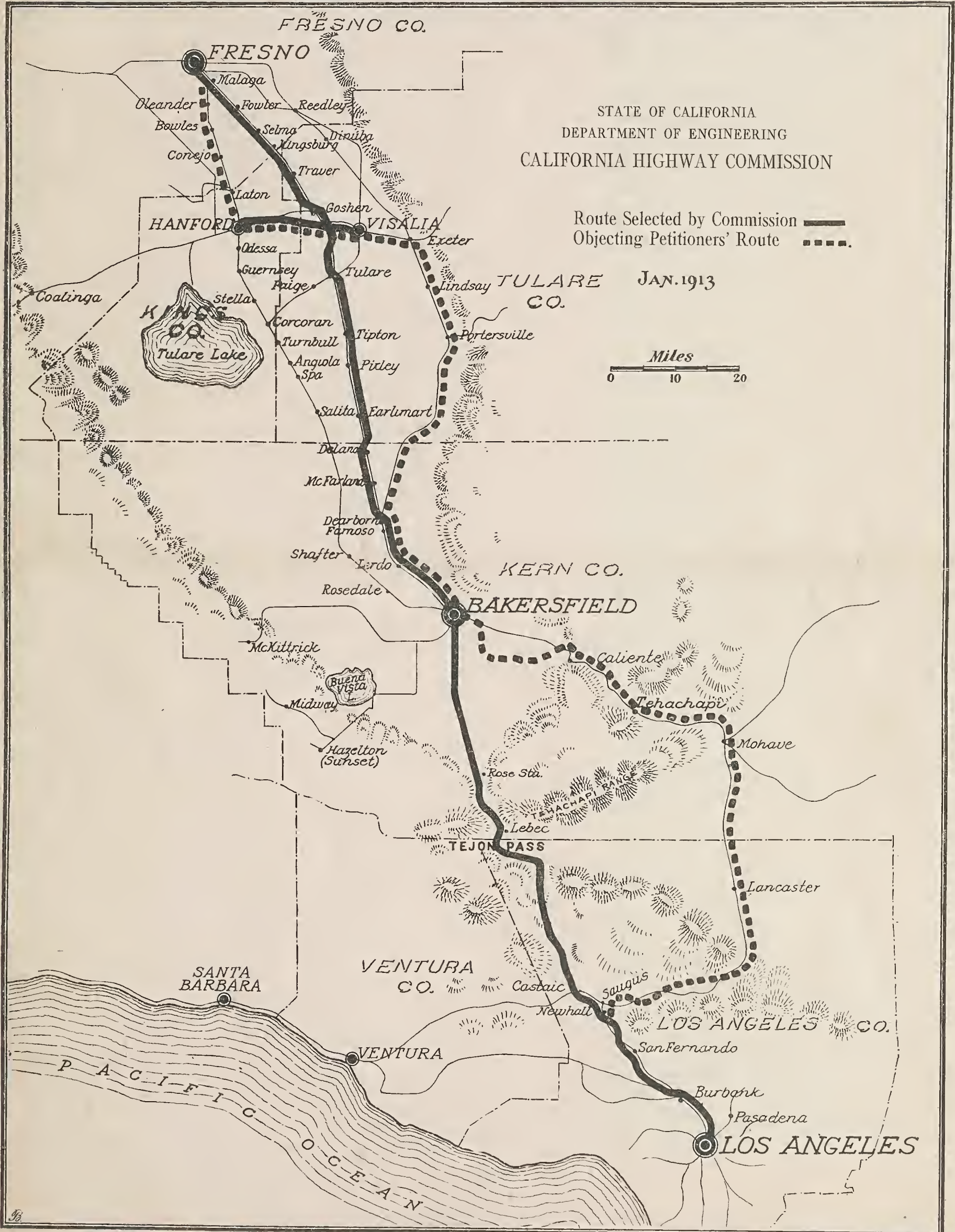


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CALIFORNIA HIGHWAY COMMISSION

OF THE

Department of Engineering

State of California

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AMEND THE POSTAL LAWS

As stated in the initial issue of this Bulletin, the Commission planned to publish it bi-monthly. Failing, however, to obtain the permission of the Postal Department to enter the publication as second-class matter, and on account also of the slow sale of the highway bonds, it was deemed expedient to defer the issuing of this number.

The Bulletin, as a medium for conveying to the public reports of the progress of the Commission's work and of interchanging information of an educational character along all road building lines between state and county authorities, is a valuable publication.

The Commission hopes to continue it at regular, stated intervals. To this end, it is urged that our representatives in Congress take up the matter of amending the laws governing second-class mail matter so that publications of the character of the CALIFORNIA HIGHWAY BULLETIN shall have equal privileges with the publications of State Horticultural, Educational and Health Boards in enjoying second-class postal rates.

The Government has a direct business interest in promoting the good roads movement and it is consistently giving moral and financial aid to this cause for the reason that every mile of good roads facilitates and reduces the cost of the Government's rural mail delivery service.

It is hoped that the highway departments of other states will cooperate with the California Highway Commission in urging upon Congress the merit of this contention.

THE AGITATION TO SAVE the native timber along the state highway, particularly through the native groves of pine and redwood in Mendocino, Humboldt, and Del Norte districts, should be reinforced by the press and civic bodies of the State. Let the state highway be a natural parkway from Oregon to the Mexican line.

SELLING THE HIGHWAY BONDS

On the 17th of April, the State Treasurer, Hon. E. D. Roberts, sold \$800,000 of the state highway bonds, the full allotment last ordered sold by the Advisory Board of the Department of Engineering.

Subscribers to these bonds were various local banking houses, as follows:

| | |
|-------------------------------|-----------|
| Orange County banks..... | \$200,000 |
| Santa Clara County banks..... | 148,000 |
| Santa Cruz County banks..... | 75,000 |
| Mendocino County banks..... | 30,000 |
| Los Angeles County banks..... | 270,000 |
| Board of Control..... | 77,000 |
| Total | \$800,000 |

Immediately following this sale, the local banks of Salinas offered to take \$50,000 worth of the bonds and Hollister banks \$25,000. The Salinas and Hollister subscriptions were made on condition that the full amount of \$75,000 would be applied to the construction of the state highway via the San Juan route.

Including this sale, the total sales of the state highway bonds is exactly \$4,000,000.

The following purchases of state highway bonds have been made by the various banks throughout the State with the understanding that the proceeds would be expended in the construction of the state highway in the respective districts where the money was subscribed:

| | |
|---|-------------|
| Hibernia Savings and Loan Society, San Francisco..... | \$200,000 |
| Bank of Willits..... | 16,000 |
| Security Trust and Savings Bank, Los Angeles..... | 250,000 |
| First National Bank, Los Angeles..... | 150,000 |
| Bank of Italy, San Francisco..... | 50,000 |
| German Savings and Loan Society, San Francisco..... | 50,000 |
| Associated Banks of Sacramento and A. Mierson Bank..... | 25,000 |
| San Bernardino National Bank..... | 175,000 |
| Citizens National Bank of Riverside..... | 100,000 |
| Associated Banks of Humboldt County..... | 100,000 |
| Hibernia Savings and Loan Society, San Francisco..... | 100,000 |
| Associated Banks of Sacramento and A. Mierson Bank..... | 125,000 |
| Union Savings Bank, Modesto..... | 75,000 |
| Sale of April 17th as above noted..... | 800,000 |
| Total | \$2,139,000 |

In Contra Costa, Alameda, Tuolumne, Santa Barbara, Sonoma, Ventura, Sacramento and other counties, public spirited efforts are in progress to induce local capitalists to take state highway bonds in sufficient quantities to provide the money necessary to build the state highway through their several jurisdictions.

The logic of these facts can not be misunderstood. The Commission will inevitably be compelled to give preference to those counties which are thus promptly co-operating with the State Treasurer in marketing the highway bonds, if the bonds do not find independent purchasers.

THE STATE HIGHWAY AND THE CITIES

The streets of an incorporated town are not under state control. No self-respecting city desires to surrender its authority over any portion of its own thoroughfares. For these basic reasons, the Highway Commission is pursuing the settled policy of requiring the various towns through which the state highway is routed to build the "link" of the big road through its confines.

It is the custom of the Commission to confer with the authorities of such towns, and as far as practicable follow their recommendations in locating the main road to and from these towns.

Conforming to this rule, the city of Roseville, Placer County, on April 15th, voted almost without opposition for a bond issue of \$20,000 for the permanent improvement of the street which will be used by the state highway.

Los Gatos, Santa Clara County, will build its connecting link at a cost of \$60,000. It will have a concrete base and will be surfaced with asphalt.

Pomona, Los Angeles County, plans to build at once her state highway "link" at a cost of \$50,000.

Gilroy proposes to spend \$34,000 on her "connecting link" of the state highway and to lose no time getting at the work.

No other movement ever started so much civic activity and ambition among the counties as well as the municipalities of California, as has this state highway enterprise.

THE SUPERVISORS OF VENTURA COUNTY have about completed a long concrete bridge of the Thomas type on the state highway between Ventura and the Rincon Causeway at a cost of about \$50,000. The bankers of Santa Barbara County are arranging to purchase highway bonds to enable the Commission to commence the construction of the state highway between these two bridges.

STATE vs. LOCAL HIGHWAYS

It was inevitable from the beginning that every county, city, town and hamlet in the State should petition for the state highway through their borders in a manner that would best serve their own local interests.

In law and in logic, in morals and economics, there was but one course for the Commission to take—that was the course it adopted. It proceeded to determine the location of the trunk lines of the State, obliterating county lines and disregarding the special pleas for special consideration from a multitudinous and contesting lot of communities.

By the closest calculations the Commission estimated that it would require about 1,800 miles of trunk lines and 900 miles of laterals to complete the skeleton system of state highways as defined by the highways act. If the state highway were really to be a STATE HIGHWAY, the Commission at the outset conceived that it must necessarily perform substantially the functions of a great artery, and that in the language of the act it should follow the most "direct and practicable" route.

Wherever any serious protest has been made against the action of the Commission, in determining these routes, it has arisen from those who put their pleas and protests solely upon the ground of their local interests, and who plainly sought to divert the state highway through their particular towns and sections for the purpose of best serving the local traffic.

The ambition of the California Highway Commission has been to see the two trunk lines of the state highway routed, as the law contemplates, so that they will most efficiently serve their purpose as *trunk lines*, to which the various counties may tie their county highway systems. Several counties in the State have already bonded themselves into the millions and have constructed from one hundred to three hundred miles of permanent roads within their borders. There are perhaps a dozen more counties now energetically moving in the same direction.

Having knowledge of these facts, the California Highway Commission, from the beginning, relied upon the various counties to take up the problem of their local highway needs and build by county enterprise all these roads which have been urged upon but which have not been accepted by the Commission.

No state highway can perform the promiscuous functions of a county highway system.

Take for instance the little state of New Jersey. It has an area of 8,224 square miles as against California's 158,297 square miles. Our Kern County alone has several hundred miles more dry land area. Yet New Jersey with but little more than five per cent of California's area, according to the 1911 report of the Commissioner of Public Roads of that state up to November 1, 1911, had given state aid under the state aid law to twenty-one counties in the aggregate sum of \$3,230,336, which applied on a total of about 1,600 miles of public roads. A map accompanying this report shows by a network of red lines the vast system of public roads that has thus partially benefited under New Jersey's state aid law.

Reference is here made to these figures from New Jersey for the purpose of giving the reader an idea of the great mileage, in the aggregate, necessarily required to serve the local highway traffic demands, and it further will convey to any one who has not given the matter much thought some conception of the difficulties and complications, entanglements and irreconcilable conflicts that would inevitably arise if the attempt were made to make a state trunk road answer the purposes of a variety of county highway systems.

RECONNAISSANCES ORDERED

In the matter of the Tuolumne County lateral, upon the recommendation of the Highway Engineer, it was ordered recently that the reconnaissance should follow a line beginning on the state highway at Farmington, San Joaquin County, thence southeasterly to Knights Ferry, thence northeasterly via Chinese Camp to Sonora.

As soon as this proposed road has reached the layout stage, the citizens of Tuolumne will buy bonds sufficient to insure its construction.

March 4th last, the Highway Engineer was authorized to proceed with a reconnaissance to be made, preparatory to a survey, of a possible route in Contra Costa County, beginning at Martinez and extending substantially parallel to the coast line and upon the high lands back of the water front to a point near Port Costa; thence via Richmond to Oakland, together with branch lines to Port Costa and to Vallejo Junction.

THE FIRST AND MOST EFFECTIVE argument that any county can offer why the Commission should begin the construction of the state highway in its particular district is to show that it has procured all rights of way in accordance with the State's survey.

CALIFORNIA STATE HIGHWAY POLICY

In bonding itself for \$18,000,000 for a state highway system without restrictions as to the time in which the money should be expended, California adopted a bold and unique program. Other states had theretofore voted even larger sums for public road improvement, but with the proviso that the money should be disbursed in installments over a long term.

California's venture in state highway building is distinguished by still another radical departure from the methods of other states in that the highways act itself, which the people adopted when they voted the \$18,000,000 bonds, practically determines within narrow lines the location of the two main trunk roads for which it provided.

In other states, after the bonds were voted, the matter of locating the state roads has usually been left to some commission or advisory board.

Many of the eastern states have adopted the state aid method of encouraging the various counties to improve the public highways. A bonus, varying from \$250 to \$1,250 per mile, according to the character of road, is paid by the state upon proper proofs. By this system those counties that are most enterprising get the most road "benefits." There is no mandatory road construction, and in practice, desultory and scattered work is the result.

The California plan, whereby the State makes available its funds as rapidly as they may be utilized, and plans the work as a magnificent whole and to be prosecuted as one great enterprise, commends itself as the wisest and most progressive.

The Bulletin, in its October issue, published the full text of Attorney General U. S. Webb's opinion as to the meaning of the State Highways Act. Any one who has read the act itself with any degree of attention could not have been surprised at the Attorney General's findings. The framers of that act clearly contemplated that the State should proceed to construct two main or trunk roads throughout the length of the State, one along the coast and one up and down the two great valleys, Sacramento and San Joaquin. The act specifically declares that these trunk lines shall be laid out by the "most direct and practicable routes," and that the county seats of such counties as may lie east or west of the said trunk lines shall be connected by laterals.

The law very explicitly limits the discretion of the Commission in the matter of locating these highways but gives it unchecked freedom in the manner of spending the money and the time in which it may accomplish the work. In routing the state highways, the California Highway Commission has studiously undertaken to comply with the provisions of the State Highways Act.

FINANCIAL STATEMENT

The following is a statement to March 15, 1913, showing gross receipts and disbursements of the Commission and a segregation of the expenditures among the seven divisions:

| ASSETS. | |
|---|----------------|
| Total expended for surveys and construction of highways..... | \$869,433 42 |
| Overhead expense to be prorated..... | 63,770 07 |
| Investment in equipment..... | 68,636 20 |
| Revolving fund | 400 00 |
| Balance in bank..... | 1,389 23 |
| | \$1,003,628 92 |
| LIABILITIES. | |
| State Highway Fund..... | \$948,385 85 |
| Reserve on uncompleted contracts..... | 53,553 84 |
| Claims in process of payment..... | 1,689 23 |
| | \$1,003,628 92 |
| Details of expenditure | |
| Division I | \$869,433 42 |
| Del Norte, Humboldt, Mendocino..... | \$125,790 23 |
| Division II | 42,765 02 |
| Lassen, Modoc, Shasta, Siskiyou, Tehama..... | |
| Division III | 175,697 31 |
| Butte, Colusa, El Dorado, Glenn, Placer, Sacramento, San Joaquin, Solano, Stanislaus, Sutter, Yolo, Yuba..... | |
| Division IV | 155,766 30 |
| Alameda, Contra Costa, Marin, Napa, Santa Clara, Santa Cruz, San Mateo, Sonoma..... | |
| Division V | 65,823 49 |
| Monterey, San Benito, Santa Barbara, San Luis Obispo..... | |
| Division VI | 160,050 79 |
| Fresno, Kern, Kings, Madera, Mariposa, Merced, Mono, Tulare..... | |
| Division VII | 143,531 23 |
| Los Angeles, Orange, Riverside, San Bernardino, San Diego, Ventura..... | |
| | \$869,433 42 |
| Bonds sold to date..... | \$3,200,000 00 |

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ADMINISTERING THE STATE HIGHWAY TRUST

How the California Highway Commission Determines the Routes, Organizes Its Field and Office Forces, and Manages the State's Business

The State Highways Act, in language that a layman cannot misunderstand, makes it mandatory to build one main interior trunk line running lengthwise of the State, and another trunk line along or near the coast, and to connect them by laterals with all county seats not touched by one or the other of these trunk roads.

Thus was the state highway system definitely determined by direct vote of the people and made obligatory beyond the power of any court or legislative body to change.

It is a highway system which compels the building of about 1,800 miles of trunk roads and about 900 miles of laterals.

From the very beginning, it was apparent that the eighteen millions provided by the State Highways Act was woefully inadequate to satisfy the demands of the people.

Recently certain large road building contractors went into the public

knowledge or respect for the law that must control those who are officially responsible, crying that the Commission ought to be spending \$12,000 a mile instead of \$7,600 a mile to construct these highways.

At \$12,000 per mile, \$18,000,000 will build 1,500 miles of roads.

But to put various ambitious towns on the state highway and to "keep peace in the family," the trunk lines must be stretched by a series of kinks and zigzags to a total aggregation of 2,150 miles of kinks and zigzags.

But there is money only to build 1,500 miles of road of the kind the contractors want. Therefore, there would be on this basis 650 miles of trunk lines and 900 miles of laterals, more than one half of the entire mileage of the state highway system, to build which there would remain not one dollar of the \$18,000,000.

The most casual and unconcerned onlooker will readily discover that



Pit River Bridge Site, Shasta County, State Highway Survey.

prints with a protest addressed to the Governor, charging that the Highway Commission was building the roads in an inferior manner.

At the hearing which the Governor gave these criticising contractors, they told his Excellency that it would cost approximately \$12,000 a mile to build the type of road which they recommended.

At \$10,000 per mile, 1,800 miles of main highways would cost every copper cent of the eighteen million dollars and leave not a penny for the construction of 900 miles of laterals.

Here, then, is the situation. The California Highway Commission on the one hand is railed at and abused, as if they were picking pockets, because they have not ordered surveys for the state highway by various diversions to satisfy conflicting and irreconcilable local demands, increasing the eighteen hundred miles of trunk roads to over twenty-one hundred miles, and adding upwards of \$3,000,000 to the total cost of building these said trunk roads alone.

On the other hand, the contractors rush in blindly, without apparent

this Commission at the outset faced an engineering and financial problem all but impossible of solution even with the greatest conceivable skill, economy, and administrative ability.

But when upon top of the inherent and unescapable difficulties which beset the Commissioners are piled the burden of satisfying the clamorous petitioners of hundreds of towns to have the highway run in as many impossible directions, and to build a kind of road that best suits the notions and purposes of those who are stocked up with large road building plants of a certain sort, it is taxing human patience to the limit.

The Policy of the Commission.

The management of this state highway enterprise concerns primarily the public which foots the bills.

In order to make the \$18,000,000 cover the cost of the best possible state highway system, the following policy was programmed at the outset by the Commission:

1. To prevail upon all counties to pledge themselves to procure all rights of way and construct all necessary bridges for the state highway in their various jurisdictions.

2. To lay out the entire system of trunk roads and laterals in accordance with the mandates of common sense, the State Highways Act and the opinion of the Attorney General by "the most direct and practicable routes."

3. To organize every department under the Commission on a merit and efficiency basis, in line with the promise and the efforts of the administration to apply clean, practical, business methods to the management of public affairs.



State Highway Surveyors Moving Camp, Rattlesnake Creek, Mendocino County.

munities which sought to have the state highway routed by various diversions.

With only a few exceptions, every county in the State has acquiesced in and agreed to the proposition maintained by the Commission that the state highway is in fact as well as in name A STATE HIGHWAY.

They readily saw the point that it was absolutely necessary for each town, city and county to hold its own local desires and interests as to the location of the state highway subordinate to the larger and all inclusive purposes of the state highway system.

It was agreed that a trunk line of a state highway could not be diverted and distorted merely to meet the requirements of local traffic without abandoning and violating the letter and spirit of the Highways Act as well as the basic needs of the highway system itself.

These various counties through their supervisors, chambers of commerce and boards of trade in effect said to the Commission, as the only solution of their own internal and irreconcilable differences as to where the state highway should go: "Locate the state highway through this county where the Highway Commission thinks best to serve the purposes of a trunk road to which all the counties may tie their local highway systems."

Upon this principle only is it possible to link all sections of the State together in a system of good roads that will afford the freest intercommunication between each section with every other section.

Thus it was that the counties which had not only generously assumed the expense of furnishing rights of way and building bridges still further contributed magnanimously to the success of the state highway enterprise by declaring for the most "direct and practicable"

routing, to the end that the total mileage and the consequent cost of construction might be reduced to the minimum, to the still further end that these roads should be constructed in as high class a manner as possible, and should be extended in fairness and equity to reach all sections of the State as contemplated by the State Highways Act.

Confirming this position, several counties have recently voted bonds for the permanent improvement of their local highways; and many other counties are actively preparing to do likewise.

Riverside and Orange counties; Kern and Santa Barbara; Fresno and Tulare; Santa Cruz and Monterey; Solano, Contra Costa and Alameda; Sonoma, Mendocino and Humboldt; Butte, Shasta and Siskiyou; San Mateo, Merced, Tuolumne and Imperial are all public-spiritedly grappling with the good roads problem, and planning to join their local road systems to the State's trunk highways.

Honor is due to Los Angeles, San Diego and San Joaquin counties as pioneers in county road improvement. These three counties alone are bonded in the aggregate for six and one half million dollars for the betterment of their roads, a sum considerably in excess of one third the entire amount available under the State Highways Act, for the construction of the entire state highway system.

This fact alone is sufficient to indicate to the most obtuse mind that it is little short of a crime to route the state highway by a deviation of a single mile to satisfy purely a local interest. To follow such a practice would inevitably deny in toto the benefits of the state highway fund to entire communities and counties.

Organization of Field and Office Forces.

Concerning the organization of the office and field forces of the Commission, it is sufficient in passing to say that the fact that the employees of the Commission have uniformly been employed upon recommendations as to their efficiency, skill and experience, and that the uniform rule of the Commission to promote and discharge employees without discrimination, solely upon their merits, has occasioned general surprise and favorable comment throughout the State.

It is simply asserting what is common knowledge to say that in no administration of the government of the State of California prior to the present one would it have been possible to have undertaken and prosecuted any great public work, such as this state highway enterprise, under these conditions.

4. To declare that the State will step into the breach and defend any contractor in the courts, without cost to him, against any suits for damages or royalties for the invasion of real or alleged rights under paving patents.

5. To make definite arrangements with the various railroad companies for a special reduced freight schedule for all road building materials, equipment, etc., transported for the construction of the state highway.

6. To enter into contract with the lowest bidders for a vast wholesale supply of crushed rock, gravel, etc., by the definite terms of which these materials should be supplied to the State far below the price usually paid by contractors on other public or private works.

7. To propose to the cement companies to place large orders for cement to be delivered and paid for within a stated period, and demanding their closest estimates in consideration of such guarantees of large orders, positively placed and promptly paid for.

8. To let contracts for construction of the state highway in ten mile units, and give all contractors the benefit of the reductions in freight rates, and first cost of rock, gravel and cement under the aforesaid arrangements with transportation companies and material men, thus affording the small contractor as far as possible an equal chance with the large contracting concerns.

9. To maintain a testing laboratory, and scientifically examine and prove according to established standards all rock, sand, gravel, cement, asphalts, oils, etc., that may be used in state highway construction.

The public deserves to know just how consistently and just how successfully the Commission thus far has adhered to its program as above outlined. Not to solicit plaudits nor encomiums, but simply to inform the public as to the real situation, it is pertinent and proper to state the following facts.

How the Counties Have Co-operated.

Not a single county in California has rejected the overtures of this Commission to furnish all rights of way and construct all necessary bridges in their several jurisdictions without cost to the State. These savings of time and money to the State by this generous and prompt co-operation from the various counties are enormous and incalculable.

In nearly every county through which a trunk line or any lateral of the state highway has been considered, the Commission has been appealed to to act as umpire in settling the contentions of rival com-

However, the Commission fully recognizes that efficiency in the public service cannot be divorced from the spirit of loyalty to the principles of good government. Working harmony in the ranks, and a zeal for earnest, faithful service, is best promoted in any organization by uniformly requiring that every employee shall stand the test of fidelity as well as efficiency.

Fidelity is an indissoluble element of efficiency in practical affairs as well as consistency in morals.

As to Paving Patents and Injunction Suits.

In the first issue of the CALIFORNIA HIGHWAY BULLETIN, which appeared last October, the Commission announced its policy of standing in between the small contractor and the powerful paving concerns assuming to do business under the protection of certain patents, and declared its purpose to defend any and all suits that might be launched in the courts to enforce the payment of any damages or royalties that might be claimed as infringements of such patents. The Commission did not undertake to deny the validity of any of these patents, but simply asserted that, if there were any valid claims for royalties, etc., the State would be responsible.

In this connection, the Commission stated: "Often a suspicion exists that both the contractors and the persons claiming patents are increasing their incomes unduly at the cost of the people." The threat of starting an injunction suit for the collection of damages or royalties often operates either to scare the contractor out of bidding, or cause him to enter into collusion with other contractors to control the situation. Thus far the Commission has not been called upon to defend any such suit.

Reduced Freight Rates Obtained.

Under the terms of a special tariff schedule the various railroad companies of California have united in conceding to the California Highway Commission carload rates for the transportation of all kinds of road building materials, machinery and equipment for road construction, which amounts to a saving of several hundred thousand dollars. It is worthy of note that various contractors, who are building bridges for the counties to be used by the state highway, are also given these reduced rates, which often amount to a saving of 50 cents per ton.

Road Materials at Bedrock.

In November of the past year, the Commission entered into a contract with one of the largest crushed rock producers in the world for a supply of one half million tons of crushed rock to be delivered at the option of the Commission within a stated period at the rate of 45 cents per ton.

The Commission further has entered into contracts with various companies supplying gravel, to deliver the same at the option and at the order of the Commission for the construction of the state highway at the rate of 27½ cents per ton. That these prices are bedrock and hard to beat is evident. With all the rivalry of competing firms, the Commission is unable to find any of them prepared to supply these materials at a less price.

While the cement companies maintain their prices rather rigidly, the Commission is buying its cement at comparatively low figures, considerably below the current market prices.

Testing All Materials Used.

Furthermore, the Commission maintains a laboratory for the testing of all materials that enter into the construction of the state highway. All cement, sand, rock, gravel, asphalts and oils are examined by this department of the Commission and scientifically tested for the purpose of insuring that all materials shall be up to the standard of quality demanded by the specifications of the Commission.

Giving the Smaller Contractors a Fair Chance.

In order that there shall be a free and open field in the bidding for all contracts to build portions of the state highway, it is the policy of the Commission, first, to let these contracts in units of about ten miles. A contractor of moderate means can usually handle a job of this size. By giving the contractor the benefit of the relief of furnishing materials

and their delivery by the transportation companies, the capital required by a contractor to handle a contract is greatly reduced and he is thereby placed in a more independent position. Furthermore, he is relieved of the temptation to hold out materials, or use inferior substitutes, for the reason that the State furnishes these materials and there is no opportunity for him to dishonestly increase his profits.

Engineer Morton's Significant Testimony.

It is significant that Mr. R. M. Morton, Highway Engineer of the San Joaquin County Highway Commission, which is just completing the expenditure of upwards of two million dollars in the construction of its system of county highways, should testify that so far as his reading, his knowledge, and his experience enable him to judge, the California Highway Commission is breaking all records made by the counties or by other states in reducing the cost of road building. Mr. Morton frankly says that, considering the type of roads the Commission is building and the high class manner in which they are constructed, it is surprising that the cost is held down to the figures at which the work is done.

An Encouraging Outlook.

With an increasing number of counties preparing to co-operate with the State Treasurer in the matter of floating the state highway bonds, under assurances that all the money available from the sale of these bonds through the efforts of the counties will be applied exclusively to the construction of the state highway in these counties, and with the brightening prospect that disputed routings will, at an early date, be definitely and finally determined, it may be safely predicted that before the end of the year 1913 splendid progress will have been made, not only by this Commission but by all our enterprising counties from Siskiyou to San Diego in the permanent improvement of our public highways and toward the consummation of the dominant ambition of every community of California to be ready and on dress parade for 1915.

Progressive San Mateo County

On the 8th of April, by a vote of "Yes," 4,253, and "No," 1,044, over 4 to 1, the people of San Mateo County declared for a bond issue of \$1,250,000 for the permanent improvement of about 110 miles of roads.



Grading State Highway Near Hopland, Mendocino County.

The proposed county system has been laid out carefully by an executive committee of the board of supervisors in consultation with experts to connect all sections of the county to the best possible advantage with the trunk line of the state highway.

No time is to be lost in carrying into execution this program. Consequently San Mateo County is looking forward to an era of unprecedented development and prosperity.

CERTAIN PUBLIC SPIRITED CITIZENS in Santa Barbara County have recently guaranteed the purchase of a large block of highway bonds to provide for the early construction of the state highway between Elwood and Gaviota Pass. This is encouraging since it will be the first voluntary money available for state highway construction on the coast road.

CONTROVERSIES OVER HIGHWAY ROUTES REVIEWED

A Comparative Study of the San Juan vs. Watsonville, the Tulare City vs. Hanford-Visalia, the Tejon vs. Tehachapi, and the Zaca Canyon vs. Alisal Routes

For many months the members of the California Highway Commission and the Highway Engineer have personally traveled and inspected all the routes which are the subjects of discussion in the protests, have in repeated hearings listened to the arguments of the proponents and opponents of the routes involved, have carefully examined written evidence of every description, and each and every recommendation for a particular route has been made to the Advisory Board only after a thorough investigation by the Commission's engineers.

The three members of the Commission, therefore, have investigated the merits and demerits of the routes, which have been advocated in the various sections of the State, as much as any body of men could do within a reasonable length of time, so that construction work might proceed to afford the people of the State some improved highways by the important year of 1915. Their investigation has been thorough in every respect.

In arriving at its determination of routes the Commission has been influenced by the following considerations:

Fourteen Dominant Reasons.

First—That the "State Highways Act" contemplates the construction of two main or trunk roads, one along the coast and the other traversing the great Sacramento and San Joaquin valleys.

Second—That the county seats of such counties as lie east and west of the trunk lines shall be connected to the trunk lines by lateral and tributary highways.

Third—That in interpreting that part of Section 4 of the "State Highways Act," which covers the selection of routes, that the emphasis is to be placed upon the expression "by the most direct and practicable route," and that these words are the controlling words of the statute.

Fourth—That the object of the statute, in so far as the two trunk lines are concerned, is by directness to afford a means of communication so that the people of the north may be in touch with the people of the south in the shortest interval of time and space, and at the same time linking together those county seats and centers of population which can practicably, and without materially sacrificing directness, be so joined in a trunk line running north and south through the State.

Fifth—That the connection of county seats and centers of population by the trunk lines is not the primary but a secondary consideration, and they should be so included in the trunk lines only when their inclusion would obviously not sacrifice directness and practicability in the trunk lines.

Sixth—That the "State Highways Act" provides for two north and south trunk lines through the State, and, in a state so much longer than it is wide, it is obvious that such trunk lines must be as direct as possible to bring the several parts of the State into the closest possible communication. That such trunk lines must be considered from a state-wide aspect is apparent, and local needs and conveniences and advancement should not be the determining factors in the selection of "direct and practicable" routes; that county lines are to be obliterated in the determination of the legal and logical trunk lines.

Seventh—That laterals are provided for in the "State Highways Act" for the express purpose of furnishing ingress and egress to and from the trunk lines for such county seats as can not practicably be reached by a direct trunk line; and that the ultimate scheme of the state highway system is to cover the State of California with a network of highways which will compact the whole State for the purpose of intercommunication of the residents of every part of the State, and so that no longer will counties be spoken of as being "remote or inaccessible."

Eighth—That the voting of the limited sum of \$18,000,000 for the system of state highways specified in the act precludes any other idea than that the routes chosen must be direct and not meandering, and that the saving of mileage is the essence of the act.

Ninth—That it was neither contemplated by the "State Highways Act" that local traffic demands should be considered in the routing of the state highways, nor that such state highways should be built primarily as feeders to carry local produce to local transportation depots and home markets.

If the act was intended for this purpose, then the effect of the word "direct" used in reference to trunk lines would necessarily be nullified, and the Department of Engineering would have to transform itself into a body of statisticians in order to determine the relative advantages of the various local communities, and while it was engrossed in the task of solving these vexing problems, new "centers of population" would spring into being as is their habit in the rapidly growing State of California. That an emphasis on local needs would necessarily produce

irreconcilable conflicts and complications between the rival centers, with which it is unreasonable to assume that the framers of the "State Highways Act" ever intended to perplex state officials, because they are essentially matters to be handled by county or municipal authorities, who are the proper public officials to solve local problems.

Tenth—That no state highway, either trunk or lateral, should be materially deflected to include a "center of population," and that the placing of centers of population on the trunk lines must not be done at the expense of several additional miles of highway construction.

Eleventh—That the expression "along the Pacific coast" does not mean a literal "shore line," but is used in a most general sense, just as "traversing the Sacramento and San Joaquin valleys" is used in terms as broad as those great valleys themselves.

That the words "along the Pacific coast" are used with the meaning of traversing the Pacific coast, but in order to make the phrase somewhat clearer, the term "along" was used in a most general sense, namely, "in line with the length of," and not in the sense of "immediately by the side of the shore."

That in attempting to build a "literal shore line" road up and down the Pacific coast, the Department of Engineering would not only sacrifice "directness and practicability," the prime factors in the law, and leave several county seats off the trunk highway, but would incur the ridicule of the thinking people of the State and deplete the \$18,000,000 fund without a proportional showing of results.

Twelfth—That each and every recommendation made to the Department of Engineering, relative to directness and practicability from an engineering standpoint, has not only been personally investigated and approved by at least two members of the Commission, but also by the Highway Engineer and by the Division Engineer of the division in which the proposed route is situated, and if such route lies within two divisions, then, by the two Division Engineers of such two divisions.

Thirteenth—That the matter of routes is largely a matter of the sound discretion of the Department of Engineering, and a finding based upon the considerations herein stated will not be held by any court to be an abuse of discretion.

Fourteenth—That the Commission has been guided in its recommendations in matters of law by an opinion furnished by the Attorney General of California, the legal adviser of the Department of Engineering, dated August 22, 1912, to which the attention of the reader is respectfully directed, and with which opinion the recommendations of the Commission in the matter of routes have strictly conformed.

The Commission has had before it for determination several cases illustrating the points mentioned above, the most troublesome of which were the VISALIA-HANFORD; the TEJON-TEHACHAPI; the SAN JUAN-WATSONVILLE and the ZACA CANYON-ALISAL controversies. In each of these cases much factional feeling has developed and the contentions have been bitter. Each will be discussed briefly.

Visalia-Hanford vs. Selma-Tulare City Route (see Frontispiece).

In this case, after much study, the Commission determined that the state highway should follow substantially the main line of the Southern Pacific Railroad between Fresno and Bakersfield with laterals connecting with Visalia and Hanford, two county seats which would not be touched by the main line. The opposition as at present constituted to this route desires the main road to extend from Fresno to Fowler, thence to Hanford, thence to Visalia, thence via Exeter, Lindsay and Porterville to a connection with the main line near Famoso, about 20 miles north of Bakersfield.

The line recommended by the Commission traverses the trough of the San Joaquin Valley and the chief reasons for its selection are as follows:

1. It is the most direct and practicable route connecting the two largest centers of population in the valley.

2. The line is an average line permitting the communities on both sides of it to reach it by laterals with the least expense.

The local traffic is well cared for by this route. Between Visalia and Fresno and between Hanford and Tulare the Commission's line best serves such traffic. On the other hand, the line of the opponents serves the local traffic better between Fresno and Hanford.

The line originally recommended by the Hanford and Visalia people, not considering the Porterville detour, leaves such thriving towns as Selma and Kingsburg entirely to one side, and leaves Reedley and Dinuba farther away from the state highway than does the line recommended by the Commission.

All through traffic would be burdened by at least an additional 17 miles which it would be forced to travel, *i. e.*, all of the travel originating

any where in the State of California south of Tulare, going to any where in the State north of Fowler, would be inconvenienced to the extent of having to travel 17 additional miles.

If the Porterville detour be also considered, all of the travel originating any where in the State south of Famoso and traveling to any point in the State north of Fowler, would have to travel 30 additional miles. All travel from the north to the south would be burdened in like manner.

The detour by way of Porterville would leave out of consideration the town of Corcoran, and all of the oil fields of the extreme west side of the valley, and would force the highway up against the eastern fringe of the valley, a location manifestly unjust to the remainder of the valley.

The city of Tulare, and Tipton, Pixley, Earlimart and Delano would be left off the state highway.

A short distance to the southwest of Tulare lies the rich alfalfa district, the local center of which is Corcoran, considered to be one of the

through Kings or Tulare counties. Everywhere else there was a predominance of argument one way or the other, and an intelligent decision could be reached. There were local disappointments, but no sense of irreconcilable injustice. But through this one stretch, no possible decision could have been made without doing injustice to somebody. There is, in the tier of counties south of Fresno, a bifurcation of population, of county government, and county seats, which gives each side equal claims to recognition. The railroads have met the situation in the only possible way—by two roads. The only way the Highway Commissioners could have done local justice would have been to do the same thing—build two roads. But they have not money enough for that, and they could not justly have granted it in this one place while denying it everywhere else. They had to choose one route, and whichever decision they made was necessarily wrong. They finally made their choice—the wrong one, of course, but either of the others would have been wrong also. And the Governor quite properly lets their decision stand. If he had overruled it, he could only have substituted one wrong road



Typical Views, Tejon-Castaic Route, State Highway Survey.

greatest in the State, and this district would not be served by the Porterville route.

In a general way, it would appear that a line which would serve with justice the entire San Joaquin Valley should be a direct line traversing the trough of that valley, and leaving the communities through which it does not pass to reach it by a system of laterals. The line adopted by the Commission meets this requirement.

It is apparent that the cost of construction would be considerably less by way of the route selected by the Commission, owing to its proximity to the railroad, thus obviating long wagon hauls of material of construction.

An editorial published recently in the *Fresno Republican*, a portion of which is quoted below, is a somewhat facetious but nevertheless correct statement of the difficulties in the choice of this route:

“* * * The only absolutely insolvable puzzle passed up to the Highway Commission was the routing of the road south of Fresno

for another, while adding the additional governmental wrong of undermining a condition which ought to be independent.

“The only right solution is two roads and the State can not provide that. The next best thing would be for the State to flip a coin, for one way or the other, the counties to supply whichever road the State did not. But that would require the county which received the State road to contribute half the expenses of a county road in another county—which the people might refuse to authorize even if there were a law for it. * * *”

Tejon-Tehachapi Controversy (see Frontispiece).

For the state highway between Los Angeles and Bakersfield the Commission has recommended a line beginning at a point near Newhall, about 32 miles northwesterly of Los Angeles, and extending thence via the Castaic Ridge and the so-called Tejon Pass to Bakersfield. This line has been generally called the “Tejon Route.” The opponents to this route recommend a line beginning at or near Newhall and extend-

ing via Mint Canyon, Lancaster, Mojave, thence over the Tehachapi Range through Tehachapi passing near Caliente, and over the White Wolf Grade to Bakersfield, following substantially the route marked by the dotted line on the map on the front page.

After investigating both routes the Commission recommended the route indicated by the heavy black line chiefly for the following reasons:



Tejon-Castaic Ridge Route, Los Angeles County, State Highway Survey.

1. It is the most direct and practicable route connecting Los Angeles with Bakersfield, it being approximately 115 miles in length as against about 175 miles by way of the opponent's suggested line, a difference of approximately 60 miles in favor of the Commission route.

2. While the Tejon summit and the Tehachapi summit are of about the same elevation, it is possible to secure much easier grades and alignment via the Tejon than via Tehachapi. There will be only 3 miles of 6 per cent maximum grade throughout the Tejon route.

3. The Tejon route better serves the west end of Antelope Valley where there are thousands of acres of land suited to agricultural uses, and places in closer touch the oil district southwest of Bakersfield with its natural center at Los Angeles.

4. The drainage is far better on the Tejon route, the Antelope Valley between Lancaster and Mojave being little better than a sink in times of wet weather. Wind conditions at Mojave are as severe as anywhere in the State, at times, and the desert traversed for a great distance on the Tehachapi route is not encountered on the Tejon line.

5. The creek crossings are fewer by 30 than on the opponent's route and the cost of maintenance will be less. No argument is needed to show the vast saving in cost of construction which will result from the saving of 60 miles in length. There is no serious engineering difficulty in its construction.

The shorter line will bond together the great San Joaquin Valley and Los Angeles and her tributary valleys and encourage travel, traffic, and intercommunication. The longer line would discourage travel and separate communities, and place a burden of 60 miles or more on every traveler who would ever travel this road, with the exception of persons going to the easterly part of Antelope Valley.

The population which would be served by the Tehachapi route has been variously estimated at from 1,500 to 2,000 persons. Should the great city of Los Angeles and the prosperous and growing city of Bakersfield, with a population in 1910 of 12,727, be pushed farther apart for all time by 60 miles of state highway more than is needed to connect them, solely because of the local needs of the sparsely settled Antelope Valley?

The Tejon route brings southern California and the great San Joaquin Valley nearer to each other politically and commercially. It would serve as a perpetual and powerful influence in removing sectional prejudices between the north and the south, and would to that extent serve to promote the unity and integrity of California as a State, and discourage the agitation for state division.

San Juan-Watsonville Controversy (see map opposite).

The route recommended by the Commission for the state highway between San Jose and Salinas passes through Gilroy, Sargent, Betabel, and San Juan, thence over San Juan Mountain to Salinas.

The opponents of this route, chiefly residents of Watsonville, a thriving city of Santa Cruz County, and the people of the northwestern part of Monterey County, ask to have the state highway diverted at Betabel or nearby, and extended thence along the Pajaro River, through or

near Chittenden to Watsonville; thence southerly through Castroville to Salinas. (See dotted line on accompanying map.)

The chief reasons of the Commission for recommending the San Juan route are as follows:

1. It is the most direct and practicable route between the lower end of the Santa Clara Valley and Salinas, the county seat of Monterey County, it being at least 15 miles shorter than the opponent's line via Watsonville. Salinas is on the natural route for travel.

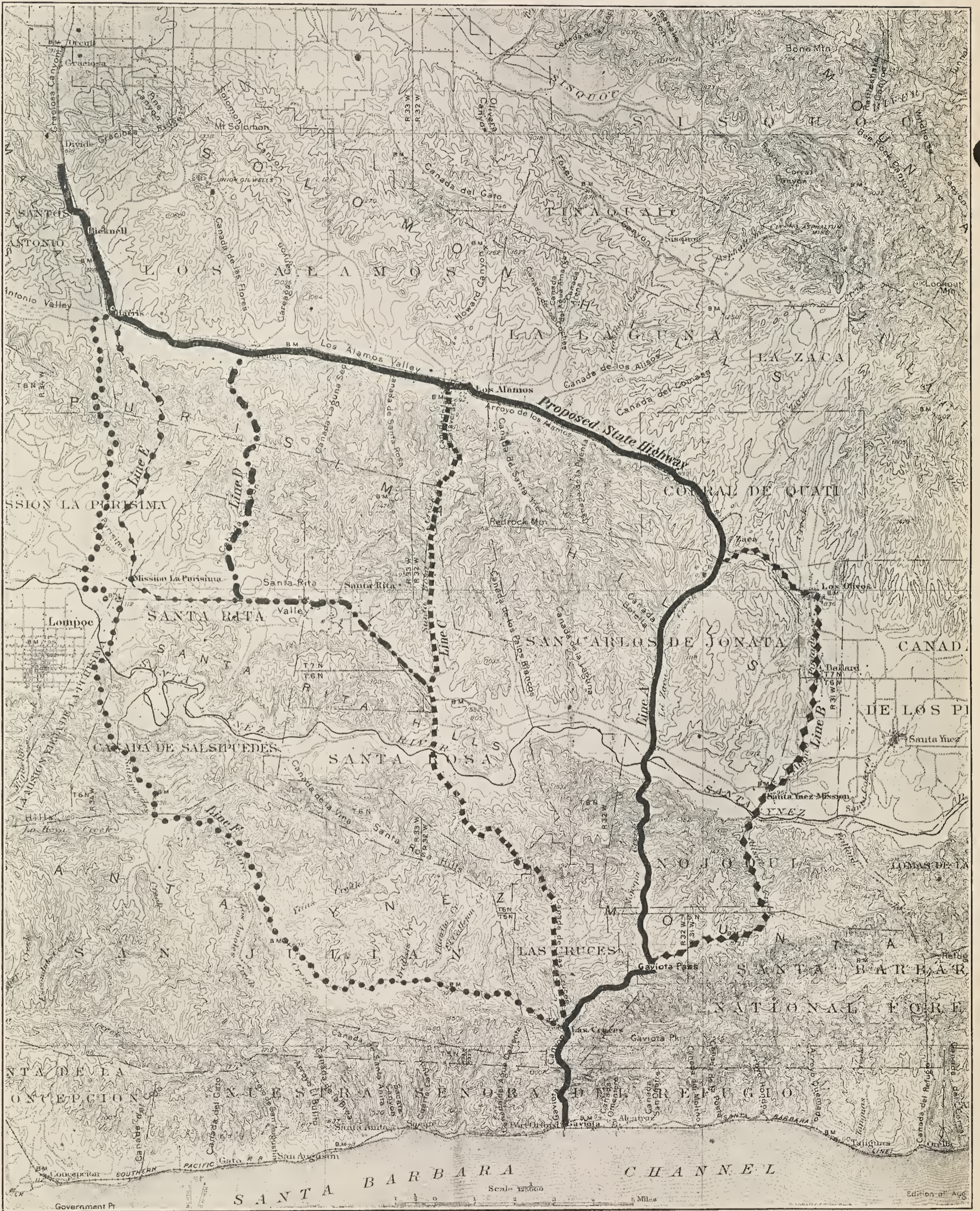
2. The town of Hollister, county seat of San Benito County, must be connected with the trunk line. This lateral, 7 miles in length, can be constructed at the least cost by tying it to the Commission's line at San Juan and to the greatest advantage to Hollister and San Benito County. If the state highway passed through Watsonville the connecting lateral would be 11 miles long. Hollister is a county seat, while Watsonville is not.

3. Notwithstanding the miserable road now existing over San Juan Mountain, most of the travel follows that route because of its directness. The road planned by the Commission will have only one mile of 6 per cent grade, the balance varying from 2 to 4 per cent.

The road proposed via Watsonville passes along the bank of the Pajaro River for some distance. The road there is menaced constantly by a bad "slide" resulting from a "fault" in the strata of the hill on one side and by the river on the other, which



Showing San Juan Route and the Opposing Riverside-Watsonville Route.



Various Santa Barbara County Routes vs. The Zaca Canyon Route.

erodes the bank to such an extent that piles and bulkheads have been placed to protect it. The road here has been destroyed more than once from these causes.

Zaca Canyon-Alisal Controversy (see map, page 10).

The routes in Santa Barbara County between Santa Maria and Gaviota have been given a great deal of consideration by the Commission and after several months of study and after many miles of preliminary survey the line marked "Line A" on the accompanying map is recommended. This line passes through or near Bicknell, Harris, Los Alamos, Zaca Station, and thence southerly via the Zaca and Nojoqui creeks, Nojoqui Hill to Las Cruces, thence through Gaviota Pass to the coast.

Lompoc, a rapidly growing community, wished to have the state highway touch the town or pass as near to it as possible. Residents of the city of Santa Barbara and the little settlements between Los Olivos and Santa Ynez wished to have the road extend to the east from Zaca Station, passing through Los Olivos, Ballard, Santa Ynez Mission, thence by the Alisal Grade to Gaviota Pass (see "Line B").

The chief reasons which moved the Commission to recommend the Zaca Canyon line are as follows:

1. It is the most direct and practicable route between Harris and Gaviota Pass. It is not the shortest, being about 4 miles longer than the shortest route through the mountain passes, but the adopted line will have but 2.5 miles of grade in excess of 5 per cent, while the shortest line ("Line D") would have 7.5 miles in excess of 5 per cent. It is 4.5 miles shorter than the Los Olivos-Alisal line ("Line B") and will have one mile less of grade in excess of 5 per cent. "Line B" was the second choice of the Commission and only after much debate was it discarded.
2. This location enables the town of Lompoc to make a connection with the state highway more easily than it could with the Los Olivos-Alisal line, and reasonably well satisfied the desires of that town. The lateral will follow the Santa Ynez River by easy grades.
3. The presence of good local material for road construction and the

delivery of materials from the railroad to Zaca Station, the downhill haul and easy grades, will greatly lessen the cost of the work as compared with any other route.

4. A dangerous grade crossing, about one mile west of Los Olivos, will be obviated as will also a 12 per cent grade in the same locality.

Naturally, there is objection by residents of Los Olivos, Ballard, and Santa Ynez to the construction of a new road which will doubtless be used by the traffic now passing through these settlements. The largest of these places is Los Olivos, itself but a small place (population, census of 1910, 220). From Zaca Station to Los Olivos is but 3 miles.

The adoption of the Commission's route entails the construction of a bridge about 1,000 feet in length over the Santa Ynez River. On the Los Olivos-Alisal line over the same river there is now a bridge of about the same span and of the type known as "combination wood and steel." This bridge will last but a few years, and the new bridge on the Zaca route will take its place.

The bridge question should not control when better alignment, better grades and four and one half miles saving in distance may be secured by the route proposed by the Commission.

IN CONCLUSION.

The foregoing statement sets forth some of the potent legal and practical reasons for the action of the Commission in presenting such recommendations. The fundamental issues may be summarized as follows:

1. Are directness and practicability the main factors?
2. Or, on the contrary, is the placing of a county seat or county seats on a trunk line, even at the expense of a number of additional miles, the primary consideration?
3. Shall the route of a trunk line be deflected, even though considerable distance is added, in order to connect the present center or centers of population numbering from a few hundred to a few thousand people?
4. Shall the plan of routing the entire system be based upon the needs of the State as a whole and its relation to neighboring states, or shall the emphasis be placed upon the local needs of the counties traversed?

GOVERNOR HEARS THE COMPLAINING CONTRACTORS

Investigates Road Making Costs and Methods, and Approves Commission's Work

On March 21st, Governor Johnson heard the complaint of a number of contractors who do city paving work, in a large way, who alleged in an open letter dated February 7th that the thin bituminous wearing surface which the Commission has specified for about 100 miles of the state highway was not "permanent" and advocated a wearing surface of bituminous material not less than 2 inches thick.

The state highways referred to are paved with a concrete base of a minimum thickness of 4 inches and 15 feet wide. Shoulders at least 3 feet wide are built on each side of the concrete. The concrete base is covered with a thin coating of asphaltic oil of special quality and stone screenings forming a bituminous carpet from three eighths to one half inch in thickness to serve as a wearing surface and to protect the concrete.

Crude Oil versus Asphalt.

The contractors' letter was published widely in the public press. A portion of it is here quoted:

* * * We marvel that the state highways of our own State are using crude oil and a small layer of screened rock, three eighths of an inch in thickness as an alleged wearing surface. We submit that crude oil, even though containing eighty per cent of asphalt, is not in any sense a cement and will be of very little value to care for the wear to which our roads are subjected, and that the mode of its application is also crude and far from being mechanically or scientifically exact; and we desire to quote the Chief Engineer of the Highway Commission—that "it is not permanent."

We wish to go on record as practical road builders that the cost of such construction and its maintenance for a period of ten years will far exceed in cost a permanent, scientifically constructed pavement such as recommended by your petitioners.

We believe that the questions above outlined are among the most important now confronting your administration, and the wise disposition of them will go further than anything else to bring lasting credit to it. * * *

At the hearing the contractors were well represented by several of the firms signing the letter. The three members of the California Highway Commission and the Highway Engineer were present.

No Fault With Our Cement Base.

By a few direct questions the Governor established the fact that the contractors had no fault to find with the Portland cement concrete base

adopted by the Commission for the main lines of travel and they made no criticism of that feature of the work other than that under some conditions the "cement base" might be unnecessarily expensive and a bituminous concrete base equally satisfactory.

The issue was thus narrowed to the wearing surface, which the contractors had declared in their letter should be not less than 2 inches in thickness.

The contractors admitted that 6 cents per square foot (54 cents per square yard) was as low a price as could be expected for from 1½ inches to 2 inches of bituminous wearing surface whether it be of the sheet asphalt type or of one of the variants of "bitulithic" and the Highway Engineer stated that the thin bituminous surface was costing less than 5 cents per square yard on the work under contract, so that it was clear that the wearing surface demanded by the contractors would cost more than ten times as much as the type adopted by the Commission (Commission's type, \$440 per mile; contractors' type, \$4,752 per mile).

Mileage of the Highway System.

Asked what the Commission's estimates were as to mileage of roads to be built under the bond issue of \$18,000,000 and the cost estimates for the work, the Highway Engineer presented the following tabulation:

| | | |
|--|--|-----------------|
| Trunk Lines: | | |
| 1,305 miles, requiring paving, at \$8,620----- | | \$11,249,245 00 |
| 480 miles surfaced with local materials, at \$5,944----- | | 2,852,905 00 |
| Laterals: | | |
| 785 miles at \$2,881----- | | 2,261,485 00 |
| Improved county roads, 190 miles, at 0----- | | 0 |
| Add 10 per cent for administration, surveys and engineering----- | | 1,636,364 00 |
| Total bond issue----- | | \$18,000,000 00 |
| Total mileage, 2,760 miles. | | |

The engineer explained that the figures of mileage were tolerably accurate but that the average prices per mile were rough only.

The thin wearing surface roads, on the basis of the 100 miles under contract, are costing about \$7,600 per mile, this cost being made up approximately as follows:

| | | |
|--|-------------------|---------------|
| Grading, culverts, etc., per mile----- | \$1,300 00 | 17.1 per cent |
| 4 inch concrete base, per mile----- | 5,860 00 | 77.1 per cent |
| ¾ inch bituminous wearing surface, per mile----- | 440 00 | 5.8 per cent |
| | <u>\$7,600.00</u> | |

Prohibitive Increase of Costs.

It was shown that if the thick wearing surface (1½ to 2 inches) were placed on the concrete bases the cost of these roads would be increased by \$4,312 per mile, making them cost \$11,912 or roughly \$12,000 per mile.

Thus on the basis of 1,305 miles of main trunk lines requiring paving, if surfaced as recommended by the contractors, the cost would be \$15,660,000, without considering any expenses of administration, surveys, and engineering. Adding 10 per cent for these items the 1,305 miles would cost \$17,226,000. In other words, 47 per cent of the mileage



Concrete Road, Armored Joints, No Wearing Surface, Wayne County, Mich.

required to be built under the law would consume more than 95 per cent of the whole bond issue.

The contractors agreed that the highway system could not be completed within the amount of the bond issue if their type of paving were adopted for the standard.

Experience of Eastern Road Builders.

Doubt was expressed by the contractors if the Commission type of wearing surface would have a life exceeding six months and the Highway Engineer recited the experience of the Eastern States in the use of



Concrete Base with Bituminized Top, Ann Arbor, Michigan.

bitumen and screenings for wearing surfaces on macadam and on concrete where the traffic is vastly in excess of that over the roads which the Commission is building and where the climatic conditions are far more severe than in California. He asserted that upon the Eastern precedents he estimated that the thin surfacings would last from one to three years and that in his judgment it was safe to estimate an average life of two years under California conditions. That re-treatments would not cost more than 5 cents per square yard and that on the basis of a re-treatment every two years the maintenance cost of the wearing surface would be \$220 per mile per year. He also stated that the grading, culverts, and concrete base represented more than 94 per cent of the total cost and that these features were "permanent."

Interest Charges Exceed Maintenance Costs.

The Highway Engineer called attention to the fact that the interest on the excess cost of the thicker surfacing (\$4,312 per mile) at 4 per cent per annum would nearly if not quite take care of the maintenance of the thin surface adopted by the Commission.

The Commissioners spoke in favor of the concrete base with the thin surface, dwelling upon the small percentage of the total cost represented in the wearing surface and calling attention to the fact that at any time in the future when the traffic requires a more substantial pavement, a



Concrete Road, Thin Bituminous Top, State Highway, Spencer, Mass.

thick wearing surface may be put on the present concrete base without loss.

What the Governor Said.

During the progress of the discussion the Governor paid the organization of the Highway Commission a high tribute and expressed his confidence in the efficiency and fidelity of this body. To one of the contractors he said, "Your proposition would forbid our finishing the work under the State Highways Act. In effect you ask that certain portions of the State shall be favored and certain other sections neglected."



Concrete Street, Thin Bituminous Top, Ann Arbor, Michigan.

The Governor ended the discussion by declaring that he cordially endorsed the policy of the Highway Commission in endeavoring to administer the eighteen million dollar fund equitably and fairly for all sections of the State and that it would be manifestly unjust as well as illegal to give certain sections the benefit of this fund and to tell the people of other localities to wait and take their chances on a possible second bond issue.

THE WEST SIDE COUNTIES ASSOCIATION, of which Mr. D. W. Ross of Red Bluff is President, representing Tehama, Colusa, Glenn, Yolo and Solano counties, is making an organized campaign to buy highway bonds enough to build the state highway from Davis to Red Bluff.



Map Showing Location of All Surveys Ordered; Also All Layouts Made by the California Highway Commission.

STATE HIGHWAY CONSTRUCTION SEVERELY TESTED

The Four-Inch Base is Undermined, and Yet Supports Ten-Ton Road Roller

On some one hundred miles of the California State Highway, now under contract, a concrete base composed of broken stone, sand and cement has been specified of a minimum thickness of four inches. Provision is made in the contracts that whenever it appears to the Highway Engineer that the sub-grade is not suitable the concrete base shall be increased in thickness at his discretion.

The specifications call for a rich mixture of concrete, consisting of one part of Portland cement, two and one half parts of sand and five parts of broken stone. One and three tenths barrels of cement are actually being used to each cubic yard of concrete in this work, and an unusual strength should be expected.

The question has been asked whether a concrete pavement of the type referred to has sufficient strength under traffic to successfully span possible burrows by animals, or old trenches which settle subsequent to the building of the road.

To demonstrate its strength, some crude tests were recently made on the highway leading to the north from Fresno City. The concrete at this place was thirty-five days old at the time of the tests, but no bituminous wearing surface had been applied.

Before the tests, the supporting earth was removed from under the concrete for a width of two feet and extending in four feet from the edge of the concrete. The tests were made with a so-called ten-ton Kelly-Springfield roller, which is so designed that one third of the load is on each rear wheel. The rear wheels are twenty inches wide.

In the first test the roller was run along the road, its rear wheel crossing the unsupported concrete twelve inches clear of the edge of the pavement.

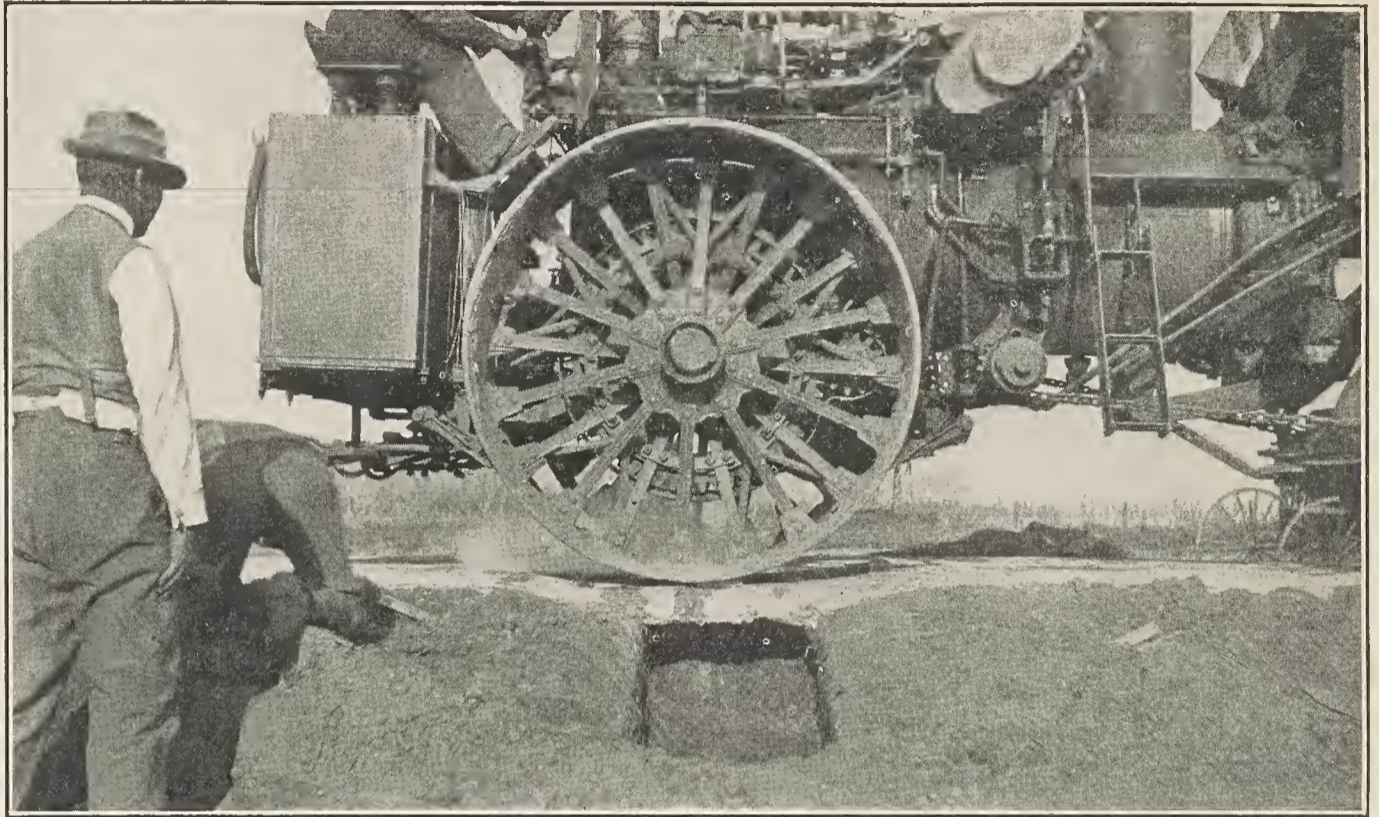
The second test was like the first, except that the wheel was but six inches clear of the edge of the pavement.

In the third test the roller was stopped and started with the rear wheel on the unsupported concrete, six inches from the edge of the pavement. There was no noticeable effect on the concrete in any of the first three tests.

In the fourth test the wheel was passed over the unsupported concrete with its side even with the edge of the pavement, and in the fifth it was made to pass over a block of wood, 2 inches by 4 inches by 8 inches, laid flat, twelve inches from the edge of the pavement and lengthwise with the road. A slight deflection was noticeable in both the fourth and fifth

tests as the roller passed over the opening, but the concrete regained its original position immediately after the passing of the roller.

Assuming that the weight on the block of wood was three and one third tons only (weight probably nearer 4 tons since the roller was supplied with water and fuel), the load in the fifth test was equivalent to



Testing Four-inch Base, State Highway.

1,666 pounds per inch of width of bearing. Looking at it another way, the concentrated load was the equivalent of a wagon with four wheels, each with 4-inch tires, carrying a load of 13 tons equally distributed over the four wheels.

The heaviest load likely to pass over the state highways is the 20-ton traction engine. Assuming that the two rear wheels carry two thirds of the weight, each wheel would carry 13,300 pounds, and if the wheels are only twenty-four inches wide, the weight per inch of bearing is 550 pounds per inch. The weight used in the tests, therefore, was more than three times as great per inch of width of tire as the heaviest load to which the pavement is likely to be subjected.

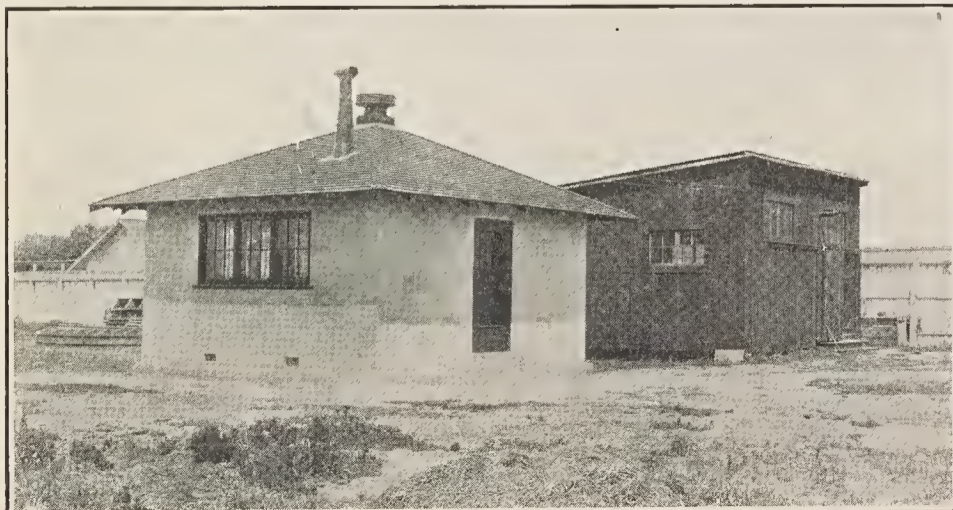
As a final test, the block of wood was moved to within six inches of the edge of the pavement, so that when the roller wheel ran up on the block it overhung the edge of the concrete by about 2 inches. In this position the combined weight and the shock due to running the roller on to the block cracked the pavement.

WORK OF THE HIGHWAY COMMISSION'S TESTING LABORATORY

All Road Building Materials Used on the State Highway are Scientifically Examined

By C. B. Osborne, Chief Geologist

The great variety of materials used in the construction of the roads being built by the California Highway Commission has made it neces-



Laboratories, State Highway Commission.

sary to install at Sacramento a laboratory equipped to test oil, asphalt, cement, rock, sand, and gravel.

Two small buildings have been built near the north end of the State Fair grounds. These are shown in the accompanying photograph. In the frame building are housed all the heavy machines for the testing of rock, sand, gravel and cement. The chemical testing and the oil and asphalt tests are carried on in the hollow tile building shown in the foreground of the photograph. This building is designed to give as far as possible proper temperature conditions for the laboratory test of oil and asphalt.

At the laboratory, tests are made to determine the material best suited for the construction and also to furnish exact data as to what material submitted passes the specifications adopted and what material has to be rejected because of failure to pass the requirements.

In the testing of Portland cement the specifications of the American Society of Civil Engineers have been adopted and the cement before being used is given a complete test for its strength both in the neat and also in a concrete mixture; for its constancy of volume in steam and water tests; and its fineness and specific gravity is also determined. The sieving test is made on samples of the sand and gravel or crushed

rock used in the concrete and in this way the proper proportions of cement, sand and rock are found to give the maximum strength. The sand is also mixed with cement in the same proportion as with Standard sand and any concrete failing to show less than 70 per cent of the strength of Standard sand concrete is rejected.

When rock is to be used for macadam or for the wearing surface on the road, a sample is taken and tested in the Duval rattler for its loss in abrasion. This is the test used by the Department of Agriculture in the office of Public Roads. In this test 50 pieces of rock weighing 5 kilograms (about 11 pounds) are placed in an iron cylinder and turned for 10,000 revolutions at the rate of 2,000 revolutions per hour. The rock falls from one end of the cylinder to the other and wears on itself and on the sides of the cylinder. If the rock loses more than 2.9 per cent in this test it fails to pass the requirements. In this way, the rock used is known to possess a high resistance to wear. The rock is also examined for any minerals that on weathering would tend to weaken the road.

The asphalt to be used is tested for its purity by the percentage solvent in CS_2 and CCl_4 and in this way can be shown whether or not the asphalt has been overheated and ruined in driving off the lighter oils. The hardness of the asphalt is determined by use of the penetration test.

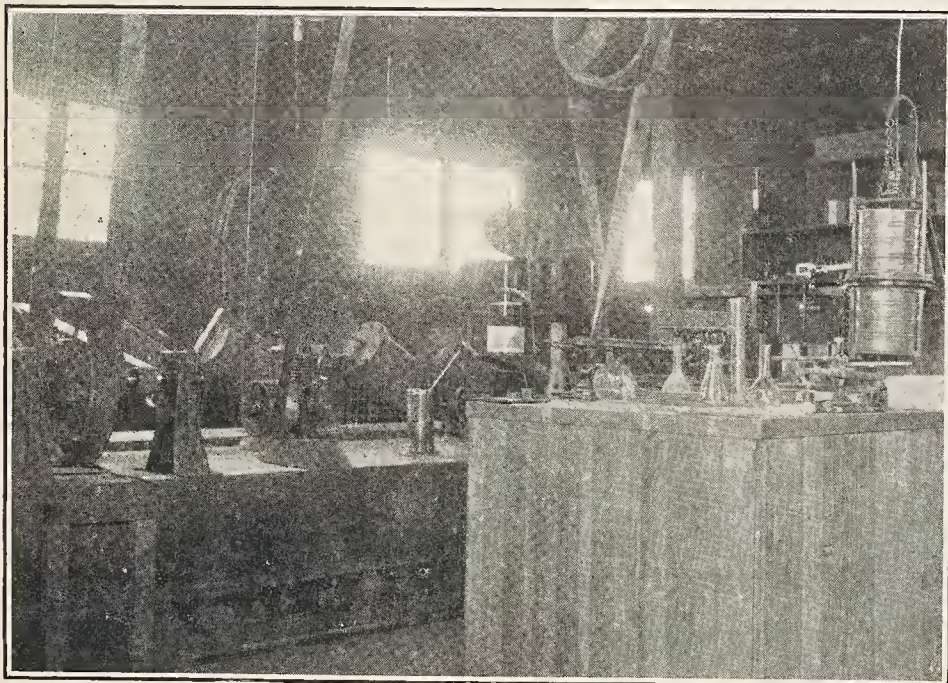
When sheet asphalt pavements are being laid samples are taken each day and tested for percentage of sand and asphalt and in this way the proper mixture to give the best result is controlled.

The purity of the road oils used is determined by the following tests: the percentage soluble in carbon bisulphide, carbon tetrachloride, and in 86° naphtha; the percentage of water, sediment, fixed carbon and ash in the road oil is found; the lighter oils are driven off in a New York Testing Oven at a temperature of 400° F. until an asphalt of 80° penetration remains and this gives the per cent of asphalt contained in the oil; the temperature of the flash point and the burning point of the oil is taken to show if the oil is a mixture of light and heavy oils and also to find the safe limits to which it can be heated for application on the road.

The oil is tested for its physical properties by the Engler viscosimeter and the Float test. These tests show the rate of flow of the oil through a cylinder of a given size at a given temperature. These tests are made according to the methods described in Bulletin No. 38 of the Office of Public Roads of the U. S. Department of Agriculture. The results are of value in showing the relative viscosity or "body" of the road oil.

The binding or sticky property of the road oils is determined by the Osborne Adhesion test.

In addition to the tests already mentioned that form the routine work of the testing laboratory special tests are made to find the value of



Commission's Testing Laboratory.

different road materials, the good and bad effects of salts, alkalies, and acids on the concrete and oil where the roads are to be built in localities presenting unusual conditions.

THE "STICKY" TEST FOR BITUMENS.

Oil has been used as a dust preventive and binder in road construction for a long period of years and has become especially important since the automobile has made necessary the use of a strong binding cement on the wearing surface of a road.

The testing of oil for road work has grown up slowly with the more

extensive use of oil in road construction and there is a very great variety of tests required by different road engineers.

There are a great many different types of viscosimeters in use to determine the "body" or viscous property of an oil at different temperatures. Those machines measure the rate at which the oil will move through an opening of a given size. The test is of value in showing the cohesive property of the oil, that is, the measure of its power to prevent a change in its shape. When an oil is very viscous it is said to have "body."



Commission's Chemical Laboratory.

Oils known to be very viscous are often sticky and some test for viscosity is often adopted to aid in getting a good binder for the roads. This test is not a sure test for a sticky oil, however, as it would be possible to get a road oil of the same viscosity as a heavy machine grease and yet while the one might have good binding properties, the other would be a lubricant of no binding value in road work. Road oils may often have "body" and yet carry a high percentage of lubricating oils. If such an oil is used it can easily be understood why the oil would fail as a binder.

A novel machine designed by Chief Geologist Osborne, which measures scientifically the comparative adhesive qualities of various oils, is in operation in the laboratory.

This adhesion test gives new information regarding road oils and promises to offer a great aid in measuring the "stickiness" or binding strength of a road oil, which is its most important property.

ACROSS THE YOLO BASIN

An extremely important link in the state highway system is the proposed road and causeway between Sacramento and Davis, in Yolo County. In going from Sacramento to San Francisco by the highway, at the present time, a circuitous route by way of Stockton must be taken, making the total length of the journey about 130 miles.

There is now no crossing across the Sacramento River north of Sacramento, except for about three months in the fall of the year, until one reaches Meridian Ferry, a point about 18 miles west of Marysville. One must travel not less than 70 miles from Sacramento to reach that ferry.

Thus communication by wagon road between the rapidly growing and prosperous sections on the west side of the Sacramento River in Yolo, Colusa, and Glenn counties, with Sacramento, the capital of the State is to all intents and purposes, cut off.

From Sacramento to Davis is about 12.8 miles, but the cost of bridging the great Yolo Basin, which receives the overflow of the Sacramento River, has heretofore prevented the construction of this important road.

During the coming year the Commission hopes to let contracts for the construction of this link. Not less than 12,000 feet of trestle work will be required and there will be much heavy grading.

The Sacramento associated banks are now considering the purchase of state highway bonds to the extent of about \$400,000 to provide the funds needed for the work.

When this link is completed, not only will the west side counties be able to reach the state capital conveniently, but the distance between Sacramento and San Francisco will be reduced from 130 to about 100 miles.

DETAILED PROGRESS REPORT OF THE STATE HIGHWAY WORK

Twenty-nine Contracts Let, Many Layouts Ready, Surveys Going Forward Rapidly

As shown by the table below, routes 9a, 10, 11 and 12, aggregating 214 miles, have been added to the state highway system since the issue of this Bulletin last October.



Concrete Mixer, State Highway, near Roseville.

This increased mileage on account of these routes, however, has been nearly offset by the reduced length of portions of the old routes as determined by the surveys, as follows:

Route 1, reduced 11 miles; route 2, 57 miles; route 3, 34 miles; route 4, 55 miles; route 5, 8 miles; route 7, 36 miles—a total reduced mileage of old routes of 201 miles.

These twelve routes are described as follows:

| | | |
|------------|---|-----------|
| Route 1. | San Francisco to Oregon line..... | 410 miles |
| Route 2. | San Francisco to San Diego via Los Angeles..... | 535 miles |
| Route 3. | Sacramento to Oregon via east side Redding..... | 310 miles |
| Route 4. | Sacramento to Los Angeles via San Joaquin Valley..... | 390 miles |
| Route 5. | Stockton to Santa Cruz via Oakland..... | 125 miles |
| Route 6. | Sacramento to Woodland Junction..... | 20 miles |
| Route 7. | Tehama to Benicia..... | 155 miles |
| Route 8. | Hopland to Vallejo via Lake County..... | 107 miles |
| Route 9. } | San Fernando to San Bernardino and Riverside..... | 105 miles |
| Route 9a } | | |
| Route 10. | Hanford to Visalia..... | 20 miles |
| Route 11. | Folsom to Placerville..... | 30 miles |
| Route 12. | San Diego to El Centro..... | 105 miles |

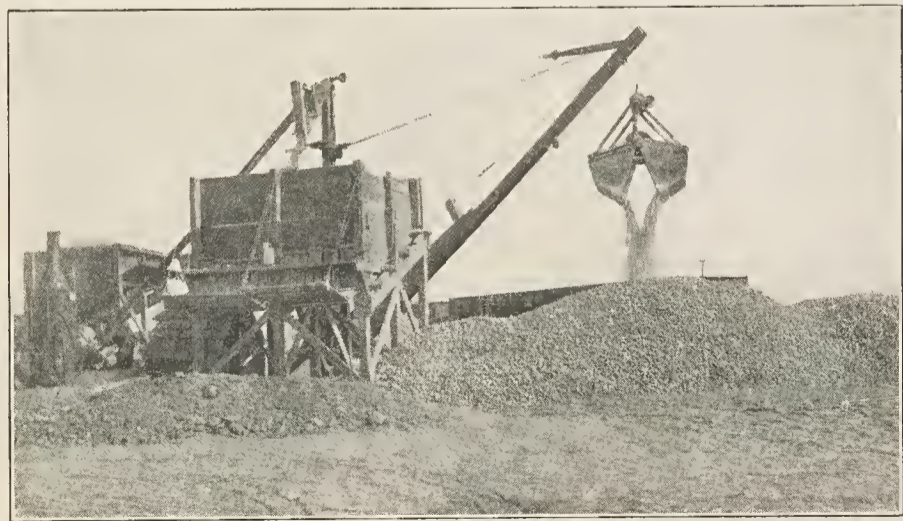
2,312 miles

To date, the number of layouts is 38, aggregating a total length of 280 miles.

The number of road contracts to date is 29 and their aggregate length is 206 miles, and their total cost will be \$1,753,748.

In engineering parlance, a "layout" is a portion of the state highway, the location of which and the plans for which have been formally approved.

These layouts, therefore, are the net result of months of field and office work. The man behind the axe, fighting his way through the brush, the man with the tape measuring base lines across creeks and along hillsides, the man behind the tripod with his note book full of



Unloading Broken Stone from Cars on State Highway near Madera.

figures and sketches, and finally the draftsman bending over his table, tracing the plans with pen in hand and a pain in the back, all perform an essential portion of the labor that produces the layout.

The accumulated layouts, therefore, which the Commission has not yet submitted to contractors are simply the depressing evidences of the fact that the work of the Commission has been clogged by the stagnant condition of the bond market.

Layout 13, 4.4 miles, Ventura County, and Layout 25, 7.3 miles, Monterey County, are dormant because there is no money to prosecute their construction.

In addition there is Layout 20, of 11.2 miles in Butte County, and Layout 24, of 6.4 miles in San Luis Obispo County. Bids for these have been received and rejected, and the work cannot be readvertised because of want of funds.

Layout 26, of 10.4 miles in San Diego County, and Layout 18, of 14.2 miles in Merced County have been submitted to contractors and bids for the same were received on November 18, 1912. On account of the lack of available funds, the Commission has not been able to award these contracts.

But this is not all. Over 200 miles of layouts in embryo are practically



Concrete Base, Bituminous Surface, State Highway, near Roseville.

worked up and can be made ready for the Commission's attention at once. They are scattered throughout a dozen counties. The only reason why they have not been offered by the Highway Engineer for approval is that there is no money on hand for the work of construction in these particular counties.

Of the 1,700 miles of surveys which the Commission has already ordered, 1,200 miles have been completed. In addition thereto, the abandoned surveys and reconnaissances aggregate several hundred miles.

Work on all contracts is going forward as rapidly as practicable. In passing, it is pertinent to note that, from the beginning, out of about two dozen contracts let, but two have been abandoned by the contractors. The Commission hopes and expects that in the future, there will be no such failures on the part of contractors.

As previously explained, the several routes are subdivided by counties, and sub-subdivided into sections which are designated by letter.

The following shows the status of work on all sections to April 1st:

ROUTE 1.

- MARIN. Secs. A and B. Surveys complete. Plans in progress.
- SONOMA. Sec. B. Laid out as a state highway September 25, 1912. Contract awarded October 22, 1912, to Richard Kcatinge & Sons. Length, 13.7 miles. Pavement, oiled concrete 15 feet wide. Probable total cost, \$109,050. Probable cost per mile, \$7,960. Per cent of contract complete March 15, 1913, 4.2 per cent. Secs. A and C surveys complete and plans in progress.
- MENDOCINO. Sec. A. Laid out as a state highway May 21, 1912. Contract awarded July 23, 1912, to the General Contracting Corporation. Length, 12.8 miles. Road to be graded 18 feet wide but not paved. Probable total cost, \$69,900. Probable cost per mile, \$5,460. Per cent of contract complete March 15, 1913, 90 per cent. Sec. C. Laid out as a state highway February 4, 1913. Contract awarded March 26, 1913, to D. L. Sawyers and C. Whited. Length, 7.6 miles. Road to be water bound macadam and gravel 15 feet wide. Probable total cost, \$55,665. Probable cost per mile, \$7,325. Sec. E. Laid out as a state highway October 22, 1912. Contract awarded February 4, 1913, to Fairbanks & Baechtel. Length, 6.9 miles. Road to be graded 18 feet wide. Probable total cost, \$32,845. Probable

cost per mile, \$4,760. Secs. B, D, and F. Surveys and plans complete. Secs. I and J. Surveys complete and plans in progress. Secs. G, H, and K. Surveys nearly complete.

HUMBOLDT. Sec. A. Survey complete and plans in progress. Secs. B, C, D, E, F, and G. Surveys begun.

ROUTE 2.

SAN MATEO. Sec. A. Survey complete. A1. Laid out as a state highway May 21, 1912. Contract awarded July 23, 1912, to F. R. Ritchie & Co. Length, 5.4 miles. Sheet asphalt 24 feet wide on concrete base. Probable cost, \$92,180. Probable cost per mile, \$17,070. Per cent of contract completed to March 15, 1913, 66 per cent. A2. Laid out as a state highway October 22, 1912. Now advertised for contract. Length, 0.2 miles. Road to be asphaltic concrete on Portland cement concrete base 24 feet wide. A3. Laid out as a state highway March 26, 1913. Now advertised for contract. Length, 1.0 miles. Road to be asphaltic concrete on Portland cement concrete base 24 feet wide. Sec. B. Surveys and plans complete. B1. Laid out as a state highway October 22, 1912. Contract awarded March 26, 1913, to S. P. Doyle. Length, 3.3 miles. Road to be asphaltic concrete on macadam base 20 feet wide. Total probable cost, \$42,980. Total cost per mile, \$13,025. B2. Laid out as a state highway March 26, 1913. Now advertised for contract. Length, 1.8 miles. Road to be asphaltic concrete on macadam base 20 feet wide.

SANTA CLARA. Secs. A and B. Survey and plans complete. A1. Laid out as a state highway July 23, 1912. Contract awarded October 22, 1912, to City Street Improvement Company. Length, 6.4 miles. Road to be asphaltic concrete on macadam 20 feet wide. Probable total cost, \$43,275. Probable cost per mile, \$6,760. A2. Laid out as a state highway July 23, 1912. Contract awarded October 22, 1912, to A. Teichert & Son. Length, 5.5 miles. Pavement, oiled concrete 20 feet wide. Probable total cost, \$47,315. Probable cost per mile, \$8,600. Per cent of contract completed to March 15, 1913, 57.7 per cent. B1. Laid out as a state highway October 22, 1912. Contract awarded March 26, 1913, to Richard Keatinge & Sons. Length, 13.0 miles. Pavement, oiled concrete 15



Motor Oil Spraying, State Highway, Los Angeles County.

feet wide. Probable total cost \$87,865. Probable cost per mile, \$6,760. B2. Laid out as a state highway March 26, 1912. Now advertised for contract. Length, 4.3 miles. Pavement, oiled concrete 15 and 20 feet wide. Sec. C. Survey complete and plans in progress.

SAN BENITO. Survey complete.

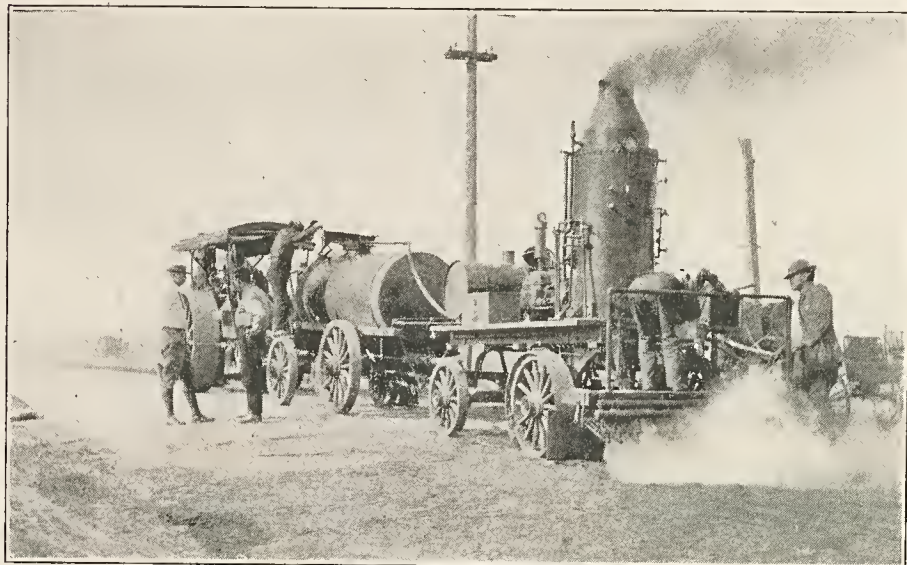
MONTEREY. Secs. B and H. Surveys and plans complete. Sec. E. Laid out as a state highway October 22, 1912. Length, 7.3 miles. Pavement, oiled concrete 15 feet wide. Secs. C, D, F, G, and I. Surveys complete. Sec. A. Survey nearly complete.

SAN LUIS OBISPO. Secs. A, C, and D. Surveys and plans complete. D1. Laid out as a state highway October 22, 1912. Bid received and rejected November 18, 1912. Length, 6.4 miles. Pavement, oiled concrete 15 feet wide. Secs. B and E. Survey complete and plans in progress. Sec. F. Survey complete.

SANTA BARBARA. Secs. B and G. Surveys and plans complete. Secs. A and F. Surveys complete and plans in progress. Secs. C, D, and E. Surveys complete. Sec. H. Survey started.

VENTURA. Sec. A. Laid out as a state highway March 26, 1913. Now advertised for contract. Length, 7.3 miles. Pavement, oiled con-

crete 15 feet wide. Sec. F. Laid out at a state highway August 27, 1912. Length, 4.4 miles. This section includes a long timber trestle which was taken over by the State. Secs. B, C, D, E, and G. Sur-



Oiling Macadam near Madera.

veys complete and plans in progress. Secs. H and I (alternate route). Surveys complete.

LOS ANGELES. Sec. A. Laid out as a state highway September 25, 1912. Contract awarded October 22, 1912, to Rogers Bros. Co. Length, 6.6 miles. Pavement, oiled concrete 15 feet wide. Probable total cost, \$50,090. Probable cost per mile, \$7,590. Per cent of contract completed to March 15, 1913, 45.8 per cent. Sec. B. Laid out as a state highway February 4, 1913. Contract awarded March 4, 1913, to John D. Marsh. Length, 10.1 miles. Pavement, oiled concrete 15 feet wide. Probable total cost, \$81,755. Probable cost per mile, \$8,095. Sec. C. Survey and plans complete.

ORANGE. Secs. A, B, C, E, and F. Surveys complete and plans in progress. Sec. D. Survey complete.

SAN DIEGO. Sec. A. Laid out as a state highway July 23, 1912. Contract awarded August 27, 1912, to M. L. Curtis & Co. Length, 8.4 miles. Oiled concrete 15 feet wide. Probable total cost, \$68,090. Probable cost per mile, \$8,105. Per cent of contract completed to March 15, 1913, 54 per cent. Sec. B. Laid out as a state highway October 22, 1912. Bids received. No award. Length, 10.3 miles. Pavement, oiled concrete 15 feet wide. Secs. C and D. Surveys and plans complete.

ROUTE 3.

SACRAMENTO. Sec. A. Laid out as a state highway August 27, 1912. Contract awarded September 25, 1912, to Burns, Clark & Da Roza. Length, 1.8 miles. Oiled concrete 15 feet wide. Probable total cost, \$13,320. Probable cost per mile, \$7,400. Per cent of contract completed March 15, 1913, 93.8 per cent.

PLACER. Sec. A. Laid out as a state highway August 27, 1912. Contract awarded September 25, 1912, to Burns, Clark & Da Roza. Length, 9.9 miles. Pavement oiled concrete 15 feet wide. Probable



Spreading Screenings for Thin Bituminous Top, State Highway.

total cost, \$83,820. Probable cost per mile, \$8,465. Per cent of contract completed March 15, 1913, 25.0 per cent. Sec. B. Surveys complete and plans in progress.

YUBA. Sec. B. Laid out as a state highway May 21, 1912. Contract awarded July 23, 1912, to F. E. Frey. Length, 9.2 miles. Oiled macadam 15 feet wide. Probable total cost, \$75,230. Probable cost per mile, \$8,175. Per cent of contract completed March 15, 1913, 66.4 per cent. Sec. A. Survey complete and plans in progress.

SUTTER. Surveys and plans complete.



Motor Spraying Machine on State Highway, Los Angeles County.

BUTTE. Sec. D. Laid out as a state highway October 22, 1912. Bids received November 18, 1912 and rejected. Length, 11.2 miles. Pavement oiled concrete 15 feet wide. Secs. A, B, C. Surveys complete.

TEHAMA. Secs. A and C. Surveys and plans complete. Sec. B. Survey nearly complete.

SHASTA. Secs. B and D. Survey complete and plans in progress. Sec. A. Survey complete. Sec. C. Survey begun.

SISKIYOU. Sec. A. Survey complete and plans in progress. Secs. B and C. Surveys begun.

ROUTE 4.

SACRAMENTO. Built by the county.

SAN JOAQUIN. Built by the county.

STANISLAUS. Sec. A. Laid out as a state highway July 23, 1912. Contract awarded August 27, 1912, to E. O. Burge. Length, 12.1 miles. Oiled concrete 15 feet wide. Probable total cost, \$84,850. Probable cost per mile, \$7,010. Per cent of contract completed March 15, 1913, 55.9 per cent. Sec. B. Laid out as a state highway March 4, 1913. Contract awarded March 26, 1913, to Considine & Bates. Length, 9.6 miles. Pavement oiled concrete 15 feet wide. Probable total cost, \$68,155. Probable cost per mile, \$7,100.

MERCED. Sec. A. Laid out as a state highway October 22, 1912. Bids received. No award. Length, 14.2 miles. Pavement oiled concrete 15 feet wide. Sec. C. Laid out as a state highway August 27, 1912. Contract awarded September 29, 1912, to the Worswick Street Paving Company. Length, 10.9 miles. Oiled concrete 15 feet wide. Probable total cost, \$84,805. Probable cost per mile, \$7,780. Per cent of contract completed to March 15, 1913, 15.9 per cent. Sec. D. Laid out as a state highway July 23, 1912. Contract awarded August 27, 1912, to the Worswick Street Paving Company. Length, 9.6 miles. Oiled concrete 15 feet wide. Probable total cost, \$74,775. Probable cost per mile, \$7,790.

MADERA. Entire county under contract. Sec. A. Laid out as a state highway July 23, 1912. Contract awarded August 27, 1912, to the Worswick Street Paving Company. Length, 9.9 miles. Oiled concrete 15 feet wide. Probable total cost, \$66,510. Probable cost per mile, \$6,720. Sec. B. Laid out as a state highway May 21, 1912. Contract awarded July 23, 1912, to Ransome Crummey Company. Length, 9.9 miles. Oiled macadam 15 feet wide. Probable total cost, \$74,255. Probable cost per mile, \$7,500. Per cent of contract complete April 1, 1913, 53.3 per cent. Sec. C. Laid out as a state highway July 23, 1912. Contract awarded August 27, 1912, to Worswick Street Paving Company. Length, 6.8 miles. Oiled concrete 15 feet wide. Probable total cost, \$46,100. Probable cost per mile, \$6,780.

FRESNO. Sec. C. Laid out as a state highway July 23, 1912. Contract awarded August 27, 1912, to the Worswick Street Paving Company. Length, 9.6 miles. Oiled concrete 15 feet wide. Probable total cost, \$62,615. Probable cost per mile, \$6,520. Per cent of contract completed to March 15, 1913, 73.4 per cent. Secs. A and B. Surveys and plans complete.

TULARE. Secs. A, B, C, and E. Surveys complete and plans in progress.

KERN. Secs. C, D, E, and F. Surveys and plans complete. Secs. A and B. Surveys complete and plans in progress.

LOS ANGELES. Secs. A, B, C, and D. Surveys complete and plans in progress.

ROUTE 5.

SAN JOAQUIN. Built by the county.

ALAMEDA. Secs. A, B, C, and D. Surveys complete.

SANTA CLARA. Sec. A. Survey complete. Sec. B. Survey complete.

SANTA CRUZ. Sec. A. Survey complete and plans in progress.

ROUTE 6.

YOLO. Sec. A. Survey nearly complete and plans in progress.

ROUTE 7.

SOLANO. Secs. C and D. Surveys complete. Sec. E. Survey in progress. Secs. A and B. Surveys not begun.

YOLO. Sec. B. Surveys complete and plans in progress. Secs. A and C. Surveys complete.

COLUSA. Secs. A, B, and C. Surveys complete.

GLENN. Secs. A, B, and C. Surveys complete.

TEHAMA. Sec. A. Survey complete.

ROUTE 8.

Surveys not begun.

ROUTE 9.

LOS ANGELES. Sec. A. Survey complete. Sec. B. Survey in progress.

SAN BERNARDINO. Secs. A, B, C, and D. Surveys complete.

ROUTE 9A.

SAN BERNARDINO. Secs. A and B. Surveys complete and plans in progress.

RIVERSIDE. Sec. A. Survey complete and plans in progress.

ROUTE 10.

TULARE. Sec. A. Survey and plans complete.

KINGS. Sec. A. Survey and plans complete.

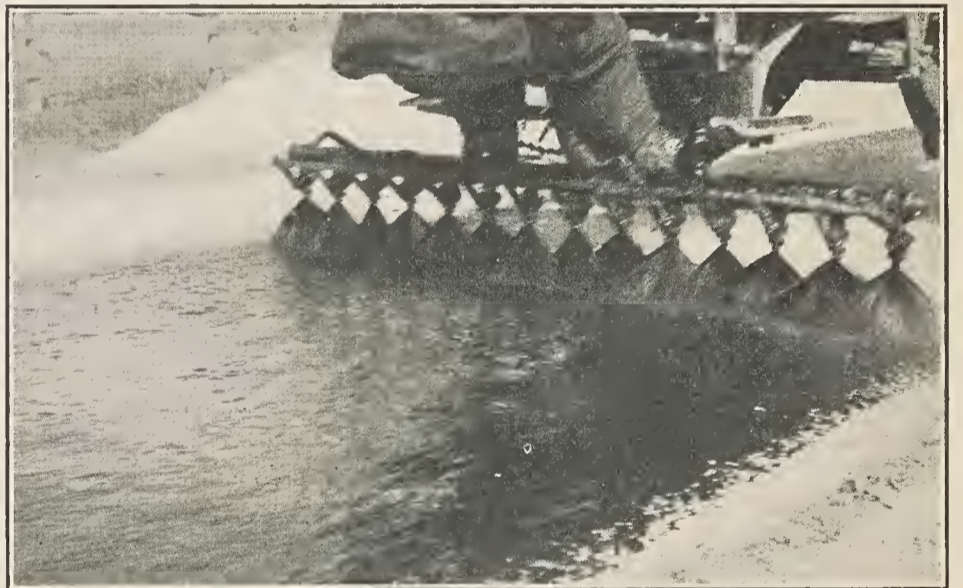
ROUTE 11.

SACRAMENTO. Sec. A. Survey complete and plans in progress.

EL DORADO. Secs. A and B. Surveys nearly complete.

ROUTE 12.

SAN DIEGO. Secs. A and B. Surveys complete. Secs. C, D, E, F, and G. Surveys in progress.



Spraying Asphaltic Oil on Concrete Base, State Highway, Los Angeles.

HOW BIG IS CALIFORNIA?

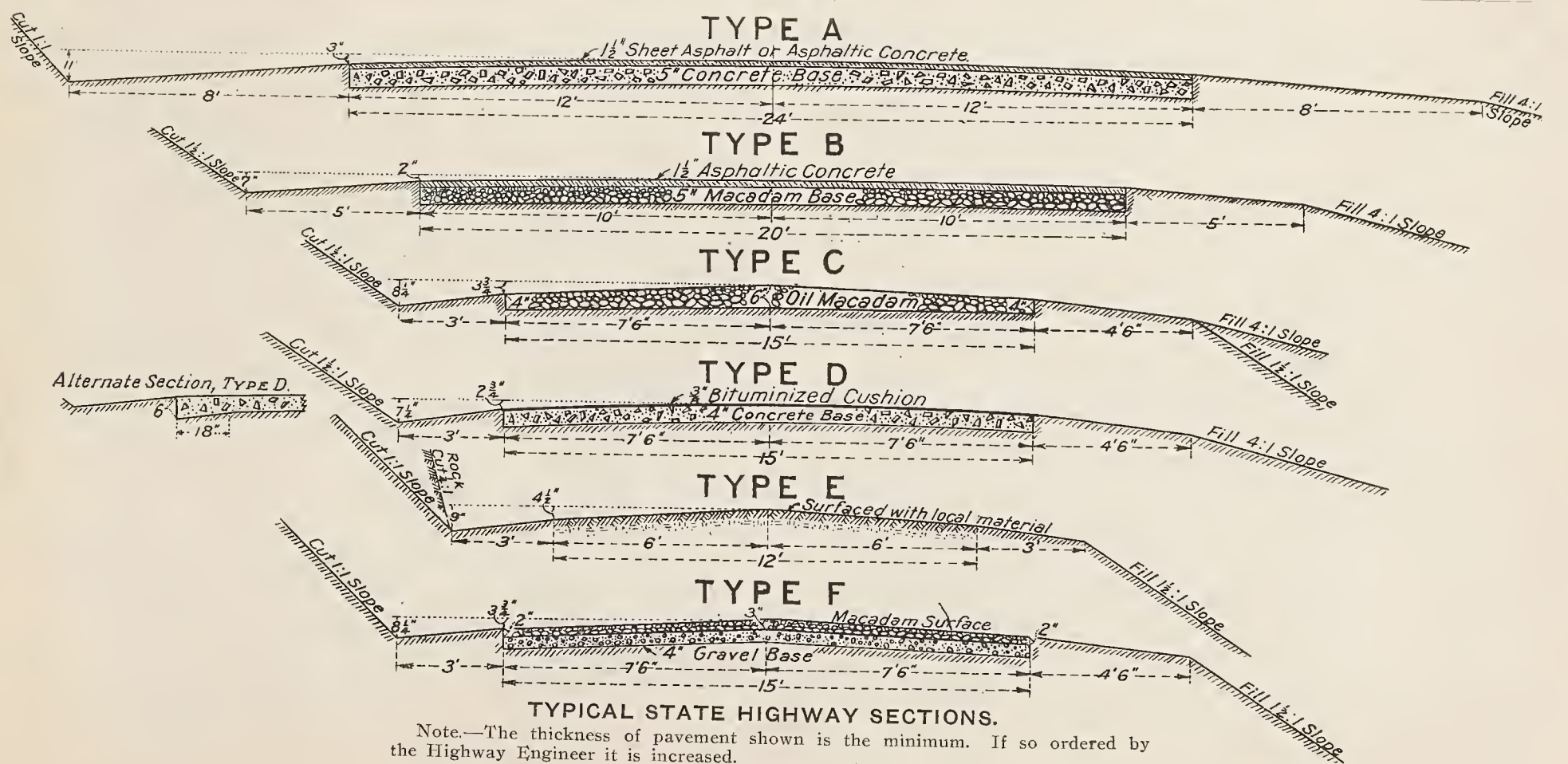
The area of this State is 158,360 square miles—an empire that exceeds by over one thousand miles the combined area of the following states: Massachusetts, 8,315; Delaware, 2,050; Maine, 33,040; New Jersey, 7,815; Connecticut, 4,990; Rhode Island, 1,250; New York, 49,170; Vermont, 9,565; Ohio, 41,060 square miles.

The total area of the United Kingdom, England, Scotland, Ireland and Wales is 121,391 square miles. Add to their territory the areas of Maine, Delaware and Rhode Island, and you are still short of the total area of California by 600 square miles.

It is the office of the California Highway Commission to conserve the state highway fund of \$18,000,000 and apply it justly and equitably under the law for the good of this giant commonwealth. In the language of Governor Johnson, "It is arbitrary and unjust to build roads in some of the counties and leave others unserved."

Table of Layouts, Showing Mileages, Types of Roads, Probable Costs, and Names of Contractors

| Layout. | Contract. | Division. | County. | Route. | Section. | Miles. | Total probable cost exclusive of engineering and overhead. | Type of pavement. | Contractor. |
|---------|-----------|-----------|-----------------|--------|----------|--------|--|---|------------------------------|
| 1 | 1 | IV | San Mateo | 2 | A1 | 5.4 | \$92,177 | 24 feet sheet asphalt on Portland cement, concrete base. | F. R. Ritchie. |
| 2 | 2 | I | Mendocino | 1 | A | 13.2 | 69,886 | 18 feet graded | General Contracting Corp. |
| 3 | 3 | VI | Madera | 4 | B | 9.9 | 74,254 | 15 feet oil macadam | Ransome-Crummey Co. |
| 4 | 4 | III | Yuba | 3 | B | 8.9 | 69,928 | 15 feet oil macadam | F. E. Frey. |
| 5 | 5 | III | Stanislaus | 4 | A | 11.1 | 77,892 | 15 feet oiled concrete | E. O. Burge. |
| 6 | 6 | VI | Merced | 4 | D | 9.6 | 74,777 | 15 feet oiled concrete | Worswick Street Paving Co. |
| 7 | 7 | VII | San Diego | 2 | A | 8.4 | 68,091 | 15 feet oiled concrete | M. L. Curtis & Co. |
| 8 | 14 | IV | Santa Clara | 2 | A1 | 6.4 | 43,274 | 20 feet asphaltic concrete on macadam base. | City Street Improvement Co. |
| | 15 | IV | Santa Clara | 2 | A2 | 5.5 | 47,338 | 20 feet oiled concrete | A. Teichert & Son. |
| 9 | 8 | VI | Fresno | 4 | C | 9.6 | 62,616 | 15 feet oiled concrete | Worswick Street Paving Co. |
| 10 | 9 | VI | Madera | 4 | A | 9.9 | 66,512 | 15 feet oiled concrete | Worswick Street Paving Co. |
| 11 | 10 | VI | Madera | 4 | C | 6.8 | 46,100 | 15 feet oiled concrete | Worswick Street Paving Co. |
| 12 | 11 | VI | Merced | 4 | C | 10.9 | 84,711 | 15 feet oiled concrete | Worswick Street Paving Co. |
| 13 | | VII | Ventura | 2 | F | 4.4 | | | |
| 14 | 12 | III | Sacramento | 3 | A | 1.8 | 13,277 | 15 feet oiled concrete | Burns, Clark & DaRoza. |
| 15 | 13 | III | Placerville | 3 | A | 9.9 | 83,600 | 15 feet oiled concrete | Burns, Clark & DaRoza. |
| 16 | 16 | IV | Sonoma | 1 | B | 13.7 | 108,761 | 15 feet oiled concrete | Rich. Keatinge & Sons. |
| 17 | 17 | VII | Los Angeles | 2 | A | 6.6 | 49,928 | 15 feet oiled concrete | Rogers Bros. Co. |
| 18 | | VI | Merced | 4 | A | 14.2 | | 15 feet oiled concrete | E. O. Burge. |
| 19 | 5 Ex. | III | Stanislaus | 4 | A | 0.7 | 4,907 | 15 feet oiled concrete | |
| 20 | | III | Butte | 3 | D | 11.2 | | 15 feet oiled concrete | |
| 21 | 29 | IV | San Mateo | 2 | A2 | 0.2 | 4,825 | 24 feet asphaltic concrete on Portland cement, concrete base. | Clark and Henery Const. Co. |
| 22 | 22 | IV | San Mateo | 2 | B1 | 3.3 | 42,980 | 20 feet asphaltic concrete on macadam base. | S. P. Doyle. |
| 23 | 23 | IV | Santa Clara | 2 | B1 | 13.0 | 87,863 | 15 feet oiled concrete | Rich. Keatinge & Sons. |
| 24 | | V | San Luis Obispo | 2 | D | 6.4 | | 15 feet oiled concrete | |
| 25 | | V | Monterey | 2 | E | 7.3 | | 15 feet oiled concrete | |
| 26 | | VII | San Diego | 2 | B | 10.4 | | 15 feet oiled concrete | |
| 27 | 20 | I | Mendocino | 1 | E | 6.9 | 52,911 | 18 feet graded | Fairbanks & Baechtel. |
| 28 | 24 | I | Mendocino | 1 | C | 7.6 | 55,651 | 15 ft. water-bound macadam, gravel | D. L. Sawyers and C. Whited. |
| 29 | 21 | VII | Los Angeles | 2 | B | 10.1 | 81,690 | 15 feet oiled concrete | John D. Marsh. |
| 30 | 25 | III | Stanislaus | 4 | B | 9.6 | 68,154 | 15 feet oiled concrete | Considine & Bates. |
| 31 | 5 Ex. | III | Stanislaus | 4 | A | 0.3 | 2,049 | 15 feet oiled concrete | E. O. Burge. |
| 32 | 4 Ex. | III | Yuba | 3 | B | 0.3 | 5,302 | 15 feet oiled macadam | F. E. Frey. |
| 33 | 26 | IV | San Mateo | 2 | A3 | 1.0 | 20,415 | 24 feet asphaltic concrete on Portland cement concrete base. | Flinn and Treacy. |
| 34 | 27 | IV | San Mateo | 2 | B2 | 1.8 | 20,215 | 20 feet asphaltic concrete on macadam base. | Raisch Improvement Co. |
| 35 | 28 | IV | Santa Clara | 2 | B2 | 4.3 | 34,235 | 15 feet oiled concrete | Richard Keatinge & Sons. |
| 36 | | VII | Ventura | 2 | A | 7.3 | | 20 feet oiled concrete | |
| 37 | | IV | Santa Clara | 2 | A3 | 1.2 | | 15 feet oiled concrete | |
| 38 | | VII | Los Angeles | 2 | C | 11.3 | | 15 feet oiled concrete | |



THE MAINTENANCE PROBLEM

(Written for this Bulletin by President Benjamin Ide Wheeler, University of California)

In planning a system of roads I should say the first thing was to plan for keeping those roads in repair. It is no great trick to build roads. The great anxiety must concern their upkeep. I do not see that this has been heretofore in California very much considered. It is pitiful to see the miles of roadway which are going steadily and rapidly into decadence. A fine macadamized road that is degenerating into ripples and bogs is a lure and a deceit. Now is the time to think out the problems connected with road repair. We are planning to open hundreds of miles of road. The initial expense is very slight as compared with the capitalized cost of annual upkeep and repair. It is useless to say that the roads will be so thoroughly constructed that repair will be inconsiderable. We



Ready for Concrete, State Highway, near Fresno.

know that that is not so. The excellent roads of France, Germany and England—and those of England now are the best—are maintained by patient, consistent, and continuous work at repairing. Whenever a slight depression shows itself on the surface of a road—a depression sufficient to accumulate moisture—it is immediately attacked and cut out like the beginnings of a cancer. One can not afford to wait; such a rotten spot grows with its own growth and then with the natural rebound of the vehicle starts other like rotten spots agrowing. It is useless to think of treating these cases by sweeping mechanical means. It is work that must be done in detail and by hand. Heretofore we have viewed the task only in its grosser forms because we have waited for the trouble to become serious before we have attacked it. If we are to have really good highways our work of repair must become much more minute than heretofore. I close where I began. The problem of road building is a problem of repairing.

THE COUNTIES WILL BUILD THEM

Probably every proposed route for the state highway that has been urged upon the Commission is a needed public thoroughfare, and if not now open and improved will in no distant day be constructed.

As to those three or four routes which have been made the subject of the greatest contention, it is a matter of common knowledge in the various localities where these proposed routes are located that their construction has practically already been determined upon by the interested counties themselves, in the event they are not adopted by the Highway Commission.

It may, therefore, be expected that in the near future, possibly before the state highway itself is completed through these particular districts, that these roads, such as the so-called Riverside-Watsonville, the Hanford-Visalia-Porterville and the Tehachapi routes will be in course of construction. So be it.

Madera's State Highway

Madera Tribune, April 10, 1913.

The work on the state highway is progressing with great rapidity, and the work being done insures a good and lasting road. The crew has crossed the river and has commenced the work of grading the hill on this side. The road from Herndon in to Fresno is a perfect drive, and that will be the condition of the great highway when completed.

PROGRESSIVE CALIFORNIA COUNTIES

Many counties are moving in the matter of systematically and permanently improving their local highway systems and joining them to the State's trunk roads.

The following counties in the amounts mentioned contemplate voting bonds for this purpose as soon as practicable: San Bernardino, \$1,500,000; Fresno, \$2,000,000; Tulare, \$1,500,000; Santa Cruz, \$1,000,000; Kern, \$2,500,000; Sacramento, \$2,000,000; Humboldt, \$1,300,000; Nevada, \$350,000; Solano, \$1,000,000; Madera, \$600,000; Trinity, \$100,000; Riverside, \$1,500,000.

These amounts in the aggregate exceed \$15,000,000.

Orange County recently voted bonds in the sum of \$1,270,000 and as elsewhere stated San Mateo County has incurred an indebtedness of \$1,250,000 for the same purpose.

Similar movements are in progress in Santa Barbara, Ventura, Merced, Marin and Sonoma counties.

A Beautiful Boulevard

Ukiah Democrat, April 4, 1913.

HOPLAND, April 3.—A large road roller arrived for the Highway Commission Wednesday to be used in putting the new road in condition between here and Sonoma County. This roller is one of the latest improved self propelling type, power being furnished by a gasoline motor. The weight of the machine is thirteen tons equipped for the road. The new road soon to be completed by the State is a splendid piece of work. Might properly be called a boulevard, rising gradually out of Sanel Valley until it commands a beautiful view of the picturesque country surrounding, with Russian River nearly always in sight; and the best part of it is, one does not need to keep the eye continually on the road ahead to avoid striking ruts, bumps or running into the bank.

Sausalito Shows the Way.

April 14th, Sausalito, by a vote of 658 to 177, voted for municipal bonds in the sum of \$100,000, for the purposes of building an asphalt pavement, beginning at the Fort Baker Reservation, around the water front, via the ferry to the northern limits of the town, connecting there with the state highway. The event was celebrated with bonfires, bells, horns, parades and oratory.

"A wave of civic pride," as the press dispatches describe it, was started by this successful campaign for the good road cause.

Other cities in Marin County, Corte Madera, Larkspur, Ross, San



Placing Concrete Base, State Highway, Los Angeles County.

Anselmo, San Rafael, and Novato, are all possessed of the same spirit of enthusiasm over the prospects of the building of the state highway in Marin County, as surveyed by this Commission.

Fiscal Agency Too Long Delayed

State Treasurer Roberts is of the opinion that the establishment of a fiscal agency by the State in the east has been too long delayed; and he confidently expects, unless the money market goes from bad to worse, to be able to float large blocks of harbor and highway bonds through the medium of the State's proposed New York fiscal agency.

STORY OF THE REBUILDING OF HISTORIC EL CAMINO REAL

Modern Road Making Methods Graphically Described by the Engineer in Charge

By A. E. Loder, Division Engineer, Division No. IV

El Camino Real of the Padres, traversing the picturesque coast of California from San Francisco to Los Angeles and beyond to San Diego, will for the most part be rejuvenated and transformed (except in name) into Route 2 of the state highways system and should become one of the most interesting and frequented lines of travel for visitors to the Golden State during 1915. This highway connects with Mission street of the Exposition City and passes through the counties of San Mateo and Santa Clara, where it bears the historic names of the Mission Road and the Monterey Road.

Beginning of the Work.

The first work of construction on this route was begun near its northerly terminus in San Mateo County on the section lying between South



Raking Asphalt Surface, State Highway, San Mateo County.

San Francisco and Burlingame. In San Mateo and Santa Clara counties four additional contracts are now under way, four others have been awarded, and one is being advertised. According to present plans, this highway should be completely paved from San Francisco to Sargent at the southerly extremity of Santa Clara County by the end of 1913.

The contractor in charge of this first stretch of construction began the work late last season. Many embarrassing delays ensued, due to the financial troubles of the contractor and to his lack of system, and the surety company on his contract was compelled, upon the demand of the Commission, to take over the work and place it in the hands of a second contracting firm. The work is now progressing as satisfactorily as the weather permits.

Type of Construction.

The type of construction on this first contract and some of its features which are not in common use in the construction of interurban roads, may be of interest.

The roadway is graded to a width of 40 feet, with a maximum gradient of 4 per cent, conforming with the rolling contour of the country. Long, easy, vertical curves connect all changes of grade, producing a pleasing profile. Flat curves are used at every deflection in the line.

The pavement is 24 feet in width and has a crown of 4 inches. Earth shoulders containing gravel and old macadam extend to a width of 8 feet along each side of the pavement with a cross slope of $1\frac{1}{4}$ inches per foot.

The pavement rests upon a thoroughly compacted sub-grade composed of old macadam and a sand-clay mixture resembling hardpan, which after rolling is in such condition that it is not damaged when the gravel and sand are hauled and dumped directly upon it without the use of planking, and it remains so compact that no dirt is picked up with the sand when loading it into the mixer.

Timber headers 2 inches by 6 inches, nailed to stakes, line the pavement trench and are laid to a line flush with the finished surface. These protect the edges of the pavement while the shoulders are being settled by traffic, and provide a means by which the pavement may be readily brought to a true and uniform surface.

The pavement consists of a 5-inch concrete base composed of a 1:3:6

mixture, to which is bonded a standard sheet asphalt surface one inch in thickness.

How the Concrete is Mixed.

The concrete is prepared in a portable mixer to a rather wet consistency and is delivered directly to its place in the pavement by means of a swinging spout. The laitance or silt-like film which forms on the surface of the concrete, not being so strong in texture as the concrete itself, would probably weaken any bond with surfacing material placed over it. To remedy this, the surface is given a rough finish, suitable for binding bituminous material, by sweeping across the line of pavement with a stiff house broom or warehouse broom before the concrete reaches its final set. The new concrete is watered daily, except in rainy or damp, cloudy weather, until about five days old.

The asphalt wearing surface being laid on this job is shown on the daily test sheets to be as near the standard grading and composition as is possible to obtain. Nothing unusual is noted in connection with its use, except that a greater density is obtained after rolling the one-inch sheet than is possible with a thicker city surface, and consequently better wearing qualities and more stability should be expected.

The most unusual features of this construction are the thin asphaltic coat used as a binder and the asphalt surface which is thinner than that usually laid upon city work.

Asphalt Surfaces in Cities.

City street asphalt surfaces are usually laid from $1\frac{1}{2}$ to 2 inches thick, with an intermediate binder course of broken stone held together with asphaltic cement and more or less sand. However, the records of several leading cities throughout the country show that in years past, as well as at the present time, standard sheet asphalt as thin as $1\frac{1}{2}$ inches has been laid without a binder, the results being satisfactory wherever a reasonably well graded asphalt was used.

An asphalt pavement of the usual standard city construction, or an asphalt concrete pavement, would be much to be desired on interurban or country highways if its expense could be provided for. In the present case economy and shortage of available funds demanded that a cheaper form of construction be used, while at the same time the traffic conditions called for a pavement substantially as durable as the more expensive types. This resulted in the character of road described, which, so far as completed and tested, promises to give satisfaction.

Applying the Paint Binder.

When the concrete is dry and at least one week old, it is thoroughly swept, removing the dust of traffic passing at the side of road. The



Rolling Asphalt Surface, State Highway, San Mateo County, Near Lomita Park.

binder coat above mentioned is then applied. This coat consists of one part by volume of melted asphaltic cement, of the consistency used in the pavement, to two parts by volume of engine distillate. The asphaltic cement is heated in a small portable kettle to a temperature between 200 and 325 degrees. A measured quantity is removed to the spreading

pail a safe distance from the fire and allowed to cool to about 250 degrees. The distillate is then added and stirred for about one minute, when it is found to be thoroughly uniform and the temperature is reduced by at least 100 degrees. The distillate can be added when the asphalt is at a temperature of 325 degrees, but at this temperature it is accompanied by considerable boiling and is somewhat dangerous.

Poured Hot from Buckets.

The binder liquor, while hot, is poured over the concrete from buckets, and uniformly swept over the surface with stiff house brooms until



Spreading Asphalt Paint Coat, State Highway, San Mateo County.

every particle of surface is coated with a thin film and all excess is swept from holes or depressions in the concrete. The paint binder penetrates deeper into the concrete when permitted to flow in a thin wave ahead of the first sweeping. A second sweeping after a few minutes removes excess from depressions and spreads it uniformly over the concrete. The thinnest possible application of paint should be used so that after evaporation, which is complete in from one and one half to two hours, the surface should have a glossy black appearance. If too small a quantity is used, or if the percentage of asphaltic cement to distillate is considerably less than above, a brown surface will result, which will not make a successful bond with the asphalt surface.

Cost of Applying the Binder.

Two men can easily mix and apply this asphaltic coat on 12,000 square feet per day. On 69,000 square feet, where the proportions were being varied somewhat, it was found that 100 square feet required 0.856 gallon of engine distillate and 3.5 pounds of asphaltic cement. The total cost on above area, including 15 per cent on labor, was \$0.0018 per square foot of surface. The economy in using this type of binder is apparent when it is considered that the old style of binder used on city work costs from 3 to 4 cents per square foot while the paint binder costs less than one fourth cent per square foot.

It is found that no inconvenience is caused to the work of laying asphalt by the placing of the asphaltic coat. After one hour's time it does not stick to the wheels of motor trucks or wagons. It is not desirable to so cover the concrete farther ahead of the asphalt work than is required for the distillate to evaporate and leave the binder hard.

Effect of Rains on Exposed Paint Binder.

In one case, several days' rain which fell on paint freshly applied caused the asphaltic coat to appear loosened from the concrete in many places. After two days' dry weather, however, it seemed to bond again to the concrete so that it could not be removed. It is believed that the paint binder will tend to waterproof the asphalt surface, preventing damage to its under side from moisture which may rise through the concrete.

If the asphaltic coat is allowed to accumulate in any quantity in a depression such as a heel mark, its location is soon apparent after the placing of asphalt since excess asphaltic cement appears on the surface during rolling. With reasonable sweeping, however, no trouble of this kind has been experienced.

There is a marked difference in the behavior of hot asphaltic mixture under the roller where the paint binder has been used and where it has been omitted. Where concrete has been painted, the asphalt does not move or welt up in front of the roller to any appreciable extent, as is noted when rolling asphalt on plain concrete.

It is found that the asphaltic cement, while dissolved in the distillate, penetrates into the surface of the concrete to a distance of from one tenth to one eighth of an inch, and in some cases even further. Samples of the surface removed show the concrete adhering uniformly to the

asphaltic surface. When removing the sample the concrete is fractured and a layer of solid concrete is removed carrying the first layer of finer gravel. When trimming a joint to begin a new day's work, the surface of the concrete base is always broken off in removing the thin edge of asphalt which has been cut from the finished work.

An Experimental Demonstration.

For experimental purposes, a few hundred feet of the surface has been placed without the use of the paint binder. As expected, no bond is secured except that of a mechanical nature, due to the roughness of the concrete. Notwithstanding the surface remains in first class condition after one month of heavy traffic, and it is believed that good results will be obtained under wear without the use of a binder of any kind. However the use of this binder at so small an additional cost will improve the pavement and prolong its life to such an extent that it will more than justify its expense.

While the asphaltic binder is not altogether a new idea, it is a new method on highway work. The history of its use elsewhere indicates that no injurious results are to be expected and that it offers a means whereby a wearing surface may be securely bonded to concrete with less thickness of asphalt and consequently less expense than heretofore, especially on work which is not called upon to meet city traffic conditions. The low cost of applying the coat, even on a small scale, also shows that it is available as a cheap and sure method of bonding a very thin mastic wearing surface to a concrete roadway.

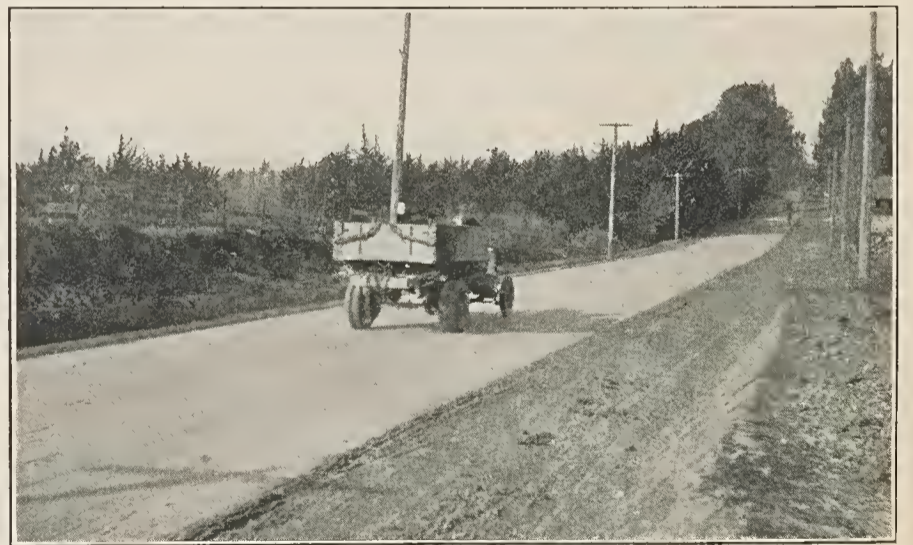
The Glenn County Stony Creek Bridge

The bridge to be constructed over Stony Creek, near Orland, in Glenn County, on the route of the state highway, will be one of the largest concrete highway bridges in the United States. The plans and specifications for this bridge were adopted as the result of a competitive examination, and were prepared by Daniel Luten.

These plans provide for a structure twelve hundred feet long composed of thirteen monolithic concrete arches, varying in length of span from seventy to one hundred feet. It will have a twenty-four foot clear roadway composed of a concrete base with a two-inch asphalt wearing surface.

The concrete foundations are carried, approximately, twenty-five feet below the bed of the stream, at which depth thirty foot piles will be driven as a further support. The bridge is designed to carry a uniform load of one hundred and fifty pounds per square foot over the entire floor surface, and a concentrated load of a twenty-four ton road roller. However, the bridge, considering the factor of safety, is designed to carry four times these loads.

It is to be built well above high water, but the designer states that in case of a flood it would stand the test of being entirely submerged. Mr.



Finished State Highway, Lomita Park, San Mateo County.

Luten states that over two thousand concrete bridges of the same design were in the recent Ohio and Indiana floods, and although three thousand bridges were destroyed, not a bridge of this type was seriously injured.

While strength and permanence are essential features in the design of the Stony Creek bridge, the artistic elements are not forgotten. The long, graceful curves of the arches will be surmounted by an ornamental concrete railing in harmony with the balance of the structure.

It is estimated that this structure complete will cost \$145,000. Construction work will begin in May, 1913, and it is expected that the bridge will be ready for traffic by December of this year. The Ross Construction Company of Sacramento prepared the plans.

SECURING RIGHTS OF WAY FOR THE STATE ROADS

County Boards of Supervisors Give Effective Assistance, and Land Owners are Generally Liberal

By C. C. Carleton, Attorney

The Attorney General of the State is the chief legal adviser of the Commission.

Hon. U. S. Webb, present incumbent, was Attorney General of California at the time the measure was prepared providing for the issuance of \$18,000,000 of bonds, for the acquisition, construction, and maintenance of a system of state highways, and the people of the State are greatly indebted to him for his care in putting the bill in proper legal form.

Since the adoption of the "State Highways Act" by the people at the general election of 1910, the Attorney General has rendered many important opinions relating to the proper conduct of the work of

It is confidently anticipated that this method of handling rights of way by the counties will result in the saving of tens of thousands of dollars to the taxpayers of the State.

The land owners in all sections, as a general rule, have been very generous and public spirited in donating the rights of way requested from them by the county representatives. A belligerent or unreasonable land owner soon discovers himself very unpopular in his own community. The money compensation thus far paid by the counties for rights of way has been an almost negligible sum compared with the amount of land acquired. As yet very few condemnation proceedings have been necessary. But the acquisition of rights of way is a slow matter even when the land owners are liberally inclined. A vast amount of work must be done. Records must be searched to ascertain the record owners of the land affected; owners must be interviewed or corresponded with; sketches and maps must be furnished to many owners delineating the rights of way desired; minor adjustments of lines and fences must be settled; vacation proceedings arranged and prepared abandoning the old roads or portions of road over property so as to leave no incumbrance on the same when the new road is located and built; co-owners must consult among themselves before executing the deeds of easement; ownerships involved in probate proceedings or title litigation must be searched and a good title to the new highways acquired out of the confusion.

The attorney of the Commission since entering upon the discharge of his duties has investigated and reported upon land and highway titles in all portions of the State, attended meetings of boards of super-

visors in many counties to discuss ways and means for the prompt acquisition of rights of way, and supervised all the right of way activities of the state and county officers and employees.

In conclusion, it may be stated that the rapidity with which the state highways are laid out and completed will very greatly depend upon the attitude assumed by property holders, and it is to be hoped that all owners will truly appreciate the value of the proposed state highways to their lands and communities, and will be ready and willing to donate the easements solicited, and thereby materially contribute toward the ultimate success of the state highway work in California.



An Ocean View from State Highway near Arroyo Honda, Santa Barbara County.

acquiring and constructing the state highway system, and such opinions have been the guides for the officers entrusted by law with the duty of accomplishing the purposes of the bonding act.

The Attorney General and his assistants have greatly facilitated the work of the Commission by prompt and able attention to all matters submitted to them.

Attorney.

Among the technical assistants deemed necessary by the Commission was an attorney qualified by experience in highway law who should devote his entire time to routine matters of a legal nature continually arising during the progress of the highway work, and who should direct all right of way activities.

Consequently, the approval of the Governor and the Attorney General first having been obtained, an attorney, who had been engaged in a similar capacity by a county highway commission, was chosen attorney of the commission, and since November, 1911, has given all of his time to the performance of his duties.

All forms of contracts, bonds, leases, deeds, resolutions, and other legal writings of the Commission are prepared in this department. The legal sufficiency of contracts, conveyances of rights of way, and titles to highways and lands, is determined. The principal function of the legal department, however, is the acquisition of necessary rights of way in a legal and orderly manner.

Rights of Way.

Ordinarily, in the forwarding of "good roads movements," the promoters do not consider the seriousness of the right of way problems. Too often the public spiritedness of all land owners is taken for granted, and when money is provided and actual work commenced, it is discovered that land owners do not intend to donate necessary rights of way, but demand fancy figures for the realty affected. The Commission, however, has from the beginning realized the importance of acquiring rights of way promptly and systematically.

The counties of the State, acting through their boards of supervisors, have almost unanimously promised to provide free rights of way for the state highway system, realizing that their officials and citizens can acquire the necessary rights of way easily and inexpensively.

The Commission, as a rule, withholds the adoption of a layout until the right of way has been acquired by the county authorities. Local influence usually induces recalcitrant or indifferent land owners to come to terms.



Saving the Trees, State Highway near Roseville, Placer County.

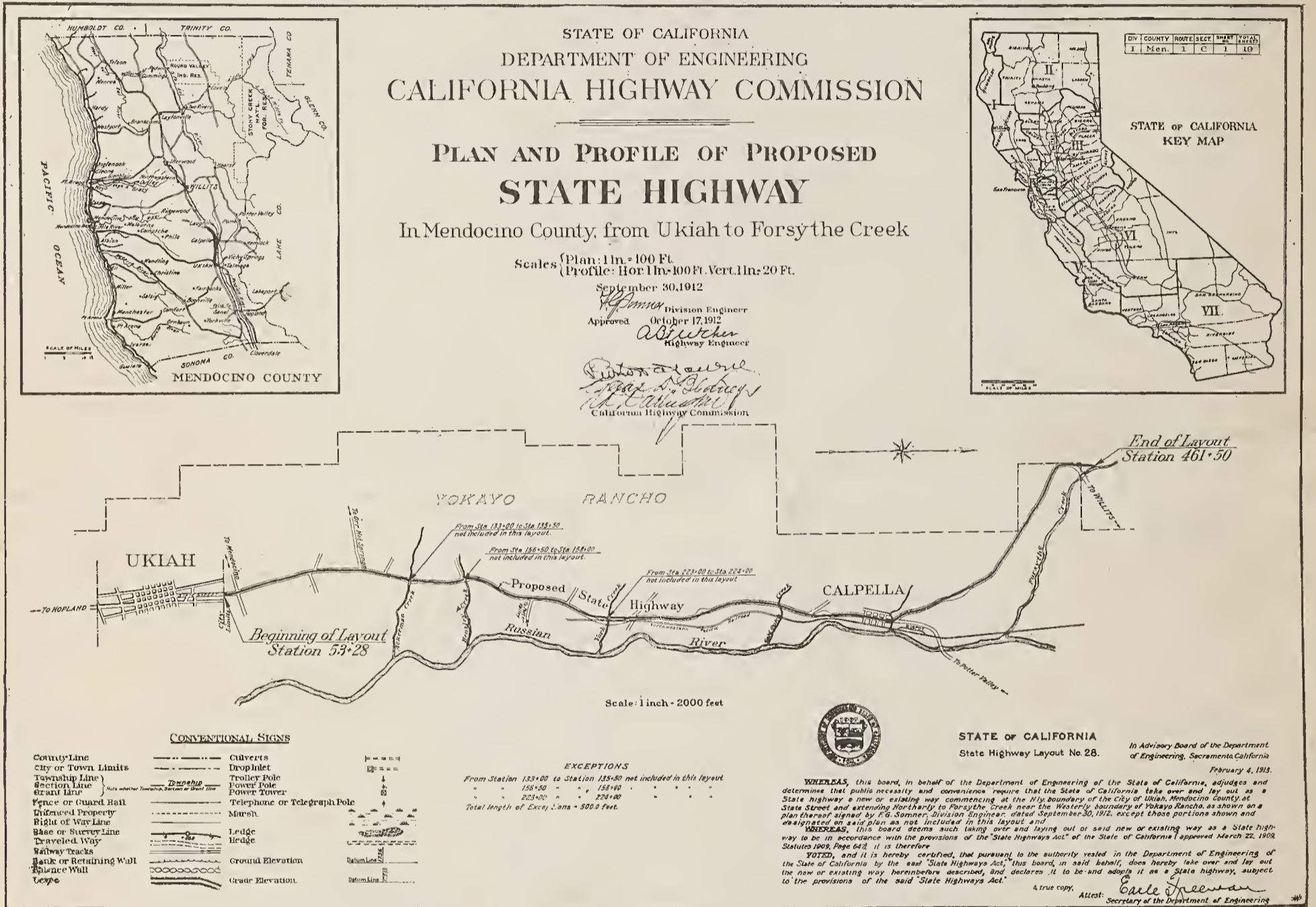
Roller Skating on the State Highway

Press dispatches report that "skating rinks in San Mateo County are doomed to a natural death, judging from the avidity with which the young folk of the peninsula towns have taken up the fad of utilizing the new state highway for roller recreation. Moonlight skating parties are quite the common thing on the new smooth surface of El Camino Real. A party of young people from South San Francisco skated six miles to Easton one evening, built a big bonfire and served coffee and cake."

Plotting the Plans and Profiles for Layouts for the State Highway

The plan is plotted from left to right, to a scale of 100 feet = 1 inch, the base line being laid by latitude and departure as obtained from the field traverse notes. Only the base line and the data relating thereto are inked. The profile is plotted below the plan and to scales of 100 feet = 1 inch horizontally and 20 feet = 1 inch vertically. The cross-sections are plotted to a scale of 5 feet = 1 inch, generally in two columns running up the sheet. After the alignment and grade have been tentatively fixed on the plan and profile, and have been transferred to the cross-sections by means of celluloid templates, the cut and fill areas on the cross-sections are measured with a planimeter and converted into cubic yards. The grade is then altered as may be necessary to give a proper balance of quantities in each one thousand feet of road.

The layout plans are made on sheets of tracing cloth twenty inches wide and thirty inches long, a binding margin being retained on the left. The first sheet of each set carries the title, a finder map of the State and one of the county, a small scale plan of the entire road, a table of conventional signs, and a certificate of layout. The last sheet is a sheet of standard structures and typical sections, and the intermediate sheets are of plan and profile, one half mile per sheet, traced from the brown paper plan. In order to maintain a uniform appearance, "zinco" engravings have been made of so much of the title and structure sheets as is common to all plans, and the sheets are printed from them. The balance, which must be done by hand, is filled in in the headquarters drafting room. Following is a typical title sheet of these plans:



San Joaquin County's Traffic Census

In its report for the period from July 1, 1912, to January 1, 1913, the Highway Maintenance Department of San Joaquin County shows some interesting data on the volume of traffic over the newly improved roads of that county.

The tabulation shows that the daily averages per observer's station were as follows:

| | Per cent. | Per cent. |
|--------------------|-----------|-----------|
| Horsedrawn: | | |
| Light vehicles | 87.7 | 36.0 |
| Heavy vehicles | 44.2 | 18.2 |
| Total horse drawn | 131.9 | 54.2 |
| Motors: | | |
| Runabouts | 19.5 | 8.0 |
| Touring cars | 66.9 | 27.5 |
| Motor cycles | 23.5 | 9.7 |
| Motor trucks | 1.5 | 0.6 |
| Total motors | 111.4 | 45.8 |
| Total all kinds | 243.3 | 100.0 |

The traffic census was taken for a period of seven days from August 26, 1912, to September 1, 1912, inclusive, and on each day the count of vehicles began at seven o'clock in the morning and lasted until seven in the evening. All vehicles, except bicycles, were counted.

In the tabulation "light vehicle" means a buggy, cart, buckboard, carryall, spring wagon or any vehicle other than a motor drawn vehicle, which is usually driven for pleasure or light business purposes. By "heavy vehicle" is meant a farm, milk, hay or grain or truck wagon, dray, grocery wagon, or any other vehicle, except a motor vehicle, usually carrying heavy loads.

The report states: "With this large amount of motor drawn vehicles passing over our highways, it would be impossible to maintain the same to any degree of efficiency were it not for the fact that the majority of all of these roads have all been constructed of oil macadam, or asphalt macadam with the bituminized wearing surface. The effect of the automobiles on this wearing surface has been beneficial, rather than detrimental, except in cases where the vehicles travel at so great a rate of speed that in turning out, the edges of the pavement are ruined. The action of the automobile tires upon the bituminized wearing surface has not been injurious to the pavement."