

CALIFORNIA
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CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE DIVISION OF HIGHWAYS FOR THE
INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 4

SEPTEMBER-OCTOBER, 1927

No. 9



BEAUTY AND UTILITY—One of California's most beautiful state highway scenes, a portion of the Peninsula highway in San Mateo County. It has handled so much traffic in late years that other routes are now being surveyed and constructed to relieve its congestion.

In this issue: BREAKING SAN FRANCISCO'S STATE HIGHWAY BOTTLENECK, PAGE 3.

CALIFORNIA HIGHWAYS

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J. P. HALL Editor
P. O. Box 1103, Sacramento, California.

Vol. 4 SEPTEMBER-OCTOBER, 1927. No. 9

CALIFORNIA DIVISION OF HIGHWAYS

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GOOD TIMBER!

The tree that never had to fight
For sun and sky and air and light.
That stood out in the open plain,
And always got its share of rain,
Never became a forest king
But lived and died a scrubby thing.
The man who never had to toil,
Who never had to win his share,
Of sun and sky and light and air,
Never became a manly man
But lived and died as he began.
Good timber does not grow in ease;
The stronger wind, the tougher trees;
The farther sky, the greater length;
The more the storm, the more the strength;
By sun and cold, by rain and snows,
In tree or man good timber grows.
Where thickest stands the forest growth
We find the patriarchs of both,
And they hold converse with the stars
Whose broken branches show the scars
Of many winds and much of strife—
This is the common law of Life.

—Selected.

THE SHORTEST DISTANCE.

Highway construction of recent years has taught the country much about road building. Highway engineering has become a highly specialized branch of engineering chiefly because modern methods of road construction demand exact supervision and planning.

One thing highway engineers have learned is that every foot a highway is shortened represents a considerable saving for the taxpayer and road users. The taxpayer saves because it means less road to build and maintain, while shortening the way results in economy and time saving for the traveler.

The old notion that a few extra miles do not matter so long as the road is good has been abandoned by all but the seekers after the longest route home.

An engineer points out that a curve with a 200-foot radius makes a road 86 feet shorter than if the road were permitted to follow the old square corner of the survey lines. Multiplying this by the number of sharp turns in the average old-style highway vindicates the road-straightening policies of the state highway departments.

Now that the motor truck is so extensively used for the transportation of food and other commodities for public consumption shortening the highway distance between the shipping point and destination means lower living costs through reduced cost of transportation. Railroads spend millions annually to find, for their tracks, the shortest distance between two points, and the saving is not for them but also for their patrons.

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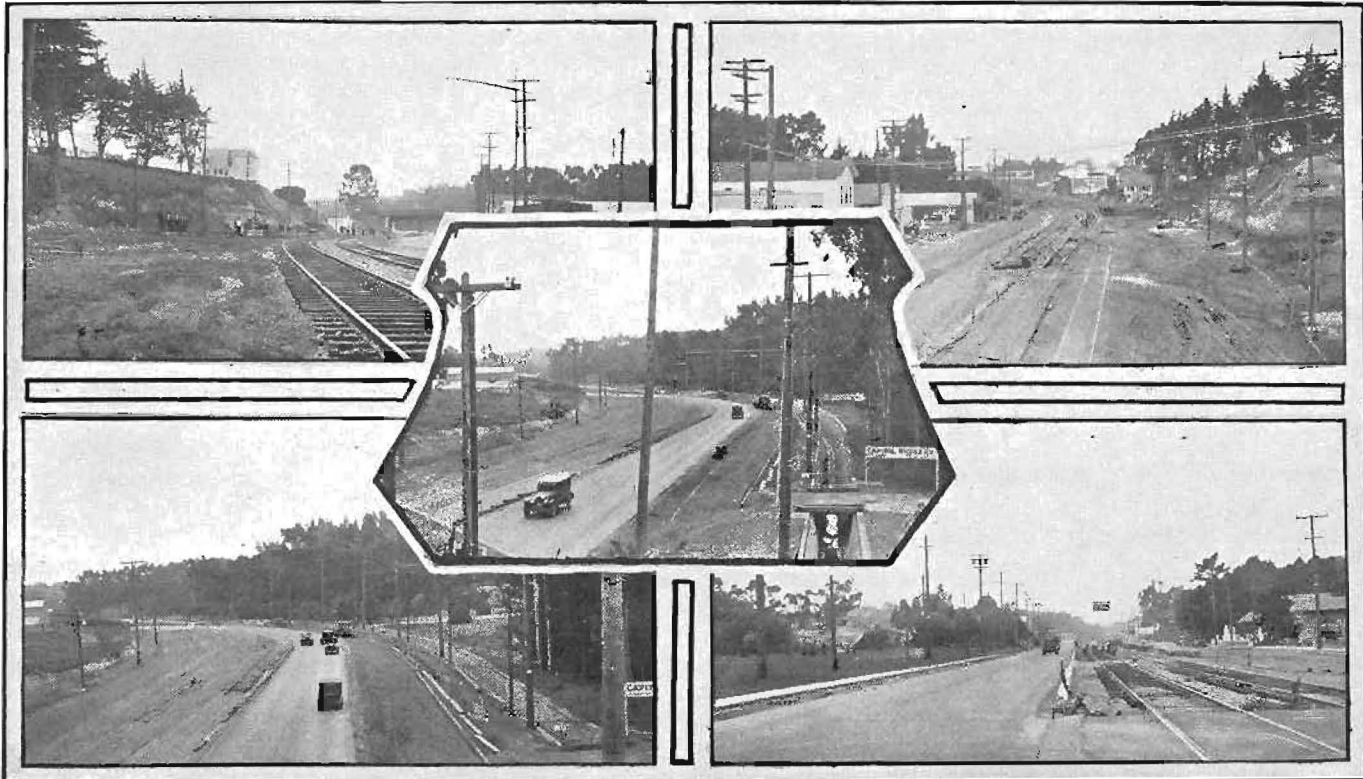
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EVERY employee of the highway commission has a direct interest in the improvement of the highway organization's methods and results, both engineering and clerical, office and field. To that end, the State Highway Engineer invites constructive criticism or suggestions from every employee.

Ideas as to the more economical and efficient handling of your job, or suggestions for elimination of waste will be welcomed. Criticism is also desired from persons outside the organization, who are in a position to give facts.

Send only signed communications addressed as follows: California Highways, P. O. Box 1103, Sacramento, Cal.

Breaking San Francisco's State Highway Bottleneck



BREAKING THE BOTTLENECK—(1) Looking south to S. P. Underpass; Completing grading work. (2) South from S. P. Bridge; Old 24-foot pavement near center. Header boards being set for concrete pavement. (3) North from S. P. Bridge car tracks being moved to center of right of way. (4) Progress in widening work in front of Cypress Lawn Cemetery. Old 24-foot pavement on left or west side of car track to be widened and resurfaced. Car tracks being reballasted. Rough grading completed on right or east side. (5) South from S. P. tracks showing storm drain.

THE widening and paving of San Francisco's only state highway outlet to the south will soon be completed and the breaking of the notorious Colma "bottleneck" accomplished. Although the date for the completion of the contract is set at November 1, 1927, it is thought by California State Highway officials that an earlier date will see the opening of this fine new section of the El Camino Real.

Six traffic lanes, three in each direction, separated by the tracks of the peninsula electric cars, will in future carry the automotive traffic with increased safety and speed from San Francisco into San Mateo County and to all points south. The tracks of the Market Street Railways Company will occupy the center 28 feet; a 10-foot easement, unpaved, will run between each traffic artery and the street car line as an added precaution against accidents, and two 10-foot strips will be reserved for sidewalks.

A \$700,000 Project.

In round figures the cost of the 1½ miles of reconstructed highway will approach a sum of \$700,000, exclusive of engineering costs. Figures for the project are as follows:

Cost of right of way.....	\$165,000
Grading and realigning.....	137,000
Paving	209,000
Cost of moving railway.....	110,000
Other improvements.....	53,000
Total	\$674,000

A Cooperative Project.

Agreements with City and County of San Francisco for an appropriation of \$150,000 with the county of San Mateo for \$50,000, and with the Market Street Railways Company for \$55,000, and the untiring support of the various county and municipal authorities made it possible for the California Highway Commission to award the contract for the grading and structures of this portion of the state highway from Colma to Cypress Lawn Cemetery. The award was made on October 7, 1926, to the Kaiser Paving Company.

Many months were required by the contractors in moving a large number of buildings and other obstructions, and it is only recently that the entire project has taken shape of the new alignment. The setting of poles, including those of the

California Highway Engineers Attend Denver Convention

FOUR of California's highway engineers, State Highway Engineer R. M. Morton, Assistant State Highway Engineer T. E. Stanton, Construction Engineer C. S. Pope, and Acting Maintenance Engineer T. H. Dennis, were in attendance at the annual convention of the American Association of State Highway Officials held at Denver, Colorado, October 3d to 6th.

This association is comprised of state highway engineers and officials of all of the states of the union, and it is this organization which has been largely responsible for important national highway legislation, and individually the members have been mainly responsible for state highway legislation and development in the states which they represent.

California Engineer Among Speakers.

One of the principal addresses was delivered by T. E. Stanton on the subject of "Bituminous Treatment on Gravel and Stone Roads." Mr. Stanton went thoroughly into the subject, telling of the work on state roads in California with the use of our two oiling methods, namely: mixing and penetration. The results obtained during the past two years in oiling state roads have attracted attention in all states of the union and Mr. Stanton was able to give the assembled delegates some first hand information that will prove very helpful to them in their future road building. He laid emphasis on the reasons that oiled roads have proven so successful in the state highway system of California, these being the elimination of dust, the resultant smooth riding macadam surface, and the several years service obtainable before paving is necessary.

A request that congress at its next session shall continue its yearly appropriation of \$75,000,000 federal aid funds for the years 1929 and 1930 for the improvement of highways within states, and a request that congress also appropriate larger funds for the roads in national forests serving as approaches to national parks featured the meeting of the National Association of State Highway Officials.

The eleven western states were emphatically in favor of larger appropriations for major highways in the national forests. The officials from the western states declared that major road improvement in the national forests was lagging behind the improvement of state highways, federal aid highways and highways within the national parks, to which latter roads, the roads in the national forests serve as approaches.

The consensus of opinion was that the appropriation for the national forest material roads should be increased from \$7,500,000 to \$15,000,000 a year. The convention went on record as favoring a substantial increase, without, however, fixing the amount of increase asked.

The last authorized appropriation of federal aid money for the improvement of roads within states falls due in 1928. The convention requested congress at its next session to indicate its intention of continuing the policy of federal aid by appropriating \$75,000,000 a year for the years 1929 and 1930. There was some agitation to ask for a larger amount, but the convention finally decided to ask for the \$75,000,000 appropriated in the last federal aid measure.

Much attention was devoted to increasing the safety factor on highways through better alignment, and through the installation of safety stop systems. Traffic stripes at the center of the roads at points of danger were also advocated.

One state announced a system of a broken line along the center of the highway where the danger was small, and a solid stripe at curves, bridge approaches or points of poor visibility.

A largely increased resort to the gasoline tax as a means of financing highways was also reported.

Other subjects on which addresses were delivered are:

"State Highway Departments' Responsibility in the Protection of Life and Property," "Federal and State Court Decisions Affecting Highways," "Suggested Changes in Bonding and Contracting Practices on Highway Construction," "Federal and State Control of Interstate Busses and Trucks."

Entertainment Features.

Tuesday evening members of the association were guests of honor at a dinner given by the Colorado Good Roads Association. Addresses were made by several governors and members of the United States House of Representatives. On the afternoon of October 5th the delegates and their families were guests on a 70-mile automobile trip over the scenic highways through the Denver mountain parks in the Rocky Mountains adjacent to the city.

Owing to the rapid development of new methods and practices in highway building in the various states the program of this convention was of unusual importance, the delegates bringing back with them much useful information for future work.

IT PAYS TO DRIVE ON HARD ROADS

Average gasoline consumption was reduced from 521 to 454 gallons per car per year as a result of highway paving done in North Carolina in the year from July, 1922, to July, 1923, according to B. C. Frost, as quoted in a statement made at a recent meeting of the Northern California section of the Society of Automotive Engineers in San Francisco. This reduction of 67 gallons of fuel consumption per car per year amounts to a saving of \$16.75 per car with gasoline selling at 25 cents a gallon.

Records of an automobile dealer in Illinois who operates a drive-your-self service and separates his cars so that some were operated almost wholly on hard-surface pavements and others on country roads, showed, according to a statement by A. J. Eddy, a civil engineer of Berkeley, Cal., that the authority states that an owner would save 2.6 cents a mile the hard-surface highway. An estimate made by another authority, states that an owner would save 2.6 cents a mile by driving on hard-surface roads rather than on dirt roads.

Taking the mean of these estimates and assuming that the owner saves 2½ cents a mile and drives 5,000 miles per year, his saving would exceed \$125 a year. Although no data were available on motor trucks, the saving may amount to as much as 5 cents a mile.

Not only does the automobile owner save money as the result of hard road construction, but the taxpayers of the county and state also save money in the long run through the building of durable types of highway. Mr. Eddy cited as an instance of this an oiled macadam pavement whose maintenance cost the city of Berkeley \$1,645 a mile per year during a two-year period, while a pavement that has an 8-inch concrete base and an asphalt surface cost only \$53 per mile per year during the same period, or slightly more than 3 per cent as much, for maintenance.—Highway Engineer and Contractor.

BREAKING SAN FRANCISCO'S STATE HIGHWAY BOTTLENECK

(Continued from page 3.)

Market Street Railways, and the telephone and telegraph lines back of the proposed curb line, and the moving of all old poles in the old right of way, has made a marvelous appearance in this new line. The Market Street Railways Company has been very busily engaged in moving their tracks to the

center line of the new right of way and rebalasting and placing new ties.

Traffic Maintained.

There has been little or no interruption in traffic during construction. Particular care was always taken to see that detours were of adequate width and properly surfaced to avoid congestion or inconvenience to the traveling public. The width of the former pavement provided only a 24-foot surface for both north- and south-bound traffic. This 24-foot strip is still in place in a number of locations in the project and it is a strange sight on a Sunday afternoon to see the broad and clear expanse of the 124-foot right of way void of buildings, while the narrow 24-foot old pavement is jammed with traffic. A sight of this nature certainly reveals the value of a widened and straightened highway capable of handling the heavy Sunday and holiday traffic and the usual week-day run of heavy trucking and other vehicles.

Paved With Cement Concrete.

As soon as grading operations had been completed to a point where it was advisable to proceed with the paving, plans and specifications were prepared and bids were received on June 13, 1927, to pave the project, 1½ miles in length, with Portland cement concrete. Some of the major items of the paving contract are:

435,000 square feet preparing and shaping subgrade for pavement.

13,000 cubic yards Class "A" Portland cement concrete in pavement.

390,000 pounds reinforcing steel in pavement and curbs.

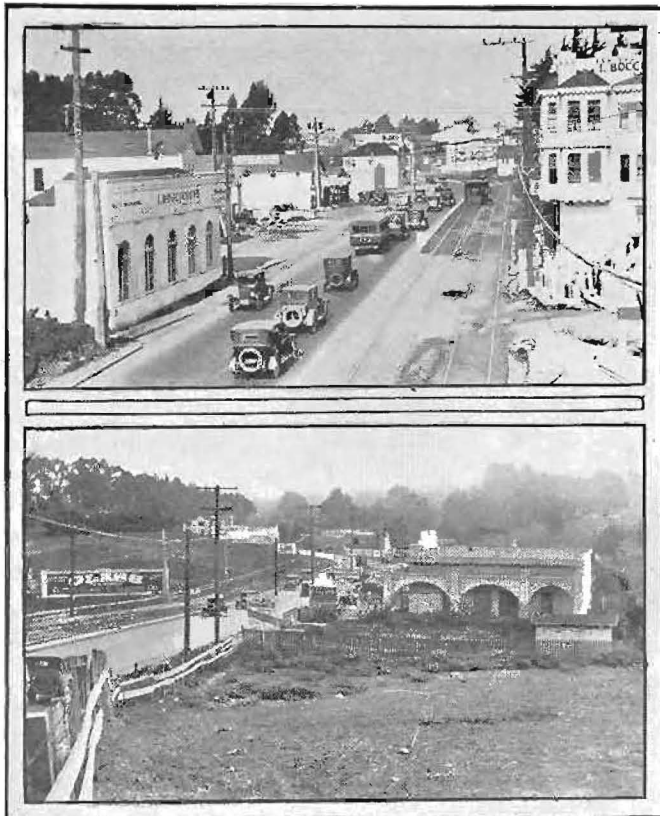
1600 tons of asphaltic concrete mixture repairs and thickening of asphaltic surface on portions of the old pavement within area of new improvement.

These major items are a portion of a contract awarded to Hanrahan Company of San Francisco, June 23, 1927. The contract specifies that all work shall be completed within 75 days after the approval by the attorney for the Division of Highways, whose approval on July 25, 1927, sets the date for completion on November 1, 1927.

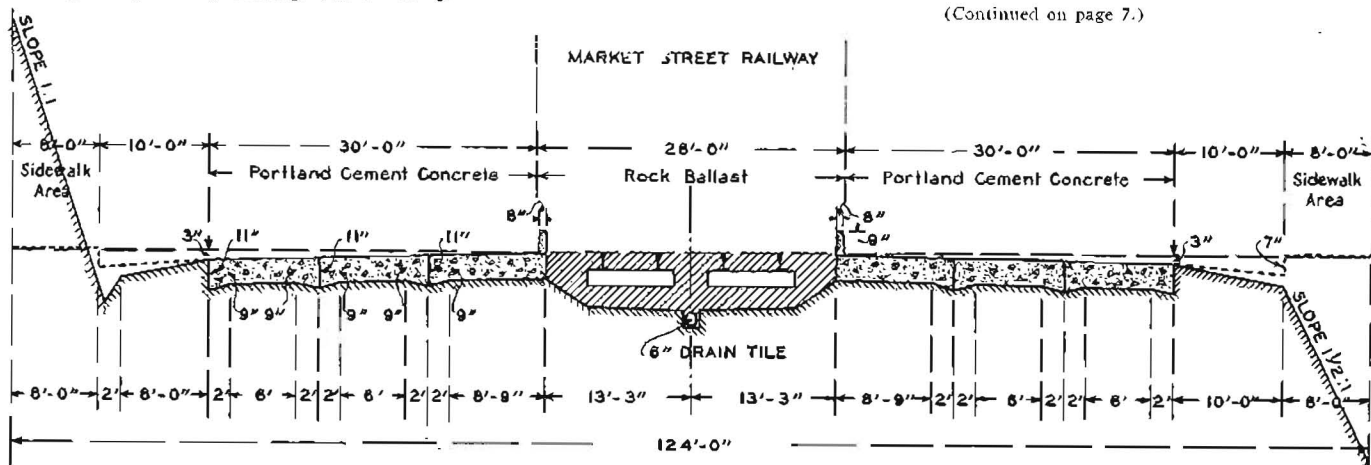
Traffic Way 124 Feet In Width.

The improvement provides for work within the entire width of right of way of 124 feet. The rebalasted and realigned

(Continued on page 7.)

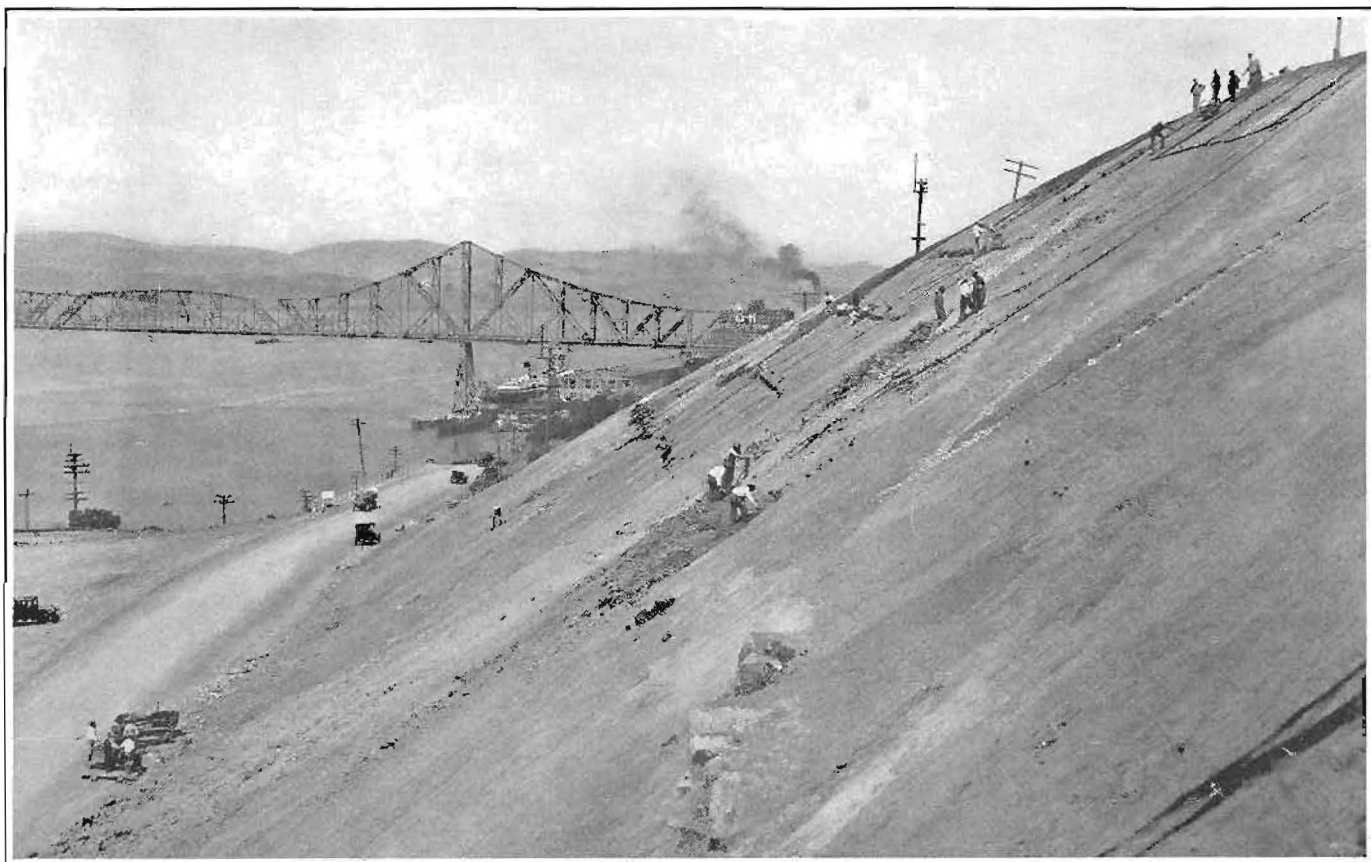


MOVING BUILDINGS A BIG ITEM—Upper, North from S. P. trestle before moving the buildings and widening. Lower, From Colma looking south, showing buildings before moving.



TYPICAL CROSS SECTION
 COLMA TO CYPRESS LAWN CEMETERY
 DIST. IV-S.M. 2 A. CONTRACT NO. 94 EC I
 SCALE HORZ 1 INCH - 12 FEET
 VERT 1 INCH - 4 FEET

Valona Slide Conquered With Concrete Slope Paving



THE VALONA SLIDE CONQUERED—Over an acre of cement concrete now will keep the Contra Costa hills from sliding the state highway at Valona into Carquinez Straits. The new \$8,000,000 Carquinez highway toll bridge appears in the view.

AT LAST the Valona Slide appears to be conquered. For years it has been a source of trouble and at one time literally shoving the concrete pavement over a cliff for a fall of at least 100 feet to the tracks of the Southern Pacific railroad which skirts the base of the sliding hill.

The formation at this point, a short distance west of Crockett, and the south approach of the Carquinez highway toll bridge, appears to have no solid foundation and when well saturated with water during the winter, moves in a solid mass.

Cemented With Gunite.

The sliding hill has been given a 2-to-1 slope, and after being smoothed by hand work was paved with 2 to 2½ inches of gunite.

Gunite is a very fine mix of sand cement and water, laid under air pressure by a cement gun. The sand and cement are mixed under pressure and led to the job through a hose under pressure. Just before it leaves the nozzle to be shot onto the job, the dry mix receives the water, properly proportioned. Eight sacks of cement were used to the cubic yard.

Construction Details.

Before placing the gunite, tile drains were installed. The pavement was placed in rectangular slabs, separated with premoulded bituminous composition strip, one-half inch thick. The slabs were reinforced with wire fabric, No. 8 gauge, spaced 4 inches apart. The reinforcing was held in place by

means of concrete or metal chains. Each slab was attached to the subgrade with 4 cement concrete anchors, 6 inches in diameter and 2 feet 6 inches long, reinforced with deformed bars. To cure the slope it was covered with burlap and uniformly sprinkled with a fine mist for four days.

The whole slope contains 44,560 square feet, or slightly more than an acre of concrete. A. Tiechert & Son had the contract.

WHERE SNOW REMOVAL IS A REAL PROBLEM

Michigan is confronted with the problem of keeping more of her state highways open in the winter, having recently adopted a program calling for snow removal on an additional 942 miles over last year, bringing the total to 6629 miles. The additional mileage calls for \$50,000 worth of added equipment and 600,000 lineal feet of snow fence at a cost of \$100,000.

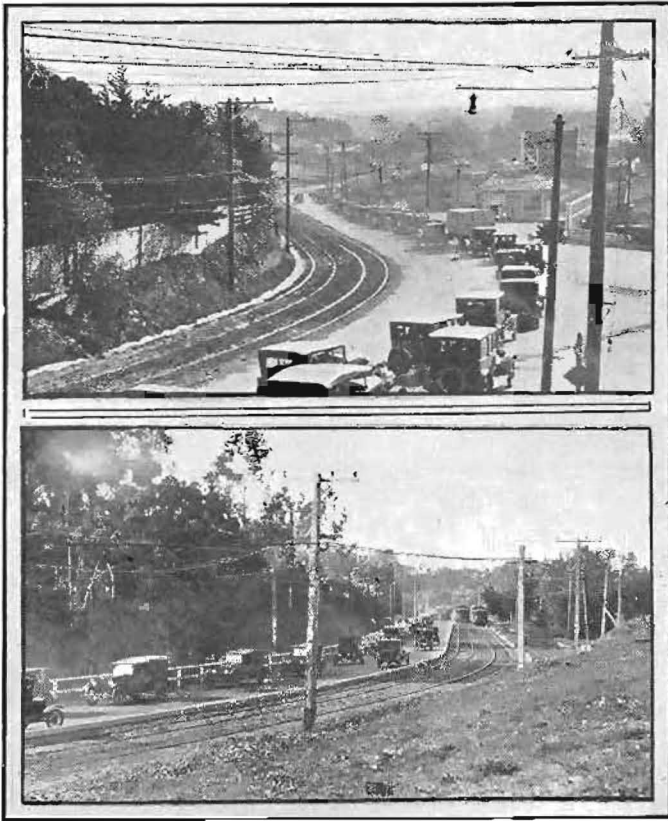
GRADE CROSSING ACCIDENTS IN 1926.

The American Railway Association reports an increase in grade-crossing accidents during 1926. Throughout the United States there were 5921 crossing accidents last year, in which 2492 persons were killed and 6991 injured, while in 1925 there were 5479 accidents in which 2206 persons were killed and 6555 injured.

BREAKING SAN FRANCISCO'S STATE HIGHWAY BOTTLENECK

(Continued from page 5.)

street railway tracks of the Market Street Railways Company are on 13-foot centers and occupy the central 28 feet of the right of way. These tracks are ballasted in rock under which is laid a 6-inch longitudinal tile drain for draining the track area. The completed open ballasted railway tracks will remain in this condition and will be curbed to prevent vehicle traffic from driving onto the area reserved for street car tracks except at specified paved crossings which provide for cross travel.



TRAFFIC SCENES ON THE OLD HIGHWAY—Upper, From Colma looking south, showing heavy traffic on old road before reconstruction. Lower, View of old road with car tracks near Eternal Home Cemetery. This portion of road has been eliminated entirely by line change.

Sixty Feet of Paving.

On each side of the central 28-foot strip reserved for the railway tracks, there is being constructed a 30-foot Portland cement concrete pavement, consisting of three 10-foot strips, nine inches thick in the central six feet and increasing from nine inches to 11 inches in the outer two feet. The slab adjacent to the center is being constructed 10 feet 9 inches wide, the additional nine inches being for support of concrete curb doweled to the pavement base.

Construction Details.

Expansion joints are provided for at 60-foot intervals and consist of prepared bituminous joint. Concrete slabs at expansion joints are doweled with five $\frac{3}{4}$ " x 24" dowels and 27-inch centers, one end being fixed, the opposite end being a slip joint. At 20-foot intervals between expansion joints

a transverse weakened plane is being constructed obtaining a true transverse natural crack line; therefore each 10' x 20' portion of pavement is separately reinforced with two $\frac{5}{8}$ " deformed reinforcing bars laid four feet from each of the four edges of the slab. A portion of the previously constructed state highway will be used as a base for the new improvement. The old width of 24 feet will be increased six feet to a total of 30 feet by the construction of a concrete shoulder 10 feet wide, four feet of it overlapping the asphaltic pavement and raised to the elevation of the new crown. The remaining portion of the area over the old pavement will be resurfaced with asphalt concrete and finished to a true cross section conforming to the standard provided in contract.

In order to facilitate the rapid placing of concrete pavement, Hanrahan and Company have constructed bunkers and proportioning plant on the railroad siding adjacent to the center of their work. All materials are loaded in dry-batch compartment trucks and hauled directly to the subgrade where a six-sack Multifoot paver receives the material and places the concrete directly in 10-foot width sections. It is the purpose to lay the concrete pavement on this line change for the immediate use of traffic and to allow the moving of the railway tracks from the old location to the new right of way, at the same time obviating two dangerous crossings of these street car tracks. Traffic will be routed over one or another of the 10-foot strips which will permit of the pouring and curing of other pavement sections on opposite sides.

This particular highway, Route 2, carries the largest amount of traffic of any road in the state as shown by a 16-hour count taken Sunday, July 17th. It is quite probable that this figure will exceed 30,000 when this improvement is completed and the entire highway thrown open to traffic, which will then give the autoists an unobstructed traffic artery between San Francisco and points south.

Right of Way.

Securing the right of way for this project was the most difficult and costly piece of work along this line undertaken in this district, and, it is believed, in the entire state. Though less than a mile and a half in length, dealings were had with hundreds of people. Whole families had to be interviewed en masse and later as separate individuals, together with their spiritual advisers, attorneys and friends. Appraisals had to be made on the moving of numerous dwellings, several road-houses, garages, service stations and monument works. This involved appraisals of the most diverse character and the patience of both the appraisers and the owners was many times at the breaking point, but now that the job is finished it may be truthfully said that amicable relations are in force between the district office and our neighbors along the highway.

The total cost of the right of way will approach \$165,000, there being still a few unsettled deals for property and building removals. This cost includes the work done directly by the state as well as monetary damage paid to the owners.

The district office was very fortunate in having the able assistance of the Right of Way Department of the Department of Engineering of the City and County of San Francisco for a large portion of the negotiations.

Don't Spread This.

Si—"Sara, is there anything you want from town this mornin'?"

Sara—"You might stop in at one of them there stores and buy a jar of that there Traffic Jam I been ahearin' so much about."

**COST OF SNOW REMOVAL
FROM STATE HIGHWAYS**

By W. A. SMITH, Assistant Maintenance Engineer.

THE Maintenance Department recently collected some information for the United States Bureau of Public Roads relative to the extent and cost of snow removal from our highways during the 1926-1927 season. It is felt that this information may be of interest to many who are interested in this branch of state highway work.

A summary of reports from the several districts shows that 299 miles of state highways were cleared of snow. Of this total, 251 miles were kept open in Districts II and VIII and the remaining 48 miles were opened to travel by Districts III and IX forces earlier than if nature had been allowed to take her course. One 12-foot rotary snow plow, eight straight-blade plows, fourteen trucks, fourteen tractors and fourteen graders were available for the work.

The cost of keeping the above mileage open was \$15,970 and of opening the 48 miles was \$6,180, a total expenditure of \$22,150 for the work.

District VIII records indicate that 7600 mile-inches of snow were removed at a cost of \$1.58 per mile-inch.

**URGE CHEMISTS TO DEVISE A METHOD TO
CHANGE CLAY INTO SAND.**

A challenge to chemists to discover a method by which clay materials could be given the characteristics of sand was made by Charles M. Upham, Director of Highway Research of North Carolina, before delegates attending the American Chemical Society convention in Detroit. The saving to road builders, he said, would amount to millions of dollars.

"I know of no greater service," he said, "that the chemist can render than to perfect a process by which clay may be treated, changing its nature so that it can be drained, and reduce to a minimum the volumetric changes when subjected to various amounts of moisture and increase the bearing value under moist conditions and render it into a material that could be shaped and maintained by road machines."

TRANSCONTINENTAL HIGHWAY SUGGESTED.

Survey for a super-highway from the Atlantic to the Pacific was suggested in a bill introduced by Senator Dupont, Republican, of Delaware.

The road would be by the most direct route and touch cities of more than 2500 only where impractical to go around them.

Damaged Goods.

Insurance Agent: "Come with me, you can get damages for this."

Negress (hit by truck): "Good Lawd, man, ah don't need no mo' damages. What ah needs is repairs."

Steering Wheel Observations.

There are really only two great questions before the American people today: how to pay and where to park. It is almost impossible for anybody to land in the gutter any more, not because of prohibition, but because some other fellow has already landed there. What this country needs isn't more freedom, but more free parking space.

The men who laid out our towns certainly didn't provide for the automobile. They should have made four curbs on every street; and why all the houses; Nobody stays home any more, or any more than we can help. Home is just a place to go to get money for gas. Home is just a place to go to start from.

If all the automobiles in the United States were put end to end and on Sunday they are. A line of automobiles is as hard to pass as good legislation. About the only road that isn't jammed on Sunday is the road to church. There is plenty of room to park in the pews, but nobody ever thinks of that.—Santa Fe New Mexican.

THE GRADE CROSSING GRAVEYARD

In the United States 22,006,957 automobiles are registered. There are 232,755 railroad-highway crossings.

In 1926 there were 2492 persons killed and 6991 injured at railroad-highway crossings. In the same period 20,819 were killed and 600,000 injured in automobile accidents upon our highways.

The elimination of railroad-highway crossings at grade would end crossing accidents. Generations of time and \$19,-000,000,000 are involved in this project.

Ratio of Killed and Injured to Automobiles Registered.

One fatality at railroad crossings to 11,201 cars.

One fatality on highway to 1001 cars.

One injury at railroad crossing to 2381 cars.

One injury on highway to 39 cars.

All public crossings are marked by crossing signs. Many have advance warning signs.

Two hundred two persons were killed and 1430 injured by running into sides of trains last year. Automobile accidents at railroad crossings resulted in the death of 50 and injury to 69 passengers and employees on trains.

Railroad enginemen are trained, selected, disciplined.

Are automobile drivers — — — ?

Recommendations.

Crossing eliminations should proceed in an orderly, consistent manner.

Highways should be rerouted, where practicable, to avoid crossing railroads.

Stop making new crossings.

Railroad crossings should be clearly and uniformly indicated to the public.

The highway traveler's view of trains should be improved, where possible.

Proper warning should be given of the approach of trains. Warning signals should be obeyed.

Where obligatory to stop before crossing railroad tracks, an ACTUAL STOP, plus observation, should be made.

Penalties should be imposed upon all who cross railroads recklessly.

LOOK and LISTEN.

Utmost care should be exercised by EVERY person at EVERY crossing.

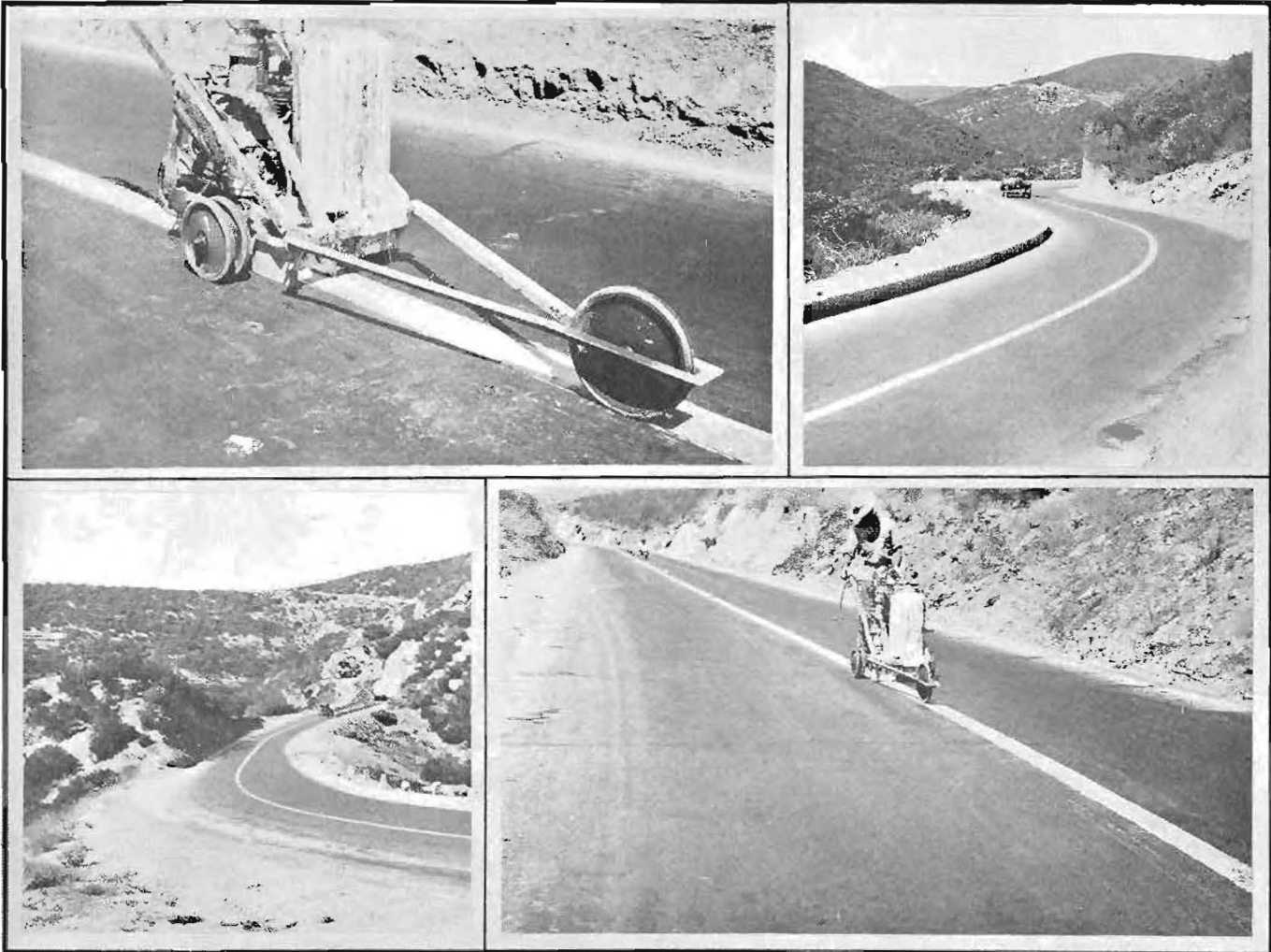
Help prevent accidents.

CROSS CROSSINGS CAUTIOUSLY.—American Railway Association.

COST OF ROAD TRAFFIC DELAY.

The utilization in 1924 of 418 miles of highway in Cook County, Illinois, was approximately 990,000 vehicle-miles per day. Assuming an average speed of 20 miles per hour, the daily vehicle-hours are 49,500. Assuming that each vehicle loses four minutes per hour due to traffic congestion on the county highways caused by natural or artificial obstructions or indirect routes, there is a daily time loss to traffic of 3300 vehicle-hours. Considering the number of persons per passenger car and the net load per motor truck the value of this lost time is at least \$3 per hour. On this basis, there is a daily net loss, due to traffic delays, of \$9,900 on these 418 miles of highway. Assuming this condition to exist 300 days during the year the annual loss is approximately \$3,000,000.—From report on the highway system of Cook County, Illinois.

THE TRAFFIC LINE STRIPE ON STATE HIGHWAYS



TRAFFIC STRIPES--(1) Closeup view of the Simmons Traffic Line Paint Spray Machine. (2) Applying second coat of paint. Sonelac used to cover first coat of Bass-Hueter Traffic White. (3 and 4) Views showing white traffic center on the Ridge Route, near Los Angeles. The stripe is of great assistance to mountain driving.

Reported by W. A. SMITH, Assistant Maintenance Engineer.

THE MAINTENANCE Department of the Division of Highways has extended the use of the painted traffic stripe to establish traffic lanes on long stretches of our heavier traveled pavements. This device had previously been used on state highways at crossings, blind curves and on narrow bridges and the results were so satisfactory that it was felt justifiable to extend its use.

The painting of a stripe on the center of the pavement, on first thought, appears a simple operation, but careful and conscientious effort is required to secure a satisfactory job. A slight variation in the line is magnified amazingly to the critical eye, and on rough pavement with ragged edges a true uniform stripe is difficult to secure. Before starting the work a number of painting and marking devices were tried out, and the Testing Laboratory analyzed various brands of paints and made series of tests, resulting in the adoption of a standard specification and equipment. For pavements with uniform edges a wheel device with marker arm at the center of the pavement may be used. On other pavements, it is

necessary to mark the line by measuring and lining in the center by means of a cable. The paint machine used is hand propelled, on which is mounted a small compressed air spray outfit.

The paint must work rapidly through the spray machine, spread uniformly, dry quickly without becoming chalky and should wear well. The specifications developed were for a comparatively cheap white paint which proved satisfactory on concrete pavements but was absorbed or broken down in a short time by asphaltic and oil types of surface. At present the department is using orange colored lacquer paint on the asphaltic surfaces. About ten gallons of paint are required per mile. Some 260 miles of six-inch traffic line have been painted. The cost varies from about \$25 to \$55 per mile. The average is about \$38 per mile. This cost is higher than originally estimated but it is felt the work is well worth the expenditure. On one section of the asphaltic desert roads with oiled shoulders, traffic was unable to distinguish the edge of the pavement at night. This caused a number of serious

THE TRAFFIC LINE STRIPE
ON STATE HIGHWAYS

(Continued from page 9.)

accidents as machines runing off into the sand were constantly in danger. The white center line now serves as a guide line and accidents have been materially reduced. In fog belts and on mountain roads, a good visible line gives a driver added assurance, as he watches the traffic line instead of the guard rail or edge of the pavement. The guide line tends, almost automatically, to hold traffic to the proper lane. It gives confidence to approaching drivers and permits of freer passing by fast machines, thus speeding up and safeguarding traffic.

Wrong Number!

"Why did Maizie lose her job in the office issuing automobile license plates?"
"They found out she was a telephone operator."

Going or Coming.

"No, sir," answered Cactus Joe. "This here is a growing community with expenses to meet. If we can't ketch a car for speedin', we ketch it for standing still."—Washington Star.

The Verdict.

The following was the verdict by an Iowa jury in a suit against a railroad company:

"If the train had run as it should have run; if the bell had rung as it should have rung; if the whistle had blowed as it should have blew, both of which it did neither—the cow would not have been injured when she was killed."—Erith Observer.

It Did.

Rastus and his wife, driving to town in their decrepit flivver, had parked it casually in the first available space. While they were away a traffic officer attached a numbered tag to the vehicle for parking in a prohibited zone. On their return, Rastus noticed the tag and was for throwing it into the street, but Rebecca restrained him.

"Sabe de ticket, honey," she said. "Dat number might win sumthin'."

Please, Teacher!

She was still rather new at driving a car and a little bit confused in traffic. Down Broadway she forgot to stop soon enough at the signal and shot out into the middle of the street.

Pompously the traffic officer bore down upon her.
"Didn't you see me hold up my hand?" he shouted fiercely. The culprit gasped a breathless "Yes."

"Didn't you know that when I held up my hand it meant Stop?"

"No, sir; I'm just a school teacher," she said, in a timid, mouse-like voice. "and when you raised your hand like that I thought you wanted to ask a question."—New York Sun.

Hey! Teacher.

Bobby's father was a highway engineer. His teacher, failing to get a satisfactory answer from several in his class in the defining of "cement," sought Bobby's assistance and received the following reply:

"Cement is the product obtained by finely poverizing clinker produced by calcining to incipient fusion an intimate and properly proportioned mixture of argillaceous and calcareous materials with no addition subsequent to calcination except water and calcined or uncalcined gypsum."

STEP ON IT!

(An English auto racer in a specially designed Sunbeam has recently hung up a world's record of 207 miles an hour. It took him four miles to stop his car. At the present rate of progress, may we hope for something like the following in 1975?)

"Mother, George and I are going out to a dance."

"All right, dear. Don't be late, will you?"

"No, Mother. The party's in San Francisco. We'll be back early."

(The Modern Girl of 1975 kisses her mother goodnight and steps into her boy friend's 1200 horsepower runabout. He puts the car in low, and they thread through the traffic of lower New York at 40 miles an hour. Once in the country, George shifts to second speed and they amble along at a comfortable 138 per.)

"Hadn't we better slow up, George? That sign back there said 'Danger: Sharp Curve five miles ahead.'"

"That's all right, Joan. We have eight-wheel brakes. Well, here we are in Chicago!"

(He quickly adjusts the armor plate about his car, and they dash through the great city at 200 miles an hour, Joan manipulating the machine gun to ward off possible attacks.)

"Someone's trying to pass, George. He's been following us all through Iowa."

"Trying to pass, huh? Just let's see him do it!"

(With a whir of gears, George shifts into fifth speed and shoots ahead like a comet. The other car follows suit. Milestones whiz past in a confused blur as the Juggernauts skim over the countryside, wheels scarcely touching the road.)

"George! Look out! Here's a railroad crossing."

"Good gosh! The fool engineer! He's trying to beat me across."

(George jams on his brakes, but it is too late. There is a terrific smash. On the far side of the track, George finally comes to a stop and turns around. The wrecked Pacific Coast Flyer lies in a tangled mass across the rails, cars telescoped and splintered by the frightful impact. Beside the track, by the grim irony of fate, stands the warning signal which would have prevented this terrible accident: "Stop, Look and Listen; Look Out for the Automobiles!")

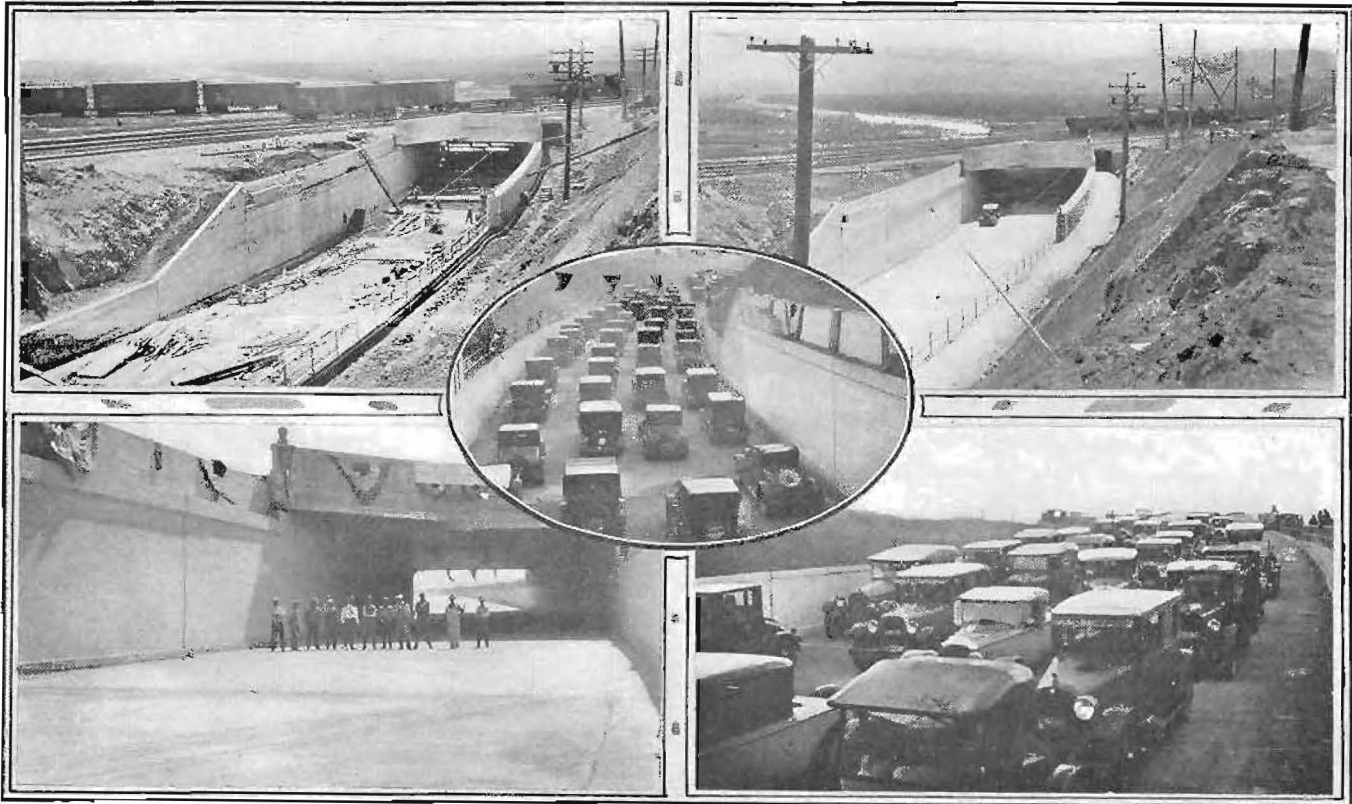
—Badger Highways.

AUTO VISITORS' NUMBERS INCREASE MONTH BY MONTH.

Nearly 100,000 persons entered California by automobile during August of this year, it is revealed in a report of the first actual count of passengers in automobiles crossing the state borders. A total of 99,657 passengers were counted in 33,572 motor cars entering the entire state during August, 1927. For the first time in history the number of passengers in the incoming tourists' cars were counted by officials at the various border stations under orders of the State Agricultural Department.

Since no check has ever been made heretofore on the number of persons that come into the state in automobiles, no comparisons can be made, but a substantial increase in the number of incoming automobiles is noted in the August figures for 1927 and 1926. During August of last year, 10,005 automobiles were counted entering over the transcontinental routes, as compared with 13,022 for the same month this year, an increase of more than 3,000 through the eastern boundary. A total of 26,433 cars were checked during August, 1926, into the entire state, but the figure was raised to 33,572 for August of this year.—Grizzly Bear.

California's Largest Underpass Opened to Traffic



SOUTH SAN FRANCISCO UNDERPASS—(1) Under construction. (2) Completed; note elevated sidewalk. (3) Ready for the opening ceremonies. (4) Traffic entering the pass on Lindbergh Day. (5) The big pass easily accommodates four lanes of traffic.

DESIGNATED as the largest structure of its type ever undertaken in California the underpass on the new Bay Shore highway at South San Francisco was thrown open to the public on September 16th. The opening was fittingly celebrated by a number of bay city and peninsular civic organizations cooperating with the Division of Highways.

This grade separation has been under construction for the past year by Barrett & Hilp, San Francisco contractors, with George W. Thompson as the Resident Engineer for the state.

Large Project.

The subway provides for a 40-foot roadway and an 8-foot sidewalk, passing under seven tracks of the Southern Pacific Company and the South San Francisco Belt Railroad. The deck is constructed to provide for one more track and the abutment walls have been built to provide for future extension of the deck to allow for five additional tracks. The length of the tunnel section of the subway is 190 feet with provision, as noted above, for an extension of 110 feet. The length from end to end of approach walls is 769 feet. The total length of paving laid under this contract is 1281 feet.

The total cost of the work done by Barrett & Hilp, contractors for the state, was \$241,000. The Southern Pacific Company placed the falsework for supporting their tracks and did other track work totaling about \$30,000. Approximately 1000 feet of 44-inch water main had to be moved and relocated. This work was done by the Spring Valley Water Company at a cost of approximately \$9,000, making the total cost of construction \$280,000, exclusive of engineering. Of this

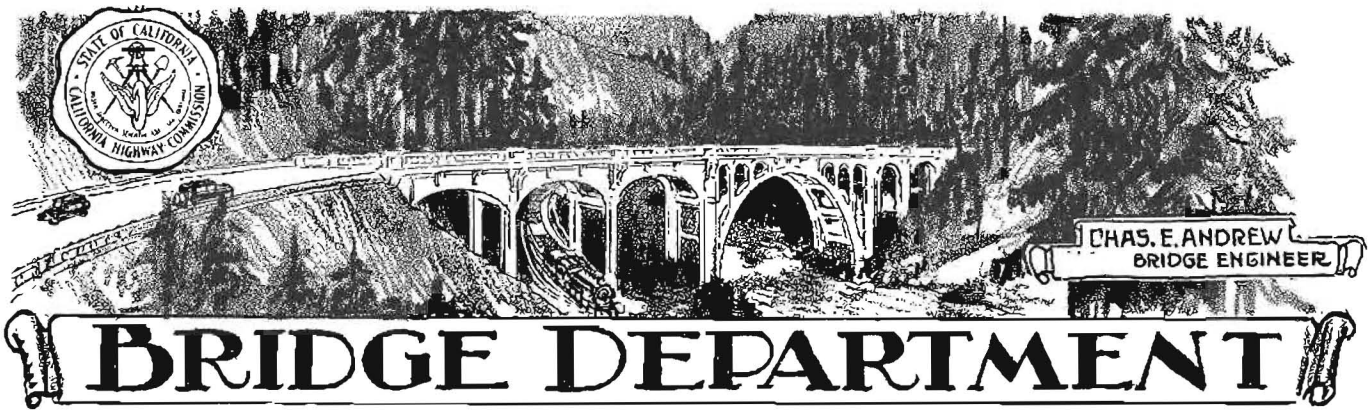
amount the Southern Pacific Company pays about one-fifth in accordance with a decision of the Railroad Commission.

Special Construction Features.

The roadway through the structure is 40 feet between curbs. There is an 8-foot sidewalk on the west side. The abutment on the east side is constructed to permit the building of an additional 40-foot subway at such future time as the present 40-foot width may become inadequate. The highway through the structure is on a curve with a radius of 1000 feet. The maximum grade of the approaches is 4 per cent. The approximate angle of crossing between the center line of highway and center line of tracks is 40 degrees, making the angle of skew 50 degrees.

On account of the large skew angle and also because yard tracks with switch points occurred over the structure, deck girders were used with span normal to the center line of roadway. Forty-two-inch plate girders spaced about 3-foot centers were used for the 42-foot span over roadway. Twelve-inch "I" beams at 18-inch centers were used over the sidewalk. The sides of the girders were encased in concrete and a 10-inch concrete deck was placed between the girders. The deck was covered with waterproofing and 15 inches of ballast placed thereon.

The low point in the subway was approximately 9 feet below ground water level and the bottom and sides up to this level were waterproofed with a 2-ply membrane waterproofing. Between abutments the pavement was reinforced against up-lift by spanning from abutment to abutment, a 25-inch pavement with 14-inch bars spaced 9- to 11-inch



BRIDGE DEPARTMENT

BRIDGE DEPARTMENT ORGANIZATION

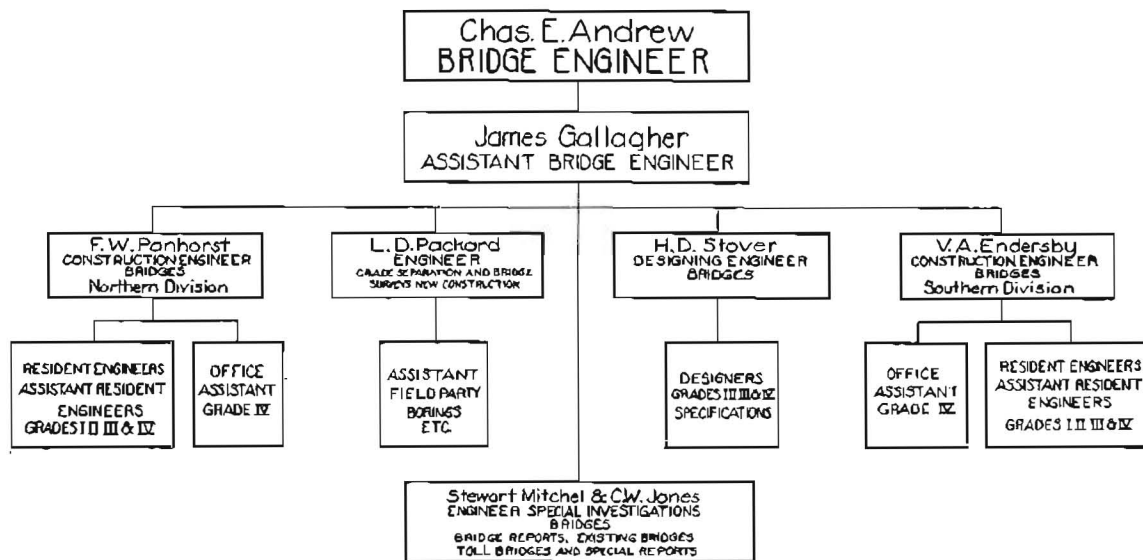
THE ACCOMPANYING is a diagram of the reorganized Bridge Department of the Division of Highways, as outlined by Charles E. Andrew, State Bridge Engineer. The divisions of the department and their respective duties have been clearly set forth, and in the general instructions issued by Mr. Andrew he has urged upon his staff the need of the

utmost cooperation between the branches of his department and with the other departments of the Division of Highways.

Two State Divisions.

For the purpose of designating the territories over which the respective construction engineers shall have jurisdiction

BRIDGE DEPARTMENT ORGANIZATION



HEADQUARTERS
NORTHERN DIVISION
SACRAMENTO

HEADQUARTERS
SOUTHERN DIVISION
LOS ANGELES

and for facilitating their duties, the state has been divided into two districts, designated the Northern District and the Southern District. The Southern District comprises the counties of San Luis Obispo, Kern, Mono, Tulare, Inyo, Santa Barbara, Ventura, Los Angeles, San Bernardino, Orange, San Diego and Imperial, with headquarters at Los Angeles. The remainder of the state comprises the Northern District, with headquarters at Sacramento.

Assistant Bridge Engineer.

The Assistant Bridge Engineer must be conversant with all matters pertaining to the design and construction of all bridges so as to be able to assist the Bridge Engineer and to act in his place during his absence. While thus empowered he must at all times confer with the Bridge Engineer in matters of major importance involving policy, change of plans, construction of all bridges so as to be able to assist the Bridge Engineer in matters of major importance involving policy, change of plans, expenditure of money, etc. All mail of the department must pass through the assistant's office and all mail and reports originating in the department must pass over his desk. He shall have full charge of the opening of all bridge bids and all necessary detail, keeping a systematic record of same and keeping close touch with the right of way department.

Designing Engineer.

The Associate Bridge Engineer, Designs, shall report to the Bridge Engineer through the Assistant Bridge Engineer. He has charge of the design of all structures, all designers, draftsmen, computers and specification writers reporting to him. He must keep a record of all their work and is to be held responsible for correctness, adequacy and cost of design. Before proceeding with designs he must have complete reports on all building sites. He must personally sign all plans and submit same for final approval to the Bridge Engineer. All plans must be signed by the State Highway Engineer.

Grade Separations and Bridge Surveys.

Engineer, Grade Separations and Bridge Surveys, shall be the title of the head of this branch. He shall have charge of the securing of all preliminary data and information necessary for the Designing Engineer and also of all necessary negotiations with railroad companies regarding the joint construction of grade separations. To expedite proceedings he must keep in close touch with the right of way department and district engineers.

Construction Engineers.

The Construction Engineers shall have full charge of the construction in their respective districts after the contracts are awarded and shall be held responsible for the proper prosecution and completion of all work. They shall have complete charge of resident engineers.

Engineer, Special Investigation.

The Engineers, Special Investigation, Bridges, are charged with making a complete survey of the bridges in the state system and to make reports on any special work that may be assigned to them, rendering frequent reports and data to the Bridge Engineer.

CARQUINEZ BRIDGE INCREASES TRAFFIC.

The traffic over Carquinez Bridge for the period of May 20th to August 31st, this year, as compared with the ferry traffic for the same period via the Vallejo-Rodeo Ferry last year, showed an increase of 87 per cent. Cars over the bridge carry an average of 2.6 passengers.

CALIFORNIA'S LARGEST UNDER-PASS OPENED TO TRAFFIC

(Continued from page 11.)

centers being required. Beyond the abutments, where the character of the subgrade permitted, the pavement was anchored by 3-inch dowel anchors spaced 42- by 54-inch centers and grounded 42 inches into the rock. Tests were made of these anchors to determine if the subgrade was sufficiently strong to develop the full strength of the dowel. The anchor pavement varied from 12 to 18 inches in thickness and was reinforced with 1/2-inch bars and wire mesh. At the south approach the subgrade changed to a blue clay and mud and anchors could not be used. Here a gravity pavement varying from 33-inch to 12-inch above the waterproofing was used. Transverse construction joints through pavement and walls were made about every 30 feet. Copper strips were placed in all construction joints just below ground water level.

Falswork for supporting tracks was placed by the Southern Pacific forces. Excavation was handled in a very efficient manner, the equipment consisting of 3 steam shovels and 10 5-yard dump trucks. The excavation was kept dry by pumping. A 3-sack mixer was used in making concrete for structure and pavement. As the railroad company found it impractical to operate on less than 4 tracks for any length of time it was necessary to carry traffic over girders soon after the deck was poured. Quick hardening aluminum cement, which attains its full strength in 24 hours, was therefore used in the deck. Six hundred and sixty barrels of this cement were used.

Forerunner of Further Construction.

The opening of this structure is the forerunner of much future construction for the Bay Shore highway. At present, a distance of 5.24 miles south of the underpass is graded to a width of 120 feet. The Highway Commission has allocated \$150,000 for its rock surfacing and oiling and an additional \$180,000 for further construction south of San Mateo. These funds will be available upon the collection of the first quarter of the new 1-cent gas tax, or about December 1st, this year.

ARKANSAS GAS TAX RAISED TO FIVE CENTS.

Each week sees one or more states increasing the gasoline tax rate. Arkansas is the latest, the rate being boosted from four to five cents. This makes four states that collect a nickel a gallon for road purposes.

Laugh That Off.

"Hello, Hayseed," said the facetious youth. "How's it for a lift to Centerville?" He jumped into the car without waiting for an answer.

Twenty minutes passed.

"Quite a distance to Centerville, isn't it?"

"Uh, huh."

Twenty minutes more.

"Say, how far is it to Centerville?"

"Few thousand miles if you go this way; 'bout twenty if you get off and walk back."—Selected.

Rather Harsh.

A man is something that can see a pretty ankle three blocks away while driving a motor car in a crowded city street, but will fail to notice, in the wide, open countryside, the approach of a locomotive the size of a school house and accompanied by a flock of forty-two box cars.

WHAT THE DISTRICTS ARE DOING

DISTRICT VI.

HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DISTRICT ENGINEER.

Counties of Fresno, Madera, Merced, Mariposa, Kings, Tulare, and Kern, north of the Tehachapi.

Convict Camp at Work on New Location.

The convict camp formerly stationed at Bloss on the Merced-Yosemite All-Year highway, has been transferred to Mid Pines, approximately six miles north of Mariposa. The camp has been established and two steam shovels are to be used in improving alignment between Mariposa and Briceburg.

Kern County Reconstruction.

Force, Currgan and McLeod are at work on the resurfacing and widening work between Lerdo and Famosa, under Contract 96FC1.

The Valley Paving Company of Visalia located their asphalt plant at McFarland for reconstruction of pavement between a point one mile south of Delano and Famosa. This work is under Contract 96FC2.

DISTRICT VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DISTRICT ENGINEER.

Counties of Los Angeles, Ventura, Orange, San Diego, and eastern Kern, south of Mojave.

Reconstruction in Orange.

George Herz and Company of San Bernardino are at work on the reconstruction of 5.7 miles of state highway in Orange County, between Galivan and Irvine. The new work provides for a 40-foot graded roadway and a 20-foot concrete pavement with two-foot rock borders.

The construction of rock borders along the recently completed pavement on the La Mesa to El Cajon reconstruction job in San Diego County is rapidly nearing completion.

Ventura Seawalls Completed.

The construction of pavement and seawalls has been completed on the Coast highway reconstruction job, between Ventura and the Santa Barbara County line. Work is now in progress on the placing of rock borders adjacent to the new pavement and the construction of sidewalks and curbs back of the sea walls.

Two State Highways Linked By New Construction.

Good progress is being made on the connecting link between Route 60 and Route 2, across the San Juan Creek flat in Orange County, near Serra. Two bridges are under construction, grading a mile of highway is in progress and the Santa Fe Railroad Company is constructing two bridges that will carry their trucks over the new state highway.

District VII Save Maintenance Buildings.

The Ridge route in Los Angeles County was recently the scene of one of the worst fires that has been experienced in the southern part of the state. The fire burned for eight days laying waste to an area of about 21,000 acres.

Both the Liebre Maintenance Camp and Superintendent Mike Sullivan's construction camp had a close call. Back firing by the state crews and a fortunate shift of the wind was all that saved these camps from destruction.

Guard rail along the highway in several places was destroyed by the fire and stones and other debris loosened by the fire were strewn along the highway for miles.

DISTRICT X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DISTRICT ENGINEER.

Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

Mother Lode Line Change.

A line change which was started last Fall on the Mother Lode highway between the Cosumnes River and Plymouth has now been completed and opened to traffic. This change was made along lines of standard construction with high grade alignment. Two very bad creek crossings were eliminated.

Non-skid Pavement.

In order to make the highway between Fairfield and Putah Creek north of Dixon safer for travel during the winter months, all the asphaltic concrete was thoroughly disked with a Killifer road disc in order to remove all the excess asphalt and expose the rocks in the mix to make the pavement non-skid. This work is now completed.

Center Traffic Line Increases Safety.

A center strip has recently been placed on the Yolo Causeway, and the wheel guards painted white. This change seems to be very popular with the motorists using the causeway, as they claim it has made the bridge much safer for traffic, especially at night.

Amador Gets Oiling.

District X has recently completed its oiling program for the second half of the year. Most of the work during this period was in Amador County on Route 54 and the Mother Lode highway.

Sonora Pass Greatly Improved.

Superintendent Harris is doing splendid work on the famous Sonora Pass. This pass has always been considered one of the toughest in the Sierra Nevada Mountains. During 1926 this road was greatly improved and continued improvement this season has put it into a safe, travelable condition.

HIGHWAY NEWS NOTES

While Colonel Chas. M. Lindbergh visited Sacramento, A. M. Bass, of Headquarters Drafting Department, was a guest at a private luncheon in the airman's apartment at the Hotel Senator.

Thos. M. Joyce, foreman, has recently been transferred from District X to District I.

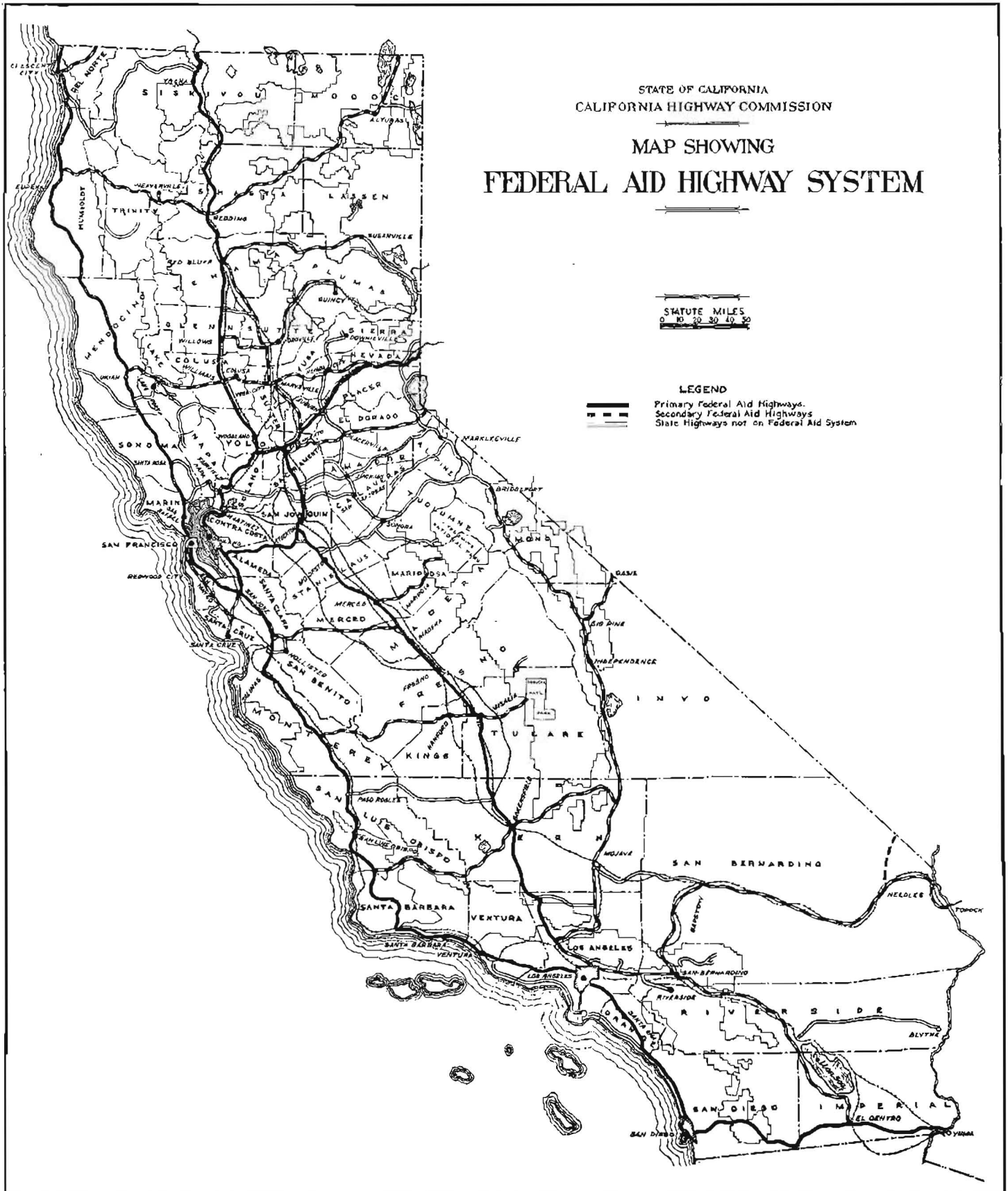
AUSTRALIAN VISITOR STUDYING CALIFORNIA HIGHWAY SYSTEM.

H. C. Rees of Lake Boga, Victoria, Australia, was a recent visitor at the central office of the Division of Highways. He is making a study of California irrigation and highway systems.

Helping Pop.

The minister raised his eyes from the notes of his sermon just in time to see his young son in the gallery pelt the congregation with horse chestnuts. The good man was preparing a frown of disapproval when the young hopeful cried out: "You 'tend to your preaching, Pop; I'll keep 'em awake."

CALIFORNIA HIGHWAYS.



SUBJECT TO FEDERAL AID—California has 4,467 miles of highway, all but 80 of which are also included in our State Highway System, for which federal aid funds can be obtained. This is known as the "Seven Per Cent System," or 7 per cent of the mileage of all existing roads of record in the state.

The Division of Highways during the 78th fiscal year, July 1, 1926, to June 30, 1927, received the sum of \$2,978,864.97 from the federal government for new construction on the state's federal aid highways.

STATE HIGHWAY FUND CONTRACTS (Bond Funds, Including Federal Aid)

Cont. No.	District	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
COMPLETED AND ACCEPTED SINCE SEPT. 2, 1927.											
525	VII	Los Angeles-Orange	60	E, A	Naples to Anaheim Bay Bridge	1.50	Portland Cement Concrete Pavement	Matich Brothers	\$59,427 56	June 1, 1927	.....

Note.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects, prison camp road activities, or day labor jobs not being done under contract.

STATE HIGHWAY MAINTENANCE FUND CONTRACTS (Including Gasoline Tax Fund)

Cont. No.	District	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Contract time, days
COMPLETED AND ACCEPTED SINCE AUGUST 28, 1927.											
M-124	V	San Benito	22	A	Between San Juan Bautista and Hollister	6.90	P.C.C. Widening and Bit. Mac. Surface	Granite Construction Co.	\$155,145 60	May 7, 1926	.....
M-148	IV	San Mateo	2	A	Between Colma and Cypress Lawn Cemetery	1.51	Grading	Kaiser Paving Co.	128,262 24	Oct. 7, 1926	.....
M-149	IV	Contra Costa	14	B	Between El Cierro and Valona	1.78	Grading and Rock Surfacing	Tieslau Brothers	211,522 77	Oct. 12, 1926	.....
M-160	VI	Kern	4	D	Kern River Bridge at Bakersfield	.....	Sidewalk and Approaches	Peterson and Eisler	8,413 31	Mar. 9, 1927	.....
M-169	VII	Orange	60	A	Santa Ana River	.....	Cleaning and Painting Bridge	W. M. Ledbetter and Co.	3,183 75	June 1, 1927	.....
M-168	VII	San Diego	12	A, B	Between La Mesa and El Cajon	3.70	Grading and P.C.C. Pavement	George Hers and Co.	154,223 57	Mar. 9, 1927	.....
AWARDED SINCE SEPTEMBER 2, 1927.											
93EC3	III	Colusa	7	B, C	Williams to Delevan	11.80	Construct Rock Borders	Hemstreet and Bell	\$38,953 12	Sept. 16, 1927	90
911EC8	III	Glenn	7	B	Across Wilson Creek	.....	R.C. Girder Bridge	Germain and Nickles	8,032 22	Sept. 30, 1927	100
94EC3	IV	Alameda-Santa Clara	5	C, A	Between Warm Springs Junction and Milpitas	4.40	P.C.C. Paving and Asphalt Conc. Surf.	Allied Contractors, Inc.	165,627 99	Sept. 30, 1927	125
95PC2	V	San Luis Obispo	2	E	Between Pismo and San Luis Obispo	9.70	P.C.C. and Bituminous Mac. Pave.	J. F. Knapp	451,393 21	Sept. 30, 1927	275
98FC1	VIII	San Bernardino	26	B	Redlands to one-third mile north of Riverside County line	4.80	Grading and P.C.C. Pavement	Matich Brothers	180,455 42	Sept. 30, 1927	150
Total State Highway Maintenance Fund Contracts Awarded						30.70			\$844,461 98		

Note.—The above obligations charged against the State Highway Maintenance Funds do not include funds from these sources obligated for general maintenance and for specific betterments being done under day labor authorization.

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO, 1927

CALIFORNIA HIGHWAYS.