247,715.50; Dillon & Boles, Los Angeles, \$237,696.26; Fred W. Nighbert, Bakersfield, \$255,333.40; Dunn & Baker, Klamath Falls, \$307,597.90; Isbell Const. Company, Fresno, \$279,544; Steele Finley, Santa Ana, \$245,487.40; Force-Currigan & McLeod, Oakland, \$274,613; Watson & Sutton, San Diego, \$272,591.70; Allied Contractors, Inc., Omaha, \$250,896.90; G. E. Fennell and Holdener Construction Co., Sacramento, \$288,291.60. Contract awarded to Dillon & Boles.

SAN DIEGO COUNTY—Between Pine Valley and Kitchen Creek about 7.2 miles to be graded and paved with P. C. C. Dist. VII, Rt. 12, Sec. D, E & F. Engr's Est. \$276,252.50. Nelson and Sloan, Chula Vista, \$295,069; Wells & Bressler, Santa Ana, \$330,207; Watson & Sutton, San Diego, \$290,050.50; Basich Brothers Construction Company, Los Angeles, \$259,999.50; Jahn and Bressi Construction Co., Inc., Los Angeles, \$303,635.50; George Herz & Company, San Bernardino, \$276,164. Contract awarded to Basich Brothers Construction Company.

SAN DIEGO COUNTY—Between Guatay Cr. and Pine Valley. About 3.9 miles in length to be graded. Dist. VII, Rt. 12, Sec. D. Engr's Est. \$91,251. Lewis

Construction Company, Santa Monica, \$106,308; Nelson & Sloan, Chula Vista, \$131,925.50; J. G. Donovan & Sons, Los Angeles, \$132,903.25; J. W. Breedlove Corp., Los Angeles, \$109,022; Hauser Construction Company, Long Beach, \$124,537; Nevada Construction Company, Fallon, Nevada, \$99,804; Isbell Construction Company, Carson City, Nevada, \$147,628; Pioneer Transfer Company, Inc., Calexico, \$123,346; Watson & Sutton, San Diego, \$136,758.50; Robinson Roberts Company, Los Angeles, \$99,215.50. Contract awarded to Nevada Construction Company.

SAN LUIS OBISPO COUNTY—Two timber bridges across Arroyo de La Cruz, fourteen 19-foot spans and San Carpojo Cr., nine 19-foot spans. Dist. V, Rt. 56, Sec. A. Engr's Est. \$31,301.25. C. C. Gildersleeve, Felton, \$28,253.75; Theo. M. Maino, San Luis Obispo, \$28,448.19; Chas. & F. W. Steffgen, San Diego, \$25,205.65; Paul M. White, Santa Monica, \$25,983.50. Contract awarded to Chas. & F. W. Steffgen.

SAN LUIS OBISPO COUNTY—Between 1.7 miles west of Shandon and the easterly boundary, about 15.4 miles in length, to be graded and paved with bituminous macadam. Dist. V, Rt. 33, Sec. B-C. Engr's Est. \$174,629. Holdener Const. Company, Sacramento, \$153,016; Granite Construction Co., Watsonville, \$174,330.38; A. Teichert & Son, Inc., Sacramento, \$150,808; Malcolm & Taylor, Walnut Creek, \$202,727. Contract awarded to A. Teichert & Son, Inc.

SHASTA COUNTY—Repair bridge across Sacramento River 1.0 miles east of Redding. Consisting one 320-foot st. truss span, one 180-foot st. truss span, one 60-foot st. truss span, one 40-foot st. truss span and 787 feet of timber trestle. Dist. II, Rt. 28, Sec. A. Engr's Est. \$32,505.50. J. P. Brennan, Redding, \$29,619.90; M. B. McGowan, San Francisco, \$34,934; Holdener Construction Company, Inc., Sacramento, \$36,460; McDonald & Maggiora, Sausalito, \$48,153.33; Fred J. Maurer & Son, Inc., Eureka, \$33,268; Parker-Schram Company, Portland, \$40,805; The Duncan-Harrelson Co., San Francisco, \$38,176; Portland Bridge Company, Portland, \$35,300; M. A. Jenkins, Sacramento, \$31,570; R. B. McKenzie, Gerber, \$29,610; N. R. Nicolaisen, San Jose, \$34,335. Contract awarded to M. B. McGowan, San Francisco.

SOLANO COUNTY—Between Fairfield and Nelsons Corner, about 5 miles in length to be graded and surfaced. Dist. X, Rt. 7, Sec. C. Engr's Est. \$38,001.50. C. W. Malcolm, Walnut Creek, \$42,301.10; Lord & Bishop, Oroville, \$47,485.50; J. R. Reeves, Sacramento, \$40,610.85; J. V. Galbraith, Petaluma, \$43,093.50; Larsen Bros., Sonoma, \$44,713.50; J. E. Johnston, Stockton, \$35,453.30; Mankel & Storing, Sacramento, \$35,178; C. W. Wood, Stockton, \$40,204.50. Contract awarded to Mankel & Storing.

TUOLUMNE COUNTY—Reinforced concrete girder bridge across Sullivan Creek 2 miles east of Sonora, and 50-foot and two 30-foot spans on concrete bents and abutments with wing walls. Dist. X, Rt. 13, Sec. C. Engr's Est. \$19,368.60; C. C. Gildersleeve, Felton, \$23,276; Paul M. White, Santa Monica, \$24,718; George J. Ulrich Construction Company, Modesto, \$19,682; C. A. Bruce & Sons, Pleasanton, \$21,847; Fredrickson & Watson Const. Company, Inc. & Fredrickson Bros., Stockton, \$20,924; The Adams Co., Angels Camp, \$18,228.50. Contract awarded to The Adams Company.

VENTURA-LOS ANGELES COUNTIES—Between Little Sycamore Canyon and Solstice Canyon, about 11.5 miles in length to be paved with Portland cement concrete and bituminous macadam. Dist. VII, Rt. 60, Sec. A. Engr's Est. \$416,098.50. J. F. Knapp, Stockton, \$402,205; Jahn and Bressi Construction Co., Inc., Los Angeles, \$393,405; George R. Curtis Paving Company, Los Angeles, \$367,525.25; Wells & Bressler, Santa Ana, \$419,296.25; Ed. Johnson & Sons, Los Angeles, \$379,630.75; Basich Brothers Construction Company, Los Angeles, \$371,665; Matich Bros., Eslinore, \$358,861.25; Sander Pearson, Santa Monica, \$354,454.50; Sam Hunter, Santa Barbara, \$358,842.50; Geo. H. Oswald, Los Angeles, \$377,902.50. Contract awarded to Sander Pearson.

YOLO COUNTY—Between 1½ miles west Yolo Causeway to Yolo Causeway 7.2 miles grading and portions surfaced with oil treated crushed gravel or stone. Dist. X, Rt. 6, Sec. A. Engr's Est. \$31,984.50. A. Teichert & Son, Inc., Sacramento, \$29,761; C. W. Wood, Stockton, \$32,212.50; Isbell Construction Company, Carson City, \$35,493; J. V. Galbraith, Petaluma, \$35,123.75; C. T. Malcom, Walnut Creek, \$30,332.25; Mankel & Storing, Sacramento, \$30,779; D. McDonald, Sacramento, \$29,375.25; A. F. Giddings, Sacramento, \$32,917.65; J. R. Reeves, Sacramento, \$34,585.50; Fredrickson & Watson Construction Company and Fredrickson Brothers, Stockton, \$25,394.05. Contract awarded to Fredrickson & Watson Construction Company and Fredrickson Brothers.

STATE HIGHWAYS IN CALIFORNIA SHOWING THE PRIMARY AND SECONDARY ROAD SYSTEMS AND THE DIVISION OF THE STATE UNDER THE BREED BILL.



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