

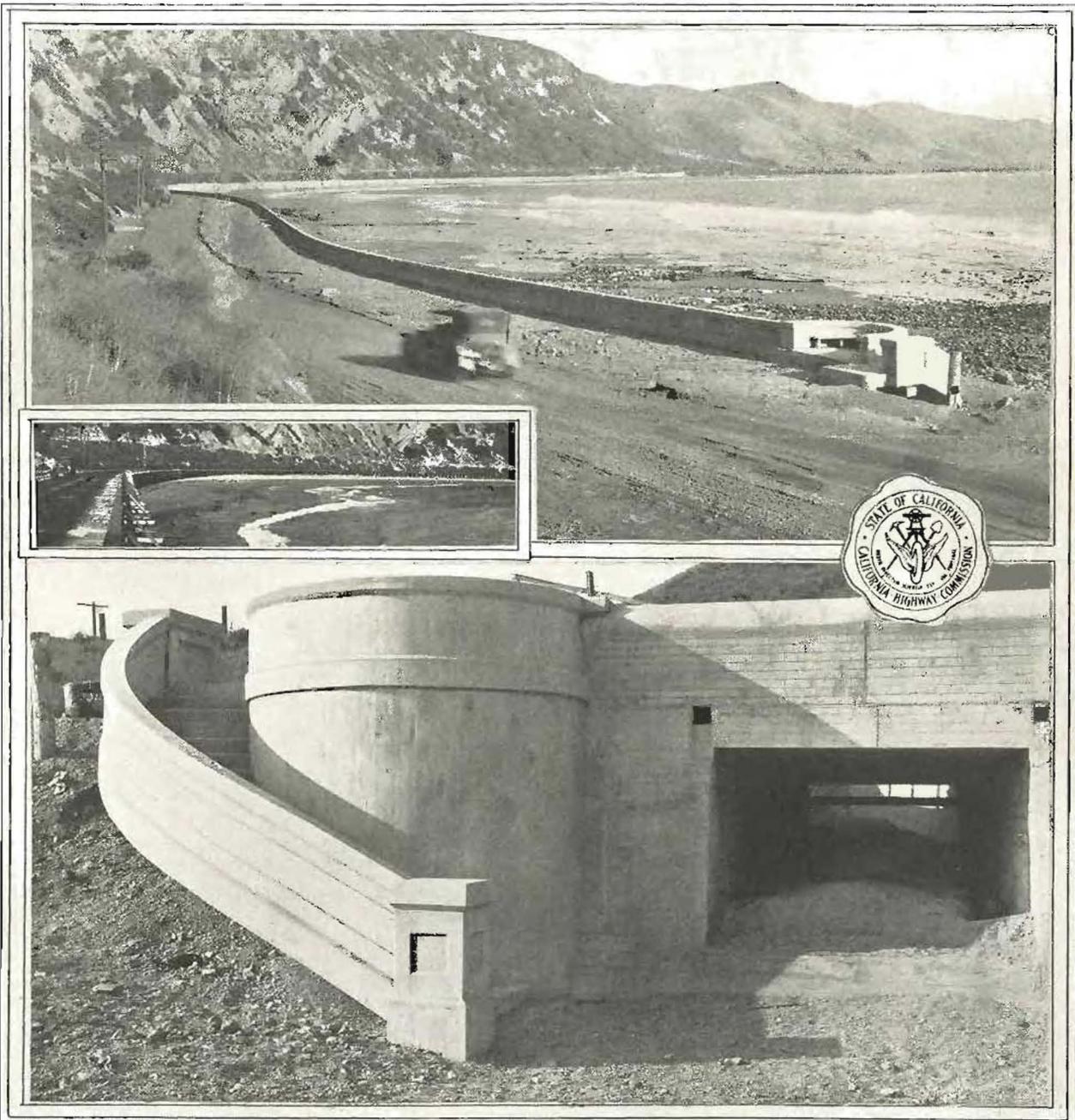
CALIFORNIA HIGHWAYS

A BULLETIN ISSUED BY THE CALIFORNIA HIGHWAY COMMISSION FOR THE
INFORMATION OF ITS EMPLOYEES AND THE PUBLIC

Vol. 3

NOVEMBER, 1926

No. 11



RINCON SEAWALLS.—*Above*, long wall and fill at Rincon, Ventura County, showing relation of highway to ocean and Southern Pacific Railroad grade at left of view; *Below*, end of wall showing steps leading to beach; opening at right is culvert; *Insert*, at left center, old wooden causeway in use prior to construction of concrete seawall. (See article on page five.)

In this issue: BUSINESS METHODS IN THE EQUIPMENT DEPARTMENT—SIGHT DISTANCE AS A SAFETY FACTOR IN HIGHWAY DESIGN.

CALIFORNIA HIGHWAYS

This Bulletin is published by the California Highway Commission for the information of its employees and the public. Editors of newspapers and others interested are welcome to use, without restriction, any of the matter herein contained. Cuts will be gladly loaned upon request.

FRANK B. DURKEE Editor
P. O. Box 1103, Sacramento, California.

Vol. 3 NOVEMBER, 1926. No. 11

CALIFORNIA HIGHWAY DEPARTMENT

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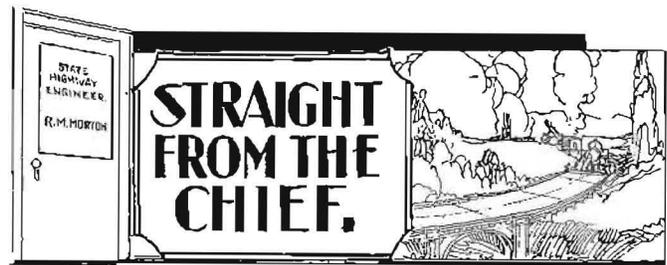
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RIGHTS OF WAY AND EMINENT DOMAIN

Securing of adequate right of way, particularly for the reconstruction of state highways, is becoming a problem of increasingly greater magnitude. Most of the divisions have been compelled to assign a member of the staff to the sole task of interviewing property owners, securing deeds, and straightening out right of way tangles.

The designation of a division right of way man requires exercise of careful judgment by the division engineer. Securing results is one part of the job; getting along with individual property owners, so as to keep their respect for the commission, is another very important part; together, they are a man-sized assignment for any one.

The engineer, or whoever undertakes the work, should have a thorough knowledge of the engineering necessity for the property sought; he should know local property values; he should be able to discuss convincingly the benefit which construction of the highway will bring; and he should know how to tactfully approach the property owner.

Although the right of way man has back of him the constitutionally granted right of eminent domain, he should never threaten. If deeds can not be obtained after every other reasonable means has been used, the procedure of condemnation which the state is thus forced to follow should be explained, but not used as a threat. The right of individual ownership of private property is one of our most sacred legal institutions. Right of way agents and engineers must always be sure they are acting according to law, when property rights are involved.

He who fills a public position is the servant of the people, not the master.

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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.

UP-TO-DATE BUSINESS METHODS BRING ABOUT COMPLETE CHANGE
IN EQUIPMENT DEPARTMENT

By R. M. MORRIS, State Highway Engineer.

DURING the past two years a complete change has been effected by the California Highway Commission in the method of accounting for the cost of ownership and operation of equipment. A survey of our equipment situation several years ago showed that the commission's equipment consisted of trucks and automobiles acquired at low cost as excess war material, and a vast quantity of articles purchased from time to time for use on the maintenance of the various highway sections, or for special construction jobs.

The accounting system on this equipment was anything but satisfactory. Some equipment purchased under special allotments found its way into the equipment accounts. Other equipment was purchased with the money allotted for a construction or maintenance project, and perhaps found its way into the equipment accounts, but more likely remained as a direct charge against the job.

Repairs were charged to the job on which the equipment happened to be located when the repairs were made. This was a practice which led to much abuse, as those responsible for each job naturally endeavored to keep their equipment repair costs at a minimum. Equipment supposed to be in good condition on release was found, upon receipt on the next job, to be in poor condition, and extensive repairs were usually required before it could be used. As the estimates of cost for doing new jobs usually included no equipment repairs, there was constant friction between the repair department and the division employees in regard to the condition of equipment. The central office was constantly required to make additional allotments to cover the repairs not included in the original job estimates.

Results of Former System.

In the absence of proper accounting methods, there was only an indifferent check on the amount of equipment owned by the state. It was supposed that the excess war equipment constituted an asset far larger than the ledger cost, which assumption has been found to be correct. However, the divisions were all guilty of the practice of hoarding equipment; that is, obtaining everything they could lay their hands on and keeping it for some future emergency, when they might have a few days' use for it. This practice cost the state extra money, for the reason that new articles were sometimes purchased, which duplicated idle equipment not reported as being available for transfer.

R. H. Stalnaker, equipment engineer of the highway organization, was encouraged by the State Highway Engineer to dig into this mess of inaccurate and confusing detail, and to bring forth a recommendation for improving conditions. It did not take him long, with the help of other engineers of the department who realized the situation, to visualize and recommend an entirely different system for handling the Highway Commission's equipment. The Highway Commission, for the past two years, has been working under the new system. We are proud to set forth the details of a system which we believe is as nearly perfect as it needs to be for the use of the state highway organization.

Basis of Present Plan.

The basis of our present system of handling equipment is that all articles, except those classed as small tools, are on a rental

basis. Rentals are charged either daily or monthly, in accordance with the use of the article. Under the new system, the maintenance equipment on each section of road is paid for from the allotment set up for maintenance of that section, just the same as are the wages of the men, or the materials purchased. On the construction jobs, such as the convict camps, the same thing applies. Shovels and other large equipment are paid for on a shift basis. Equipment used more than one shift is paid for accordingly.

The rental rates include the estimated cost of repairs, and depreciation. The job pays for the running or operating expenses. The rental receipts are placed to the credit of the equipment funds, and from these funds is defrayed the cost of operation of the Equipment Department, and the operation of the various shops owned by the state. Not only does the Equipment Department make shop repairs in each of the divisions, but it also renders such service as sending mechanics from the shops to the field and maintaining field mechanics to make emergency repairs.

Department Now Self-Supporting.

From the gross rental credit receipts, there is deducted the cost of repairs and cost of operation of the Equipment Department. The balance constitutes a depreciation reserve. From this fund are purchased new articles of equipment to replace those which have become obsolete or have worn out in service. Therefore, the Equipment Department has become self-supporting.

It has been found that close estimates of equipment charges can be made at the beginning of new jobs. Reports on costs of performing maintenance or day labor work are now accurate. No longer do we have to make excuses for our cost data in so far as equipment is concerned.

The inauguration of the rental system and its successful use has been coincident with the construction of several up to date shops for equipment repairs. Adequate shops have been constructed at Redding, Fresno, Lankershim, San Bernardino, Bishop and Crescent City during the past three years.

Drastic steps have been taken by the Equipment Department to clean up all the obsolete articles, junk, etc., which have been accumulating for years around the premises owned by the State Highway Commission. Thousands of dollars have been realized from the sale of junk and second hand equipment, and placed in the equipment fund. A proper inventory has been prepared, and the Equipment Engineer and his assistants have at their fingers ends the complete history of every article of equipment. The history includes its financial record, and they know whether or not it is making money.

This information enables us to avoid loading up with articles which look good but for which we do not have sufficient use to make their ownership a paying proposition. Gradually, the Equipment Department is able to concentrate its purchases on those articles which our experience informs us are money makers.

Centralization of authority over the equipment has inevitably led to quantity purchases. Quantity purchases of standardized articles are made, resulting in saving much money over prices

PICKFORD AND FAIRBANKS HELP DEDICATE HIGHWAY



SOUTH COAST BEACHES JOINED BY HIGHWAY.--Douglas Fairbanks, center, as the blacksmith, forges chain which binds together communities from Long Beach to Serra, while Mary Pickford, left, "Spirit of Progress," gives her blessing; center rear, Division Engineer S. V. Cortelyou of Division VII; right, Commissioner Nelson T. Edwards; extreme right, Supervisors S. H. Finley and George Jeffrey of Orange County. The celebration was held at Laguna Beach on October 9th.

CONFIDENT of what the new state highway means to the future progress and prosperity of their respective communities, residents of the south coast cities celebrated recently the opening of the Newport-Laguna unit of the Oxnard-San Juan Capistrano highway. An allegorical pageant over the new coast route ended at Laguna in the forging of a great symbolic chain of friendship, linking together the beach communities from Long Beach southward to Serra. The internationally known motion picture actor, Douglas Fairbanks, as mighty Vulcan, welded the links together, while his no less famous wife, Mary Pickford, presided over the scene as the "Spirit of Progress."

Members of the board of supervisors of Orange County, who have assisted the state by financing the erection of a number of expensive bridges, the mayors of the several cities in route, and representatives of civic associations and chambers of commerce

were among those participating. The State Highway Department was represented by Commissioner Nelson T. Edwards and Division Engineer S. V. Cortelyou of Division VII.

The completion of the Newport-Laguna contract opens to traffic the new coast highway from Long Beach to Serra, where it joins the original Los Angeles-San Diego state highway. Considered by the commission one of the trunk highways of the state system, work has gone steadily forward over a period of several years, and, while yet incomplete, the highway is already carrying a considerable traffic.

Description of Work.

The most recent project, the Newport-Laguna contract (No. 479 Orange 60 A & B), covers a distance of 9.8 miles, four miles of which was paved with Portland cement concrete and 5.8 miles surfaced with bituminous macadam. The cement concrete pave-

SEAWALLS REPLACE WOODEN TRESTLES ON VENTURA COAST

AFTER more than two years of effort a massive reinforced concrete seawall now protects the coast state highway where it passes along the ocean beach from Sea Cliff to Ranch El Rincon in northern Ventura County. The contract, awarded to the J. H. Tillman Company of Portland, Oregon, on June 11, 1924, was accepted by the commission on October 12, 1926.

Completion of the work a few weeks ago ended a two-year battle to wrest from the surf a strip of land 6400 feet in length and sufficient in width for the placing of an adequate pavement. The seawall was necessary because the only other available location is already occupied by the tracks of the Southern Pacific railroad, and for the further reason that the light wooden trestle that formerly carried the highway was rapidly falling into a state of dilapidation that made it beyond repair.

Nearly 16,000 cubic yards of high quality concrete went into the building of the huge seawall which rests on a firm foundation of shale and gravel beneath the sands of the beach. The wall averages sixteen to eighteen feet in height, but by far the greater portion is hidden from sight beneath the surface of the beach.

Wall Has Proved Effective.

The Santa Barbara earthquake did no damage to completed sections of the wall, but did delay the contractor's operations. At another time during construction the work was again interfered with by a coastal storm of almost unprecedented severity. Completed sections of the wall, however, proved its effectiveness as a protection for the highway.

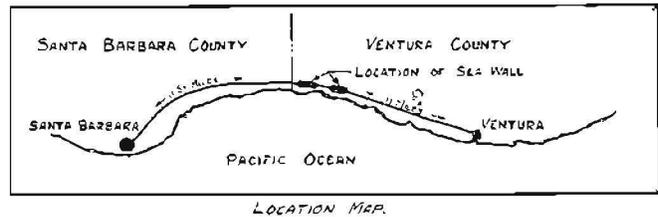
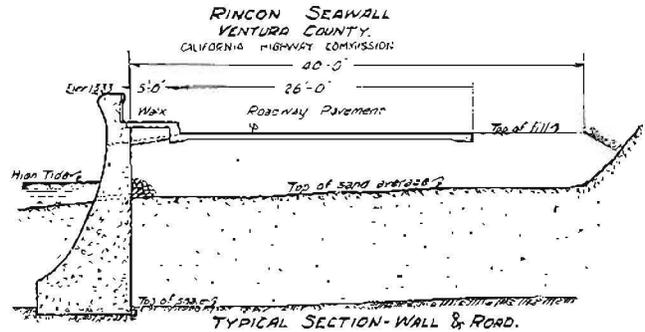
The space back of the wall has been filled with sand and the old trestle removed. Removal of the trestle was done by Division VII and proved a difficult undertaking because of the necessity for keeping the highway open for travel. Great credit for getting the job done with a minimum of inconvenience to the public is due Maintenance Superintendent Louis Prosper. He and his crew kept traffic moving in rain and storm while the work was under way.

The Bridge Department, too, is proud of the work of C. O. Dingle who served as resident engineer for that department during the long period the project was under construction. The Ventura

seawall was planned and built during the period when the late Harlan D. Miller was head of the department and is one of the structures in which he took justifiable pride.

Pavement Next Year.

When the fill back of the wall has settled sufficiently, there will be constructed upon it a pavement of ample width to care for the traffic over this section. In addition there will be parking space for vehicles and a sidewalk for pedestrians inside the



parapet. The ends of the wall have been finished with ornamental stairways which lead to the beach.

Completion of the pavement, which is planned for next year, will transform one of the worst sections of the Coast route into one of the most attractive. The work is classed as reconstruction and is being financed from the gasoline tax funds. The cost of the work done by the Tillman Company was approximately \$430,000. (See illustration on front cover.)

ment was placed 20 feet wide and seven inches thick with nine-inch edges and center, and five-foot rock borders.

The macadam was placed 20 feet wide and six inches thick. It is composed of a water bound macadam base, 4½ inches in thickness, and a surfacing of 1½ inches of oil macadam.

Work was begun by Kavanaugh and Twoby, contractors, in September, 1925; the project was accepted by the commission on November 16th. Omission of paying on a part of the project was due in part to lack of funds. With the completion of this unit, however, the initial improvement has been completed from Long Beach to the Serra connection, with the exception of a short section at the mouth of San Juan Creek and two subways under the Santa Fe tracks at Serra. The construction of the latter, it is expected, will be under way shortly.

Some damage was done to the newly completed work on this project by the heavy rains last spring, and considerable replacement of embankment and enlargement and repairs to the drainage system is now under way.

Holds Record for State.

The cement concrete pavement placed on this project is notable because of the exceedingly smooth riding surface obtained and the unusual strength recorded by tests of samples of the mix.

A vialog test of the four miles of pavement showed an average roughness of only 4.8 inches per mile, the smoothest

section of pavement yet completed on the state highway system of California. Forty-five test cylinders of concrete showed an average compressive strength of 5305 pounds per square inch at the end of twenty-eight days. This also is a record for California, and undoubtedly compares favorably with such pavements being built elsewhere.

The resident engineer on this project was R. L. Thomas of Division VII. He was assisted by L. R. McNeely, as inspector at the mixer. Winthrop Aldrich was assistant during placing of the waterbound macadam base. Bryan H. Allen was inspector of subgrade, while Charles A. Lane served as inspector at the proportioning bunkers at Newport.

Other sections of the new coast route, south of Long Beach, completed by the incumbent highway commission include the paving between Huntington Beach and Newport and the grading and surfacing between Laguna Beach and Serra.

RUSH WORK.

Teacher: "When was Rome built?"

Boy: "At night."

"Who told you that?"

"You did. You said Rome wasn't built in a day."—*Sunshine Bulletin.*

Sight Distance as a Safety Factor in Highway Design

By FRED J. GRUMM, Engineer of Surveys and Plans.

IT HAS been truly stated that "the real problem on our highways is not poor design but incompetent and careless driving." The method that first presents itself of dealing with this problem is the more vigorous enforcement of our traffic laws. Enforcement of the law will probably always be the most effective means even though the question, whether the provisions of the law are correct or can be improved upon, is always open. A substantial contribution, however, to the safety of the road user, to the protection of the careful driver from the careless driver, is the provision for long unobstructed view or ample sight distance.

It is obvious that a long, clear sight distance adds to the road user's comfort, since it allows for maintenance of a more uniform speed. It adds also to his safety, as it provides for ample distance in which to bring his car to a stop, when this is necessary.

One of the conditions to which a motor vehicle operator must conform, in order to be called a "safe driver," is to operate his vehicle at such a speed that it can be stopped within the distance that is sure to be free from obstruction. The driver is not responsible for road or traffic conditions which may affect the unobstructed lane or course in which his car will travel. He is responsible, however, for being able to stop his car, whenever necessary, within the unobstructed course.

There are several factors on which the distance required for stopping depends: the speed of the car, the surface of the road, the condition of the brakes and the reaction time of the driver. Disregarding for the moment the influence of road and traffic conditions, it may be possible to establish the relation between stopping distance and sight distance if proper values can be found for these factors.

A definite relation can be stated between the speed of a car

and the stopping distance under certain given conditions. Experiments and investigations conducted by automotive engineers supply reliable data. In applying these to average conditions of vehicle and road, we are compelled, in the interest of safety, to accept for consideration as a standard, the stopping distance required by the most poorly braked car. Studies conducted by the United States Bureau of Standards indicate that perhaps the highest standard we may expect to enforce is a stopping distance of 50 feet from a speed of 20 miles per hour.

What Studies Show.

In the following tabulation are shown the rate of speed in miles per hour and in feet per second, the stopping distances for two-wheel and four-wheel brakes published by the Thermoid Rubber Company, the stopping distances from an actual test of a two-wheel brake car, and those derived from studies of the United States Bureau of Standards. The stopping distances are from the time the brakes are applied until the car comes to a full stop. The prescribed conditions are a dry, level road, and a uniform deceleration from a known to a zero velocity.

Rate		Stopping Distance (Feet)			U. S. Bureau Standards
Mi. pr.	Ft. pr. Sec.	*2 Wh. Brakes**	*4 Wh. Brakes**	Actual Test**	
10	14.66	9.2	6.17	9.0	12.5
15	22.00	20.8	15.9		28
20	29.33	37	24.7	34.9	50
25	36.66	58	38.6	53.6	78
30	44.00	83.3	55.5	74.4	112
35	51.33	113	75.6		153
40	58.66	148	98.7	135.5	200
45	66.00	187	124.9		253
50	73.33	231	154	178.0	312

*From Thermoid Rubber Company Chart
**With brakes in proper adjustment.

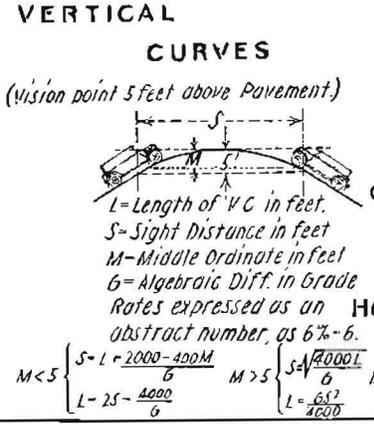
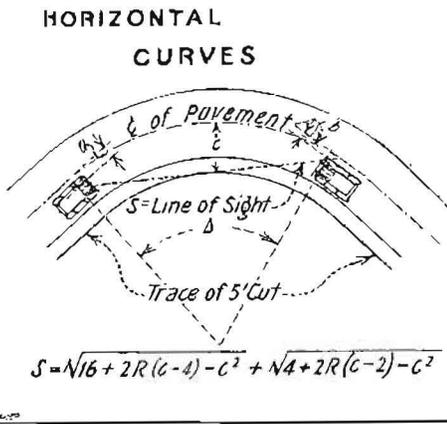
SIGHT DISTANCES, 100 FEET TO 500 FEET.

Sight Distance	Radius of Horizontal Curve					Length of Vertical Curves					
	#1	#2	#3	#4	#5	Algebraic Difference in Grade Rates					
						14	12	10	8	6	4
100'	120	100	Less than 100' Radius.								
150'	260	220	190	180	170						
200'	440	380	330	310	290	110					
250'	690	580	500	470	450	210	170	100			
300'	1000	840	720	670	640	320	270	200	100		
350'	1340	1150	970	910	860	430	370	300	200		
400'	1750	1500	1260	1190	1130	560	480	400	300	130	
450'	2220	1880	1590	1500	1420	710	610	510	400	230	
500'	2730	2330	1970	1870	1760	880	750	620	500	330	

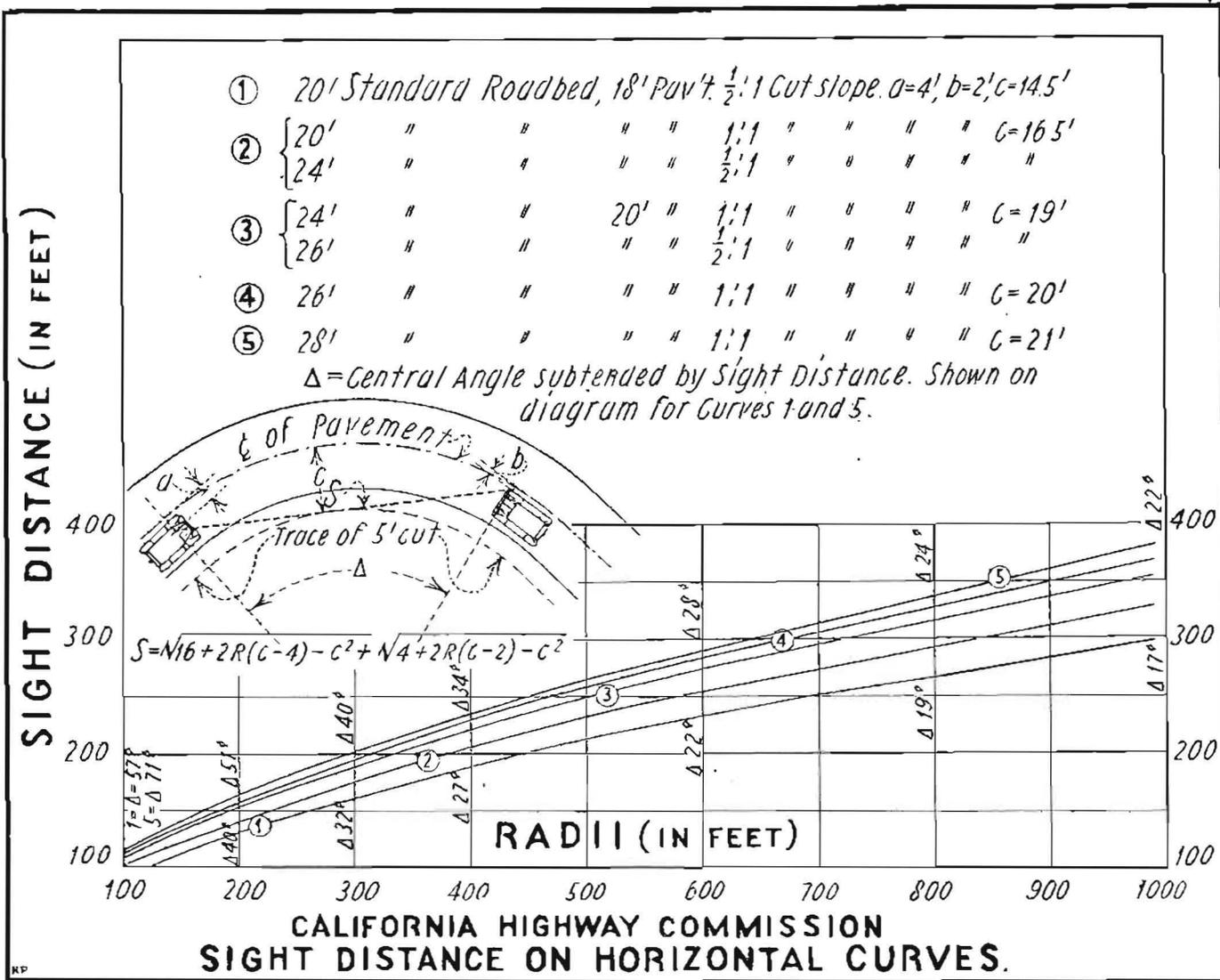
- ASSUMPTIONS**
- ① 20' Standard Roadbed, 18' Pavt. 1/2 Cut slope, a-4 b-2' c-14 1/2'
 - ② 20' " " " " " " 1:1 " " " " c-16 1/2'
 - ③ 24' " " " " " " 2:1 " " " " " " c-19'
 - ④ 26' " " " " " " 2:1 " " " " " " " " c-20'
 - ⑤ 28' " " " " " " 1:1 " " " " " " " " " " c-21'

MINIMUM Δ FOR SIGHT DISTANCES

R	1	2	3	4	5
100	57°	61°	67°	69°	71°
200	40°	43°	46°	48°	51°
300	32°	35°	38°	39°	40°
400	27°	30°	32°	34°	34°
600	22°	24°	27°	27°	28°
800	19°	21°	23°	24°	24°
1000	17°	19°	20°	21°	22°
2000	12°	13°	14°	15°	15°



CALIFORNIA HIGHWAY COMMISSION
TABLE OF
SIGHT DISTANCES
FOR
HORIZONTAL AND VERTICAL CURVES
SEPT. 1926



The corresponding values in columns 3 and 5 show a fairly close agreement except for the higher speeds. The stopping distances for cars with two-wheel brakes, shown in the last column, are based on a coefficient of friction between tire and road of 0.6 and a ratio of the height of center of gravity to length of wheelbase of the car, from which factors a deceleration of about 9 feet per second per second results.

With the alteration of the given conditions, such as a wet road, a downhill grade or inadequate brakes, the values in the table are immediately increased. The friction coefficient on a wet road may drop to 0.1 or 0.2 causing a nearly proportionate decrease in the deceleration, which may have a value as low as 2 feet per second per second. This means that either the stopping distance is increased from 3 to 4 times or that the initial speed must be decreased one-half or more in order to stop within the same distance.

For instance, at a dangerous intersection, the sight distance and unobstructed course ahead is 65 feet. In this distance, the driver must be prepared to see an approaching car, decide to stop, apply his brakes and bring his car to a full stop. With good brakes and no loss of time on his part, he could accomplish this if he were driving on a dry road at a speed not in excess of 20 miles per hour. If the road is wet and slippery, however, he probably can not make the stop from a speed greater than 10 miles per hour. Evidently, then, the stopping distance with relation to the unobstructed course, which involves the sight distance,

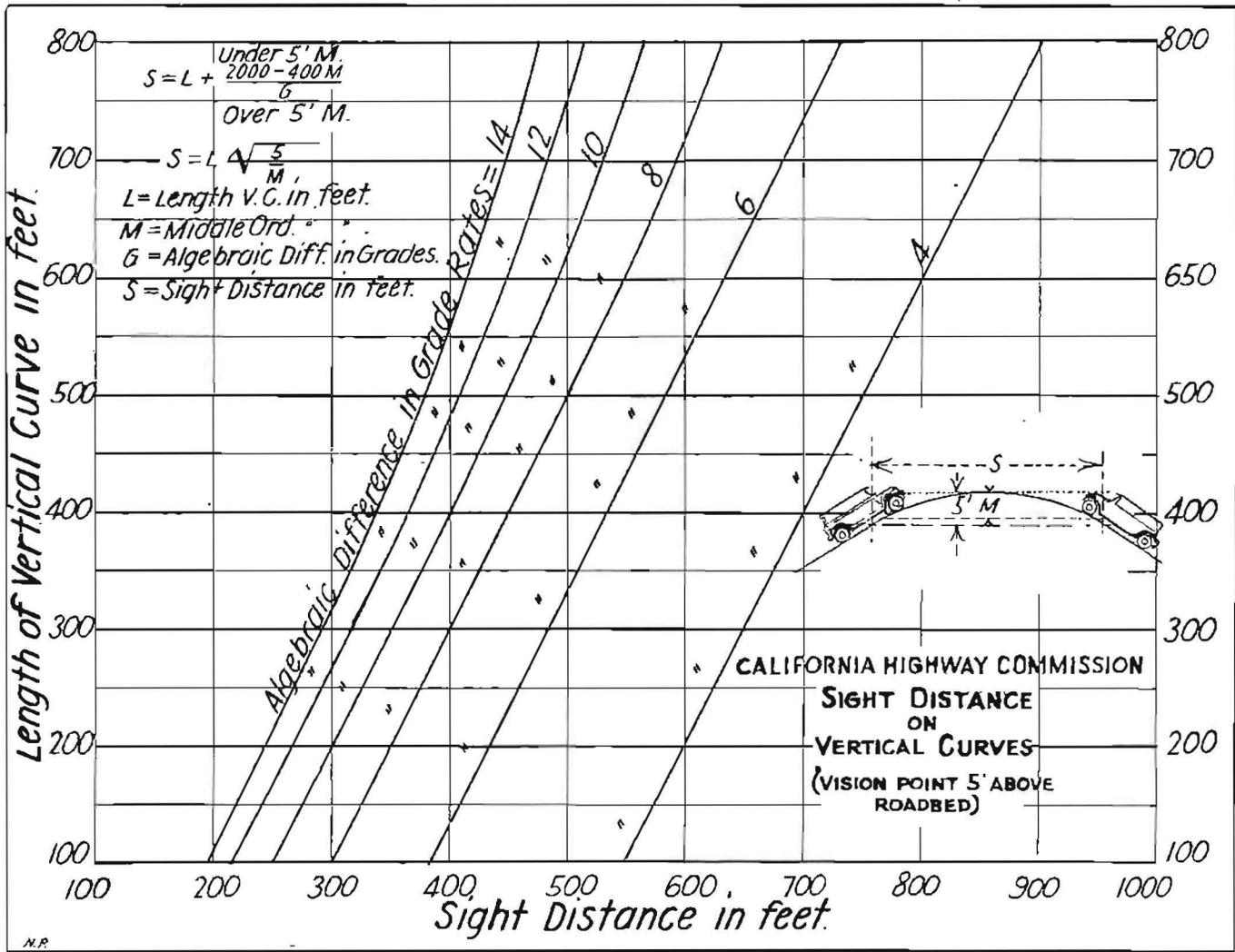
is the more important factor of safety and determines the safe speed at which a car should be driven.

In the above cited example, the other factor affecting the stopping distance is given consideration, namely, the personal equation, or the reaction time of the driver. Some interesting experiments in this connection were conducted in Washington, D. C., by Messrs. F. A. Moss, staff psychologist, Bureau of Public Personal Administration, and H. H. Allen, assistant mechanical engineer, Bureau of Standards. It was found that the average reaction time of the persons tested was approximately one-half second, that the reaction time was not appreciably affected by the speed at which the person was driving, and that reaction time may be reduced by training.

If to the stopping distance shown in the tabulation is added the proportionate distance in feet per second required by the reaction time, a fairly definite value is obtained of the total distance necessary to safely stop a car from a given rate of speed.

Relation of Stopping Distance to Sight Distance.

The relation of the stopping distance to the unobstructed course is clearly similar to that of stopping distance to sight distance, since the unobstructed course is determined by the sight distance. This may be shown by the case of the horizontal curve. On a curve, the view may be obstructed by embankments, buildings, trees or bushes. The driver, say on a curve to the right, can see his right-hand side of the road for a definite distance. If in this



distance, he sees no obstructions, such as vehicles, pedestrians or animals, he has an unobstructed course equal to his sight distance, but no more. The sight distance, then, determines the safe stopping distance, which in turn determines the safe speed at which the driver may proceed.

It is assumed that each vehicle is proceeding in its own lane or course. Law and custom have well established this practice as one of the commonest rules of the road. Even the careless, senseless driver must experience some pangs of conscience when he causes confusion or narrowly escapes accident by the violation of this accepted principle, and here, especially, the safety afforded by long sight distance is obvious. When the lane of travel becomes a common one, as in the case of a single track road, it is clear that the unobstructed course is only one-half of the distance which the driver can see, as each driver of two vehicles approaching each other at equal rates of speed must stop within one-half the distance separating them when they first sight each other.

In the case of the other type of curve, that is, the vertical curve over the top of a hill, the situation is similar to the horizontal curve, but it seems that the average driver is not so strongly impressed with this similarity and has not yet acquired the full appreciation of the relative hazard to traffic which the vertical curve presents. It seems advisable, in this case, to provide even a larger safety factor by increasing the sight distance generously beyond what is theoretically required.

Engineer Designs Illustrating Graphs.

The accompanying tables and graphs, designed and prepared by B. W. Booker, office engineer of Division I, show, for various

widths of roadway, the length of radius on horizontal curves and length of parabolic vertical curves necessary to obtain a given sight distance. The line of sight is at a height of five feet. For horizontal curves, the sight distance is measured between points on the inside lane and is consequently the shortest distance. The driver is concerned principally in seeing the lane in which he expects to travel; if this is clear, he may proceed safely.

A concrete example applying the data and tables may be of interest. From the sight distance table, assuming a 24-foot standard roadbed, 20-foot width of pavement, 1 to 1 cut slopes, we find that a curve with radius of 500 feet will provide a sight distance of about 250 feet. An unobstructed course of this length, with the ideal conditions of a dry, level road and allowing a margin of only one second in addition to the required reaction time, would permit of a speed of 35 miles per hour in rounding this curve.

In discussions of this subject, it is not uncommon to have cited an example of two cars approaching each other at an equal rate of speed; the conclusion is then made that the sight distance necessary to provide for safety is the sum of the required stopping distances for both machines. This, obviously, is true only where the two cars are traveling in the same lane. Its application to a roadway of two lanes or wider, and providing the sight distance necessary for higher speeds, would soon carry us beyond all bounds of economy in our construction.

It is interesting to note the comparison of sight distances on horizontal and vertical curves. For instance, where minimum radii of 200 and 300 feet are used on heavy work, a 150-foot vertical

SAND HILLS PAVING PROJECT IS PRAISED AT EL CENTRO DINNER

GOOD roads enthusiasts from southern California counties and also from Arizona gathered at a banquet in El Centro on October 27th to celebrate the recent completion and opening to traffic of the new pavement across the Sand Hills of Imperial County.

Numerous speakers, as reported by the *El Centro Press*, gave unstinted praise to the skill of the engineers who planned the seven miles of new asphaltic concrete pavement across the dunes and to the contractors who built it. Appreciation also was expressed for the interest taken by the highway commission in the improvement of the trunk highways extending through Imperial County.

Among the guests who addressed the gathering was Commissioner Nelson T. Edwards, who expressed pride in the accomplishments of the commission in the state as a whole and also on the Borderland route between El Centro and Yuma. Details of the Sand Hills project were related by E. Q. Sullivan, division engineer of San Bernardino. The Mountain Springs grade project was described by S. V. Cortelyou, division engineer of Division VII.

The Chamber of Commerce of El Centro was host for the evening and W. W. McEuen, president of the chamber, presided. The program was arranged by George E. Bowles, chairman of the Good Roads Committee.

The new Sand Hills highway, it was reported, has reduced the running time between El Centro and Yuma forty-five minutes besides greatly increasing the comfort of the trip across the desert.

EQUIPMENT DEPARTMENT NOW FUNCTIONING MORE EFFICIENTLY

(Continued from page 3.)

quoted for an occasional purchase. Heavy quantity purchases have been made of road graders, tractor grader outfits, truck repair parts, etc.

To take care of the accounting for the vast number of articles owned by the Highway Commission, there has been installed in the headquarters shop and in all of the division shop offices, an accounting system handled with bookkeeping machines. Transactions are closed daily, and stock cards balanced. The Equipment Department always knows where it stands financially.

The machine bookkeeping system has been worked out by one of the accountants of the Board of Control, Mr. C. E. Malm. Mr. Malm's vision of the proper accounting system for our Equipment Department has resulted in a system which gives us far more data than we ever had before, and the best part of it is that it gives it quickly and accurately.

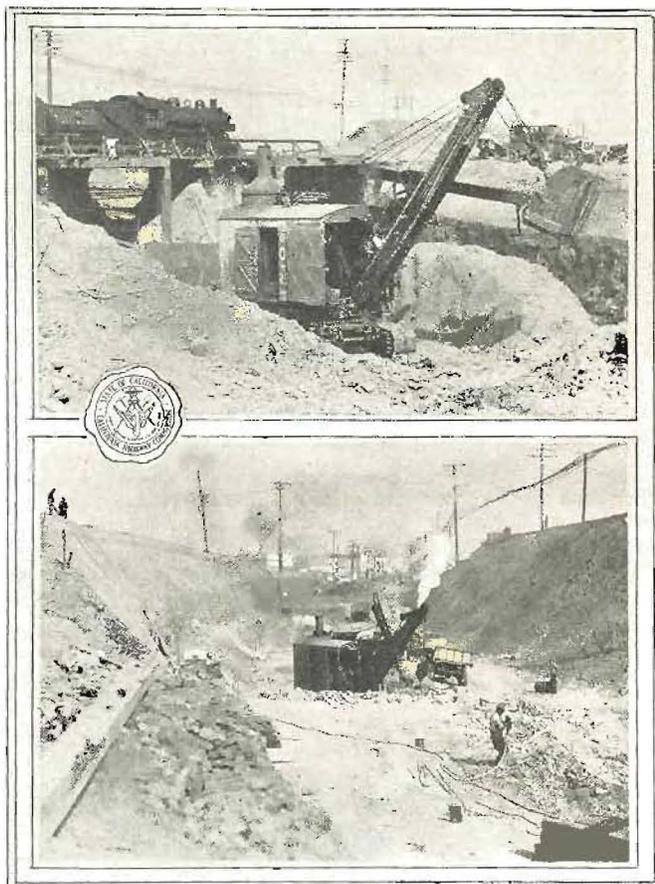
Several years ago, we made excuses for our Equipment Department. Now, through the hard work of Mr. R. H. Stalnaker, and the cooperation, advice and assistance of Mr. Malm, we make excuses no longer. We are proud of the department, and would not return to the old methods under any circumstances. We challenge any organization to bring forth a better system than we have or equipment better taken care of. Gradually, as we dispose of obsolete material, and the old equipment is replaced by new and up to date equipment, our maintenance costs will decrease.

With both the manufacturers and the Highway Department working on design of specialized equipment, and trying to find the best article to suit the job, economy is bound to result.

Hostess' daughter (trying desperately to keep the conversation going)—"Did you ever hear the joke about the curio dealer who had two skulls of Columbus—one when he was a boy and the other when he was a man?"

Wiggins—"No; I don't think I have. What is it?"

Nine



BAYSHORE UNDERPASS—Rapid progress is being made on Bayshore highway underpass at South San Francisco, ground for which was broken on August 28th. It will be the largest to date on the state highway system.

SIGHT DISTANCE

(Continued from page 8.)

curve gives considerably more sight distance, even with a 12 per cent grade change. A combination of horizontal and vertical curve will slightly reduce the sight distance shown in the tables. The amount of this reduction is indicated by the following: A 300-foot radius curve, in combination with a grade change of over 10 per cent, reduces the sight distance 15 feet from that shown on the horizontal curve diagram.

The setting forth of these values of stopping distance does not mean that the principle of adopting minimum sight distance to meet the requirements is advocated; it is the hope, rather, that with more definite and ample information, realizing the tendency to increase driving speeds, a better understanding of the requirements of comfort and safety may be had and that we may more intelligently provide for these in future design.

By the introduction of superelevation, we overcome the riding discomfort produced by the short radius curve; we add materially to both comfort and safety by building our highways wide; but the average driver has greater peace of mind and a greater feeling of security when the road lies open and unobstructed before him; when he can see clearly the way ahead.

National Good Roads Week January 10-17, 1927.

THE second National Good Roads Week has been named as the week beginning January 10, 1927, according to H. G. Shirley, president of the American Road Builders' Association. The chief event of the week will be the road show and convention in Chicago at which many highway authorities are expected to gather for a comprehensive program of review, discussion of problems, and planning for the future of the industry.

COUNTY BRIDGES ON MOTHER LODE HIGHWAY REBUILT BY STATE

UNDER chapter 234 of the Statutes of 1925, the California Highway Commission was directed to take over for maintenance various county roads on designated state highway routes. Typical of the roads taken over is Route 65 from Auburn to Sonora, commonly known as the Mother Lode Highway.

When maintenance forces took charge of this route, many of the bridges were found to be far below the standards of the state and some were in an unsafe condition. An example of such structures was the bridge across Mokelumne River between Jackson and San Andreas, consisting of a steel truss center span and timber trestle approaches. This bridge, originally built many years ago as a toll bridge, had been later taken over by the counties.

Four caps in the trestle were of wood and badly rotted, all other caps were constructed of two pieces of channel iron and were in good condition. The stringers were spaced too far apart and all were badly rotted; the floor planks were so badly worn that longitudinal plank runners had been installed to carry the traffic. The clear width of the bridge was less than thirteen feet and the structure accommodated only one-way traffic.

Under specific authorization the super-structure was entirely

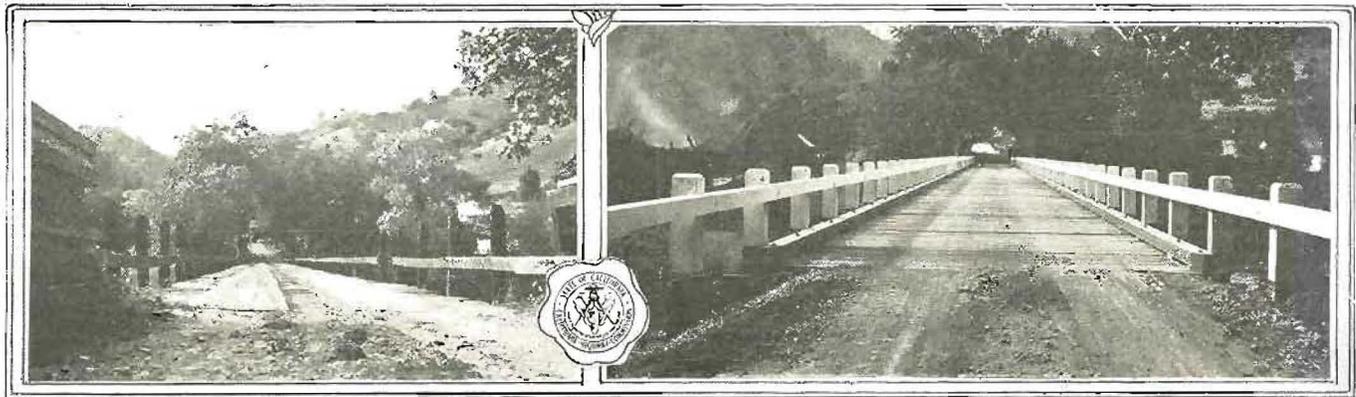
rebuilt. The four defective caps were replaced, new stringers, deck, guard rail and wheel guard were placed throughout. The deck was widened as far as the steel caps and truss would permit, making a clear width of 14 feet between guardrails, which allow vehicles to pass one another while on the bridge. A laminated deck of 2" x 4" stock took the place of the old type deck and standard guard rails with 8" x 8" wheel guard replaced the old rickety guard rail. Repairs are now finished with the exception of asphalt macadam surfacing for the floor.

Fifty-five thousand board feet were required to reconstruct the bridge and the entire cost stands to date at \$3,350, including cost of all materials and labor.

The bridge over the North Fork of the Calaveras River, consisting of an old 162 foot combination Pratt truss, was found to be in very bad shape. Woodpeckers and rot had weakened the timbers in the truss until they were no longer safe. Special allotment authorized the placing of concrete footings and frame bents under the six panel points.

Other small structures along this route have been strengthened so that all are now safe for ordinary travel. In another year, however, decks of several structures will need replacing.

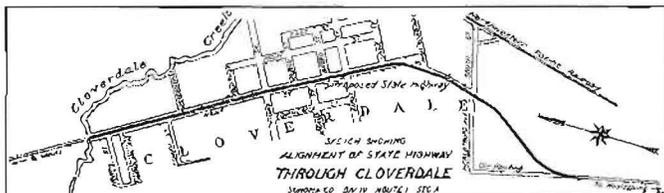
Pictures showing "before" and "after" views of the Mokelumne River bridge are shown herewith. The work was done by the regular maintenance forces of Division X under the direction of Maintenance Engineer Clarence Bovey.



MOTHER LODE IMPROVEMENTS—Left, Mokelumne River bridge when taken over from county; Right, bridge with deck and floor rebuilt by forces of Division X. (Photos by Division X.)

NEW PAVEMENT THROUGH CLOVERDALE IMPROVES ALIGNMENT

DA NGEROUS curves at the southerly approach to the town of Cloverdale on the Redwood highway, Sonoma County, have been removed by the completion of the paving contract of J. V. Galbraith (Contract 510, IV Son. 1-A). The new 20-foot concrete pavement has been completed through the business district to a connection with the existing pavement south of the town.



The elimination of two bad turns, one a right angle, was made possible by the securing of new rights of way, which were furnished by the municipality.

In the business district, the city of Cloverdale, using the District Improvement Act, has placed an additional width of pavement, providing a completed pavement approximately 56 feet in width. The center 20 feet was paved by the state.

The improvement completes a continuous pavement from the

San Francisco ferry at Sausalito to the north city limits of Cloverdale, including the distances through cities.

The Cloverdale improvement was made possible by the cooperation of the municipality. Division IV had charge of the project.

WHAT ARIZONA FARMERS THINK OF THEIR PAVED HIGHWAYS.

Maricopa county, Arizona, with 20,000 motor vehicles, has paved 330 miles of road in a three-year period. The *Farm Journal*, Philadelphia, estimates that these roads save car owners \$1,560,000 a year, on a basis of 3000 miles travel per car per year and an average saving of 26 cents a mile in operating costs, as compared with the dirt roads they formerly had. An additional saving of \$160,000 in transporting farm produce brings the total to \$1,720,000 a year. Bond issues totaling \$8,500,000 were used in financing the road program. The annual interest, sinking fund and maintenance total \$646,000 a year, making the annual net earnings more than \$1,000,000.

The *Farm Journal* sent letters to the rural residents of the county, asking if the roads saved money for them, and whether they would vote for bonds if the question came up again. Replies were received from 144, of which 137 were wholly favorable, three did not believe the roads saved enough to pay the cost, two said the roads did not save anything, one said the roads were profitable but he would not vote for them again, and one, having no machine, said he did not know.

Increased farm land values, longer life of machines, saving in gasoline, tires and repairs, were among the benefits mentioned. Others said the comfort and satisfaction of riding on good roads were worth the whole cost.

DIVISION VII ENGINEERS PERFECT DEVICE TO SUPPORT REINFORCING STEEL IN CONCRETE PAVEMENTS

A DEVICE which appears superior to any method yet proposed for properly supporting reinforcing steel in the construction of cement concrete pavements has been perfected by two engineers of Division VII, it is reported by S. V. Cortelyou, division engineer, in a letter to the Construction Department. It consists of a bar into which are fitted adjustable hooks that hold the reinforcement in correct position during placing of concrete. The bar when in use rests across the header boards, as shown in the accompanying illustration and sketch.

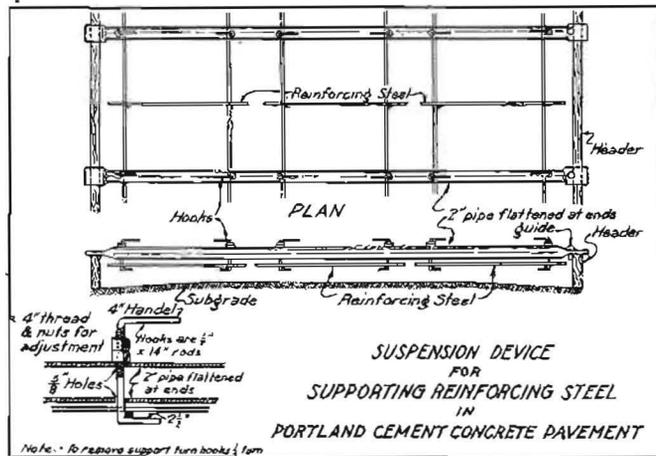
To hold mesh or bar reinforcing in place so that it will have a proper position in the concrete slab has ever been a problem in the construction of pavements. Formerly reinforcing was held up by a small pile of concrete mix placed on the subgrade, but the steel had to be adjusted from time to time as placing of the mix progressed. With constant watchfulness this method gave fair results, but was far from satisfactory.

Another plan sometimes followed was to place small blocks of concrete or rocks on the subgrade to hold the reinforcing. This method was never satisfactory and has long been discontinued. Still another method was the use of a sled dragged on the subgrade behind the mixer. The sled often gave better results than other methods but had many objectionable features.

A more recent plan is the use of especially manufactured steel pins or chairs. (Such pins have been specified for use on the Debo cut-off project near Oxnard, where they will be tried for the first time in Division VII.) Pins or chairs, however, can not be used on second-story concrete since the pins can not be driven into the old base and chairs must be held against slipping.

Tests Prove Advantage.

The plan of the bar and hooks, as worked out by Resident Engineer W. D. Eaton and Assistant Resident Engineer Walter



T. Lamb on the Jahn and Bressi contract in San Diego County (M-93 VII-S.D. 2-C&D), seems to have many advantages over any of the above methods. By it, the reinforcing steel may be placed in correct position and held there. Numerous tests of the position of the steel after tamping of the fresh concrete demonstrate this to be a fact.

The device is left in position until the concrete is spread and is removed just ahead of the tamper. The hooks are adjustable and can be changed for different thicknesses of pavement, while the drilling can be varied to suit any type of reinforcement.

The division believes the success of the device is assured. It is positive in the placing of the reinforcement, costs little, and is simple in operation.



THROUGH HILLSBOROUGH—Widened Peninsula state highway, San Mateo County, where it borders on one side municipality of Hillsborough and on the other side city of San Mateo. A cement concrete shoulder and additional asphaltic surfacing provide a forty-foot street. (Div. IV photo.)

ANOTHER improvement on the Peninsula highway which will facilitate traffic through cities of Hillsborough and San Mateo has been completed by Division IV, working in cooperation with the city of San Mateo. (Contract M-137, IV S.M.2-B.) The work done consisted of the placing of an 8-foot concrete shoulder on the west side of the existing 24-foot pavement and the placing of an asphalt concrete surface over the old asphalt surface.

A similar improvement was made on the east side of the highway by the city of San Mateo, which financed an 8-foot concrete shoulder with a curb and gutter to match the work done by the state.

The completed roadway, including the work done by the city of San Mateo, provides a 40-foot pavement through the Hillsborough-San Mateo section. Similar widening has been done by the state on other sections of the Peninsula route through San Mateo County. The work was done by the Municipal Improvement Company.

ASSOCIATION HONORS MR. TOY

The American Association of State Highway Officials at its recent convention, held at Pinehurst, North Carolina, reelected Chairman Harvey M. Toy of the California Highway Commission a member of its Board of Directors. This action was taken despite the fact that Chairman Toy was unable to be present and is a recognition of his services in furthering the cause of federal aid throughout the West.



ANOTHER DIVISION VII INVENTION IN USE—Device perfected by resident engineers to hold cement concrete pavement reinforcement in position during placing of mix.

ROAD CONGRESS PUBLISHES REPORT OF C. S. POPE

THE permanent International Association of Road Congresses, which this year held its fifth meeting at Milan, Italy, has issued in printed form the report on bituminous and asphaltic roads prepared for the congress by Charles Stockton Pope, M. Am. Soc. C. E., Construction Engineer for the California Highway Commission. Mr. Pope was chosen as chief reporter for the United States on asphaltic roads.

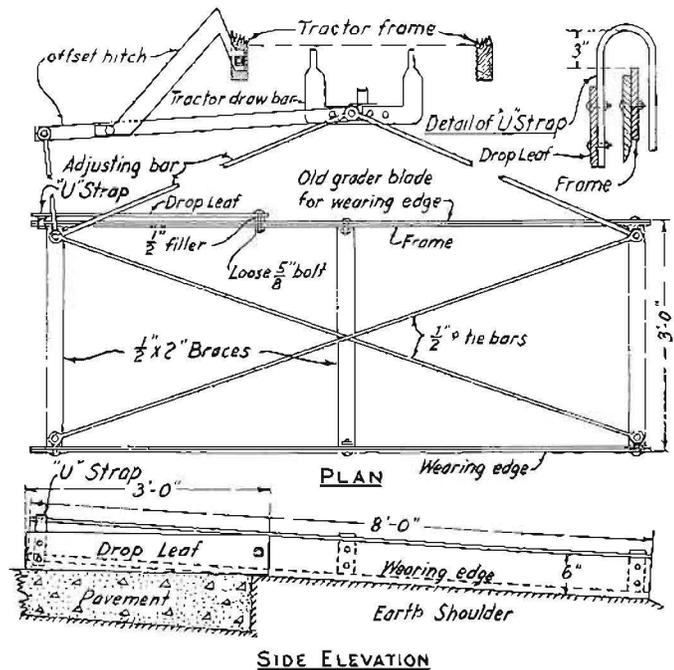
After defining the various types of road included within the designation "bituminous and asphaltic," Mr. Pope's discussion includes a presentation of the subject under the following headings: Classification by Construction Methods, Advance in Practice; Binder Distributors, Mixer Plants, Bituminous Binders, Properties, Identification Tests, Classification Tests, Differentiation Tests, Aggregates, Wear and Impact Tests, Cementation Tests, Asphalt Sands and Mixed Pavement.

The collaborators who assisted Mr. Pope and whose papers on details of the subject are also quoted at some length in the published report are: Christian P. Jensen, County Surveyor, Fresno, California; Philip P. Sharples, Consulting Highway Engineer, Redondo Beach, California; Henry G. Shirley, Chairman, State Highway Commission, Richmond, Virginia; and Francis P. Smith, Consulting Highway Engineer, New York City.

DIVISION II HAS PLAN FOR DROP-LEAF SHOULDER DRAG

THE necessity for a return trip when grading shoulders to throw excess material back and to clean the pavement has been obviated by a new drop-leaf shoulder drag developed by Division II, a plan for which is shown herewith.

The drag is used behind a one-man grader and is set to throw the material away from the road. It takes the excess material



thrown up by the grader and smooths it over the shoulders. The drag, the division reports, makes the usual extra trip unnecessary and saves about a third of the expense of grading shoulders.

The outfit was designed by Maintenance Superintendent E. L. Stump and was built from old grader blades and scrap iron at a cost of about \$12.



Drag in use in Division II for shaping of shoulders.

EFFECTIVE ASPHALT PATCHER.

THE conical-shaped asphalt pouring pot shown in the accompanying illustration has been found to be a very convenient piece of equipment, reports the Maintenance Department. It is in use in several of the divisions for filling pavement cracks with hot asphalt.

A three-eighths-inch rod for regulating the flow of the asphalt extends through the center of the cone to the outlet at the point. This is done by raising or lowering the rod by means of the latch shown at the base of the wooden handle.

The capacity of the container is one gallon. The pot here shown was made up in the Headquarters Shop from a plan furnished by Division III.



BROKEN CUT SLOPES SAVE GRADING QUANTITIES

THE use of broken cut slopes to save grading quantities and possibly avoid slides is being put into practice in Division I, on some of its grading contracts. The view shown herewith is on Route 15, west of Wilbur Springs, now being graded by prison labor.

The difference in character of soil as shown by the first shovel-cut indicated that, while the top half of the cut would require a slope of 1 to 1 to prevent slides, the lower left of the cut could be taken out on slopes of $\frac{1}{2}$ to $\frac{3}{4}$ to 1 with safety.

The application of this principle was the means of saving many yards of excavation in this one cut.



BROKEN SLOPES—View on convict job in Lake County. Division I, showing (on right of cut) broken slope which saved grading quantities.

BIDDING FOR THE TOURIST

ONE OF the projects of the California Highway Commission in making the highways of the state better, safer and more attractive, is the construction of a high arch bridge over Dog Creek Canyon, on the Pacific highway, in the Sacramento mountains. In making this and other great improvements in the route through these mountains, the prime purpose is to facilitate travel into California from the north by this chief artery of motor travel of the Pacific Coast. In order to do this many miles of this highway have been regraded and finely graveled, other miles paved, and it is the purpose of the commission to pave it all as rapidly as funds for that purpose may be secured. All of that highway from San Diego to British Columbia, passing through three states and one province, is paved except these few miles in the Sacramento mountains.

When this work shall have been fully done, the Pacific Coast will possess the longest continuously paved highway in the world, along whose length greater and more numerous scenic wonders and attractions exist than along any other touring route on earth. That is something worth striving for. It would bring into California an increased number of tourists and add to the already huge sum of money expended by motorists as they wheel over our highway system.

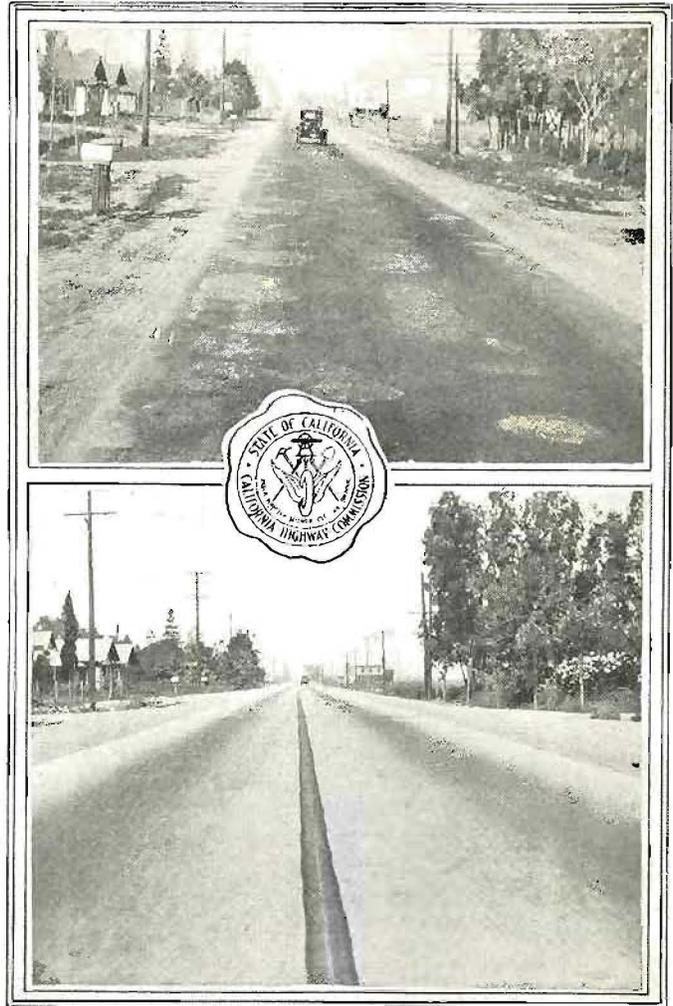
The time is soon coming, when motorists will consider the opportunity to wheel over this great Pacific highway, from Mexico, through California, Oregon, Washington and British Columbia, as their chief inducement for crossing the continent. The commission is showing great financial wisdom in bringing to perfection as speedily as possible this great backbone of Pacific Coast travel.—*Turlock Journal*.

To Repel Invaders.

The following sign is displayed above the ice-cream counter of a prominent drug store:

"Take a brick home; it's fine when company comes."—*Union Pacific Magazine*.

Thirteen



BEFORE AND AFTER, DIVISION VIII—Above, old patched pavement near Redlands. Below, same location, new 20-foot "second story" concrete pavement recently completed. (Photos by Div. VIII.)

GOOD JUDGMENT USED

(*Santa Ana Register*.)

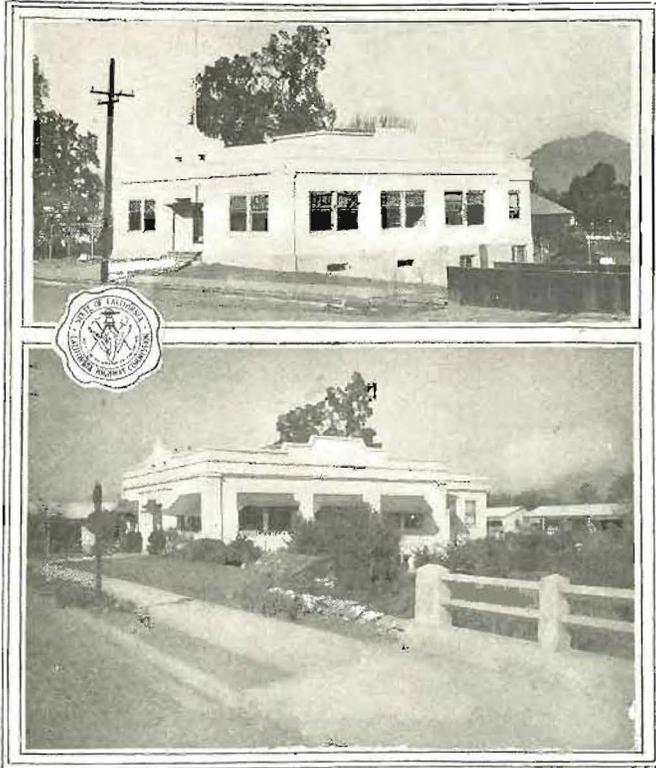
WITHIN three or four months, the fine new bridge on West Chapman street across the Santa Ana River will be completed and in use.

It will be a bridge that will accommodate traffic for many years to come. It was with a view to the future that a decision was reached by the State Highway Commission and its engineers to dismantle the old bridge and rebuild a broad structure, adequate to the demand of traffic. Any effort to have used the old bridge would have resulted in two contingencies, one the leaving of a wall down the center of the bridge, which would be an ever-present menace to life and property, the other the placing of the bridge far off center.

Since the cost of the new bridge, as it is being built, was only some \$10,000 or \$12,000 greater than would have been the cost of building an addition to the old bridge along its south side, it seems to us that the State Highway Commission would have been short-sighted indeed had it decided in favor of letting the old bridge stand.

Incidentally, we might remark that, after the bridge is built, the next big job on hand will be to keep the river under the bridge.

WHAT THE DIVISIONS ARE DOING



BEAUTIFICATION AT WILLITS OFFICE—Views show office and grounds of Division I as they were a few years ago and today. Planting of grass, shrubs and flowers was done by T. H. Taylor in addition to his regular duties of janitor and testify to his energy and interest.

DIVISION IV.

HEADQUARTERS, SAN FRANCISCO.

JOHN H. SKEGGS, DIVISION ENGINEER.

Counties of San Francisco, Marin, Sonoma, Napa, Contra Costa, Alameda, Santa Clara, Santa Cruz, and San Mateo.

THE Pacific States Construction Company of San Francisco has completed the rough grading, including the installation of pipe culverts, on its Contract (M-144, IV Mrn.L-B), for straightening and widening the existing highway through the cities of Ross and Larkspur, Marin County, a section of the Redwood highway. Contractors are now busily engaged in making subgrade for the new pavement.

Tieslau Brothers, contractors, have started work on their contract (M-149, IV C.C.-14-B), for the grading and straightening of the state highway in Contra Costa County from El Cierro to Valona. This work will involve heavy yardage and extensive remedial work in the vicinity of Valona slide, which has given the commission considerable trouble in the past in maintaining an existing road over the sliding area.

"Bottleneck" Work Starts.

The Kaiser Paving Company, contractor, has commenced work of widening and straightening that section of the Peninsula highway known as the "Bottleneck" extending from Colma to Cypress Lawn Cemetery, in San Mateo County. It is contract M-148. The contractor's forces have been at work for several weeks

clearing the right of way through Woodlawn and Greenlawn cemeteries.

The work will consist of constructing a graded roadway on each side of the center of the new right of way. The central 28 feet will be occupied by the double track of the San Mateo line of the Market Street Railway. The typical cross section provides for a central 28 feet for car tracks with a 40-foot roadway on either side thereof, together with 8-foot sidewalks, making a total width of 124 feet. A paving contract is expected to follow the grading.

DIVISION VI.

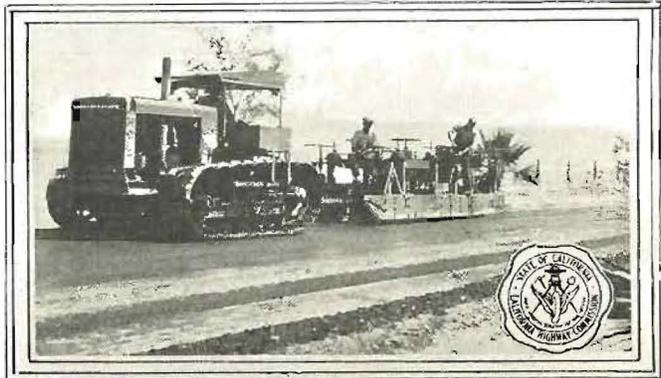
HEADQUARTERS, FRESNO.

E. E. WALLACE, ACTING DIVISION ENGINEER.

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

THE California Road and Street Improvement Company has completed its contract for widening and resurfacing with asphaltic concrete a short section of state highway south of Fresno, between Church avenue and Cherry avenue. A full width street has been provided in cooperation with the city of Fresno.

Chester A. Failing was awarded the contract for graveling between Mormon Bar, through the town of Mariposa, to the



Asphalt pavement planer in operation near Bakersfield, Division VI. It deposits removed material at edge of concrete shoulder to form solid border.

first crossing of Bear Creek, on the Yosemite lateral. The work will greatly improve this route for winter travel. Rock is being crushed at the dump of the famous old Mariposa Mine, near the town of Mariposa.

The new division office building at Fresno will be completed about November 15th. Division VI expects to move into the new headquarters shortly after that date.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

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

CONSTRUCTION of the Oxnard-Hueneme road cut-off is progressing rapidly. This 5-mile section of new highway will connect Oxnard with the highway down the coast; the connection is to be made in the vicinity of Point Mugu. Culvert construction and grading is in progress and preparations are being made for placing concrete pavement.

Along the coast westerly from Ventura and extending to Sea Cliff, a distance of 8.4 miles, the width of the roadway grade will be increased and the pavement double-decked and widened with cement concrete. The contractor, J. F. Knapp, of Stockton, is on the job and has commenced work. Otto Parlier has subcontracted the construction of seawalls, about 1500 lineal feet, a part of the reconstruction program covered by the contract.

From the easterly city limits of Santa Ana and on through Tustin, 1.6 miles, the Griffith Company of Los Angeles has been awarded a reconstruction contract for the building of a 56-foot cement concrete pavement with gutters and curbs. A local improvement district is cooperating and the work is well under way.

A 15-mile pipe line has been laid from Jacumba to the foot of Mountain Springs grade by Jahn and Bressi, contractors, to furnish water for the construction of the 20-foot cement concrete pavement on Mountain Springs grade, San Diego and Imperial counties. Grading and culvert construction is in progress.

DIVISION X.

HEADQUARTERS, SACRAMENTO.

R. E. PIERCE, ACTING DIVISION ENGINEER.

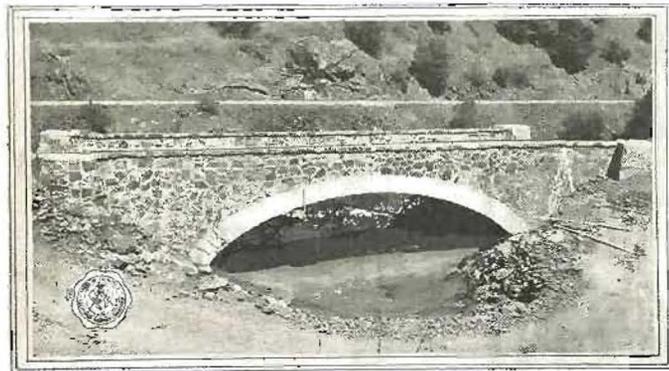
Counties of Amador, Calaveras, Alpine, Tuolumne, Stanislaus, San Joaquin, Solano, and southern Sacramento and Yolo counties.

TWO sharp reverse curves, one just south of Ceres, the other north of Keyes in Stanislaus County, have been replaced by long, easy curves. The work was done by the Valley Paving and Construction Company, using asphaltic concrete pavement with crushed gravel subgrade and borders.

C. L. Caine, foreman in charge of maintenance in Solano County, is performing exceptionally good work in widening the roadbed and patching broken sections of concrete pavement. Some patches which are being placed can hardly be termed "patches," inasmuch as, in some places, broken pavement has been replaced in strips as long as 150 to 200 feet, varying in width from one-half to the full width of the pavement. All the patch work is being done by placing asphaltic macadam under general maintenance allotments.

Improving Pioneer Roads.

Under D. M. No. 186, H. S. Clark, maintenance foreman, is constructing a new section of road on the Mother Lode route which will eliminate two bad creek crossings between Plymouth and the Cosumnes River in Amador County. Upon the com-



STONE FINISH BRIDGE—Reinforced concrete bridge with exterior finish of natural stone completed on Merced canyon entrance to Yosemite Valley. Three such bridges have been built on this section. (Bridge Department photo.)

pletion of this work, the Mother Lode highway between Jackson and El Dorado will be made an all-year road.

Maintenance forces under the supervision of Superintendent H. L. Montfort are doing widening work at several points along Priests Grade. (X. Tul-40-B.) With the completion of this work, this road will be made much safer for travel to Yosemite National Park via the Big Oak Flat.

W. H. Martin, superintendent in charge of maintenance in San Joaquin County, has recently completed the construction of gravel shoulders for 0.7 of a mile east of Tracy. (X. S. J.-5-A.)

WHO COULD IT BE?

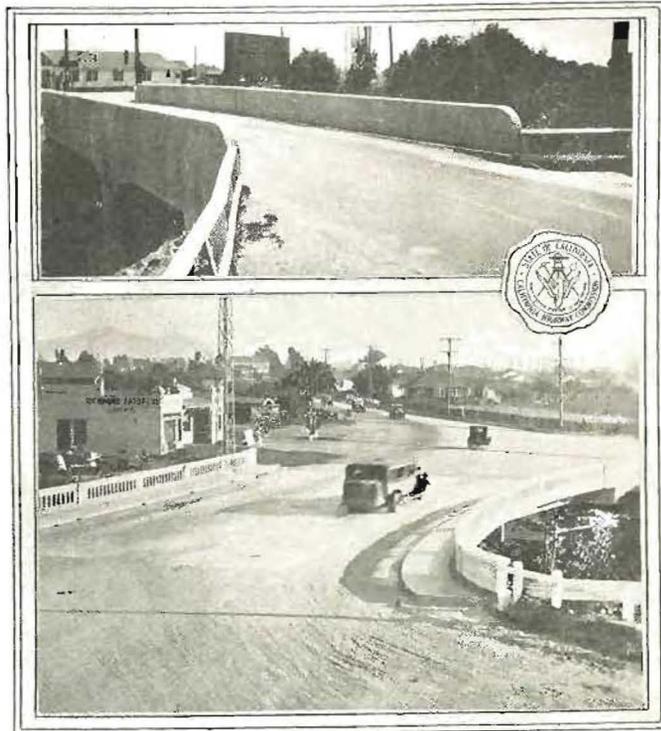
"Stop!" cried the voice in the taxi.
The driver stopped.
"I don't mean you. Keep right on driving," said the voice.

Fifteen

BRIDGE DEPARTMENT NEWS

J. A. MOHR and Son, contractors, have completed the cleaning and painting of the steel bridge across the Russian River near Healdsburg, Sonoma County, on the Redwood highway. The work consisted of cleaning the two steel spans and placing a primer and finishing coat of paint, the finished coat being sanded to a point about 5 feet above the sidewalk grade.

McDonald and Maggoria, contractors, are making satisfactory progress under their contract (M-135, IV Mtn. 1-B), for the widening of an earth fill concrete arch across San Anselmo Creek



BEFORE AND AFTER—Views at San Pablo Creek on state highway leading from Martinez to Oakland. New structure provides ample width, improved alignment, and safety walks for pedestrians. A reconstruction job. (Bridge Department photo.)

in the city of Ross, Marin County. The arch ring is completed and the contractors are at present completing the sidewalk on the east side, which is cantilever from the spandrel wall. Forms are now being constructed for placing the sidewalk on the west side of the old structure. The sidewalk is being constructed to conform to the new curve laid out over the existing structure.

On the Los Angeles to San Diego route good progress is being made on the new reinforced concrete girder bridge across Santa Ana River, two miles north of Santa Ana.

HIGHWAY NEWS NOTES

Chairman and Mrs. Harvey M. Toy of San Francisco have announced the engagement of their daughter, Miss Elizabeth Toy, to Mr. Arthur Lewis Schwartz of Cleveland, Ohio.

E. C. Pohl and H. D. Mills, of the Nevada state highway department, visited Sacramento recently for the purpose of making a study of the accounting department of the California Highway Commission. They were particularly interested in the rental system of accounting in operation in the Equipment Department.

Division Engineer E. E. Wallace of Fresno reports the arrival of a daughter, Janet Marie, on November 16th.

EXCUSED.

Jimmie carried the following excuse to the teacher the next morning: "Please excuse Jimmie from being absent. He had a new baby brother. It was not his fault.—Emory Toreador.

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

Cont. No.	Di- vision	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Con- tract time, days
COMPLETED AND ACCEPTED SINCE OCT. 12, 1926.											
463	VII	Los Angeles.....	60	A	Arroyo Sequit to Las Flores Canyon.....	16.13	Grading.....	S. Wright Jewett.....	\$306,300 00	Feb. 13, 1925	
487	VII	Los Angeles.....	60	A	Latigo Creek to Las Flores Canyon.....	6.70	6.3 mi. P.C.C. Pave., 0.4 mi. Bit. Mac.	Ed. Johnson and Sons.....	241,904 25	Nov. 13, 1925	
499	III	Placer.....	3	A	Across Auburn Ravine at Lincoln.....		Concrete Girder Bridge.....	Holdener Const. Co.....	17,618 18	May 15, 1926	
500	II	Lassen.....	28	A	Between 4 miles W. of Bieber and Bieber.....	3.80	Grading and Seroened Gravel Surf.....	John F. Collins.....	74,608 02	May 27, 1926	
AWARDED SINCE OCTOBER 12, 1926.											
516	V	Santa Barbara.....	2	E	Across Gaviota Creek.....		Concrete Girder Bridge.....	Oberg Bros.....	\$23,411 25	Nov. 16, 1926	175
									Sub-total.....	\$23,411 25	
PENDING AWARD—None.											
									Total State Highway Fund Contracts Awarded and Pending Award.....	\$23,411 25	

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.	Di- vision	County	Route	Sec.	Location	Miles	Type	Contractor	Estimated cost	Date contract awarded	Con- tract time, days
COMPLETED AND ACCEPTED SINCE OCT. 12, 1926.											
M-110	VII	Los Angeles.....	4	B, C	Castaic School to Half Way Inn.....	22.00	Bituminous Macadam Surface.....	Fred Nighbert.....	\$196,136 61	Dec. 14, 1925	
M-117	IV	Contra Costa.....	14	A	Across San Pablo Creek at San Pablo.....		Concrete Girder Bridge.....	R. B. McKenzie.....	23,231 25	April 23, 1926	
M-131	II	McDouc.....	28	C	Between Alturas and Royce Ranch.....	10.84	Grading and Crushed Rock Surfacing.....	J. P. Holland, Inc.....	66,883 50	June 8, 1926	
M-137	IV	San Mateo.....	2	B	Through the town of Hillsborough.....	0.23	P.C.C. Pave. Wid. and Asph. Conc. Surf.	Municipal Imp. Co.....	8,430 41	Aug. 16, 1926	
AWARDED SINCE OCTOBER 12, 1926.											
DM-184	VI	Mariposa.....	18	C-D	Morman Bar Road to First Crossing Bear Creek.....	9.05	Surfacing existing roadway.....	Chester A. Failing.....	\$26,550 00	Nov. 16, 1926	220
M-152	VII	Orange.....	60	A	Across Santa Ana River.....		Clean and Paint Bridge.....	Natl. Sand Blast Corp.....	2,323 75	Oct. 22, 1926	75
M-153	IV	Marin-Sonoma.....	8	A	Petaluma Creek Basculc Bridge.....		2 Pile Fenders and 4 Pile Dolphins.....	Healy-Tibbitts Const. Co.....	11,857 50	Oct. 22, 1926	60
M-154	V	Santa Barbara.....	2	G	At the Ellwood Overhead Crossing.....	0.30	Grading and Rock Surfacing.....	E. Schelling.....	20,466 00	Oct. 29, 1926	100
M-155	VII	Los Angeles-Ventura.....	2	C-B	Between Calabasas and Camarillo.....		Widening and Repairing 4 Bridges.....	Henry Auerbach.....	23,989 78	Oct. 29, 1926	150
M-156	VII	San Diego.....	2	C	Across Las Flores Creek.....		Concrete Girder Bridge.....	Sidney Smith.....	28,372 50	Oct. 29, 1926	150
M-157	VII	Los Angeles.....	9	E	Across Eaton Canyon Wash.....		Concrete Girder Bridge.....	Sidney Smith.....	36,490 50	Oct. 29, 1926	100
									Sub-total.....	\$150,064 03	
PENDING AWARD—None.											
									Total State Highway Maintenance Fund Contracts Awarded and Pending Award.....	\$150,064 03	

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.

Station

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