

California Department of Engineering Highway Commission

CALIFORNIA HIGHWAY BULLETIN

Volume I

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CALIFORNIA HIGHWAY BULLETIN

PUBLISHED BI-MONTHLY BY THE
CALIFORNIA HIGHWAY COMMISSION

OF THE

Department of Engineering

State of California

BURTON A. TOWNE, CHAS. D. BLANEY, N. D. DARLINGTON
Commissioners

AUSTIN B. FLETCHER, Highway Engineer

W. R. ELLIS, Secretary

Forum Building, Sacramento, California

DIVISION ENGINEERS—OFFICE ADDRESSES:

Division I.	F. G. SOMNER,	Willits, Mercantile Building
Division II.	T. A. BEDFORD,	Redding, C. R. Briggs Building
Division III.	W. S. CARUTHERS,	Sacramento, Forum Building
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Division VI.	J. B. WOODSON,	Fresno, Forsyth Building
Division VII.	W. L. CLARK,	Los Angeles, Union Oil Building

THE GOOD ROAD BUILDER FIRST SURVEYS THE ROUTE;
HE STARTS FROM SOMEWHERE TO GO SOMEWHERE;
HE SHOWS HOW IT IS DONE;
HE MAKES TRAVELING EASIER FOR OTHERS.

A FOREWORD

Widespread interest in the state highway undertaking calls for the publication from time to time of a report from the California Highway Commission. Therefore, this Bulletin.

It is a state document. Its purpose is to present authoritative reviews of the work accomplished and forecasts of the plans proposed by the Commission under the State Highways Act of 1909.

The Commission plans to issue the Bulletin every two months. Copies will be mailed regularly upon application to those interested.

Freight and Material Contracts

In its endeavor to make the \$18,000,000 build as many miles of highway as practicable and do good work, the California Highway Commission has undertaken:

First—To obtain from the different railroad companies a schedule of freight rates on road materials, substantially reducing the schedule of published tariffs.

Second—To secure from the cement dealers an agreement to make a wholesale price to the state for the required cement below the going market rate for that commodity.

Third—To contract to reduce rates with owners of rock quarries and gravel deposits for the delivery of large quantities of broken stone and gravel, these materials to be shipped as required during the life of the work.

Already the Commission has arrived at an understanding with the transportation companies under which there will accrue to the state a saving of hundreds of thousands of dollars in the hauling of the road materials by rail.

A substantial reduction in the price of cement has been offered, but the figures are not as close as the Commission expects yet to obtain from the cement producers.

Reductions on nearly half a million tons of broken stone and gravel have been agreed upon in contracts now being executed with quarry owners, the price obtained by the Commission being at least 25 per cent per ton lower than the going rates.

In purchasing the materials directly, the Commission believes that many contractors, who by reason of limited capital or credit are not ordinarily able to finance large construction works, will be enabled to undertake successfully the state highway contracts.

The Commission does not consider that in the interest of the people the contract work should be controlled by a limited coterie of opulent contracting firms. There is plenty of room on the state highway for large and small, and without crowding.

The quality of materials may be better controlled by the State furnishing them, and the burden of the inspection of the work is lightened, since the engineers will need attend to the working processes only.

With materials furnished to him, the contractor is not tempted to "scamp" on either quality or measurement.

To insure that proper materials are supplied, a laboratory suitably equipped with apparatus and in charge of a testing engineer has been established. Elsewhere in this Bulletin, the laboratory and its activities are described.

Questionable Paving Patents

The position of the California Highway Commission is that if there are any royalties to be paid for the use of any pavement or pavement processes in the construction of the state highway, the State will assume the responsibility, if the courts shall determine that the use of such pavements or processes is subject to claims for royalties under valid patents, and if the State by such use has committed a tort for which it is liable.

The policy of the United States Patent Office, in issuing letters of patents for road types and processes so freely and with so little apparent discrimination, has resulted in much confusion. These patents are so numerous and conflicting in their claims that neither the contractors nor the engineers are ever sure of doing their work unharassed by claims of alleged patentees.

The immediate result of this turmoil and uncertainty is that the people in many instances pay more than is right for their roads and streets. In self-defense, the contractor must bid sufficiently high so as to protect himself against embarrassment if he is called upon to defend himself against claims for royalties, even if he believes that the work for which proposals are asked does not infringe upon any valid patent.

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 Commission is of the opinion that if royalties must be paid, it will show better in the final analysis if such royalties are paid directly from the public treasury.

County Highway Work

That the state highway undertaking has aroused public interest in good roads throughout the State of California, is evidenced by the activities of various counties in preparing to permanently improve their respective county highway systems and connect them with the state's trunk roads.

Credit is particularly due to Sacramento, Los Angeles, San Diego and San Joaquin counties for having "pioneered" in independent efforts to substantially improve their public roads. In September, 1907, Sacramento voted bonds in the sum of \$825,000 for good road purposes; \$600,000 to cover the construction of one hundred and four miles of highways and \$225,000 for building bridges. About the same time, Los Angeles voted \$3,500,000 for like purposes. On March 16, 1908, San Joaquin followed suit by bonding itself for \$1,890,000 for good roads, and on August 3, 1909, San Diego pledged her credit in the sum of \$1,250,000 to permanently improve her highway system.

Ventura County has already expended the most of its \$250,000 of bonds for bridges, and has recently constructed by direct taxation a bridge over Ventura River at Ventura at a cost of \$50,000.

San Benito County this year has bonded itself for \$300,000 for county roads.

The latter part of 1911, Glenn County voted \$290,000 for concrete bridges and \$160,000 for highway improvements.

Among the counties that are now energetically agitating for the public improvement of their highways and are preparing to move aggressively in the matter are Orange, Santa Barbara, Yuba, Sonoma, Solano, Siskiyou, San Mateo, Amador, Stanislaus, Riverside, Butte, Tulare, and Humboldt.

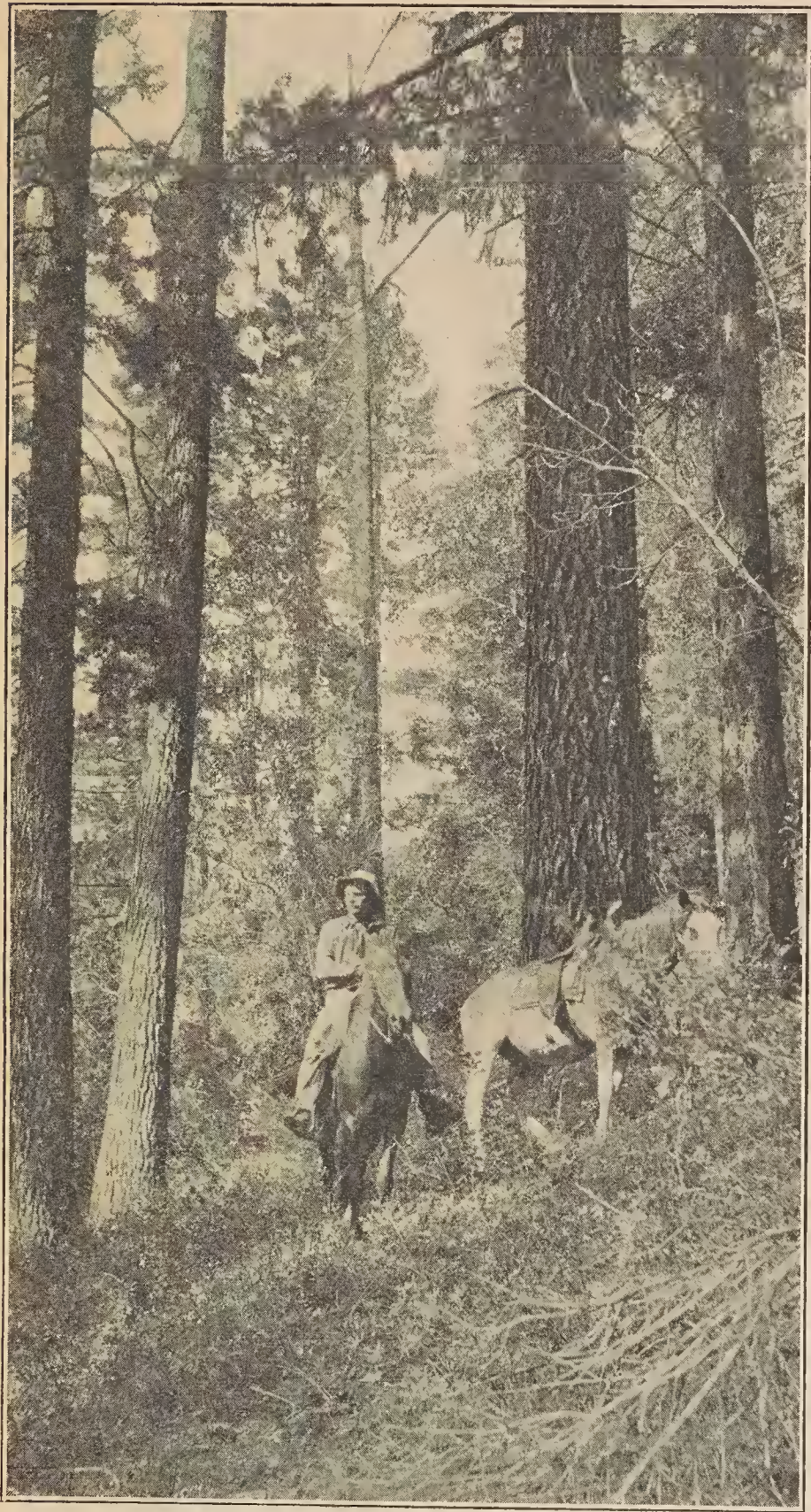
Among the counties which report doing considerable road improvement work by direct taxation and which can show excellent results are Trinity, Tehama, Sutter, Santa Clara, Napa, Imperial, Contra Costa, and Mono.

Del Norte County reports that the Supervisors are setting aside yearly 35 per cent of the general road fund for permanent road work. Last year they purchased a steam road roller, rock crushing plant and dump wagons at a cost of about \$6,500, to assist in the work of road building.

From present indications, it may safely be prophesied that contemporaneously with the expenditure of the \$18,000,000 voted by the State for highways, the various counties will in the aggregate spend \$18,000,000 more in improving their tributary systems.

SAVE THE NATIVE TREES ALONG THE HIGHWAY

Let the Standing Timber on all Rights of Way Go to the State Forever



In the Tall Timber of Humboldt County. Reconnoitering for the State Highway.

At the September session of the California Highway Commission, the following resolution was adopted:

Voted, That it be the policy of the Commission that standing timber on rights of way of state highways in the forest districts of the State be preserved, and that rights of way be acquired with the standing timber thereon, and that landowners be encouraged to leave timber uncut for a considerable distance on both sides of state highways in order to enhance the scenic beauty and attractiveness through wooded portions of California.

It is pertinent in this connection to make public the following letter addressed by the Commission last April to the Board of Supervisors of Del Norte County:

April 27, 1912.

MR. E. E. COMMERFORD, *Chairman,*

Board of Supervisors Del Norte County, Crescent City, California.

MY DEAR SIR: Referring to your letter of April 10th, addressed to the California Highway Commission, which I acknowledged on April 26th, I am directed by the Commissioners to address you again, particularly with reference to the suggestion which you offered that, "if the State in accepting rights of way for the state highway would leave the ownership of the standing timber in the right of way in the present owners, the matter can be easily adjusted by the county and the owners of the land," etc.

These Commissioners are endeavoring to take the broad and farseeing view in routing the great highway, and to keep uppermost in mind the welfare of the State in all of its large and enduring aspects.

They have traveled thousands of miles throughout the length and breadth of the State and have been greatly gratified and encouraged to learn that intelligent public sentiment everywhere is cordially in favor of constructing this State highway in a manner that will not only best serve the State industrially and commercially but which will contribute most to the development of the State in opening up now inaccessible sections of the commonwealth and revealing to the world its grand natural beauties and resources.

In furtherance of this public spirited purpose, the people of a number of sections, notably in Humboldt and Santa Barbara, have given this Commission their enthusiastic assurance that wherever the State highway may be routed in these counties through native forests, they will endeavor not only to guarantee that the standing timber upon the rights of way acquired shall go to the State but that the timber on each side of said rights of way to a distance of one hundred feet shall also be dedicated to the public and preserved for the perpetual beautification of the state highway.

It is the purpose of this Commission in routing the state highway through forest lands to allow it to follow where necessary a winding course, thus avoiding as far as possible the destruction of native trees.

The people of Del Norte County surely appreciate that the state highway is worth every effort they can put forth not only to bring it to them but to make it what it ought to be, famous the world over for its scenic beauty.

Your people, naturally enough, have grown so familiar with your magnificent forests and mountain grandeur that you fail to appreciate this value. It is hoped, however, that your honorable Board of Supervisors will readily understand the spirit and intent of the Commission in urging you to fall in line with other sections of the State in the matter of seeing to it that not only the standing timber is left on all rights of way that your county may guarantee for the purposes of the highway but that the timber on both sides of the right of way, to a liberal distance, shall also be saved for all time for the enjoyment of all the people and the honor of Del Norte.

Hoping to hear from you further in regard to this important matter.

Very respectfully,

THE CALIFORNIA HIGHWAY COMMISSION,

W. R. ELLIS, Secretary.

The Commission believes that the various boards of supervisors, civic societies and the press throughout the State will cordially coöperate with it in encouraging this stand for the preservation of native trees of California along the state highway.

Bridges, Trestles and Culverts

At its last regular session, the Commission adopted minimum requirements for all new bridges, trestles and culverts, which do not carry street railways, built for the state highways, as follows:

(a) All such structures are to be designed by competent engineers and the plans, specifications and workmanship be subject to the inspection and approval of the Highway Engineer of the Department of Engineering.

(b) The width of such structures, exclusive of sidewalks, if any, shall be not less than 21 feet in the clear.

(c) Concrete bridges shall be designed to sustain, in addition to the dead load, a uniform live load of 150 pounds per square foot of roadway and the floor system to carry a 20-ton traction engine.

(d) Steel bridges of span less than 150 feet shall be designed to sustain, in addition to the dead load, a uniform live load of 100

pounds per square foot of roadway and the floor system to carry a 15-ton road roller; for spans in excess of 150 feet a uniform live load of 85 pounds per square foot of roadway, the floor system to carry a 15-ton road roller as in the case of spans of less than 150 feet.

(e) Trestles shall be designed to sustain, in addition to the dead load, a uniform live load of 150 pounds per square foot of roadway, and the floor system to carry a 15-ton road roller.

Further, that the Commission hereby declares itself in favor of concrete structures whenever such structures are consistently possible because of their substantial permanency.

THE CAREFULLY prepared paper by Highway Engineer A. B. Fletcher, which was read at the State Convention of Supervisors in Bakersfield last May, is left over to appear in the next Bulletin. It is a valuable contribution to good roads literature.

ROUTING THE CALIFORNIA STATE HIGHWAY

The Attorney General Confirms the Commission's Position

The great problem that confronted the California Highway Commission at the beginning was the interpretation of the meaning of the State Highways Act of 1909, as to the routing of the highway. It was found even with the aid of good lawyers that it was not an easy matter to construe the meaning of that act. Aside from the legal difficulties, there were two divergent and irreconcilable policies that were urged upon the Commission in locating the highway.

The situation compelled the Commission to take either one or the other horn of this dilemma. Either they must route the main highway by "the most direct and practicable route" in the language of the highways act, ignoring county lines and local interests to the end that the State as a whole should be best served, or in response to appeals from various counties, they must proceed to lay out this great highway in a series of county links, each link to be rather a part of and to serve the functions of a county system and to satisfy local travel.

There was in the beginning a popular notion, held even by county officials, that the eighteen million dollar highway fund was an immense grab bag, into which each county had an independent right to dip its hands for the money with which to construct public roads within its own jurisdiction, in accordance with its own ideas of what was expedient and best for itself.

It is an old axiom that the test of any law or rule is its universal application.

While making their preliminary tours over the State, during which they covered over six thousand miles up and down our great valleys and through the mountain districts, the Highway Commissioners had an opportunity to meet the people of the various sections of the State and to personally discuss with representative bodies the question of highway routes. The Commissioners at every opportunity thus offered, laid the matter before the people. The popular response was all but unanimous in declaring that it was the business of the California Highway Commission to lay out the great trunk lines of the state highway by the shortest and most feasible routes.

It was seen at once by the people themselves that if each county were permitted to dictate how the state highway should run through their particular section, it would be "as crooked as a ram's horn." It would be lengthened by hundreds of miles and its cost thereby proportionately

increased. At the same time its value as a great thoroughfare, contributing to ready and convenient intercommunication between the widely separated portions of the State, would be greatly impaired.

If, for instance, in Butte County, the main highway were diverted to the county seat, Oroville, and then zigzagged back to make connections, and this were permitted to be the plan pursued in routing the state highway in other counties, Butte County people, in traveling through Tehama and Shasta to Siskiyou or through Yuba and Placer to Sacramento would find themselves covering perhaps double the mileage that would be necessary if the highway were routed by the "most direct and practicable route."

Therefore, the people of Butte County, including the ambitious citizens of their thriving county seat, Oroville, united in declaring that Oroville waived all claim to be upon the main highway, and that Butte County would accept and be satisfied with any route of the main highway selected by the Commission through their county which would best serve the purpose of the State at large.

County after county, speaking through their Boards of Supervisors, likewise assured this Commission that as soon as it had in its discretion fixed the location of the main highway through their several counties, they would proceed at once to lay out and construct permanent county systems of roads to connect with and complete the Commission's highway scheme.

Just as naturally as a great river, like the Mississippi, flows down the trough of the valley, draining into the sea and inviting its tributaries to feed their volume into it, or as a great transcontinental railroad by the economic laws of traffic and engineering is necessarily constructed by the most direct and practicable routes, depending upon its tributary lines from both sides to complete its system, so naturally and inevitably it would seem that, in laying out a great state highway, directness should be recognized as the first and foremost requirement, in order that it may be serviceable as the main artery of a great highway system.

So interpreting the spirit and intent of the highways act, and so viewing in its large State-wide aspects the state highway problem, and upon the recommendation of the Highway Engineer, the California Highway Commission proceeded to fix the routes and commence active construction work.



Rincon Road Causeway, Ventura County. Built by Popular Subscription at Cost of over \$32,000. To be Finished by California Highway Commission.

When Tulare and Kings counties were reached, however, a difficult situation presented itself. North of these counties, Fresno County extends from the Coast Range to the Sierra Nevada Mountains; south of them Kern likewise lies across the trough of the San Joaquin Valley. No difficulty had been encountered in finding the short cut, either across Fresno or Kern County, but on account of the fact that Kings lies duly west of Tulare and that the dividing line between them is somewhere near the trough of the valley, and from the further fact that Hanford, the county seat of Kings County, lies about twenty miles almost duly west of Visalia, the county seat of Tulare, it is apparent that it was physically impossible to route the main highway by a practical direct line out of Fresno County through Hanford, then easterly through Visalia and then southerly to Bakersfield.

After the most deliberate and painstaking investigation of the situation, the Commission and the Highway Engineer agreed that the only practical solution to the situation was to continue the main highway in direct line from Fresno to Kern, passing between Hanford on the west and Visalia on the east, and constructing laterals to connect each with the main highway; and it was so ordered.

The people of these two communities were disappointed at the prospects of being left off of the main highway. Through State Senator Larkin of Tulare County, the matter was brought to the attention of his Excellency, Hon. Hiram W. Johnson, Governor, who referred the questions raised by the contentions of the Hanford-Visalia people to Attorney General U. S. Webb.

The issues thus raised are of vital importance as affecting the present work in hand and the future policy that shall govern the Advisory Board of the Engineering Department, of which the California Highway Commission is an executive committee. It is pertinent, therefore, to publish in full the letter of the Governor to the Attorney General with the opinion as delivered by the latter officer to the Governor.

Viewing the questions raised by the Governor's letter from a purely legal standpoint, the Attorney General gives a clear cut and unequivocal definition of the meaning of the law, and which in all respects sustains the position taken by the California Highway Commission in the matter of selecting routes for the state highway.

The Attorney General's Opinion

STATE OF CALIFORNIA.

OFFICE OF ATTORNEY GENERAL.

SAN FRANCISCO, August 22, 1912.

HON. HIRAM W. JOHNSON,

Governor of California, Sacramento.

DEAR SIR: I am in receipt of your communication of July 2, 1912, reading as follows:

By what is termed the "State Highway Act," that is, the act wherein the \$18,000,000 bonds were voted by the people, it is provided as follows:

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

Recently some difference has arisen as to the construction of the language used. This difference has occurred in reference to the route proposed to be laid out from Fresno to Bakersfield. The people of Hanford and Visalia insist that legally these two county seats must be upon the route or routes of the state highways. Some have desired a direct highway to be run from Fresno to Bakersfield which would traverse practically the same route as the railroad tracks now traverse and which would not pass through either Hanford or Visalia, and the people of the latter two places argue that such a route, even though Hanford and Visalia might be connected by laterals with it, would not comply with the law and the provisions quoted, they insisting that it is mandatory that these county seats be connected as part of the route or routes of the state highways. Would you kindly give me your construction of the matter?

Another matter that has caused some difficulty is the construction of the words "centers of population." It is insisted that on the one hand that this means the larger centers of population such as San Francisco, Los Angeles, Sacramento, Stockton and Fresno, and on the other hand that it refers to centers of population in the vicinity of the route even though such centers in comparison with the cities mentioned may be of small consequence in numbers. Would you please give me your construction of the meaning of the phrase?

Would you also advise me whether in your opinion, the law contemplates that the county seats of Del Norte and Siskiyou be connected with the state line joining Oregon on the north and the county seats of Imperial and San Diego be connected with the state line joining Mexico on the south?

You will observe that the phraseology is used "by the most direct and practicable routes," and immediately afterward the clause "connecting the county seats of the several counties through which it passes," and then following are these words "and joining the centers of population together with such branch roads as may be necessary," etc. Would you advise me whether this should be construed to mean that directness of route must be at all hazards observed or whether the joinings of "centers of population" is a desideratum?

In reply, permit me to say that the language of the "State Highway Act," approved March 22, 1909 (Stats. 1909, p. 647), so far as it relates

to your questions, is ambiguous. Section 1 of that act provides, in part, as follows:

A system of state highways in and for the State of California shall be constructed and acquired as and in the manner provided by law by the Department of Engineering of said State at a cost not to exceed eighteen million dollars.

Section 4 of that act, covering the matter before us, provides, in part, as follows:

The moneys placed in the state highway fund, pursuant to the provisions of this section, shall be used exclusively for the acquisition of rights of way for and the acquisition and construction of said system of state highways. The route or routes of said state highways shall be selected by the Department of Engineering and said route shall be so selected and said highways so laid out and constructed or acquired as to constitute a continuous and connected state highway system running north and south through the state, traversing the Sacramento and San Joaquin valleys and along the Pacific coast by the most direct and practicable routes, connecting the county seats of the several counties through which it passes and joining the centers of population, together with such branch roads as may be necessary to connect therewith the several county seats lying east and west of such state highways.

THE STATUTE DOES NOT FIX THE ROUTE.

Of course, it is to be understood that it is not within my province to designate particularly any route or routes to be followed or the county seats or centers of population which shall have a situs upon any highway constructed. The geographical route of the state highway is not specifically confined by the statute to particular localities or places. The statute by its terms seems to contemplate only the indication of a general direction—from north to south—of the project. It would be an actual reduction to an absurdity to say that the statute, because of its terms, located and fixed a highway along a particular course, especially when one considers the topography of our State.

LEFT TO THE DEPARTMENT OF ENGINEERING.

These matters are, by the act, to be determined by the Department of Engineering. Any legal construction of the act, in such matters, can only be for the purpose of determining from a legal standpoint what the Legislature contemplated by the act which they have passed in so far as it bears upon the questions which you have asked me.

TWO MAIN HIGHWAYS CONTEMPLATED.

After considerable study, I am of the opinion that that statute contemplates a state highway system, comprising two main highways, each running in a general north and south direction throughout the State, and connected by branch roads with such county seats of the several counties as are not upon the main lines.

It will be noted that the Department of Engineering is to select the "route or routes of said state highways," and, again, "state highways" are to be so laid out as to constitute a continuous and connected "state highway system."

BY THE MOST DIRECT AND PRACTICABLE ROUTE.

In indicating the general direction in which the system shall run, it is stated as "running north and south through the State, traversing the Sacramento and San Joaquin valleys and along the Pacific coast by the most direct and practicable route." Now, it would, of course, be impossible for one highway to run north and south through the State, traversing both those valleys and also run along the Pacific coast. The most that could be done under that construction would be to run the highway from the most southerly point touched in the San Joaquin Valley westerly to the Pacific coast, and then south. But clearly that is not the route that was contemplated.

ALONG THE PACIFIC COAST.

Seemingly, by the expression "and along the Pacific coast," it was contemplated that there would be two routes, one running in a general direction north and south through the State, traversing the two main valleys mentioned, and the other in the same general direction north and south through the State, but traversing that region lying along the Pacific coast. Each of these two routes was to constitute a main highway, and was to be laid out by the most direct and practicable route.

CONNECTING THE COUNTY SEATS.

In the expression "Connecting the county seats of the several counties through which it passes," we have an intimation that it was not contemplated that the respective main highways were to connect upon the main line the county seats of all the counties. Had that been the intention, the act would have probably read: "connecting the county seats of all the counties," but that would have been impossible if the road was to run north and south by the most direct and practicable route. And that it was contemplated that there would be some county seats which would not be upon the main highways is shown by the last paragraph in the section of the statute quoted, which reads: "together with such branch roads as may be necessary to connect therewith the several county seats lying east and west of such state highway."

WHERE THE STATUTE IS MANDATORY.

I consider that the main purpose of the statute was to create a state highway system, running north and south through the State, as a means of communication for the entire State, in order that the people of the north might be in touch with the people of the south and the denizens of all the country between be brought in contact. And, for this reason, I consider that portion of the statute which provides for the construction of such highways in such manner as to "constitute a continuous

and connected state highway system running north and south through the State, traversing the Sacramento and San Joaquin valleys and along the Pacific coast by the most direct and practicable routes," as the portion of the statute which we are to treat as mandatory, and for the purpose of effecting the object displayed we must treat the balance of the statute as subordinate thereto.

JOINING CENTERS OF POPULATION.

In other words, our main idea of the highway in considering the routes should be that it is to run north and south by the most direct and practicable routes. And, with this idea in view, the connecting of the county seats of the several roads through which the highway passes and the joining of centers of population are but the incidents to the main idea of north and south direction by the most direct and practicable route.

SPECIFIC ANSWERS TO THE GOVERNOR'S QUESTIONS.

With this conception of the general intendments of the statute, I shall endeavor to answer the questions propounded by you in your communication.

1. With reference to your first question, permit me to say that it is evident that the main highway which shall traverse both the large interior valleys cannot pass through both Hanford and Visalia and at the same time comply with the mandate that it shall *run north and*

trend merely for the purpose of connecting with it the county seat of that county.

CONNECTING COUNTY SEATS BY LATERALS.

Presumably, it was contemplated that in locating the highway there would be occasions when the highway must necessarily be routed in a way which would not permit of connecting it directly with one or more county seats, and, therefore, with that thought in mind, it was provided that there should be "such branch roads as may be necessary to connect therewith the several county seats lying east and west of such state highway."

WITHIN DISCRETION OF ENGINEERING DEPARTMENT.

Therefore, in answer to your first question, I am of the opinion that the Department of Engineering may, in the exercise of its discretion, route the main highway, which I may term the valley highway, in such way that it will run either between Hanford and Visalia, connecting them with it by laterals, or through either one of those two county seats, connecting the other therewith by laterals, according as to which route that department considers the most direct and practicable route north and south through that portion of the State.

AS TO CENTERS OF POPULATION.

2. With respect to your second question, as to the construction of the words "centers of population," permit me to say that I do not believe that it was intended to limit that term to the large centers of population



Three Miles of California State Highway Near Marysville, Yuba County, Ready for Surfacing.

south by the most direct and practicable route. Although it is evident that the Department of Engineering, in compliance with the main purpose of the act, may, in the exercise of its discretion, run that main highway through one of those two county seats, yet there is nothing in the act which makes it obligatory that either of those two places should be upon the line of that main highway. In the exercise of its discretion, in laying out such highway and keeping the required north and south trend by the most direct and practicable route, the Department of Engineering may find it best to run that highway from some point north of those two places through one of them or deflect it from both.

COUNTY SEATS NOT NECESSARILY ON THE MAIN HIGHWAY.

It is true that the act reads "connecting the county seats of the several counties through which it passes and joining the centers of population," and, from this, it might be argued that it was thereby intended that through whatever county the road ran, the county seat of that county must be within its path. This, however, would not be always practicable, for the main highway in the pursuit of a direct route might but touch or traverse one corner of a county at a point which would be some distance east or west of the county seat of that county; and it would then be in disregard of the mandate of the statute if the highway was then deflected to any considerable extent from its north and south

such as you have mentioned. The term is used in connection with the term "county seats of the several counties" so that apparently it was intended thereby to cover places other than those which, as county seats, might also be in their respective counties, centers of population; that is to say, places which though not county seats were of considerable importance and centers of population in their respective counties.

MERELY DESCRIPTIVE AND ILLUSTRATIVE.

That term "joining the centers of population" was, in my opinion, intended merely as descriptive of the general purpose of the highway system, illustrative in a measure of the object which the Department of Engineering should have in view in routing the highway. The sense in which the term is used, or the extent to which it shall be carried, is not stated in the statute, but seemingly it must be left as a fact to be determined from existing conditions by the Department of Engineering.

THE DEPARTMENT MUST DETERMINE THE FACT.

Therefore, if in routing such highway by the most direct and practicable route through some county, a place in that county, of such magnitude in the sound judgment of the Department of Engineering as to be treated as a center of population thereof to be served by such highway, lay within its general path, then the Department of Engineering

in running such highway, if it determines for itself that such place is such center of population to be so served, may, in the exercise of its discretion, so run such highway, bring it in touch and join it with other centers of population lying along such highway system.

"CENTERS" MAY BE LEFT OFF ALTOGETHER.

It is likewise possible that there may be centers of population lying off from the main highway, but these, in so far as they are not county seats, must either come in touch with the highway system by reason of their being situated upon the laterals connecting the county seats with the main highway, or else if not so situated, they can be no part of the system under the present statute.

NEED NOT BUILD TO ADJACENT STATE LINES.

3. With respect to your third question, as to connecting the county seats of Del Norte and Siskiyou with the state line on the north and the county seats of Imperial and San Diego with the state line on the south, permit me to say that I find nothing in the statute which requires such connections to be made. In so far as there may be centers of population, within the meaning of that term as hereinbefore suggested, lying within the path of said main highways, north of said two northern county seats or south of said two southern county seats, it is within the power of said Department of Engineering to extend said main highways beyond said county seats to said centers of population, but there is nothing in the statute which requires such extensions to be made if the sole object of such extensions is to reach the state lines on the north and the south.

LATERALS FOR COUNTY SEATS ONLY.

4. With respect to your fourth question, permit me to call your attention to the punctuation of the statute which is different from the punc-

tuation of the statute as you have quoted it in your letter. In the statute there is a comma after the word "population," and the clause "joining the centers of population" is coupled by the word "and" with that which immediately precedes it with reference to connecting the county seats of the several counties. The balance of the paragraph seemingly stands alone and as it reads requires the construction of such branch roads as may be necessary to connect with the highway system the several county seats lying east and west of that main highway that is nearest, of course by the most direct and practicable routes, to such county seats.

THE MAIN DESIDERATUM.

The answer to your fourth question will be found in what I have said in the forepart of this opinion in discussing the general scope of the act, and in what I have said in my answer to your third question. But to repeat the same, let me say again that in my opinion the main desideratum is a general highway system, the routes of which shall be most direct and practicable, and that it should be the aim of the Department of Engineering in determining such route or routes of such system, when it shall have determined the most direct and practicable route, to run the highway in such manner that without sacrificing directness and practicability of routes the county seats of the several counties through which it passes may be connected and the centers of population joined, and that, when in so running the highway by a direct and practicable route that aim cannot be accomplished, there shall then be constructed such branch roads as may be necessary to connect with such highway the several county seats lying east and west of such highway and nearest thereto by the most direct and practicable routes.

Very truly yours,

U. S. WEBB, Attorney General,
By ROBERT W. HARRISON, Deputy.



Building the State Highway Near Burlingame, San Mateo County.



Work on the State Highway Near Burlingame, San Mateo County.

The Engineering Department

As provided by the amended statutes, the Department of Engineering of the State of California consists of an Advisory Board of seven members, composed of the Governor as ex officio member and chairman, the State Engineer, Superintendent of State Hospitals, Chairman of the State Board of Harbor Commissioners of San Francisco, and three other members to be appointed by the Governor.

The intent of the law in providing that the Governor should appoint three members of the Advisory Board of the Department of Engineering was to give the Chief Executive freedom in selecting a board into whose hands he could especially place the execution of the eighteen million dollar highway trust.

In accordance therewith, the Advisory Board of the Department of Engineering of the State of California met in the Governor's office on the eighth day of August, 1911, at which the following were present:

Hon. Hiram W. Johnson, Governor.

Mr. Nat. Ellery, then State Engineer.

Mr. J. J. Dwyer, Chairman of the Board of Harbor Commissioners of San Francisco.

Dr. F. W. Hatch, General Superintendent of Hospitals.

Mr. Burton A. Towne, of Lodi, appointed member.

Mr. Charles D. Blaney, of Saratoga, appointed member.

Mr. N. D. Darlington, of Los Angeles, appointed member.

At this meeting, the Advisory Board adopted the following resolution, designating the three appointed members as a committee to be known as the California Highway Commission:

Resolved, That the appointed members of this board, to wit, Messrs. Charles D. Blaney, Burton A. Towne, and N. D. Darlington, be and they are hereby appointed a committee, to be known and designated as the "California Highway Commission," with the jurisdiction and powers following, to wit:

(1) To take full charge of the entire matter of the construction and acquisition of a system of state highways in and for the State, as and in

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

(2) To do and perform every act and thing in and about the premises that a committee of this Board may be lawfully authorized to do for or on behalf of this Board; and to have full charge and control of the acquisition and construction, of the laying out and the building of a system of such highways.

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

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

By the foregoing, it will be seen that the California Highway Commission is an executive committee to which is delegated all the powers and functions of the Advisory Board of the Department of Engineering, permissible under the law and necessary to the work of constructing the state highway under the State Highways Act.

While the Advisory Board has reserved the right to place its final seal of approval upon the proceedings of the Commission, and while the Commission scrupulously submits all its official acts to the Advisory Board for such ratification, this control on the part of the Advisory Board has always been exercised in the spirit and intent of the above stated enabling resolution which places the responsibility of the state highway undertaking upon the three appointed members and the Highway Engineer.

COUNTIES PROVIDE RIGHTS OF WAY AND BRIDGES

Boards of Supervisors are Helping to Build the State Highway

Under date of February 19, 1912, the California Highway Commission addressed the following self-explanatory letter to the various Boards of Supervisors throughout the State:

SACRAMENTO, February 19, 1912.

To the Honorable, the Board of Supervisors of the County of Merced.

GENTLEMEN: A number of counties of the State, through their representatives among whom were many supervisors, have voluntarily offered to provide free rights of way and to build all bridges necessary for such state highway or highways as may be located within their respective limits.

It is apparent that the bond issue of \$18,000,000 is inadequate for the great work projected, and the Commission believe that each county which

IN BOARD OF SUPERVISORS, MERCED COUNTY, STATE OF CALIFORNIA.

September 17, 1912.
Present: Supervisors T. H. Scandrett (chairman), J. R. Boxter, H. G. Peck, George H. Whitworth and C. S. Cothran.
Absent: None.

In the matter of the California State Highway.

The following resolution is presented to the board and adopted:
WHEREAS the California Highway Commission has requested that this Board of Supervisors agree to grant to the State of California the rights of way and to construct the bridges necessary in laying out and constructing in this county the roads provided for in the highway act of 1909; and

WHEREAS the Board of Supervisors realize that the bond issue provided by said act is inadequate to the great work projected; and



Pismo Beach, San Luis Obispo County. On Route of State Highway.

may be benefited by the routing of the state highway system through its territory will be ready to do its part in making the state highway undertaking an unqualified success.

The Commission consider it to be the proper time, while surveys are being ordered and estimates prepared, to have official action taken indicating the disposition of the several counties in this behalf, and it is desired to have offers of free rights of way and bridges by the counties embodied in formal resolutions by their governing boards.

Accordingly, the Commission request your honorable board to consider this important matter at once and trust that you will adopt a resolution agreeing to furnish to the State of California free rights of way and to build necessary bridges for such state highway or highways as may be located in your county.

After you have taken action, please transmit to the Commission a certified copy of your resolution.

Very respectfully,

CALIFORNIA HIGHWAY COMMISSION,
By W. R. ELLIS, Secretary.

The response from the counties to this appeal for their coöperation has been prompt and most encouraging.

The routes of the two main highways may now be considered practically determined upon. The central or valley highway, as proposed, traverses about twenty counties, the coast route about sixteen counties. Eventually the remaining twenty-two counties will be connected by laterals, surveys for some of which have already been ordered.

Of the thirty-five counties on the direct route of these main highways, only two evince any disposition to be reluctant in pledging to procure the rights of way and construct the necessary bridges in their respective jurisdictions, free of cost to the State. It is unnecessary to state that in these dilatory counties the Commission has not yet started any highway construction work.

Of the twenty-two counties that will necessarily be reached by laterals, twelve have already filed with this Commission, through the formal action of their boards of supervisors, unconditional pledges to procure the rights of way and to build the bridges for the highway in their respective districts without cost to the State.

Several of these tardy lateral counties have signified their intention to take favorable action in this matter at an early date.

Herewith is reproduced in full the certified copy of Merced County's resolution, which is in form similar to most of the pledges made as to rights of way and bridges by the various counties.

WHEREAS this county desires to coöperate with other counties in assisting the state authorities in the completion of the best possible system of state highways, and to be joined therewith; therefore, be it

Resolved, That the Board of Supervisors hereby agrees to obtain all rights of way and to build and construct all required bridges for the state highway where located by the Highway Commission of the State of California in and through Merced County, free of cost to the State of California.

STATE OF CALIFORNIA, } ss.
County of Merced. }

I, P. J. Thornton, county clerk and ex officio clerk of the Superior Court of Merced County, State of California, do hereby certify that the foregoing is a true and correct copy of a resolution passed by the Board of Supervisors of said county at their regular meeting on September 17, 1912, and that the same is now of record in my office.

In witness whereof, I have hereunto set my hand and affixed the seal of said Board of Supervisors, this twentieth day of September, A. D. 1912.

P. J. THORNTON,
County Clerk and ex officio Clerk of the Superior Court,
Merced County, California.

It would, indeed, be difficult to adequately appraise the value of this "team work" of the counties in thus relieving the Commission of the burden of clearing up titles to rights of way and getting deeds therefor. Local people can always best and easiest take care of the local difficulties that such an undertaking involves.

If there is a possibility to make the \$18,000,000 highway fund come anywhere near covering the cost of the proposed state system, it will only be by dint of the most economical management, reinforced by the energetic and effective coöperation of the county governments in thus relieving the State of the burden of procuring rights of way and building the bridges.

Progress of the State Highway in Yuba

The Natomas Consolidated is filling an order placed by Contractor Frey, who is building a ten-mile strip of the state highway from Marysville southward, of 24,000 tons of crushed rock. The first shipment of the material was made August 5, 1912. Up to the present time, something over 7,225 tons have been delivered.

Contractor Frey has graded over eight of the ten miles which he has contracted to construct, and at this time has about three miles covered with rock, leveled and rolled, ready to be surfaced with oil and screenings, as shown in the picture on page six.

Other views taken on this piece of work are found on page ten.

EMPLOYEES APPOINTED SOLELY ON MERIT

Applying Business Methods to a Great Public Work

It would naturally appear that the expenditure of \$18,000,000.00 in the construction of twenty-five hundred miles of public roads would require the direct employment by the State of an army of thousands. This is not necessarily the case, however.

The long-pursued policy of the State has been to contract for the construction of its public works and buildings.

While the California Highway Commission has not committed itself to this method, all work under the Highways Act thus far started has been let to the lowest responsible bidders. It is obvious, therefore, that the vastly greater portion of the labor employed on the state highway is hired by these bidders.

On the pay roll of the Commission for the month of September, 1912, there were three hundred and six persons, classified as follows:

	Headquarters.	I.	II.	III.	IV.	V.	VI.	VII.	Total.
Secretary	1	--	--	--	--	--	--	--	1
Assistant Secretary	1	--	--	--	--	--	--	--	1
Assistant Highway Engineer	1	--	--	--	--	--	--	--	1
Division Engineers	--	1	1	1	1	1	1	1	7
Principal Assistant Engineer	--	1	1	1	1	1	1	1	7
Attorney	1	--	--	--	--	--	--	--	1
Office Engineer	1	--	--	--	--	--	--	--	1
Resident Engineers	--	1	--	1	1	--	1	1	5
Assistant Resident Engineers	--	1	--	--	1	--	--	--	2
Chief Accountant	1	--	--	--	--	--	--	--	1
Clerks	2	1	1	1	1	1	1	1	9
Stenographers	5	--	--	--	1	1	1	1	9
Typists	1	--	--	--	--	--	--	--	1
Messenger	1	--	--	--	--	--	--	--	1
Geologist	1	--	--	--	--	--	--	--	1
Testing Engineer	1	--	--	--	--	--	--	--	1
Draftsmen and Computers	4	4	5	6	6	11	4	7	47
Chiefs of Party	--	5	5	4	4	6	3	6	33
Instrument Men	--	3	4	3	5	7	3	6	31
Rodmen	--	11	8	7	13	14	8	12	73
Axmen	--	7	3	3	5	4	--	1	23
Timekeeper	--	1	--	--	--	--	--	--	1
Levelers	--	1	--	--	1	--	--	--	2
Stakeman	--	1	--	--	--	--	--	--	1
Chainman	--	1	--	--	--	--	--	--	1
Janitor	--	--	--	--	--	1	--	--	1
Teamsters	--	3	3	--	2	4	--	6	18
Cooks	--	5	6	--	--	5	2	8	26
Totals	21	47	37	27	42	56	25	51	306

From the above table, it will be observed that two hundred and

competency, ability, and character should be the prime qualifications that should govern in the organization of its office and field forces.

If the State is to be permitted to do its own business in a businesslike way, it must adopt those ordinary, practical business methods that are everywhere recognized in the business world as the prerequisites of efficiency and success. To avail itself of the best technical skill that the State's money can procure has been consistently the aim of the Commission, and this spirit has bred into the individual member of the organization a certain pride in his employment which challenges him to give his best to the State.

As against the man who imagines he receives his appointment by grace of a political pull or as a reward for services to the party, one who wins preference on the showing of his special training, experience and personal worth will ordinarily apply himself with greater zeal and interest to his work, since he realizes that he has been taken upon his own merits and that his career in the department will be made or marred alone by his own conduct.

In a work such as this Commission is charged with, it is peculiarly important that its forces not only possess the proper skill and training, but what is rarer, the heart interest which stimulates each individual to earnest and conscientious endeavor in the discharge of his duties.

By the process of "finishing" with laggards and derelicts, and of advancing those who prove their fitness to fill vacancies higher up in the service, the Commission, under the generalship of the Highway Engineer, has assembled a loyal, earnest body of employees with whom it is an honor to be associated.

There are at present approximately twelve hundred formal applications for employment on file with the Commission, and the list grows daily.

The applicant, in filling out this blank, states the date and place of his birth, where educated, what positions he has held during the past ten years, the salaries he received in such previous employment, when he left his last position and for what reasons, whether he has any disqualifying defect in body or mind, and references with post office addresses.



Reinforced Concrete Bridge Over San Luis Rey River. Length, 690 Feet. Built by San Diego County Highway Commission. On Route of State Highway.

seven of the employees are engineers, surveyors and draftsmen; twenty-three are classified as clerical; of axmen, teamsters, and cooks, there are sixty-seven. But even these last mentioned are not to be considered as common laborers. Aside from sobriety and physical and moral fitness, it takes considerable experience to serve a surveying crew satisfactorily as axman, teamster or cook.

Therefore, it may be truly stated that among the limited number of positions available under the Commission, there are practically no positions for untrained and unskilled people.

At the outset, the California Highway Commission determined that

When such an application is received, it is classified according to the character of the employment sought, and indexed. A letter accompanied by a return report form and a return addressed and stamped envelope is sent out to each of the persons named as references. When these reports are received, they are attached to the application and it is filed for consideration.

The great majority of those to whom these reference blanks are sent forward their reports promptly and with evident candor. Sometimes an applicant gives names as references without any expectation that the persons referred to will be called upon to testify in his behalf.

When the report comes in, perhaps it will read "Never heard of the party mentioned," or worse, "So and So worked for this company in 1909 and was discharged for negligence and dissipation."

As new men are needed, because of the expansion of the Commission's work or to fill vacancies that occur for various reasons, the force is recruited from those whose applications are on file. When from five to fifty good men are in line for a job, and there is only one place open, it is simply a case of the Highway Engineer's recommending the one who seems best to answer the requirements.

In all cases where the positions are of the more responsible character, requiring technical training, the applicant is usually invited to a personal interview with either the Highway Engineer or one of the Division Engineers before he is recommended for employment.

The new government of the city of Sacramento at the outset adopted a system of formal applications for employment, copied after that of this Commission. Other important departments of the State have recently taken up the study of the Highway Commission's method along this line with serious intent to apply the same progressive principles to their organization. This is in line with the efforts of all the best influences that have always been at work in the political life of the State and Nation, seeking to apply to the public's business the same efficiency and honesty in management that is necessary to the success of any private undertaking.



Making Reinforced Concrete Culvert on State Highway Near Marysville.

Where the Money Goes

Hon. E. D. Roberts, State Treasurer, has sold state highway bonds as follows: On October 21, 1911, \$400,000 and on July 11, 1912, \$1,200,000, making a total of \$1,600,000. From the General Emergency Fund the Commission had received prior to the sale of these bonds, \$731.30.

The State Treasurer reports on October 9, 1912, that there remains to the credit of the highway fund in his hands the sum of \$1,263,742.93.

The amount, therefore, expended by the Commission during the little more than a year of its existence is \$336,257.00 plus the \$731.30, or \$336,988.57.

In subsequent numbers of the Bulletin detailed financial statements of the receipts and disbursements of the Commission will be published.

Approximately the following tabulation will show for what purposes the money thus far has been paid out:

Headquarters, equipment	\$8,746 82	
Headquarters, salaries	17,986 20	
Headquarters, personal expenses, officers	4,229 06	
Headquarters, miscellaneous expenses, rent, etc.	17,080 38	
Headquarters, paid contractors, for construction work....	33,229 92	
Headquarters, office fund	100 00	\$81,372 38
Seven divisions, equipment	\$50,942 99	
Seven divisions, salaries	136,960 67	
Seven divisions, personal expenses, officers.....	6,025 13	
Seven divisions, miscellaneous expenses, provisions, etc.	61,687 20	\$255,615 99
Total expenditures		\$336,988 37

The past year has been one of organization and necessary preliminary work.

The work of the architect is fairly well completed; the foundations are laid; the raising of the structure has begun. Before the end of 1913 hundreds of miles of the state highway system will be completed and thrown open to the public.

It will be the business of the Bulletin to keep the public promptly posted as to the progress of this work.

Geological and Laboratory Department

The Highway Commission has a physical and chemical testing laboratory located on the State Fair Grounds in Sacramento. This laboratory is equipped to test road metal, gravel, sand, asphalt, road oil and cement. As far as possible the Commission has adopted the specifications of the American Society of Civil Engineers and the American Society for the Testing of Materials for all tests. Tests of road metal, asphalt and road oil are made to conform to the methods used in the laboratory of the Office of Good Roads, Department of Agriculture, Washington, D. C.

The hardness and toughness of road metal is determined by the abrasion method (Deval type). The percentage of absorption and specific gravity is also determined.

Sand and gravel are tested by sieving to determine the grading; also for the percentage of voids. The sand is mixed with Portland cement in a 1-3 mortar, and the tensile strength of this is compared to the strength of mortar made with standard sand.

Road oil is tested for volatility, flash, viscosity, adhesiveness, percentage of asphaltum and percentage of water and foreign matter.

Asphaltum is tested for solubility in carbon tetrachloride, 86 naphtha and in carbon bisulphide. The penetration, the percentage of volatile material, and the amount of free carbon are determined.

Portland cement is tested according to the specifications adopted by the American Society of Civil Engineers.

The testing laboratory is in charge of a member of the American Society for the Testing of Materials. He has had years of experience in testing road materials.

An examination is made of all available deposits of road metal, gravel, sand, or other material suitable for the highway construction. The Geologist's report on these materials contains the following information:

The location of the deposit.

The transportation facilities from the deposit to the point of use.

The equipment and method of handling the material.

The average daily production.

The approximate amount of material available.

The action of the material where it has been used.

The uniformity of the deposit and the methods used to prevent foreign or poor material being included in the output.

In addition, samples are taken for the laboratory test.



Building the State Highway Near Marysville.

San Luis Starts Condemnation Proceedings

The Supervisors of San Luis Obispo County are setting the pace for other boards of supervisors in their aggressive action to obtain the necessary rights of way for the state highway through their county. They have directed the District Attorney to bring condemnation proceedings against certain landowners who refuse to make reasonable terms in the matter of giving deeds for these rights of way through their lands. Further, they have called formally upon the County Surveyor to lend the District Attorney all required assistance in the matter.

It is obvious that, whether a house is to be built or a public road constructed, the very first thing to attend to is to get a good and sufficient deed to the land that it will occupy.

San Luis Obispo is nobly doing its best to facilitate the work of the State in highway matters. Many other counties are showing the same commendable spirit.

ONE THOUSAND MILES OF HIGHWAY SURVEYED

First Year's Work of the Commission Graphically Reviewed

Early in its work the Commission chose certain main routes as follows:

Route 1.	San Francisco to Oregon line.....	421 miles
Route 2.	San Francisco to San Diego via Los Angeles.....	592 miles
Route 3.	Sacramento to Oregon via east side Redding.....	344 miles
Route 4.	Sacramento to Los Angeles via San Joaquin Valley.....	445 miles
Route 5.	Stockton to Santa Cruz via Oakland.....	133 miles
Route 6.	Sacramento to Woodland Junction.....	20 miles
Route 7.	Tehama to Benicia.....	191 miles
Route 8.	Hopland to Vallejo via Lake County.....	107 miles
Route 9.	Los Angeles to Riverside.....	46 miles

The aggregate length of these routes is approximately 2,300 miles. Surveys were started in February, and the plans and estimates pushed forward as rapidly as consistent with good work. As the work advanced the several routes were subdivided within the counties into sections of convenient lengths. A number of these sections are already under contract and the building has begun.

The type of construction and the width of roadway for the different sections vary considerably to meet local conditions. Near San Francisco, where the traffic is extremely heavy, provision has been made for sheet asphalt pavement 24 feet wide with sufficient earth shoulders on either side; but in some of the mountainous districts roads are to be graded but eighteen feet wide, and they will not be paved. The usual width of pavement will be fifteen feet and the minimum width of shoulders on either side, three feet.

Following is a table showing the status of the work on the several routes by counties:

ROUTE 1.

MARIN. Sec. A. Survey complete. Sec. B. Survey nearly complete.

SONOMA. Sec. B. Laid out as state highway September 25, 1912. Now advertised for contract. Length 13.7 miles. Pavement, oiled concrete 15 feet wide. Sec. A. Surveys complete. Sec. C. Survey nearly complete.

MENDOCINO. Sec. A. Laid out as state highway May 21, 1912. Contract awarded July 23, 1912, to the General Contracting Corporation. Length 12.8 miles. Road to be graded but not paved. Probable total cost \$69,900. Probable cost per mile \$5,460. Secs. B, C, D and E. Surveys complete. Willits to Humboldt County line, surveys begun.

HUMBOLDT. Surveys begun.

ROUTE 2.

SAN MATEO. Sec. A. 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 total cost \$92,180. Probable cost per mile \$17,070. Sec. B. Survey complete.

SANTA CLARA. Sec. A. Laid out as a state highway July 23, 1912. Part 1. Length 6.4 miles. Sheet asphalt 20 feet wide on macadam base. Part 2. Length 5.5 miles. Oiled concrete 20 feet wide. Both parts of Sec. A are advertised for contract. Secs. B and C. Surveys complete.

SAN BENITO. Surveys nearly complete.

MONTEREY. Surveys complete.

SAN LUIS OBISPO. Surveys complete.

SANTA BARBARA. Secs. A, B, C, E, and F. Surveys complete. Secs. D and G. Being surveyed. Sec. H. Built by county.

VENTURA. Sec. F. Laid out as a state highway August 27, 1912. Length 4.4 miles. This section includes a long timber trestle partially built. The State has taken over the completing of the trestle. Secs. A, B, C, D and E. Surveys practically complete.

LOS ANGELES. Sec. A. Laid out as a state highway September 25, 1912. Now advertised for contract. Length 6.6 miles. Oiled concrete 15 feet wide. Secs. B and C. Survey complete.

ORANGE. Surveys nearly 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 \$69,710. Probable cost per mile \$8,300. Secs. B, C and D. Surveys 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 \$13,700. Probable cost per mile \$7,615.

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. Oiled concrete 15 feet wide. Probable total cost \$84,950. Probable cost per mile \$8,580. Sec. B. Surveys complete.

YUBA. Sec. B. Laid out as a state highway May 21, 1912. Contract awarded July 23, 1912, to F. E. Frey. Length 8.9 miles. Oiled macadam 15 feet wide. Probable total cost \$70,930. Probable cost per mile \$7,970. Sec. A. Surveys nearly complete.

SUTTER. Sec. A. Survey complete.

BUTTE. Secs. B, C and D. Surveys complete. Sec. A. Survey in progress.

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

SHASTA. Sec. B. Survey complete. Secs. C and D. Surveys begun. Sec. A. Survey not started.

SISKIYOU. Sec. A. Survey nearly complete. Sec. B. Survey 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 11.1 miles. Oiled concrete 15 feet wide. Probable cost, total, \$81,800. Probable cost per mile \$7,370. Sec. B. Survey complete.

MERCED. Sec. C. Laid out as a state highway August 27, 1912. Contract awarded September 25, 1912, to the Worswick Street Paving Co. Length 10.9 miles. Oiled concrete 15 feet. Probable total cost \$85,950. Probable cost per mile \$7,885. Sec. D. Laid out as a state highway July 23, 1912. Contract awarded August 27, 1912, to the Worswick Street Paving Co. Length 9.6 miles. Oiled concrete 15 feet wide. Probable cost, total, \$73,260. Probable cost per mile, \$7,630. Sec. A. Surveys complete.

MADERA. Entire county under contract. Sec. A. Laid out as a state highway July 23, 1912. Contract awarded August 27, 1912, to the Worswick Paving Company. Length 9.9 miles. Oiled concrete 15 feet wide. Probable cost \$69,050. Probable cost per mile \$6,975. Sec. B. Laid out as a state highway May 21, 1912. Contract awarded July 23, 1912, to Ransome-Crummey Company. Length 10.0 miles. Oiled macadam 15 feet wide. Probable total cost \$74,750. Probable cost per mile \$7,425. 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. Probable total cost \$47,970. Probable cost per mile \$7,055.

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 \$64,810. Probable cost per mile, \$6,750. Secs. A and B. Surveys complete.

TULARE. Sec. D. Survey complete. Secs. A, B, C and E. Not started.

KINGS. Sec. A. Survey complete.

KERN. Secs. D, E and F. Surveys complete. Secs. A and C. Surveys progressing. Sec. B. Survey not started.

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

ROUTE 5.

SAN JOAQUIN. Built by the county.

ALAMEDA. Sec. C. Survey complete. Sec. A. Survey in progress. Sec. B. Survey not begun.

SANTA CLARA. Sec. A. Survey complete. Sec. B. Survey not begun.

SANTA CRUZ. Sec. A. Survey complete.

ROUTE 6.

YOLO. Sec. A. Survey begun.

ROUTE 7.

YOLO. Secs. B and C. Surveys complete. Sec. A. Survey not started.

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.

Surveys not begun.

SUMMARY.

Upwards of 1,000 miles have been surveyed and practically 152 miles of road have been laid out as State highway. Of this mileage 115 are now under contract and 32 miles are advertised for contract. The pavement for the roads which have already been laid out may be classed as follows:

Sheet asphalt on concrete base.....	5.4 miles
Sheet asphalt on macadam base.....	6.4 miles
Hydraulic concrete with oiled surface.....	103.9 miles
Macadam with oiled surface.....	18.9 miles
Grading (no pavement).....	12.8 miles
Miscellaneous	4.4 miles
Total	151.8 miles

A STATEMENT FROM THE HIGHWAY ENGINEER

Comments on the Municipal League Committee's Report

To the California Highway Commission.

GENTLEMEN: Agreeably to your request for my opinions I make the following comments on the report of the Committee of the League of California Municipalities dated August 22, 1912, and presented to the League at its convention held at Berkeley during the last week of September.

I have been informed by one of the members of the committee that it was their intention that the report should be a friendly criticism of the work so far undertaken by the Commission and, notwithstanding the publication of the report in the newspapers more than a month in advance of its submission to the League, I am compelled to believe that the committee intended to be helpful rather than inimical.

Naturally, their comments on the good judgment of the Commission in its choice of routes and upon the efficiency of its engineers in the surveying work is gratifying and I can find no fault with that portion of their report.

They devote considerable space to quotations from my paper read August 5, 1912, before the Pacific Highway Association at San Francisco and later in their report they infer that the "oil macadam" type of pavement will be made more or less of a standard throughout the state and indicate their disapproval of that type of pavement.

I cannot concur in their utter disapproval of "oil macadam," for I believe that when properly constructed it is worthy of recognition as a pavement for rural highways, but they are not warranted in assuming that that type is contemplated as a general "standard" for the state highways of California, and I regret that in my San Francisco paper I left an opportunity for such an assumption.

Had the committee found time to discuss the plans of the Commission with me, I could have made clear to them that and some other points about which they are apparently misinformed.

SPECIFIC CRITICISMS IN REPORT.

Thin Asphalt Wearing Surface, San Mateo.

The reporters object to the sheet asphalt wearing surface specified for the road in San Mateo County between South San Francisco and Burlingame, saying that "a one-inch wearing surface seems to be much too thin, and not in accordance with modern paving practice."

It is true that one and one half inches of sheet asphalt is the minimum thickness usually specified for city street work and that the San Mateo work is somewhat of a departure. I believe, however, that for the rural road there contemplated, the thin wearing surface will last many years. My opinion is confirmed by a number of asphalt workers who were consulted and by my observation of sheet asphalt streets where by accident the surface is much thinner than the specifications intended.

Concrete Base Work.

The reporters call attention to the difficulty of securing good concrete under adverse conditions on highway work where "water and transportation facilities are not convenient," and call such a base, no matter what its thickness, an impracticable structure, but in their suggested specifications—somewhat inconsistently—they devote two paragraphs to their recommendations for concrete bases with different wearing surfaces, and earlier in their report they approve the concrete base for the San Mateo road.

I agree that a concrete base, of whatever thickness, must be put down with the greatest of care and must be properly protected at every stage of the operation until it has received the wearing surface; but that the

engineers and contractors of California cannot secure good hydraulic concrete work, and at a reasonable cost, is an unwarranted assumption even if the conditions be adverse.

On some 78 or more miles of state highway under contract, a concrete base 4 inches thick has been specified. This must be considered as a minimum thickness only. The unit contract prices are based upon cubic yard measurement, and it is intended to increase the thickness of the concrete base whenever it is not possible to secure an adequate subgrade. On the 78 miles under contract, however, the subgrade is for the most part satisfactory for the minimum 4-inch concrete base. It should also be remembered that the concrete specified is a much richer mixture than is customarily used for pavement bases.

Mastic Wearing Course—Bituminous Tops.

In the early specifications bids were asked for a wearing surface of mastic (a composition of asphaltic cement, finely powdered limestone and stone screenings), but the bids received were so high that no work of that nature was contracted for. It is, however, proposed to do enough of this work by "force account" to demonstrate its value and to secure accurate cost data. In my opinion there is much merit in this type of wearing surface.

Instead of the mastic, the contracts provide for a wearing surface composed of a rich asphaltic road oil and stone screenings—a protective coat from 3/8 inch to 1/2 inch in thickness. Such work ought to be done under California conditions for 5 cents or less per square yard. This protective coat, under the present traffic on the rural highways, should last from two to three years, if precedent under far more adverse conditions in other parts of the country is worth considering. Hundreds of miles of water-bound macadam have been maintained by this process since the year 1906 in Eastern States, and my recent inspection of these roads has reinforced my belief in the efficacy of the treatment. If, under the rain, snow, and frost conditions, which obtain there, the oil protective cost is successful, it is unbelievable that similar wearing surfaces on top of comparatively clean, hydraulic cement concrete bases, with a far better grade of oil than that used in the East and with the benign climate of this State will not be equally satisfactory as regards cost and quality.

COSTS.

The reporters advocate the asphaltic concrete type of pavement for general use, and I agree that it is an excellent pavement, although I prefer a road with a hydraulic cement concrete base to one consisting wholly of bituminous concrete.

The lowest price quoted by the reporters for asphaltic concrete, 5 inch work, in Sacramento, is 11 cents per square foot, including grading. A similar work in Fresno has cost 15 cents, and in Madera 14 cents per square foot, they say. It is fair to remark that these costs are low, and that from 15 cents to 17 cents per square foot would more nearly approximate the going rate for this class of work.

The tabulation below indicates what will be the probable costs of the 78 miles of "oiled concrete" already contracted for by the Commission. In the compilation the costs of bridges, culverts, drainpipes, guard rails, and other miscellaneous items, always needed in rural work, are omitted for purposes of comparing costs with the figures for asphaltic concrete above quoted. In the table the inclusion of all of the grading costs on the state highways is unfair, in that it includes a much greater width than the width of the paving, while the grading costs applying to the costs of asphaltic concrete quoted are only for the width actually paved.

ESTIMATED COST OF "OILED CONCRETE" ROADS, OCTOBER 1, 1912.

Contract Number.	County.	Route.	Section.	Length.	Contractor's bid plus 3 per cent.	Materials furnished by the state plus 3 per cent.	Total.	Culverts and miscellaneous plus 3 per cent.	Estimated cost of grading and paving.		
									Per mile.	Per square yard.	Per square foot.
5	Stanislaus	4	A	11.07	\$59,042	\$22,763	\$81,805	\$49	\$7,381	\$0 839	\$0 093
6	Merced	4	D	9.61	51,854	21,408	73,262	742	7,546	0 858	0 095
7	San Diego	2	A	8.43	50,918	18,792	69,710	1,741	8,062	0 916	0 102
8	Fresno	4	C	9.56	43,537	21,279	64,816	197	6,759	0 763	0 085
9	Madera	4	A	9.94	46,924	22,127	69,051	261	6,921	0 786	0 087
10	Madera	4	C	6.82	32,786	15,186	47,972	491	6,962	0 791	0 088
11	Merced	4	C	10.89	59,322	26,631	85,953	4,111	7,518	0 854	0 095
12	Sacramento	3	A	1.84	9,434	4,274	13,708	325	7,273	0 826	0 092
13	Placer	3	A	9.93	61,418	23,537	84,955	4,139	8,139	0 925	0 103
Total				78.09	\$415,235	\$175,997	\$591,232	\$12,056	\$7,417	\$0 843	\$0 094
Average											

The error, however, is doubtless partially offset by the admitted higher cost of grading under the urban conditions where the asphaltic concrete work was done.

It will be noted in the foregoing table that the average cost per square yard for the work is \$0.843. Doubtless this is higher than it should be, and there are indications that as the contractors become familiar with the work the price will be reduced.

The typical state highway as planned is paved to a width of 15 feet, and there are therefore 8,800 square yards of pavement to the mile.

At the average price per square yard as shown in the table, the average cost of grading and paving the typical state highway will be \$7,417 per mile on the "oiled concrete" basis.

Taking 14 cents per square foot (\$1.26 per square yard) as being about the average of the costs for asphaltic concrete quoted by the reporters, the typical state highway would cost \$11,088 per mile for grading and paving with asphaltic concrete, or \$3,671 per mile more than the "oiled concrete" will cost. The asphaltic oil protection top

I submit that on the foregoing basis the "oiled concrete" road merits serious consideration as a standard for the California state highways, but the showing is vastly in its favor if the asphaltic concrete type or the sheet asphalt type of pavement are charged with their proper maintenance costs.

The idea somewhat generally prevailing that the latter kinds of pavement require no expense for maintenance is a fallacy. Asphaltic concrete and even the best pavement of this type known as the "bitulithic" pavement, if kept in the best of condition, require paint coats or "squeegee" coats of bitumen after a few years of use, at a cost of several cents per square yard. Sheet asphalt, if the experience of the city of Buffalo, N. Y., during more than thirty years is any criterion, costs nearly 4 cents per square yard per annum for repairs and maintenance, overhead charges omitted.

CONCLUSION.

The report of the committee to the League of California Municipalities raises some interesting points, but they touch upon no subject which has not been considered pro and con many times at the executive meetings of the Commission.

I think that the plan adopted of constructing the bases of the roads of hydraulic cement concrete is above adverse criticism. A foundation is thus provided for almost any kind of wearing surface which the future may develop.

The State Highways Act provides that the state shall maintain the roads and by the time the money is needed the Legislature will doubtless appropriate money for that purpose. When the time arrives that a better type of wearing surface seems desirable, it is likely that another bond issue will be voted. A permanent base will be ready to receive it.

The pith of the criticism is that the Commission is trying to do too much work that the committee is pleased to call "mediocre" in an endeavor to complete the state highway system within the sum appropriated, namely, \$18,000,000.

The reporters virtually recommend that the requirements of the State Highways Act be disregarded and that the Commission proceed with its work, without particular consideration of the entire mileage, and pave the main lines with either sheet asphalt on a heavy concrete base or with the so-called asphaltic concrete.

Such ultra-substantial work as the committee recommends would be more nearly applicable to the needs of Fifth avenue in New York or the London Embankment, and the rural roads of California will hardly require such heroic treatment, at least during the life of the present bond issue.

Were it desired to build now such costly types of road what justification would an officer of the people have in disregarding the plain mandates of the law and deliberately adopting a policy which would leave out from the system from one quarter to one third of the roads which the people voted to improve.

Who in the State has the power, the right, or the assurance to direct or to even connive at such a policy?

Respectfully, (Signed) A. B. FLETCHER,
Highway Engineer.

October 10, 1912.

Municipal League Committee's Report

Following is the report of the Committee appointed by the League of California Municipalities, to which the Highway Engineer refers, in the foregoing article.

HEADQUARTERS OF THE LEAGUE OF CALIFORNIA MUNICIPALITIES,
SAN FRANCISCO, CALIFORNIA, August 22, 1912.

To the League of California Municipalities, San Francisco, California.

GENTLEMEN: We, your committee appointed at the Santa Barbara convention for the purpose of watching the progress of the work of the State Highway Commission and reporting our findings to your body, beg to submit the following brief report of the progress up to the present time.

PROBLEM BEFORE THE COMMISSION.

The language of the highways act recites: "The route or routes of said state highways shall be selected by the Department of Engineering, and said route shall be so selected and said highways so laid out and constructed or acquired as to constitute a continuous and connected state highway system running north and south through the state, traversing the Sacramento and San Joaquin valleys, and along the Pacific coast by the most direct and practicable routes, connecting the county seats of the several counties through which it passes and joining the centers of population, together with such branch roads as may be necessary to connect therewith the several county seats lying east and west of such state highway." A study of this paragraph will indicate to every one that this phase of the work is by no means easy of fulfillment by the Commission, particularly when the various community factions in practically every county will make every effort to induce the Commission to favor their own particular interests.

We have nothing but the highest commendation for the Commission's choice of



A Mountain Grade on the State Highway, Between Cloverdale and Hopland in Mendocino County.

can be replaced at any time after it has worn so as to require renewal at not to exceed 5 cents per square yard, and under any traffic which I can foresee on any of the roads already contracted for, a treatment will last two years at least and perhaps three years. If it lasts two years the annual cost of restoring the surface will not exceed 2½ cents per square yard per year or \$220 per mile per year; if three years, \$146.67 year per mile.

As already stated, the difference between the first costs of the two types is \$3,671 per mile and at 4 per cent interest, the asphaltic concrete road costs \$147 per mile per year more for interest charges than does the "oiled concrete." If, therefore, the oil coat lasts three years the cheaper type of paving may be kept in repair for the amount the more expensive road costs per annum for interest.

main routes covering a total mileage of approximately 2,300 miles, which added to about 400 miles of lateral highways extending out to more or less isolated county seats, will bring the grand total in the neighborhood of 2,700 miles. If the \$18,000,000 was to be spread equally over the entire 2,700 miles the cost per mile, including engineering, overhead charges, etc., would be restricted to \$6,667 per mile. Every one conversant even in a small degree with road building, will appreciate the fact that good roads of standard designs cannot be constructed for that amount of money, and will, therefore, realize at least one of the difficulties confronting the Highway Commission in carrying out the spirit of the act itself.

Up to the present time the energy of the Commission has been devoted mainly to surveys, determination of routes and the adoption of specifications for about 100 miles of highway.

We find that the survey work has been done in a very careful and efficient manner, combining the final survey along with the preliminary work, thus reducing to a minimum the expenses of engineering work.

As to the quality of roads in general, we will quote from the address of Mr. Austin B. Fletcher, Highway Engineer, read at the meeting of the Pacific Highway Association in San Francisco, August 5, 1912: "In brief the standard road which the Commission proposes to build will have the following principal characteristics:

1. A right of way not less than 60 feet in width where it is reasonably possible, and as direct between objective points as is consistently possible.
2. Gradients not exceeding 7 per cent, even in the mountainous parts of the State.
3. Curves as open as possible, and in no case of less than 50 feet in radius.
4. As many culverts of sufficient capacity as are needed to take care of surface and underground water.
5. A traveled way under ordinary conditions not less than 21 feet in width, and in the mountains not less than 16 feet wide, with the center paved or surfaced so as to be hard and smooth under all climatic conditions at all times of the year, the width of the surfacing to be in general 15 feet.
6. Smoothly graded roadsides, reserved for future tree planting.

For the main roads of the system the choice for surfacing seems to lie between the so-called oil macadam type and a concrete road with a bituminous surface, the latter being considerably more expensive than the former, but much more desirable as concerns quality and permanency. It is evident that neither type can be adopted for general use unless the cost of the materials and the freight charges for transporting them are reduced to the lowest point possible.

It seems apparent that not less than 2,700 miles of the state highway must be built to comply with the provisions of the 'State Highway Act.' Of this mileage it is possible that one third, or 900 miles, will be in the mountains, and will require no surfacing other than local gravel, and that 1,800 miles will have to be surfaced with materials more or less expensive."

"On all the roads now advertised and awaiting contract, it is proposed to use a hydraulic cement concrete base 15 feet wide, covered with a thin surface of bituminous mixture.

Whether or not much additional work of this character may be done depends largely upon the cement manufacturers.

It is probable that they will make some reduction in the cement price to induce the Commission to adopt the concrete base for its standard type of construction. Whether the reduction in price will be sufficient to permit of so general a use of concrete is not yet determined."

The sheet asphalt now in course of construction in San Mateo County consists of a 5-inch cement concrete base overlaid with a one-inch thickness of sheet asphalt wearing surface. These specifications for the roads now awaiting the awarding of contracts call for a 4-inch cement concrete base overlaid with a three-eighths inch thickness of asphalt "mastic," the asphalt "mastic" to be composed of between 40 per cent to 60 per cent of asphaltic cement, and the balance of filler.

It can be inferred from the above quotations that the desire and aim of the Commission appears to be to distribute the money value in terms of first cost as equally as possible among all the districts affected and thereby sacrifice, in our estimation, permanency and durability of the pavements.

We would submit that it is our opinion that a better plan of procedure, and one which would also fulfill the requirements of the act, would be that where pavements are constructed at all, they be constructed of a character which is known to be the most durable, permanent and practicable under local conditions; this, of course, would mean that a smaller percentage of paved roads and a greater proportion of graded roads would be constructed than under the present plans. We feel that whatever work is done should be done with the end in view of securing the best pavement known to highway builders to-day, thus, reducing to the smallest degree possible the factor of future cost of maintenance, for which, by the way, no specific provision has been made to our knowledge. We believe that even though some localities would have to be satisfied with an ordinary graded highway, or perhaps an oil surfaced highway under the present bond issue, this would be a far better course to pursue, not only for the reason that the best pavement is none too good; for the further reason that when the bond issue is exhausted the Commissioners could go before the people and claim that whatever work was done had been done according to the best known construction, and that the graded roads would be finished and could be used as subgrades for future pavements if the people would see their way clear to vote an additional bond issue.

There can be no question but that the present bond issue is inadequate to serve all communities with a comparatively permanent pavement, and we believe it far better policy to have good work done as far as can be, than to make an effort to serve all communities by half-way measures. Mediocre or experimental pavements of the character specified can only result, in a very few years at the most, in a roadway which will be extremely expensive to maintain, and probably need reconstruction, but will result in serious reflection upon the ability and foresight of the Commission. If our plans would be carried out, all work done would be of a permanent character, either in completed pavement, or as a material step toward such a completed pavement, and we believe that the matter could be placed before the people in such a manner as to prove to them that the expenditures that were to be made were made to the best advantage, and thus gain their confidence to such an extent that they will be glad to provide the means necessary for the continuance of the good work.

PRESENT SPECIFICATIONS.

Of the specifications for the five and four tenths miles now under course of construction in San Mateo County, we have no criticism to make other than that a one-inch wearing surface seems to be much too thin, and not in accordance with modern paving practice.

In the matter of oil macadam, which, according to Mr. Fletcher's report, will be made more or less of a standard throughout the State with the Highway Commission, we wish to say that it does not meet with our approval. This form of pavement is comparatively new, and has, in fact, not been in use long enough to give us an opportunity of judging of its permanency or durability. Some of our highway pavements laid with oil macadam three or four years ago have resisted disintegration fairly well; perhaps more of them, however, have shown a considerable degree of disintegration and depreciation. Oil macadam constructed by the penetration method cannot be built with sufficient uniformity to prevent more or less disintegration or a soft, spongy surface. If constructed by the mixing method we claim that the additional cost of asphalt over oil would be so immaterial that an asphalt macadam (asphalt concrete) would be far preferable. In thus reporting

adversely with reference to oil macadam pavement the very important item of maintenance, which for this pavement will be large, is given consideration.

For this expense, as above mentioned, no provision has yet been made, and which must probably fall upon the various counties in which such pavements lie.

As a commentary on the matter of oil macadam, we would call to mind that Los Angeles County alone spent \$3,500,000 on oil macadam highways, and that in the latter part of 1911, when practically all of the bond issue was spent, the grand jury of the county met and in a final report stated, as we recall the words, "that the oil macadam roads in Los Angeles County were an absolute failure."

The specifications for work now being advertised include a four-inch cement concrete base (mixed in the proportion of one part of cement, two and one half parts of sand and five parts of gravel or crushed rock), and a mastic wearing surface of from 40 per cent to 60 per cent of asphaltic cement and the balance of filler. On highway work where water and transportation facilities are not convenient, we claim that a cement base of only four inches in thickness or any other thickness is an impracticable structure; it will be extremely difficult and prohibitive in cost for any contractor to protect the concrete from the sun without covering the same with earth, and it will be even more difficult to keep it wet. We fear that the result will be that the base will crack from the lack of proper moisture and protection, and furthermore we fear that the surface can never be swept or brushed clean enough to enable the asphalt paint coat to be applied in a thoroughly satisfactory manner. Even though boards were used to protect the concrete from the sun, dust will certainly be blown in over the concrete, and thus defeat the proper application of the asphaltic paint coat. Furthermore, as regards the wearing surface, we fear that the high percentage of asphaltic cement will either cause the surface to soften and gradually leave the pavement during the hot weather, or, if the penetration is so low that it will not run in hot weather, it will be so stiff as to crack in cold weather, thus allowing water to find its way underneath the wearing surface. The effect then would be that the wearing surface will separate itself from the base and rapidly peel off under the continual wear of heavy traffic, and of course it is still an undisputed fact that concrete such as will appear in the specified base will give very little resistance to the effect of general traffic.

We believe that the three eighths inch of mastic wearing surface will not only be very expensive comparatively, but will be much more unsatisfactory than even a one-inch wearing surface or squeegee coat such as is used as a flush coat to finish an asphalt concrete pavement. The amount of asphalt necessary in the proposed mastic surface is just the same as would be required in a 2-inch sheet asphalt wearing surface. This surface specification has not been tried out satisfactorily and is therefore an experiment.

It is our belief that, particularly up and down the San Joaquin Valley, motor trucks will come into use immediately upon the completion of the highway for the purpose of transporting freight from terminal points, and this factor should be taken into careful consideration before specifications are adopted for such highways. In all other respects, so far as the information has come before us, the plans of work contemplated by the Commission are very excellent and worthy of recommendation.

SUGGESTED SPECIFICATIONS.

Having in mind the increasingly greater traffic demands which will be made after the completion of the highway, we would suggest three classes of pavement as being much more permanent and satisfactory in every way than those proposed.

1. A standard pavement, consisting of a cement concrete base, and a bituminous wearing surface of at least two and one half inches thick, constructed according to best modern practice; this form of pavement has been proven to be successful in all large cities and is considered standard by all municipal engineers.

2. A pavement consisting of a 5-inch cement concrete base, as before, but overlaid with a two and one half inch thickness of bituminous rock, similar to many pavements in San Francisco and other cities.

3. A pavement, commonly known as asphalt concrete, consisting of a base course three inches thick and a wearing surface two inches thick, each course to be separately rolled to complete resistance. This form of pavement has been in use for many years and has proven entirely satisfactory.

A bituminous concrete similar to the asphaltic concrete might be used to advantage along the line of the coast route. For present highway purposes in most localities, we consider that the asphalt concrete form of pavement would be, in all respects, the best pavement to be had under existing circumstances.

In support of our contention that an asphalt concrete pavement can be laid at a comparatively low cost, we would cite that in Sacramento contracts were recently entered into for a 5-inch asphalt concrete at the rate of 11¾ cents per square foot including grading; also that in Fresno, contracts for a similar 5-inch pavement were entered into at the rate of 13 cents per square foot including grading; also that in Madera, similar contracts were made at the rate of 14 cents per square foot including grading.

RECOMMENDATIONS.

In conclusion, we would remind your body that approximately 70 per cent of the burden of taxation will fall upon the incorporated cities. If poor pavements, or experimental pavements are laid between cities, they will be the greatest sufferers and would therefore have the best right to be heard in the matter of pavements. In view of the seriousness of adopting improper specifications we would recommend that you give the matter your careful and immediate attention.

Respectfully submitted.

(Signed) CHRIS P. JENSEN.
S. J. VAN ORNUM.
J. J. JESSUP.

Anti-Road Sign Movement

Judging from the general tenor of newspaper comment, public sentiment throughout the State is warmly in sympathy with the movement started by the Civic Section of the California Federation of Women's Clubs of the Northern District for the protection of the state highway system against the hideous road sign which obliterates the landscape and mars the beauty of the scenery along nearly all of California's highways.

Mrs. Bradford Woodbridge, of Roseville, chairman of the Civic Section and Mrs. George W. McCoy, of Placerville, president of the Northern District of the Federation, are leading in this aggressive campaign.

It is needless to say that the California Highway Commission endorses the movement which these public-spirited ladies represent.

The State Printing Office

The renovated, reorganized State Printing Office, under State Printer F. W. Richardson, is another department of the administration which is conducting a great public work along thorough business methods. This Bulletin is a testimonial in this respect that speaks for itself. The Highway Commission uses large quantities of printed matter—and the State Printing Office is doing the work in a high-class manner at bed-rock commercial costs.

Warning Signs for Torn-Up Roads

It is obvious that during the construction of state highways, public travel must be inconvenienced to a considerable extent. To minimize the annoyance, the following General Instructions have been issued:

GENERAL INSTRUCTIONS TO DIVISION ENGINEERS No. 76.

To Division Engineers of the California Highway Commission.

GENTLEMEN: In the future and until further orders you will, acting under section 4 of the specifications, instruct the contractors in all cases of light grading that the road is not to be torn up for more than one half mile in advance of the completed pavement.

In the case of oil concrete the half mile may be measured from the completed concrete notwithstanding that the concrete has not sufficiently hardened to receive the traffic.

Nothing in this letter should be construed as prohibiting the building of culverts if proper by-passes are maintained, the working outside of the traveled way, or the rough grading of heavy work where time for settlement is necessary before the pavement can be laid thereon, even though these operations be more than one half mile in advance of the completed pavement.

Yours very truly,

(Signed) A. B. FLETCHER,
Highway Engineer.

GENERAL INSTRUCTIONS TO DIVISION ENGINEERS No. 84.

To Division Engineers of the California Highway Commission.

GENTLEMEN: You will see that the following order relative to "ROAD CLOSED" signs is observed on all state highway constructions in your division.

Road Closed Signs.

Before construction begins on any state highway, warning signs shall be erected, at the expense of the State, under the direction of the Resident Engineer, in the manner following:

(a) Three types of sign will be furnished by Headquarters, printed on cloth, reading as follows:

(Type 1)

STATE OF CALIFORNIA.
DEPARTMENT OF ENGINEERING.
CALIFORNIA HIGHWAY COMMISSION.
STATE HIGHWAY UNDER CONSTRUCTION.
POSITIVELY NO PASSING.

(Type 2)

STATE OF CALIFORNIA.
DEPARTMENT OF ENGINEERING.
CALIFORNIA HIGHWAY COMMISSION.
STATE HIGHWAY UNDER CONSTRUCTION.
ROAD DANGEROUS BUT PASSABLE.

(Type 3)

STATE OF CALIFORNIA.
DEPARTMENT OF ENGINEERING.
CALIFORNIA HIGHWAY COMMISSION.
STATE HIGHWAY UNDER CONSTRUCTION.
-----MILE-- BEYOND THIS SIGN.
TURN HERE.

(b) The cloth signs will measure 25 inches by 38 inches and they are to be attached to substantial sign boards with moldings to prevent the fraying of the edges of the cloth. The boards shall be securely fastened to 3 inch by 3 inch scantling, the bottom of the sign to be 4 feet above the ground and the posts to be set 2½ feet into the ground.

(c) The signs shall be placed:

1. At the beginning and at the end of each portion of the road torn up.

2. At every road entering or intersecting the road torn up.

3. At road forks sufficiently distant from the road torn up to give travelers ample warning that the state highway is under construction, and not passable. The resident engineers shall fill in the "distance blank" on such signs.

(d) All such signs shall be properly lighted at night by lanterns furnished by the Contractor.

(e) The sign boards shall be removed as soon as conditions will permit and taken care of so that they may be again used elsewhere.

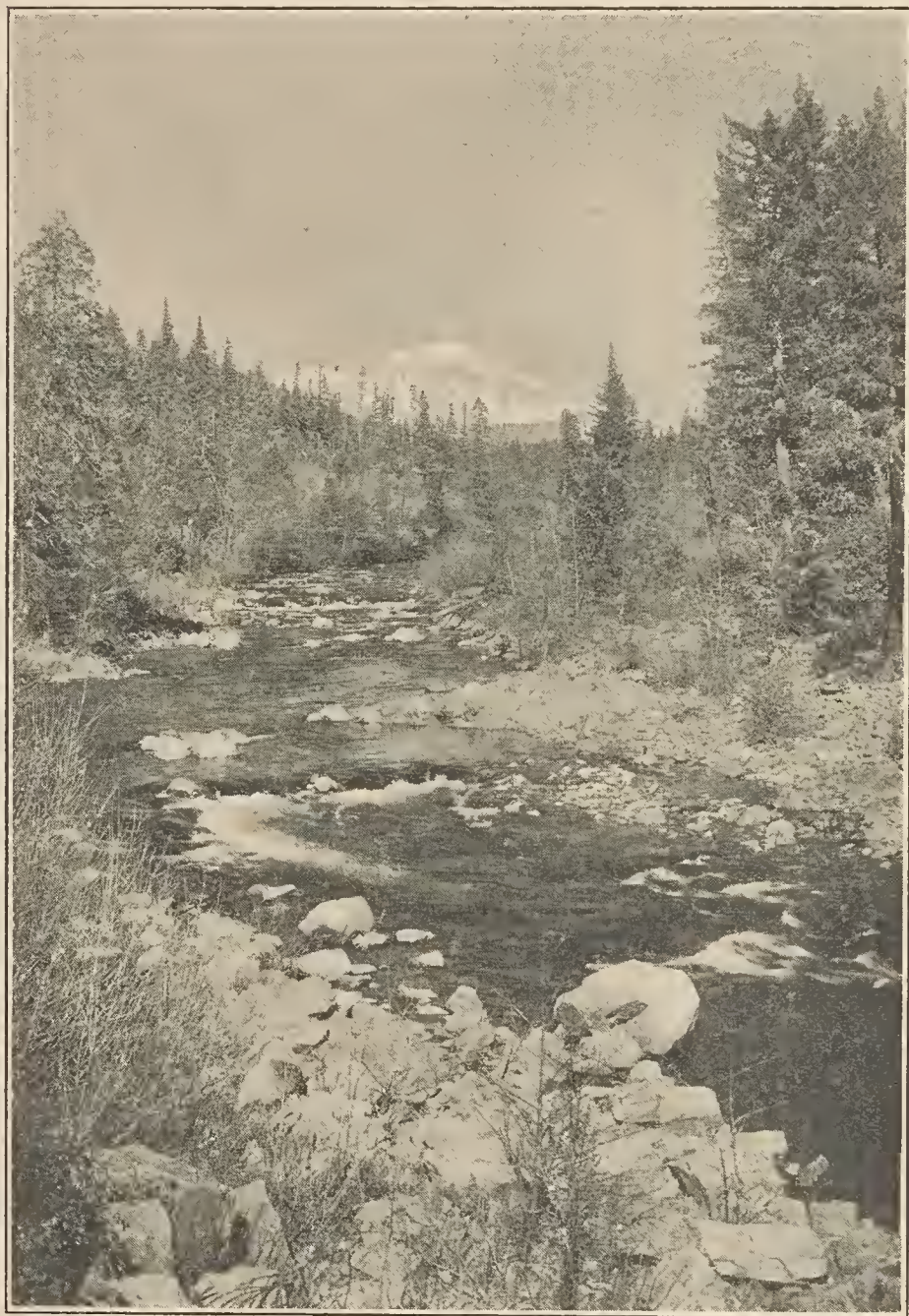
Yours very truly,

(Signed) A. B. FLETCHER,
Highway Engineer.

Building the Highway Through Cities

The question of jurisdiction and responsibility over those links of the state highway which might lie within the limits of incorporated cities and towns, at the outset occasioned some perplexity. But the Commission promptly met the situation by determining to adopt the fixed policy of leaving to the towns and cities which the highway might touch the building and maintenance of these connecting links.

This seemed the only logical course to pursue. The use by the city of its own streets is manifestly always far in excess of any possible through or outside travel. Not only the first cost of construction but the expense of maintaining a city's streets are legitimate charges against the municipality. No town wishes to surrender the control of any of its thoroughfares to the State. The right to have a free hand in the granting or denying of franchises for street car lines, the laying of water and gas mains and the erection of telegraph and telephone poles along its public streets is the jealously guarded prerogative of every municipality.



"Old Shasta" is on the State Highway.

But while the Commission has decided to build the highway only to and from the limits of incorporated cities, due attention has been given to negotiations with all cities and towns that may possibly be touched by the highway, to the end that such municipalities shall pledge themselves to construct the connecting link of the state highway within their limits in as good form and manner as that of the state highway to and from such town.

It is significant that not a single city or town has demurred to this proposition. In many instances, the coming of the state highway, knocking at the doors of a lethargic community, has aroused it to undertake not only the permanent improvement of the "link," but to inaugurate a general campaign of street building and civic progress.

Chart of Organization

The accompanying chart is an analysis of the organization of the California Highway Commission. The diagram illustrates the Commission's relationships to the Department of Engineering, the Administration and the State, and traces its own internal ramifications.

This chart was worked out by the firm of Klink, Bean & Co., expert accountants, who also devised and organized the Commission's accounting system.

In subsequent numbers the Bulletin will more fully explain this most important department.

The Power of the Press

Through a press clipping bureau service, this Commission is fairly well posted as to highway movements and agitations throughout the State; but a prompt and more satisfactory gleaning of news and comment is obtained directly from the columns of those newspapers which are mailed regularly to the Commission. Publishers of the following journals courteously accord such favor to this department:

Daly City Record.	Oxnard Courier.
Placerville Republican.	Stockton Record.
Sacramento Tribune.	Delano Record.
Yolo Independent.	Dinuba Sentinel.
Ukiah Press Republican.	San Mateo Times.
Grizzly Bear.	Downieville Messenger.
Wheatland Four Corners.	Biggs Argus.
	Glendora Gleaner.

Hardly ten counties, however, are represented by these publications.

It might be well worth while if the various boards of supervisors caused one or more of their representative local newspapers to be mailed to the Highway Commission regularly, in order that the activities of all these counties in public road improvement may be the more fully and promptly reported to this department.

The newspapers of California, almost without exception, are constant and effective champions of the good roads cause.

This Bulletin could profitably devote a page in each number to a résumé of the editorial expressions and news reports with reference to good roads that from month to month may be gleaned from these local papers.

The Secretary's office regularly clips and classifies all such press matter for the perusal of the Highway Engineer and the Commissioners.

The Maintenance Problem

The California Highway Commission at its regular session on September 23d formally instructed the Secretary to address a letter to Hon. A. B. Nye, State Controller, informing him that in the opinion of this Commission the sum of \$200,000 should be appropriated by the ensuing legislature for the purpose of maintenance of the state highway during the years 1913 and 1914.

This maintenance problem must be met and solved by the State, and the Commission believes that in thus calling the State Controller's attention to the matter a timely step has been taken which insures that the next Legislature will give the subject its careful consideration.

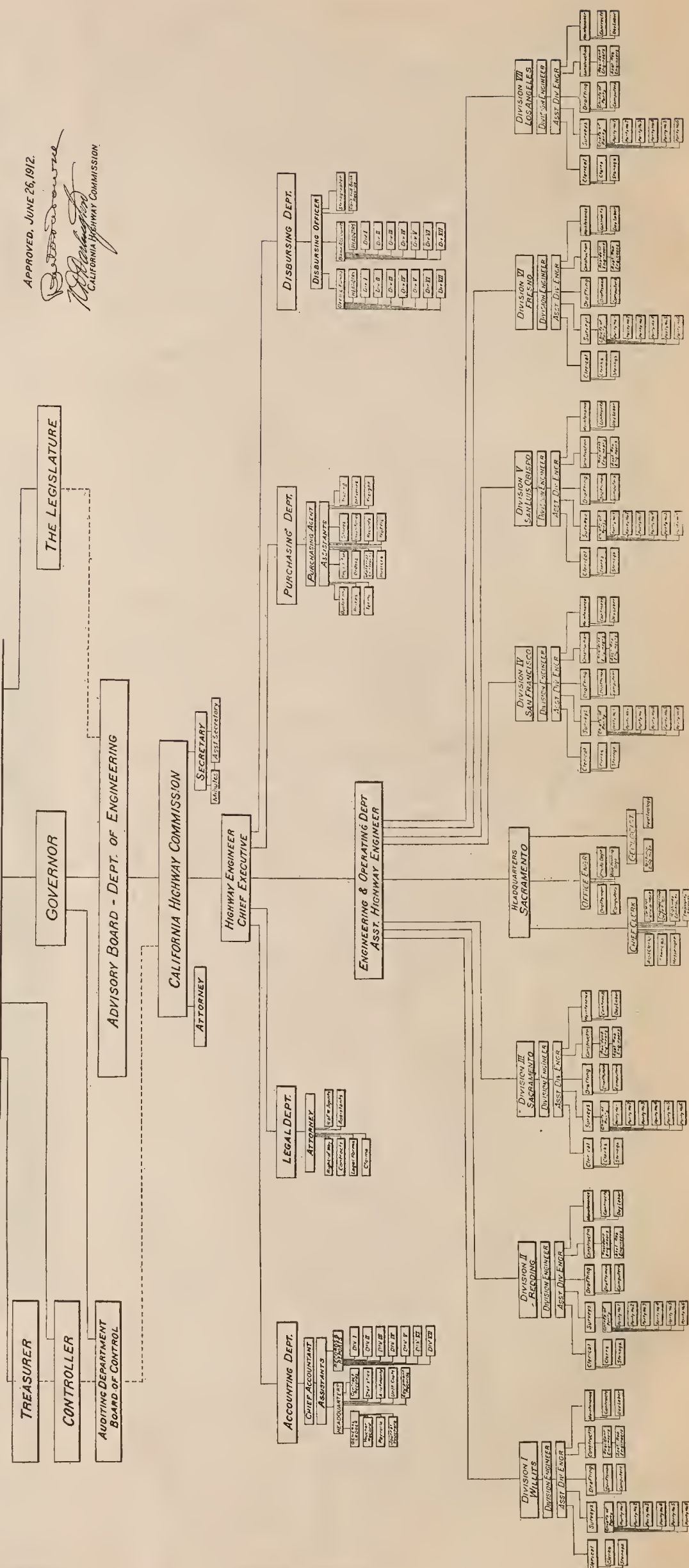
The second number of the CALIFORNIA HIGHWAY BULLETIN will appear December 15, 1912. Its preparation has already begun.

ORGANIZATION AND ACTIVITIES CALIFORNIA STATE HIGHWAY SYSTEM. BOND ISSUE OF \$18,000,000.

APPROVED, JUNE 26, 1912.

Wm. Richardson
SUPERINTENDENT
CALIFORNIA HIGHWAY COMMISSION

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