

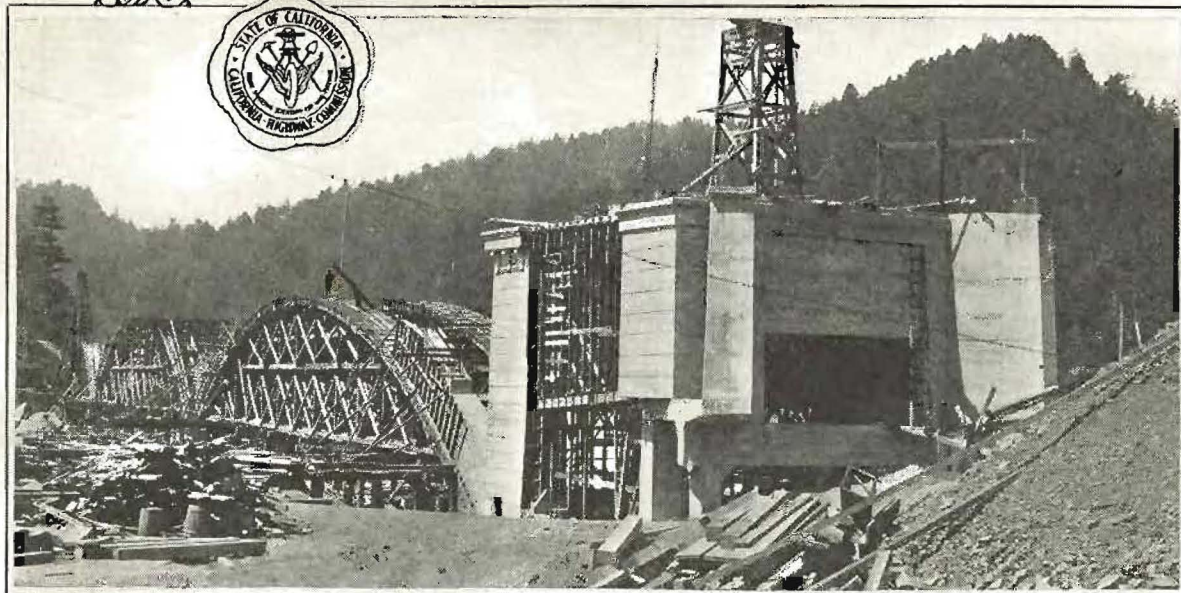
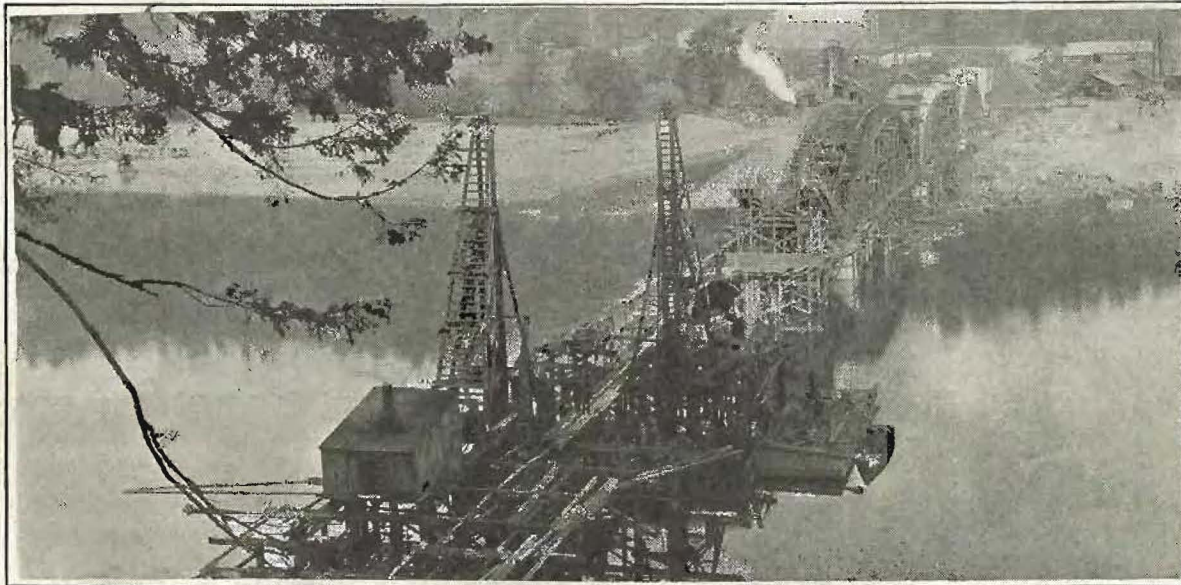
CALIFORNIA HIGHWAYS

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

Vol. 2

NOVEMBER, 1925

No. 11



FEDERAL AID HELPS BRIDGE MIGHTY RIVER—Views showing progress on the Douglas Memorial Bridge spanning the Klamath River, near Requa, Del Norte County, a federal aid project on the Redwood highway. Its completion will give great impetus to the development of the northwest section of the state. Since the above pictures were taken rapid progress has been made and pouring of concrete on all arch rings and keys has been completed. (Bridge Department Photos.)

WEST JOINS NATION IN DEMANDING CONTINUANCE OF FEDERAL AID

CALIFORNIA HIGHWAYS

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HARVEY M. TOY, Chairman;
N. T. EDWARDS and LOUIS EVERDING, Commissioners.

ROBERT M. MORTON, State Highway Engineer.

W. F. MIXON, Secretary.

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

Vol. 2. NOVEMBER, 1925. No. 11

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FEDERAL AID FAIR TO ALL STATES

IN A RECENT ATTACK on federal aid for highways Governor Ritchie of Maryland contended that those states paying heavy income taxes receive back a smaller percentage in federal aid than do states whose income taxes are smaller. That is quite true, but it is based upon a sound American principle that has made a strong union of the states possible, that has been the foundation of our wonderful system of public schools and has, in fact, contributed to the general development and progress of the entire country.

Ever since the union of the thirteen original colonies the strong states have been aiding the weak and the strong counties have been helping those not so fortunate. The strong states have profited by this principle because the building up of the weaker states has made the big states stronger. It may be true that the weaker states appear to get more than their share in the distribution of federal aid for highways, but all states will benefit by the building up of a great national highway system, and those benefits will accrue more quickly through federal aid than if they await the individual resources of the separate states. Governor Ritchie's contention is no argument against federal aid; rather to any thinking person it is the best excuse and reason for it.—*Southwest Builder and Contractor*, Los Angeles.

CALIFORNIA FOR FEDERAL AID.

A COMMENDATORY WORD

(From the Redlands Facts.)

THE *Facts* believes that the State Highway Commission is functioning to the very large usefulness of the people of California. Certainly that is true in this part of the state, and we have heard similar expressions of opinion from other sections. Perhaps the system in effect has improved—perhaps any of several things—but certainly we are getting a fine amount of excellent road building and improvement. It is always a pleasure to speak a commendatory word and that word is a strong one in this instance.

Already Done.

The blushing bride-elect was rehearsing the ceremony that was about to take place.

"I shall expect you to give me away, dad," she said to her fond parent.

The latter looked up nervously from his paper. "I'm afraid," he murmured, "I've done it already. I told Herbert this morning that you had a disposition like your mother's!"

West Joins Nation in Demanding Continuance of Federal Aid

A UNITED WEST has joined other states of the Union in demanding of congress a continuance of the federal aid policy. Born of a common desire for uniform action, the Western Road Association, representing those who speak for better highways in the western states, came into being in San Francisco during the week of November 9th. Gathered together at the All-Western Road Show were representatives of the mountain and coast states, both public officials and those engaged in private enterprise. The subject of federal aid and future highway construction was everywhere discussed and a decision to organize an association to represent the eleven western states was given unanimous approval.

Carl E. McStay, of the Automobile Club of Southern California, was chosen president; Harvey M. Toy, chairman of the California Highway Commission, was elected a vice president; and P. H. Curtis, of Los Angeles, secretary-treasurer. Representatives of the eleven states participating in the body will make up the board of directors.

At a meeting of the executive committee, it was decided that Mr. Toy should attend the Detroit convention of the American Association of State Highway Officials as spokesman for the new organization. He was given full authority to present the association's views, which were unanimously adopted, as follows:

1. Continuance of the federal aid program for a period of ten years with appropriations by congress of \$100,000,000 annually;
2. Continuance of the forest highway program for a period of ten years with appropriations by congress of \$10,000,000 annually;
3. No change in the present method of disbursing

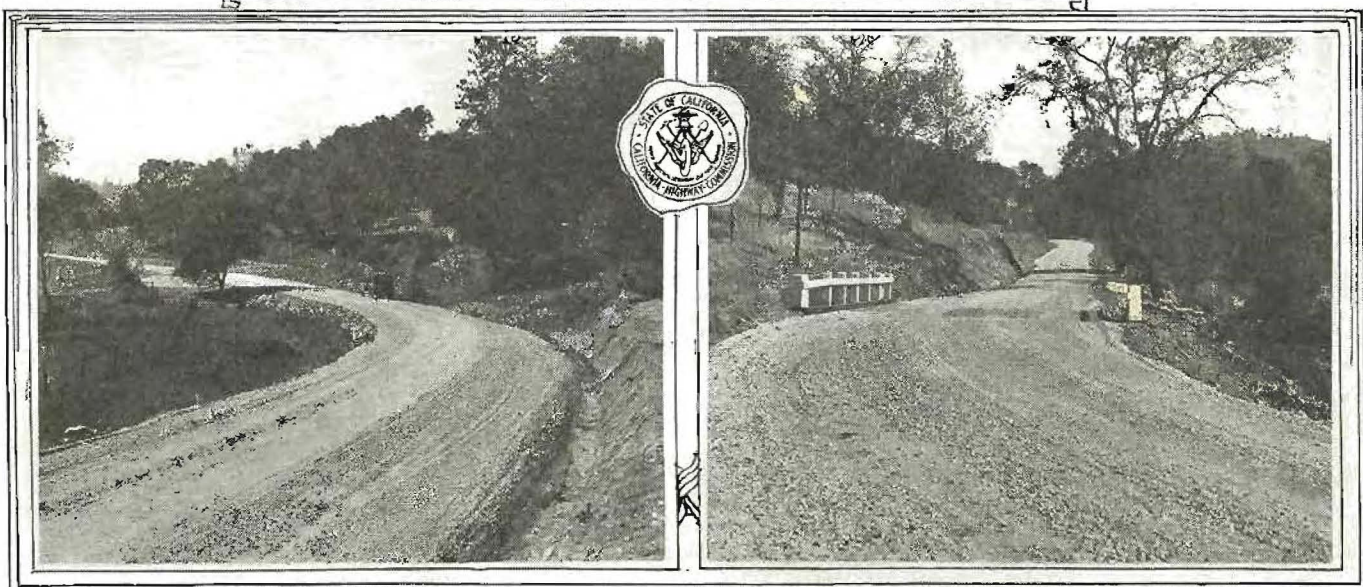
federal aid, particularly with reference to the graduated scale.

Mr. Toy left for the East with a united West behind him. In this section of the country there is no divided opinion upon the subject of federal aid. The South, likewise, is giving it whole-hearted support as the most powerful influence for progress and good will since the days of reconstruction. From New England comes assurance of strong support, and, in the Middle West, representatives of such states as Indiana, Michigan, and Minnesota are emphatic in their demand that the cooperative plan for the construction of a great system of national highways shall not be disrupted by failure of continued federal support.

IN EFFECTING an organization having for its object the promotion of federal aid, the West is not sectional. It is the declared purpose of those who gathered in San Francisco to bring the merits of federal aid to the attention of the people of all the states. The West wants its highways built, and is straining every resource to that end, but it is just as anxious for completion of the transcontinental highways that will link the Atlantic with the Pacific. Highways through the coast and adjoining states, where more is being spent per capita for roads than in any other section of the country, will not reach their highest point of usefulness until connected up with the interstate systems of the Mississippi Valley and the eastern seaboard.

It is the old story of the railroad over again. The Central Pacific was of little value to the people of California and

(Continued on page 10.)



ALPINE HIGHWAY ABOVE JACKSON—No wonder the people of Jackson are pleased with the new section of the Alpine highway, east of that city, toward which they contributed \$10,000. The views were taken by Division X following the recent acceptance of the contract. The road has an eighteen-foot width of grade, in addition to drainage ditches, and a crushed rock surface. The alignment of the old road has been greatly improved.

WIDENING AND THICKENING OF STATE HIGHWAYS

By R. M. MORRIS, State Highway Engineer.

RECONSTRUCTION of already improved highways, since the enactment of special revenue measures in 1923, has, in California, assumed a position of high importance in the work of the State Highway Department. By legislative action at the 1923 session, the revenue available for maintenance and widening was doubled when the gasoline tax of two cents per gallon and the nominal registration fee were substituted for the former horse-power tax.

The Highway Department this year will receive as its share from these sources (one-half the net collections) considerably over \$9,000,000. The law requires that this fund be expended for maintenance, repairs, widening and reconstruction of state highways. About 60 per cent is available for major widening and reconstruction. The remainder is necessary for general maintenance. (Maintenance funds will have to be increased somewhat next year when all traversable routes will come under state jurisdiction.)

Several Plans Followed.

The Highway Department follows several plans in the widening and reconstruction of pavements. The type to be used on a specific project is chosen after a study of the physical features. Availability of materials, condition and width of pavement, alignment, grades and soil conditions enter into the choice of type. The present and probable future traffic are considered in planning the width.



NEW SHOULDERS IN YOLO COUNTY—View of new six-foot flush cement concrete shoulders recently placed on the state highway between Davis and the Woodland Wye, Yolo County. This section now has a twenty-seven-foot width of pavement and, in addition, a two-foot rock shoulder at either edge, making a thirty-one-foot roadway. The county cooperated with the state in financing the improvement. (Photo by Div. X.)

Most of the original pavements built by the state are of Portland cement concrete, 15 feet in width and from 4 to 5 inches in thickness. Many miles of county-built pavements of varying types and widths, generally of light construction, have been incorporated into the state's system.

Widening work includes concrete shoulders built flush with the existing pavement; raised concrete shoulders and asphalt concrete surfacing; asphalt concrete shoulders and surfacing for the full width and second story concrete shoulders and resurfacing. In locations of light traffic and where suitable materials are available, oiled macadam shoulders are sometimes built.

Future Program is Large.

About 600 miles of state highway pavements have been already widened, of a total of about 2400 miles. At least 1500 miles more will require widening as fast as funds are available.

The original width of pavement constructed from five to fifteen years ago was 15 feet. This width becomes overstressed with a traffic in excess of 1000 vehicles per day. Corner breaks and settlement of the edges occur, and it is impossible to keep shoulders flush with the pavement. Our traffic counts indicate that a 20-foot pavement readily handles a traffic up to 6000 vehicles per day, and is not overstressed until 10,000 vehicles per day is reached. When the traffic exceeds that amount, additional widening or a second road is considered necessary. Often, however, this heavier traffic occurs in suburban districts where the building of a full width street, with curbs and gutters, is required, and a large portion of the cost is defrayed by the adjacent property owners. The width generally adopted for the average pavement reconstruction is 20 feet.

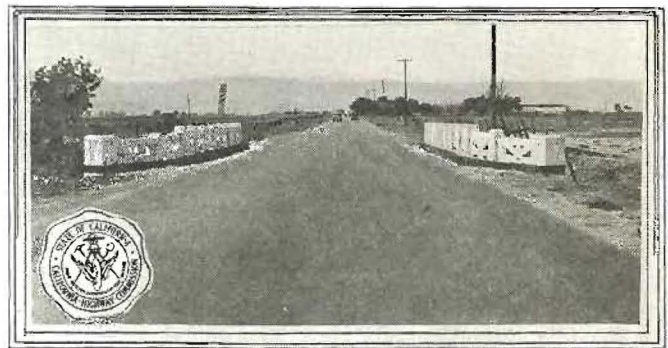
Where the existing pavement is in good condition, cement concrete shoulders 2½ feet wide and 7 inches in thickness are placed at either side of the existing 15-foot slab. In preparing subbase for this type of widening, the soil is excavated for several inches beneath the edge of the existing pavement to form a joint and give added strength to the edge of the old pavement. Most work of this nature contemplates future surfacing over the entire width of the pavement.

It is usually required that only one side of the highway be worked on at a time in order that there may be no interruption to traffic. During 1924 California completed about 26 miles of this type of widening at an average cost of \$10,493 per mile. This also included the widening of grade from 21 feet or 24 feet to 30 feet and the extension of culverts.

Combination Proves Successful.

A type of widening and thickening which has proven successful is a combination of concrete shoulders and asphalt concrete wearing surface. The shoulder is laid 7 or 8 inches thick at either side of the existing concrete slab and raised about 3 inches above it. An asphalt surface not less than 2 inches in thickness is placed over the old pavement and extends into an offset built into the new concrete shoulder, thus making a perfect seal and water-tight joint.

This type of surfacing and widening is placed where the existing concrete base is still in fairly good condition but where it may be predicted that the end of its economic life is fast approaching.



WIDENED AND THICKENED PAVEMENT—Pavement in Solano County rebuilt with asphalt concrete for both shoulders and surfacing. The base is the old fifteen-foot concrete pavement. The new width is twenty feet.

WE MUST BE ON THE ALERT

THOSE who want federal aid for highway construction continued must be alert for the agitation in the eastern states for its discontinuance is becoming more insistent. There are some eastern states in which the people do not believe they are getting as much out of federal aid as they should and unless the propaganda now being spread about is combatted they will gain the support of legislators who think they see in it a possible political issue.

Discontinuance at this time of federal aid when a system of national highways is just being developed would be most unfortunate. Without assistance of some sort the western states will be many years in building their portion of this national highway system because of their sparse population and expansive domain which requires a great mileage, much of it of very difficult construction. Concerted action by civic associations throughout the eleven western states for continuance of federal aid should be invoked at once—*Southwest Builder and Contractor*.

widened to 40 feet by means of 8-foot concrete shoulders on both sides, 8 inches in thickness with 10-inch edges. The old asphalt center was dressed up with a new asphalt concrete wearing surface. On this width of highway separated into traffic lanes by the appearance of the materials, the slow moving commercial traffic tends to concentrate on the shoulders at the side, leaving the center free for faster traffic.

The most costly completed section of state highway reconstruction was completed in 1924 near Los Angeles, with the cooperation of the county and an improvement district. The old 20-foot oiled macadam roadway was replaced with a street 56 feet wide between curbs. A subbase of decomposed granite was first placed, then a 7-inch Portland cement concrete base finished with a 2-inch asphalt concrete surfacing. This improvement cost approximately \$150,000 per mile.

It is time the big business men of this and every other community devote some of their time to planning for traffic conditions of the future and help lay out some traffic rules and regulations which will be national in scope and uniform in enforcement.—*San Francisco Examiner*.

About 180 miles of concrete highways have been widened and thickened by this method at an average cost of \$22,400 per mile.

A variation of this type is the construction of asphalt shoulders instead of concrete shoulders. Under this method a base 2½ feet wide and 4 to 5 inches in thickness of asphalt concrete is placed at the side. This is followed with a leveling course of asphalt, and a wearing surface completes the job. The cost of this type of work on a typical project, which includes rather heavy grading quantities and the lengthening of many drainage structures, was approximately \$30,000 per mile. For the paving alone, the cost is usually little less than the cost of an installation of concrete shoulders and asphalt center.

This plan has been successfully used on widening oiled macadam highways. The first step usually consists in placing a macadam foundation at the side of the existing oiled macadam highway and permitting it to remain open to traffic over a season. This is followed by the placing of a leveling course over the old pavement and the new shoulders, which is followed with a wearing surface of the same material. One typical project of this nature in 1924 cost about \$24,000 per mile for an 8½-mile section.

Oiled macadam roads have been widened, thickened and leveled with asphalt concrete in varying widths. The thickness of the new surfacing usually varies from 1½ inches to 3 inches. The aim of such work is to improve riding qualities of the surface and utilize the old base as a foundation. Such work will average \$10,000 per mile in cost.

"Second Story" Concrete.

The most costly type of reconstruction is the second story concrete. This consists of a slab of concrete usually 20 feet in width placed on and overlapping the edges of the original 15-foot pave-



SECOND STORY CONCRETE.—A rebuilt pavement in Ventura County. The new twenty-foot slab was placed over the old fifteen-foot pavement. This was necessary to sustain heavy traffic. (Photo Div. VII.)

ment. For this work the standard thickness is a minimum of 5 inches in the center, increasing to 7 inches at the edge of the old slab and 9 inches at the outside edge. Special attention is paid to the subbase under the overlapping edge of the new pavement, and the extensions beyond the edge of the old pavement are reinforced with steel. Transverse and longitudinal joints are placed.

This type of resurfacing is usually chosen where the old pavement is broken and in poor condition, having reached the end of its economic life. About 78 miles of this type of reconstruction have already been installed at an average cost of about \$31,720 per mile, including widening the grade and lengthening drainage structures.

Heavy Pavements Needed for Traffic.

California has widened state highways to widths of twenty, twenty-four, twenty-seven, thirty, forty and fifty-six feet. On one particular job a 24-foot asphalt surface on a concrete base was

Five



SECOND STORY WORK IN SONOMA.—Placing of new pavement on the Redwood highway, a reconstruction project. Tests show it to be some of the strongest concrete ever placed on the state system. (Photo Div. IV.)

Laboratory Develops Quick Hardening Concrete

By C. L. McKesson, Materials and Research Engineer.

STATE Highway Engineer R. M. Morton directed the research department, some months ago, to endeavor to develop a quick hardening concrete for emergency use on state highways. A product was desired which would be reasonable in price and which could be safely opened to traffic in a comparatively short time after placing. The results of experimental work at the laboratory indicate such a concrete can be had at a slight increase in cost over standard mixtures. Concretes were developed which, under favorable conditions, will withstand traffic in twenty-four to forty-eight hours.

In any test series a considerable number of individual test specimens are desirable, if averages are to be accepted as reliable. It was, therefore, necessary to confine this test series for quick hardening concrete to two brands of Portland cement and one brand of high alumina cement. The Portland cements selected were Santa Cruz, a standard commercial cement produced in northern California, and Victor Oil Well cement, a southern California product. These two cements were chosen because they gave highest seven-day compressive strengths in 1-3 mortar with Standard Ottawa sand.

The early and ultimate strengths of various brands of cement vary from time to time. The selection for this series of tests was made about one year ago on the showing of seven-day strengths at that time, and should not now be followed without further tests to determine present relative strengths.

Tests That Should be Made.

For use in quick hardening, the available brands should be tested at seven days, preferably in 1-2 mortar with and without calcium chloride as an admixture. The brand which shows the highest early strength should be chosen for use in quick hardening concrete. This practice of selecting a cement because of high seven-day strength would not be desirable in ordinary work, because high early strength does not necessarily indicate high ultimate strength. In this work, early strength is the primary consideration. All of the quick hardening mixes will be richer than usual and will have sufficient ultimate strength.

The suggested tests also will show whether calcium chloride should be added. Some of our cements show little, if any, beneficial effects from the use of this chemical; others show appreciably higher early strengths. Lumnite cement was included in the series as a representative of the new type of high alumina cement now being introduced on the market.

Portland Cement Concrete.

Mixtures were made up with each brand using six, seven, and eight sacks per cubic yard of concrete. The specimens were 6 x 6 x 12-inch prisms. Natomas gravel and Livermore sand were used in all tests.

In the preparation of these specimens, no refinement was practiced not obtainable in the field. The usual A. S. T. M. method of laboratory preparation of concrete consists of grading material separately for each specimen and of mixing each specimen in a separate batch. This was abandoned in this series because such methods could not be followed in the field. Concrete was mixed with a shovel on a platform in batches of six specimens each. The only refinement was in grading aggregate in two sizes, 40 per cent passing 2" and retained on 1" and 60 per cent passing 1" and retained on ¾". This could be done in the field and would undoubtedly result in greater uniformity in concrete. Water was accurately measured, but concrete was sufficiently wet for field use, slump 1¼- to 1½-inch.

The results of these tests are shown in Table I and graphically in Figure I.

QUICK HARDENING CONCRETE—TABLE I.

Table Showing Individual Breaks Specimens 6" x 6" x 12".

Mixture	Batch No.	24-hour strength	48-hour strength	3-day strength	7-day strength	28-day strength
1. 6 sack Victor Oil Well without Cal. Chloride (1-1¼-3½ mix)	1	800	1580	-----	3091	4362
	2	-----	1720	-----	3286	5105
	3	795	1600	-----	3100	4475
	3	-----	1720	-----	2930	4516
Average.....	-----	797	1672	2350	3157	4616
2. 6 sack Santa Cruz without Cal. Chloride (1-1¼-3½ mix).	19	1061	1978	-----	2855	4124
	20	-----	1827	-----	3072	4428
	21	-----	1869	2186	2913	4530
	21	841	1416	-----	2903	4358
21	-----	1522	-----	2416	4250	
Average.....	-----	951	1722	-----	2832	4328
3. 6 sack Victor Oil Well with 2 per cent Cal. Chloride (1-1¼-3½ mix)	7	1270	1840	-----	2841	4167
	8	-----	1950	-----	3061	4167
	8	-----	1860	2328	3011	3841
	9	1440	2200	-----	3105	4075
9	-----	2140	-----	3086	4300	
Average.....	-----	1355	1998	-----	3021	4110
4. 6 sack Santa Cruz with 2 per cent Cal. Chloride (1-1¼-3½ mix).	4	1635	2240	-----	3569	4105
	5	-----	1940	-----	3616	-----
	5	-----	2370	2440	3286	4302
	6	1585	1960	-----	3225	4180
6	-----	2090	-----	3292	4155	
Average.....	-----	1610	2118	-----	3398	4185
5. 7 sack Victor Oil Well, with 2 per cent Cal. Chloride (1-1½-3 mix).	13	2190	3000	-----	4025	4700
	14	-----	2855	-----	3822	5236
	14	1870	2511	-----	3586	4405
	15	-----	3006	-----	3908	4742
15	-----	2878	3160	4333	4783	
Average.....	-----	2030	2810	-----	3913	4774
6. 7 sack Santa Cruz with 2 per cent Cal. Chloride (1-1½-3 mix).	10	2030	3030	-----	3961	5000
	11	-----	2880	-----	4016	4861
	11	-----	2750	3122	3900	4833
	12	2010	2730	-----	4097	4397
12	-----	2910	-----	3722	4617	
Average.....	-----	2020	2860	-----	3939	4751
7. 8 sack Santa Cruz cement with 2 per cent Cal. Chloride (1-1-3 mix).	16	2470	2847	-----	3894	4519
	17	-----	3017	-----	3844	4656
	17	2630	2878	-----	4344	-----
	18	-----	2742	-----	3833	4725
18	-----	2997	3360	3917	5086	
Average.....	-----	2500	2896	-----	3966	4740
8. 7 sack Santa Cruz without Cal. Chloride (1-1½-3 mix).	22	1219	1800	-----	2941	4530
	23	-----	2094	-----	3219	5122
	23	-----	2150	2847	3475	5120
	24	1078	1819	-----	3267	4472
24	-----	2000	-----	2947	5222	
Average.....	-----	1148	1973	-----	3169	4893

It will be noted calcium chloride materially increased the early strength of the concrete and that there is no difficulty involved in its use. It should be added to mixing water in the proportion of 2 pounds of flake calcium chloride to each sack of cement, or, if liquid calcium chloride is used, it should be on the basis of 1½ pounds of anhydrous calcium chloride per sack of cement. Professor Abrams, in Bulletin No. 13, shows that there is no retrogression in concrete due to this small amount of calcium chloride.

In this test series it was found that 2000 pounds compressive strength could be obtained in twenty-four hours using a seven-sack (1-1½-3) mix. Much concrete pavement has been opened

to traffic in twenty-one days with a lower strength. After forty-eight hours, the strength of this mixture was 2800 pounds.

Eight sacks per cubic yard (1-1-3) with calcium chloride, gave a somewhat higher strength in twenty-four hours, but the advantage was almost lost at forty-eight hours.

It is believed that the seven-sack mixes used in this test may be opened for use in forty-eight hours provided following conditions are carefully observed:

1. Use good coarse concrete sand.
2. Use well graded gravel or crushed stone.
3. Use a reputable brand of cement which shows high seven-day strength.
4. Use about six gallons of water per sack of cement.
5. Weigh or measure water for each batch and add one pound fourteen ounces (avoirdupois) calcium chloride crystals per sack of cement.
6. Mix thoroughly, place on wet subgrade and keep wet and protected for forty-eight hours.
7. Earth, curing paper covering or calcium chloride surface application would insure some further curing even after pavement had been opened to traffic.

High Alumina Cement Concrete.

The specimens for this test consisted of twenty-five specimens 6" x 6" x 12". The cement was obtained from the Atlas Lumnite Cement Company of New York. Livermore sand and Natomas gravel were used as in preceding tests. Grading and methods of manipulation were as described for Portland cement concrete.

Specimens marked B-25, B-26, and B-27 were from batches 25, 26, and 27, respectively. Each batch contained concrete for six specimens, was mixed by hand, and proportioned as follows:

- 7,000 grams water
- 15,096 grams Lumnite cement
- 29,808 grams fine aggregate
- 62,595 grams coarse aggregate
- Slump 1½ inches

The mix was approximately 1-1.75-3.5 (loose measure) and yield was on basis of six sacks of cement per cubic yard of concrete in place.

Specimens marked B-28 were from a nine-specimen batch, with following proportions:

- 11,000 grams water
- 27,072 grams Lumnite cement
- 44,712 grams fine aggregate
- 93,892 grams coarse aggregate
- Slump 1½ inches

This mix was approximately 1-1½-3 (loose measure) and yield was on basis of seven sacks per cubic yard.

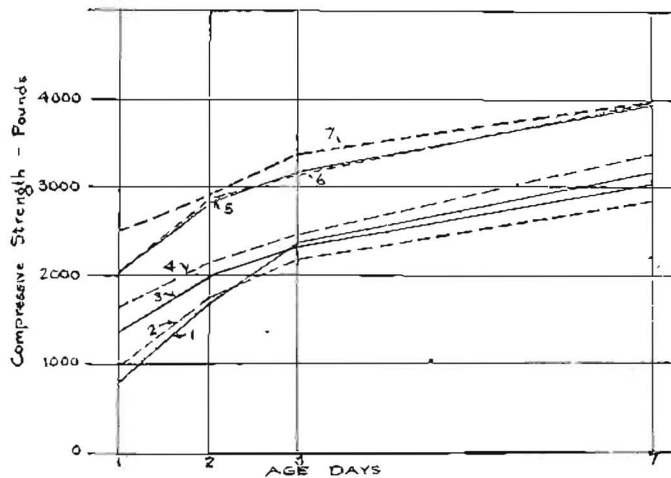
The strengths obtained are shown in the following tabulation:

COMPRESSIVE STRENGTH OF CONCRETE MADE WITH LUMNITE CEMENT

Batch No.	6 sack cubic yard						7 sack cubic yard		
	1 day	2 day	4 day	7 day	28 day	90 day	1 day	2 day	28 day
25.....		6050	6330	5020	5960				
26.....	5360	6040	5600	5240	5770	5340			
27.....		5780	5840		5220	6090	5320		
28.....						5330	5060	5790	5680
								6410	6790
								5950	5350
								5970	
								6030	
Average....	5360	5862	5285	5336	5796	5325	5060	6030	5940

The total number of specimens was too small to give specimens for average values at all ages. At the time the tests were made, this cement was not on sale on this coast and the material for these tests was obtained by express, hence a limited quantity was available. More recent tests, however, indicate that these tests are

FIGURE 1.



TESTS OF QUICK HARDENING CONCRETE—For Highway Maintenance or Construction.

Reference numerals on curves indicate mixtures as follows:

- No. 1. Victor cement—1-1¾-3½ mix (6 sack); no admixture.
2. Santa Cruz cement—1-1¾-3½ mix (6 sack); no admixture.
3. Victor cement—1-1¾-3½ mix (6 sack); 2% CaCl₂.
4. Santa Cruz cement—1-1¾-3½ mix (6 sack); 2% CaCl₂.
5. Victor cement—1-1½-3 mix (7 sack); 2% CaCl₂.
6. Santa Cruz cement—1-1½-3 mix (7 sack); 2% CaCl₂.
7. Santa Cruz cement—1-1-3 mix (8 sack); 2% CaCl₂.

typical of results to be expected of this unusual cement and the following may be stated as tentative conclusions:

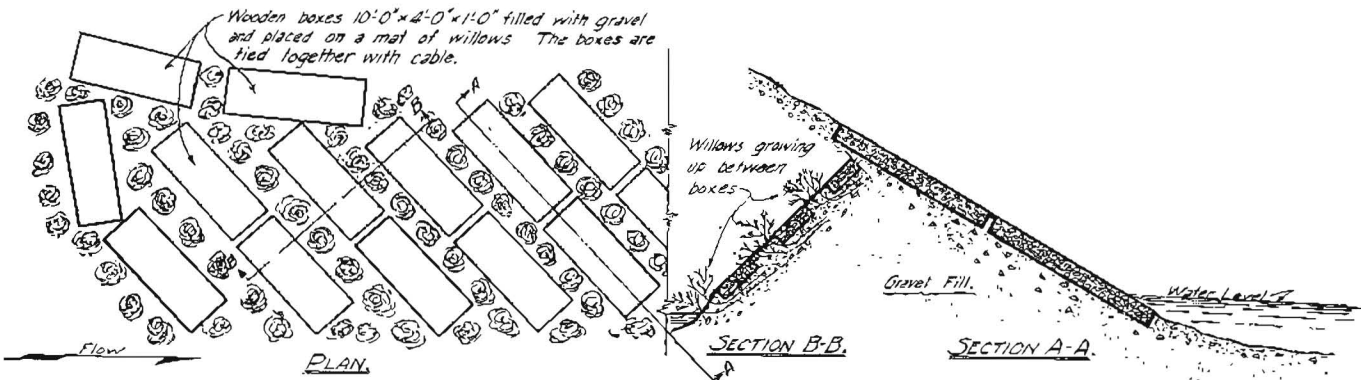
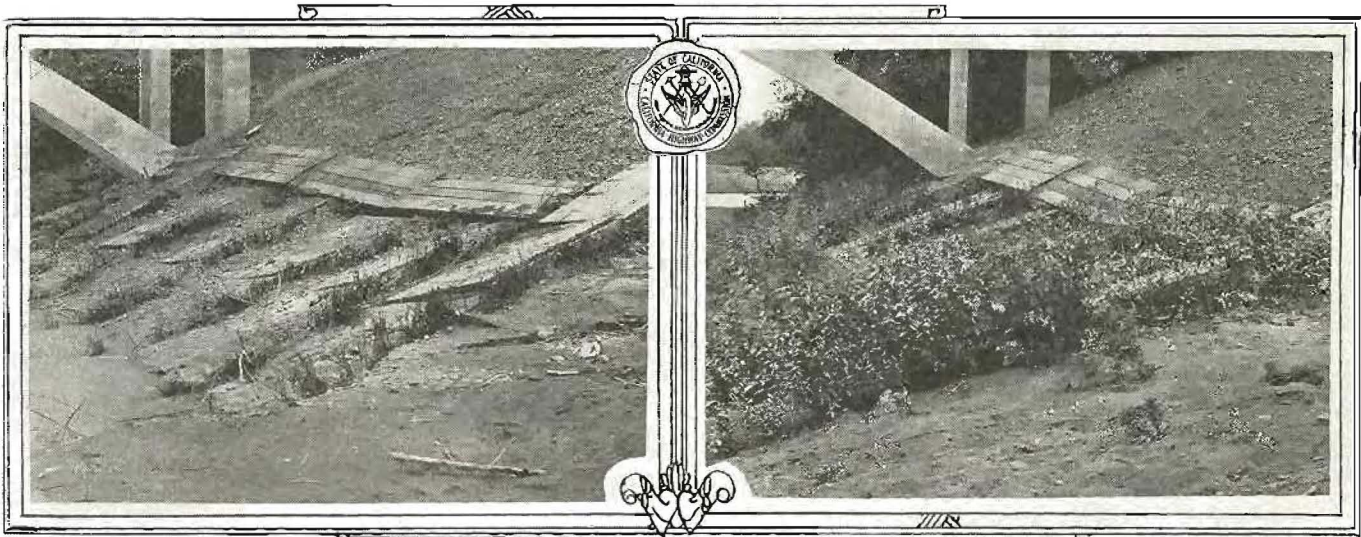
1. Strengths of 5000 pounds per square inch may be obtained in twenty-four hours without curing, using the normal amount of cement (6 sacks per cubic yard).
2. There is apparently little to be gained by using a richer mix.
3. The tests indicate no increase of strength is to be expected in twenty-eight days. (The tests apparently show a slight retrogression.)
4. The series previously reported with tests included herein, make the following strength-cost comparisons possible.

Brand	Sacks cu. yd.	Compressive strength			Cost cement (and CaCl ₂) per sq. conc.	Cost cement per sq. yd. 6" pave.
		24 hour	48 hour	28 day		
Lumnite.....	6	5360	5960	5790	12.75	2.12
Santa Cruz.....	*7	2020	2860	4751	5.15	.86
Victor Oil Well.....	*7	2030	2810	4774	8.54	1.42
Santa Cruz.....	*8	2500	2895	4746	5.86	.98
Santa Cruz.....	**6	951	1722	4338	4.17	.70

*With 2 per cent CaCl₂ admixture.
 **Ordinary specification Paving Mix without CaCl₂.
 Assumed prices Cement Lumnite..... \$8.50 hbl. Net F.O.B. Sacramento.
 Assumed prices Santa Cruz cement..... 2.78 hbl. Net F.O.B. Sacramento.
 Assumed prices Victor Oil Well cement..... 4.72 hbl. Net F.O.B. Los Angeles.
 Assumed prices CaCl₂..... 40.00 ton. Net F.O.B. Sacramento.

This comparison suggests the use of Lumnite cement only where a very high early strength is imperative. Seven sack Santa Cruz with CaCl₂ gives 2000-pound concrete in twenty-four hours, 2800-pound in two days, and a very high twenty-eight-day strength at a cost of only 16 cents per square yard more than ordinary concrete, and for \$1.24 less per square yard than with Lumnite cement. Such concrete might be opened to traffic in two or three days and with the low additional cost of 16 cents per square yard for six-inch

BRIDGE DEPARTMENT USES NEW TYPE OF BANK PROTECTION



BANK PROTECTION WORK, VAN DUZEN RIVER—Left, showing placing of boxes to protect newly planted willows. The boxes are cabled to the abutment of the bridge and catch silt, protecting the young trees. Right, the willows after five months of growth. Below is a sketch showing details of the method of constructing and placing this type of bank protection which is being used in Humboldt County. (Photos by Bridge Department.)

By L. D. PACKARD, Bridge Department.

A NEW PLAN for protecting banks, a departure from the usual type of willow protection work, is being tried by the Bridge Department at the approach fill at the south abutment of the Van Duzen River bridge, on the Redwood highway in Humboldt County.

Timber boxes 1' x 4' x 10', constructed from 2" material, were placed on top of a mat of willows, as shown in the accompanying sketch and photographs. The boxes are designed to prevent the willows from being washed away before they have grown to sufficient size to withstand destructive action of flood waters.

The boxes were set at a 45° angle to the flow of the stream and at an angle of 15° or 20° to the stream surface. When placed in this manner, they cause silt to be deposited on the young trees, materially aiding their growth. To prevent the boxes from being washed away, they were filled with coarse gravel, fastened together with cables, and anchored to the bridge abutment.

The willows, when planted, were placed with the small ends pointing up stream. Cuttings of not to exceed one inch in diameter were used.

As necessary materials were readily available, the plan proved economical. The total cost was \$247 for twenty-five boxes, or \$9.88 per box installed. The protection was placed during March of this year. Despite two rises of the river since that time, the willows, on September 1st, showed a growth of about two feet in height. By the time the next highway water occurs, they should be well rooted.

It was at the suggestion of Commissioner Louis Everding that this type of protection was used. He has been familiar with its effectiveness along Mad River, Humboldt County, where the plan has been followed for six years by the Northern California Redwood Company. The results so far, the bridge department believes, justify the recommendation of the commissioner.

QUICK HARDENING CONCRETE

(Continued from page 7.)

pavement (or 19 cents for 7-inch pavement) might be economical for use on paving projects and in structures, as well as in patching.

Lumnite cement is now carried in stock on this coast and the very high strength developed in the first twenty-four hours will

doubtless render it of great value where high strength concrete is required and immediate use is of prime importance.

When the headlights are out and the driver "lit up," the undertaker smiles.—St. Paul Herald.

CALIFORNIA FOR FEDERAL AID.

FIELD TESTS FOR DETERMINATION OF ADVERSE SOILS

By C. S. PORG, Construction Engineer.

FROM TIME TO TIME it is desirable for resident engineers to be able to determine whether or not soils which are available for paving foundations are suitable for the purpose. The following rather simple tests have been in use for some time and are considered reliable for the determination of adverse soils.

The lineal shrinkage test, which was first used many years ago on work in Los Angeles, still holds a valuable place in determining the qualities of soil which may render them unfit for foundations, while the method of determining moisture equivalent, as developed by Mr. Rose of the Bureau of Public Roads and first used extensively on road work by Mr. McKesson, replaces the more cumbersome laboratory methods heretofore in use.

A description of the two tests follows:

MOISTURE EQUIVALENT.

Except in cases of doubt, it is not always necessary to submit soil samples to the laboratory. A common method of testing the acceptability of a soil is to determine the so-called moisture equivalent percentage or, in other words, its propensity for holding water. The following field method will be sufficiently accurate to indicate the quality of subgrade materials in this respect, or for supplying the data for division engineers' preliminary reports.

Procedure.—Thoroughly air-dry and pulverize a 500-gram (or if more convenient a 20-ounce) sample of soil to be tested. Remove all pebbles larger than $\frac{1}{8}$ of an inch, then slowly and uniformly wet the sample to the point of saturation, that is, until the addition of any more water would cause the same to remain unabsorbed on the surface of the mass. It is imperative that this point be carefully determined as much will depend on the investigator's judgment.

The final consistency of the mixture should be about equal to that of putty and such that it can be easily kneaded and compacted with a spoon or spatula. Next carefully weigh the sample. *The moisture equivalent percentage is the difference between the wet and dry weights of the sample computed as a percentage of the dry weight.*

In general, when the moisture equivalent percentage is less than 20 per cent, the soil is satisfactory for subgrade. When between 20 and 30 per cent, the soil is only fair for subgrade and when it exceeds 30 per cent, the soil will make poor subgrade and some form of treatment probably will be necessary. When the resident engineer obtains results of 20 per cent or over, he should report to the division engineer for advice.

EQUIPMENT NECESSARY.

1 agate basin; 1 100 c. c. burette; 1 pair suitable scales; and 1 spoon or spatula for mixing.

LINEAL SHRINKAGE.

Soils which shrink or swell under varying water content, thereby causing displacement of the subgrade, are a detriment to the life of a road surface. Resident engineers are cautioned to be ever on the alert for the appearance of such soils. Their presence in the work very probably would nullify much of the extreme care taken later with the road surface and cause its early disintegration.

The following field method of determining the percentage of lineal shrinkage of soils will be sufficiently accurate to indicate the quality of materials in the subgrade:

Procedure.—Slowly and uniformly wet a sample of soil weighing about twelve ounces to the point of extreme saturation, as in the previous test. The final consistency of the mixture should be

such that it can be easily kneaded and compacted. Pack as much of the sample as is needed with a wooden tamper in $\frac{1}{2}$ -inch layers in a galvanized iron or oiled wood mould, approximately 1" x 1" in cross section and either exactly 10 inches or else 12 $\frac{1}{2}$ inches in length. The mould may vary from 1" x 1" to other satisfactory dimensions, but a length of either 10 or 12 $\frac{1}{2}$ inches is recommended since a 10-inch length will give 1 per cent on a 1/10 scale and a 12 $\frac{1}{2}$ -inch will give 1 per cent for each $\frac{1}{8}$ -inch on a foot rule. Push the sample free of the mould on to any flat smooth surface. After drying the specimen thoroughly, carefully measure the length.

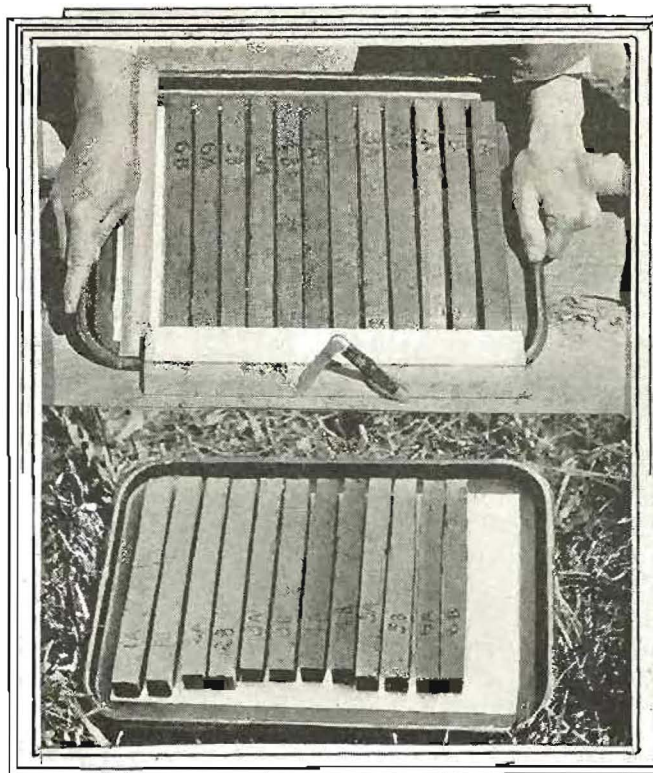
The drying should be done on a bed of dry sawdust or similar material to prevent warp. The specimen should also be turned over from time to time to secure uniform drying on all sides. *The lineal shrinkage percentage is the difference between the wet and dry lengths of the specimen computed as a percentage of the wet length.*

Usually, it is desirable to cast two or three test bars from each sample of soil for check purposes.

When the lineal shrinkage percentage is greater than 5 per cent (which corresponds approximately to a moisture equivalent of 30), special precautions should be taken to insure the road surface against failure due to movement of the subgrade. When such results are obtained, the resident engineer should report immediately to the division engineer for advice.

EQUIPMENT NECESSARY.

One galvanized iron or oiled wood 1" x 1" x 12 $\frac{1}{2}$ " mould (open two sides); and one carpenter's foot rule.



Examples of Soil Tests.

ELIMINATING CURVES ON THE RIDGE ROUTE

THE RIDGE ROUTE proper, between Los Angeles and Bakersfield, follows a new location where there was no previously existing highway. Its original location, which has numerous blind and sharp curves, was deemed adequate for traffic at the time the road was planned and built, but here, as elsewhere, tremendous increases in traffic are demanding wider and straighter roads.

The California Highway Commission for the last two years has allotted a considerable sum from the gasoline tax funds for widening and straightening work on the Ridge route. State forces began work at the Castaic school in May, 1924, and at the present time the widening work has been extended northward a mile beyond Big Swede cut, a distance of 17.5 miles.

Sight distance at "blind" curves is being improved and hazardous points removed, the excavated material being used to widen shoulders and fills. While the work is intended primarily to remove dangerous points, the alignment is being improved as the work progresses. A striking example is the Callahan line change, where one curve of 1500 feet has been substituted for seven short and sharp curves of varying degrees of radius.

The work has progressed to a point where paving of line changes is possible. Bids for the paving work will be opened in Sacramento on November 30th.

Cost is Low.

About 135,000 cubic yards have been moved to date at a cost of \$0.47 per yard. This cost is considered low, taking into account the scattered character of the work and the further fact that traffic must be handled in safety and without delay. The circumstances make state forces peculiarly adapted for the work.

Superintendent M. L. Sullivan is in charge of a twenty-man crew which is operating a three-quarter-yard P. and H. power shovel and a small fleet of dump trucks.

WEST JOINS NATION IN DEMANDING CONTINUANCE OF FEDERAL AID

(Continued from page 3.)

Nevada until its rails joined those of the Union Pacific at Promontory Point, bringing about a connection with the developing railway systems of the East.

The West sincerely believes the great transcontinental highways are the concern not of the western states alone, but of the whole nation; that they are necessary in the interests of national development and social solidarity. It is this view of the federal aid situation that the Western Road Association will endeavor to present to the people of the country.

HOW MANY AUTOS ARE THERE?

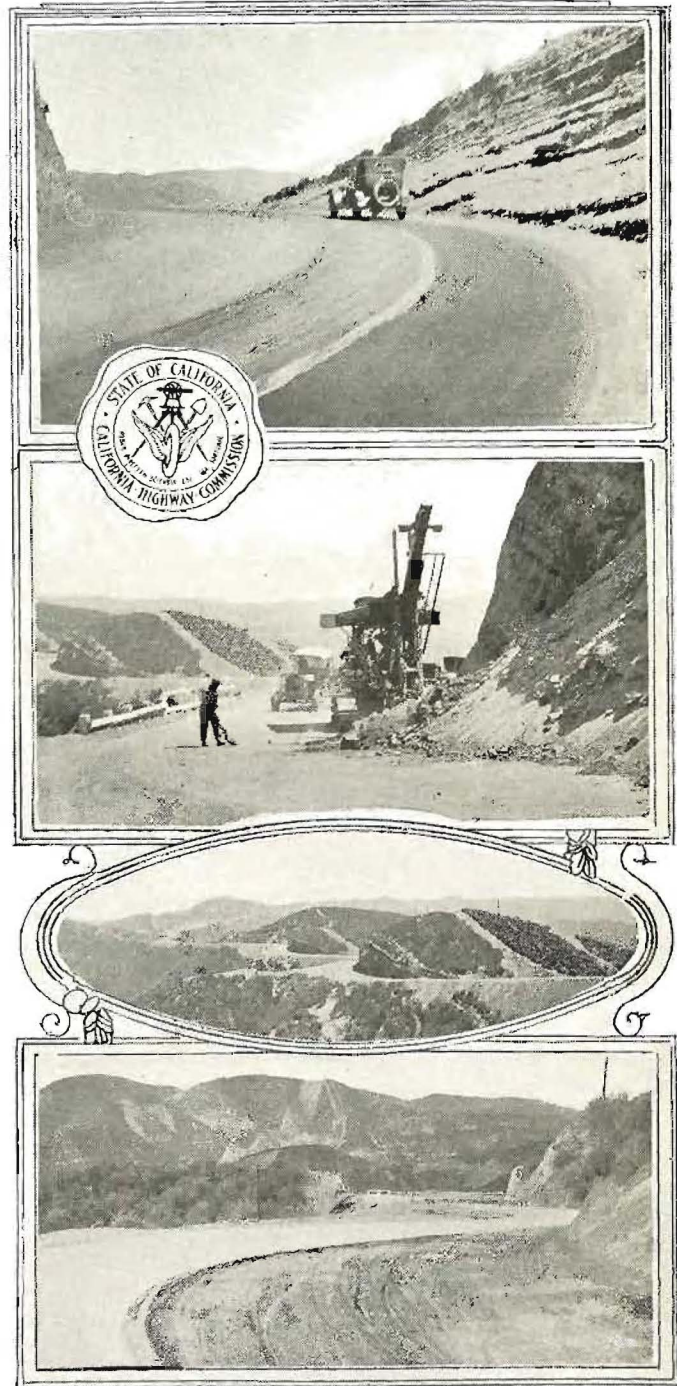
Throughout the length and breadth of this country there are 17,740,236 automobiles, according to recent statistics. Startling as this figure is, it scarcely suggests the amount of time saved due to the rapidity of modern transportation. So many machines—there are two million more cars than telephones in the United States—indicate that ownership of an automobile is necessary to fully enjoy the advantages of healthful recreation.

And, after all, our health comes first. Without it no pleasure could be derived—life would be scarcely worth living. An automobile is the best form of health insurance.

CALIFORNIA FOR FEDERAL AID.

Frequent users of the Ridge route, particularly motor transportation companies, have not complained of the manner in which traffic is being handled but on the other hand have commended most highly the work accomplished.

The accompanying illustrations show the character of the work being done in northern Los Angeles County.



IMPROVING THE RIDGE ROUTE.—Motorists using the Ridge Route between Bakersfield and Los Angeles are commending the work being done by state forces under the direction of Division VII. Curves are being widened or eliminated by a twenty-man crew and a power shovel. Work has extended over seventeen miles of highway to date. (Photos Div. VII.)

STATE REAL ESTATE MEN BACK FEDERAL AID

THE CALIFORNIA Real Estate Association, during its recent state convention in Fresno, unanimously adopted resolutions asking congress for increased appropriations for a continuation of federal aid to the states for highway construction. The national association of realty men was called upon to take similar action.

The resolutions are as follows:

WHEREAS, Construction of highways is necessary for the continued development and prosperity of the country; and,

WHEREAS, The policy of congress in extending aid to the states for the building of highways has resulted in the designation of a national system of highways connecting all the states; and,

WHEREAS, Without federal aid, highway construction in the sparsely settled public land states of the west can not be continued, thereby indefinitely postponing completion of urgently needed transcontinental highways; therefore,

Be it resolved by the California Real Estate Association, in conference assembled at Fresno, California, this eighth day of October, 1925, That we hereby urge upon congress the continuation of the present policy of the federal government; and,

That we favor increased rather than decreased appropriations for aid to the states in highway construction; and

That we call upon the National Real Estate Association to take similar action in support of the federal aid policy; and,

That we urge the representatives in congress and the United States Senators from California to support continued federal aid appropriations during the coming session of congress.

AN ALL NIGHT TOWN

WHAT highway building is doing for the country town is discussed by the Banning (Riverside County) Record. Twenty years ago the present state highway was a dusty street, now it is a busy, paved business section. From a sleepy village Banning has changed to an "all night town." Says the Record:

Banning has made a "hit" with travelers by maintaining night and day service. The motorist at any hour may obtain here everything from a quart of oil to a spare tire or a mid-night lunch. The bright lights of the city welcome the traveler from out of the darkness and stillness of the desert and one can almost hear the chimes playing "Home Sweet Home."

Truck men appreciate the night service to the full extent. These men leave the Imperial Valley late in the day and make the long run into Los Angeles at night, arriving there with perishables for the early morning market.

The importance of Banning as a supply station has only begun. Its development in this line will be steady.

PROMISES FULFILLED

(From the Brawley News.)

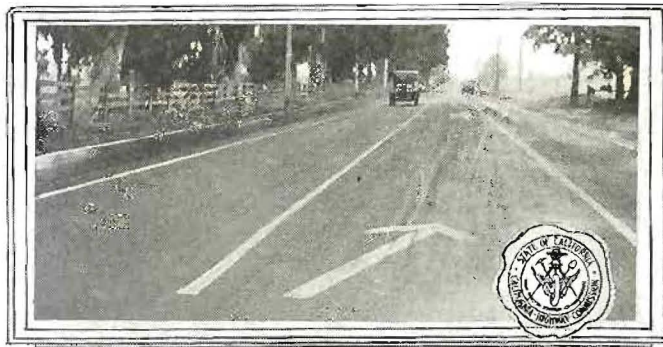
WITH WORK in progress on the Brawley-Imperial state highway, the El Centro-Holtville sector of the same road and between Holtville and the Highline, in addition to the straightening of the Mountain Springs grade, a road building program unprecedented in this portion of the county is under way.

Several hundred thousand dollars are being spent by the State Highway Commission on these various roads in Imperial County, an indication that the Richardson administration is fulfilling its promise to complete at the earliest possible date the through highways. In previous times, something of a battle royal occurred when any attempt was made to induce the State Highway Commission to spend a cent in Imperial County.

The Richardson administration won't get many votes in this county as a result of its highway building. The county's vote is negligible compared with that of other districts, but the Governor is attending to the business of the state regardless of vote-catching schemes and this is one indication of his system.

Good roads don't cost—they save.

Eleven



TRAFFIC LANES ON PENINSULA HIGHWAY—Plans being tried in Division IV to bring about maximum use of wide pavement. (Photo Div. IV.)

TRAFFIC LANES ON PENINSULA HIGHWAY HELP TO SPEED UP TRAFFIC

A NOVEL METHOD is now being tried in Division IV in an effort to bring about a more efficient use by traffic of the thirty-six-foot pavement on a portion of the Peninsula highway immediately adjacent to the city of San Mateo, San Mateo County. Three traffic strips have been painted longitudinally with the pavement in the following manner:

One strip 4½ inches wide was painted down the center line of the pavement and two additional strips, with 9' 6" clearance, on either side of the center line strip. All three strips were painted on the asphalt concrete surface which is slightly over 20 feet wide, leaving the two 8-foot strips of bare concrete shoulder on either side of the old pavement, or a total of 8' 6" outside of the traffic strip. The width of lanes are, therefore, outside strips, 8' 6"; and the two center lanes, 9' 6".

Slow moving traffic is expected to confine itself to the outside lanes, leaving the central two lanes for the fast automobile traffic going in either direction. Local and state traffic officers have promised to assist in directing traffic in accordance with this plan.

Tread lightly, my friend, this spirit has fled.

On earth he was Hiram Begum;

He sat at the wheel

Of his automobile,

After downing a gallon of rum.



ROADSIDE WATERING PLACE—Fountain built on the highway right of way near Sonora, Tuolumne County, with funds furnished by the Lions Club of that community. Its water supply comes from a nearby spring. Plans were furnished and the work supervised by Division X.

WHAT THE DIVISIONS ARE DOING

DIVISION I.

HEADQUARTERS, WILLITS.

T. A. BEDFORD, DIVISION ENGINEER.

Counties of Del Norte, Humboldt, Mendocino, and Lake.

DEL NORTE COUNTY has again stepped forward and has made a payment to the Commission of \$2,000 to aid in the building of a section of the Roosevelt highway along the coast, immediately south of the Oregon Line. Plans for this work have been forwarded to headquarters. The Supervisors of Del Norte County, on several occasions, have demonstrated their confidence in the methods of the state by voluntarily advancing funds for construction and maintenance of state routes in Del Norte County.

Survey work on that portion of the Tahoe-Ukiah highway along the northeast shore of Clear Lake is progressing rapidly. As soon as a location is finally decided upon, it is understood Lake County plans to grade that section between Clear Lake Beach and Stubbs Ranch. When this connection is completed, it will be possible for traffic to make the entire circuit of Clear Lake, a dream of Lake County for many years.

Division I Culverts Inspected.

For a week and a half representatives of Division I and the Sacramento testing laboratory "looked under the roads" in this section of the state. Many drains in all parts of the division were examined, and it is believed much valuable data were obtained relative to the life of culverts under the severe conditions prevailing in the north coast counties. It is evident some mistakes have been made in the original locations, and that maintenance methods can be changed to advantage.

DIVISION II.

HEADQUARTERS, REDDING.

H. S. COMLY, DIVISION ENGINEER.

Counties of Siskiyou, Modoc, Trinity, Shasta, Lassen, Tehama, and northern Plumas.

MODOC COUNTY and the state are cooperating in the construction of two miles of graded road from the Cedarville causeway eastward to the Nevada line. This is one of the interstate connections added to the state highway system by the legislature. The work will make the road from Alturas via Cedarville

into Nevada passable during winter months. The work, which is in charge of Superintendent J. W. Clark, will be completed in time for traffic during the present winter.

A survey party is now completing the location of 35 miles of highway on the county road between Alturas and Lakeview, Oregon. It is proposed to complete the plans for this work during the winter and to begin construction work next spring. The work will be financed by Modoc County. This road is an interstate connection which has been included in the California federal aid system, and, doubtless, will be made a state highway in the future.

Plan Crossing of Lake.

Division II and the engineers for the Great Western Power Company are engaged in working out plans for a causeway across the upper end of Big Meadows, Plumas County, on the Susanville lateral. A section of this road, it is expected, will be flooded by Lake Almanor when the raising of the dam on Feather River is completed. The raising of the water level of the lake affects 7000 feet of highway. The direct location of the highway across the lake bed will save 4.5 miles of distance, as compared with a road around the upper end of the enlarged lake.

The Nevada Contracting Company, engaged in the reconstruction of eleven miles of the state highway in the Sacramento Canyon, is now making the great cut at the Salt Creek divide which may reach an ultimate depth of 100 feet. It will be one of the deepest highway cuts in the United States.

DIVISION III.

HEADQUARTERS, SACRAMENTO.

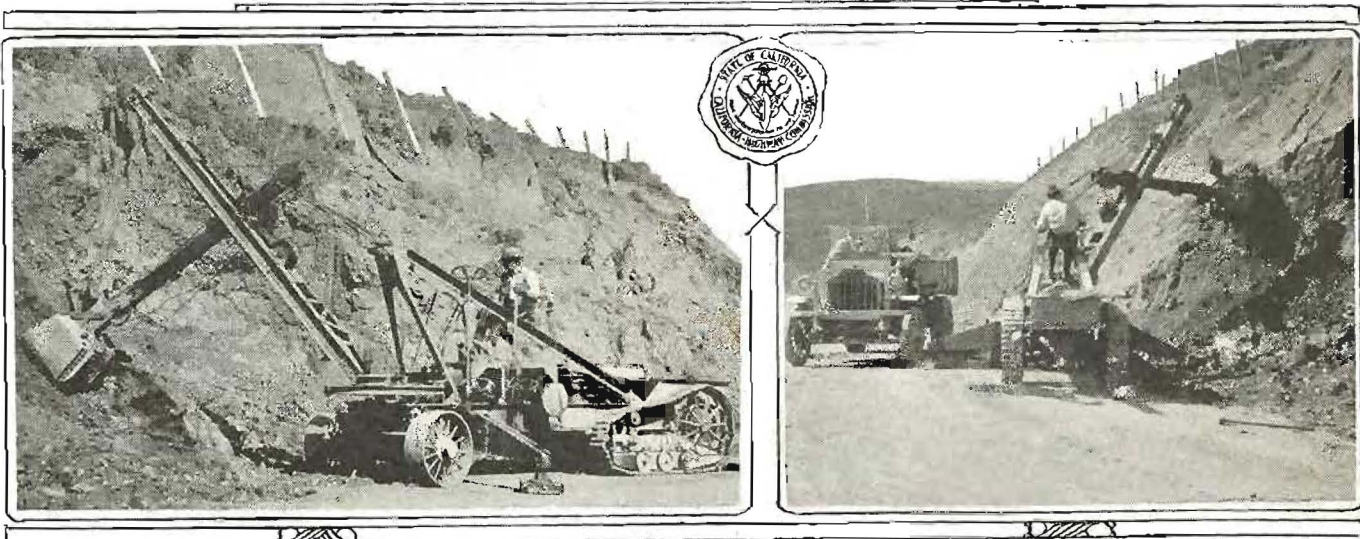
F. W. HASELWOOD, ACTING DIVISION ENGINEER.

Counties of Butte, Colusa, El Dorado, Glenn, Nevada, Placer, southern Plumas, Sierra, Sutter, Yuba, and northern Sacramento and Yolo.

GRADING of the eight-mile section of the Victory highway between Colfax and Gold Run, Placer County, has been completed by Contractor C. R. Adams, the work having been finished ahead of schedule. Giddings and Whyte are placing a one-way surfacing on a part of this project to provide for winter travel.

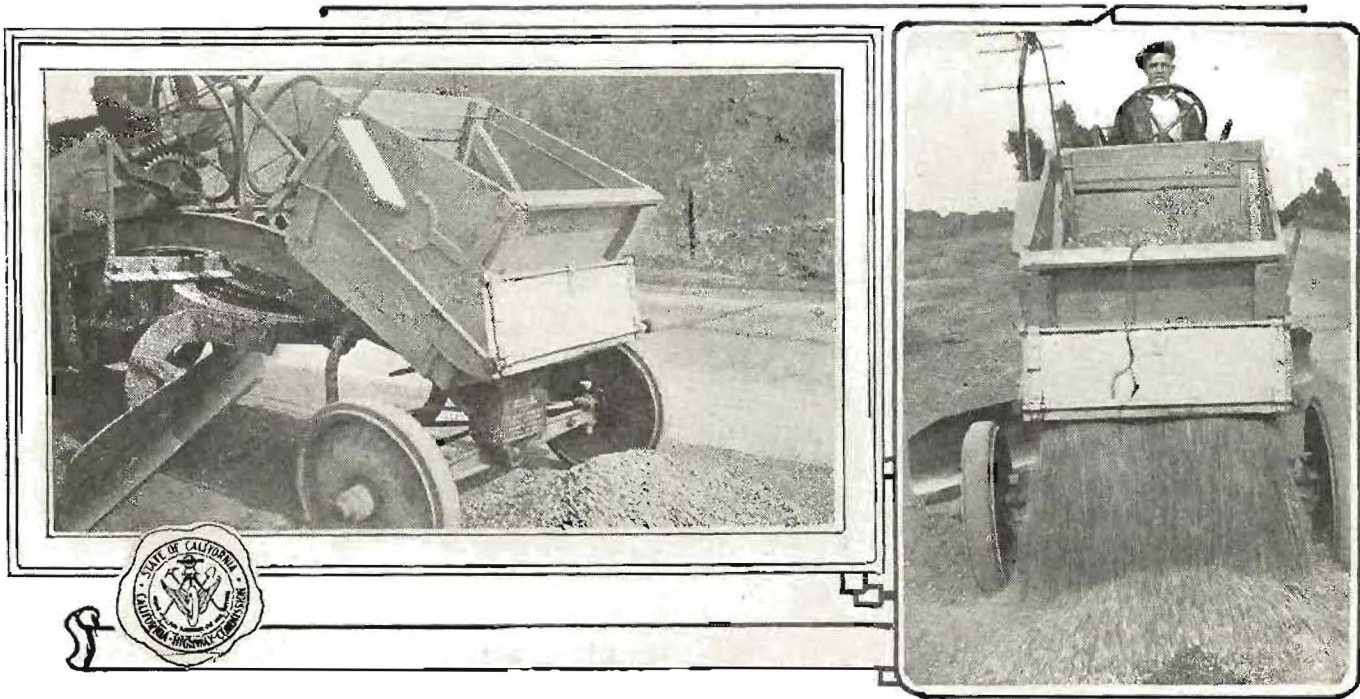
The Nevada Contracting Company has completed about 1.5 miles of grading on the six-mile contract between Floriston and the Nevada line. Fair progress is being made.

The Irely and Holden contract for grading and surfacing work above Placerville, on the Lake Tahoe highway, has been extended



ONE-MAN SHOVEL, ON THE SKYLINE—Division IV is well pleased with the performance of the Insley one-man power shovel. The views show one of these machines in service removing small slides from the Skyline boulevard in San Mateo County, where they have proved effective equipment. (Photos by Div. IV.)

GRAVEL HOPPER ATTACHED TO GRADER FOR SHOULDER WORK



MAINTENANCE AID—Views of gravel hopper which has been attached to a grader by a Division II maintenance foreman. It aids in patching rock shoulders, one man operating the entire outfit. The blade immediately spreads the rock to a true grade. (Photos by Div. II.)

DIVISION TWO has furnished the BULLETIN views of a gravel hopper attached to a one-man grader which is in use by the maintenance crew in the vicinity of Red Bluff, Tehama County. The outfit was developed by Superintendent E. L. Stump, who reports it economical and serviceable in keeping rock shoulders flush with the pavement and in good travelable condition.

The hopper will hold a third of a yard of crushed rock or gravel and is so adjusted that small amounts of rock may be

dropped here and there, where needed, as the grader moves along the shoulder. Small depressions are filled with surfacing which is immediately spread to a true grade by the blade of the grader.

The extra weight of the hopper and contents does not seriously overload the equipment, the division says, but rather has a beneficial effect in steadying the grader, making the blader operation more thorough and effective. The cost of the outfit complete and installed is about \$25.

DIVISION REPORTS

to cover the surfacing of the entire 5.8 miles and it is expected that the work will be completed before the first of the year.

By the time this bulletin is off the press, the concrete paving between the American River bridge and North Sacramento will have been completed. The underpasses are finished and opening of the improvement to traffic early in December is expected.

Clearing of brush and trees along the west shore of Lake Tahoe, between McKinneys and Tahoe City, has been authorized. The clearing is preparatory to improvement of this section of the state highway, probably next summer. If weather conditions permit the work will be continued throughout the winter.

Bridges to be Built.

Informal contracts have been awarded to the division for the construction of a timber pile trestle bridge on the Willows-Oroville lateral in Glenn County and for two similar spans on the Chico-Orland highway in Butte County. The bridges were made necessary by damage done during the high water of last winter.

Storage sheds for equipment are being constructed at the recently acquired maintenance station sites at Tahoe City, Myers Junction, and Truckee, all in the Lake Tahoe section.

Funds have been authorized for surveys for the elimination or improvement of twenty-seven reverse curves on the main trunk highway in the Sacramento Valley, where jogs around railroad property were necessary, for the realignment of the highway near Placerville, and near the Sylvan School, between Sacramento and Roseville.

Surveys have been authorized of the following county bridges on trunk highways in Division III, looking to their replacement by modern state-built structures: bridge over Auburn Ravine, south of Lincoln; Pine Creek bridge north of Chico; Stone Corral Creek and Funks Slough bridges in Colusa County; and the Wilson Creek bridge in Glenn County.

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 WORK of widening to forty feet the state highway between San Bruno and Cypress Lawn Cemetery is progressing satisfactorily. The heavy cement concrete shoulder on the west side of the roadway has been finished and opened to traffic. The shoulder on the east side is now being completed after which the asphalt concrete wearing surface will be placed over the old pavement, completing the project. All curves are being super-elevated. Where necessary, asphalt concrete wedges have been placed over a portion of the old pavement, preparatory to the placing of the surfacing.

Placing of 5.2 miles of embankment across the marshes from South San Francisco to San Mateo, on the Bay Shore highway, is rapidly nearing completion. The borrow material yet to be placed is considerably less than 100,000 cubic yards. The next step will be the placing of a surfacing which, it is hoped, will be a part of the 1926 program.

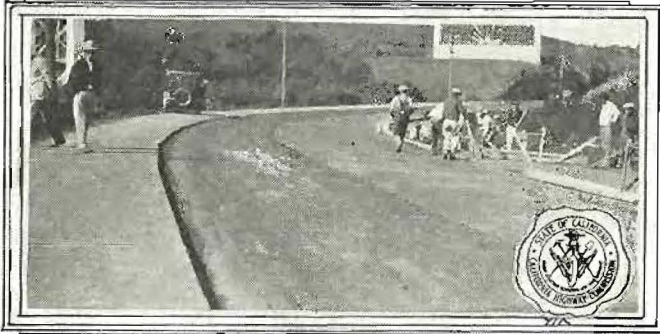
DIVISION REPORTS

(Continued from page 13.)

Guard Rail Construction Under Way.

S. A. Martindale, contractor for the placing of 10,000 lineal feet of guard rail on the Skyline boulevard, has begun work near the Colma road.

Fair progress is being made by the Kaiser Paving Company on the contract for the placing of bituminous macadam shoulders either side of the existing pavement between San Pablo Creek and

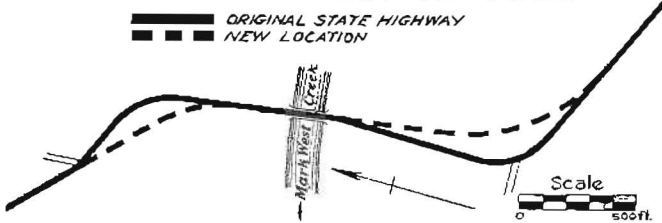


WIDENING PENINSULA HIGHWAY—Shoulder of heavy concrete completed. work under way on opposite side of the highway. To super elevate the curve, a wedge of asphalt concrete has been placed over a portion of the old pavement, preparatory to placing new surfacing. (Photo Div. IV.)

El Ciervo, Contra Costa County. Rocking has progressed from San Pablo to the west city limits of Pinole. Grading is being completed on Oleum Hill near the Union Oil refinery.

J. V. Galbraith, contractor, is rapidly nearing the completion of his reconstruction project between Santa Rosa and Healdsburg on the Redwood highway in Sonoma county. The new "second story" cement concrete pavement is being placed in two ten-foot widths. Some of the "breaks" on this project have shown very high strengths, probably the highest on any state pavement in California. Grading of line changes at Mark West Creek, and about

CALIFORNIA HIGHWAY COMMISSION
**STRAIGHTENING OF EXISTING STATE HIGHWAY AT
MARK WEST CREEK SONOMA COUNTY DIV. IX**



one mile north of Santa Rosa, is now under way. These line changes will be permitted to settle during the winter before a pavement is placed.

Traffic has been successfully handled during the summer on various detours over county roads and at the side of the highway.

Maintenance forces are making good progress on a section of heavy grading on the Boulder Creek road, leading to the California Redwood Park, in Santa Cruz County. The work is expected to continue until heavy rains make it necessary to close down operations for the winter.

DIVISION VII.

HEADQUARTERS, LOS ANGELES.

S. V. CORTELYOU, DIVISION ENGINEER.

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

BUILDING of curbs and placing of concrete pavement on the Whittier boulevard reconstruction job, in Los Angeles County, is progressing rapidly. The new pavement is open to traffic between Montebello and the Union Pacific underpass. The latter is under construction.

Paving operations having been completed, placing of rock borders on the Jahn and Bressi contract. 5.6 miles from San Juan to Galivan, Orange County, is now under way. The concrete outfit has been shipped to Oceanside, San Diego County, where the same firm has another reconstruction contract under way. Grading is well along north of Oceanside.

Approximately two miles of twenty-foot pavement and nearly all grading has been completed on the San Onofre-San Mateo Creek line change, in San Diego County.

On the Malibu Ranch grading contract, Coast boulevard, Los Angeles County, all grading has been finished between Latigo Creek and Las Flores Canyon. Work is now under way at the westerly end of the contract and at Zuma Canyon.

Paving South of Newport.

Paving is well under way south of Newport on the Newport Beach-Laguna project.

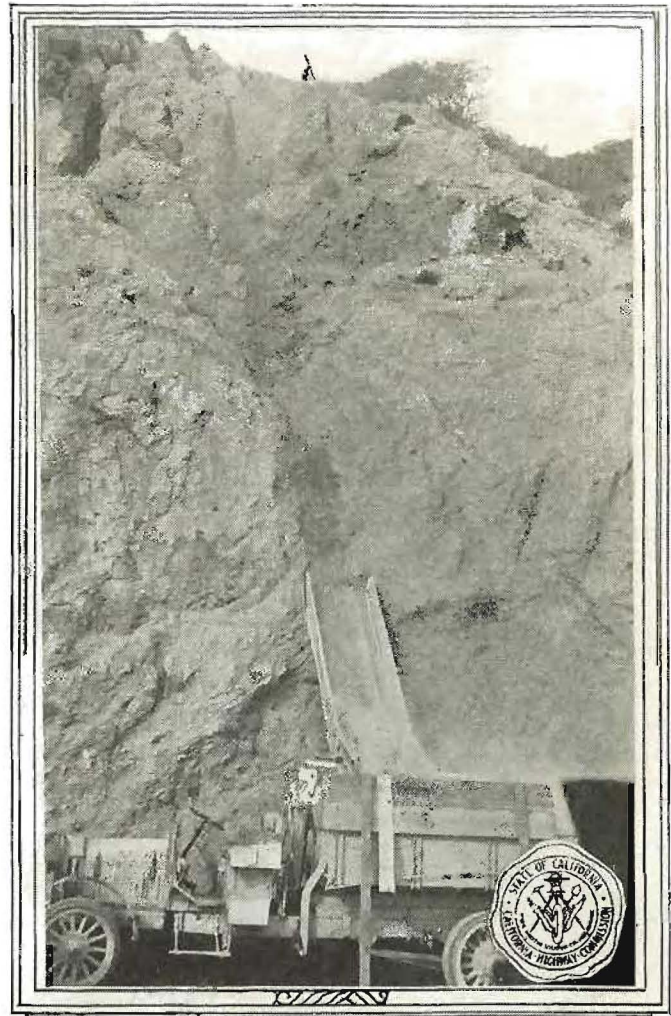
Two power shovels and a large grading outfit are at work on the Laguna-Serra grading contract, which will complete the opening of the southern end of the Coast boulevard.

Traffic Cared for.

Work is going ahead rapidly on the widening and realignment of the Mountain Springs grade between San Diego and El Centro. The contractor is planning to double his forces in the near future. The work is being done without interference with traffic.

Dewey and Rawson have begun lengthening of culverts and grading preparatory to placing flush concrete shoulders on the Foothill boulevard between San Fernando and La Canada, Los Angeles County.

Work has started on the rebuilding and widening of the Middle



LABOR SAVING MAINTENANCE OUTFIT—A little pick and shovel work by the maintenance crew starts a small avalanche and fills the truck in short order. Outfit in use on shoulder widening work north of Santa Monica, Division VII.

Causeway on the Coast Route, north of Ventura. A part of the work includes three large box culverts which will be constructed to handle drainage.

DIVISION X.

HEADQUARTERS, SACRAMENTO

J. C. McLEOD, DIVISION ENGINEER.

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

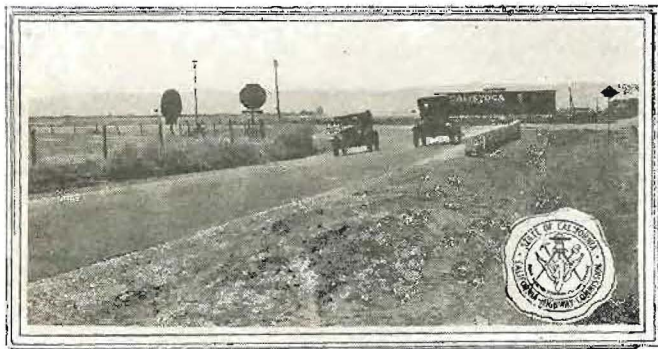
CONTRACTOR J. F. Knapp is making rapid progress on the paving of the state highway through the town of Manteca, San Joaquin County. The state is paying for a twenty-foot strip in the center of the street and the property owners for the balance on either side to complete a full width pavement.

The new state pavement between Turner Station and the Stanislaus River has been completed and opened to traffic. Shoulder work and grading will be completed by the time this bulletin is off the press. C. W. Springer has been resident engineer on this project.

Progress is being made on the paving of the southern approach to Sacramento on the Stockton boulevard. Moving of the tracks of the Central California Traction Company to the center of the street has been completed.

Shoulders Improve Highway.

A marked improvement in the condition of the state highway between Davis and Woodland, and the Woodland Wye and Putah



BANKED CURVES—The original construction of the trunk highway through Solano County did not include super-elevation of curves. Division X recently completed the banking of these curves and their repavement with asphalt concrete. The safety of the highway has been greatly improved.

Creek, is evident following the completion of placing of "flush" concrete shoulders. Two-foot rock shoulders have been placed at either side of the new concrete shoulders and the earth shoulders widened and considerably improved.

The Amador County Board of Supervisors has contracted with R. N. Murdoch to make improvements on the Mother Lode highway between Drytown and Amador City, in line with its policy of turning over the highway to the state in as good a condition as possible on January 1st. The contractor is now working between Central House and Drytown, on state work.

Maintenance Activities.

Funds have been allotted and work is now under way on a line change on the Ebbetts Pass highway, in Alpine County. The worst grades on the east side of the pass are being eliminated by a new location of the road.

Widening work on the Big Oak Flat road between Bucks Meadow and South Fork has been completed.

In San Joaquin County, a mile of oil macadam east of Clements, on the San Andreas lateral, has been rebuilt under the direction of Superintendent Clarence Bovey. Local residents have commented favorably on the improvement.

Curves on the trunk highway north of Stockton, between the diverting canal and the Calaveras River, have been super-elevated and improved as to drainage.

HIGHWAY NEWS NOTES

C. S. POPE, construction engineer, has returned from an inspection trip through Oregon and Washington where he made a study of the latest highway design and practices of those states.

Earl McNeely, outfielder for the Washington Senators, visited old friends at headquarters and in Division III following his return from the east.

Division III reports W. H. Miller is now in charge of widening work at Lake Tahoe in the place of W. G. Walker, who has been ill.

J. W. Vickery, well known member of the Division III forces, is the father of a brand new son, who weighed 11½ pounds upon arrival.

Bureau Man With Division X.

N. W. Collins, formerly with the Portland office of the Bureau of Public Roads, is now a member of the Division X staff.

Miss Ruth Miles, chief stenographer, Division X, is touring Europe and the British Isles in company with members of her family. Miss Betty Bell of the Division of Water Rights has succeeded to her position.

Several radio sets have been installed in the Briceburg prison camp with funds raised by the San Francisco *Chronicle*, which accepted voluntary contributions for this purpose.

Southern News.

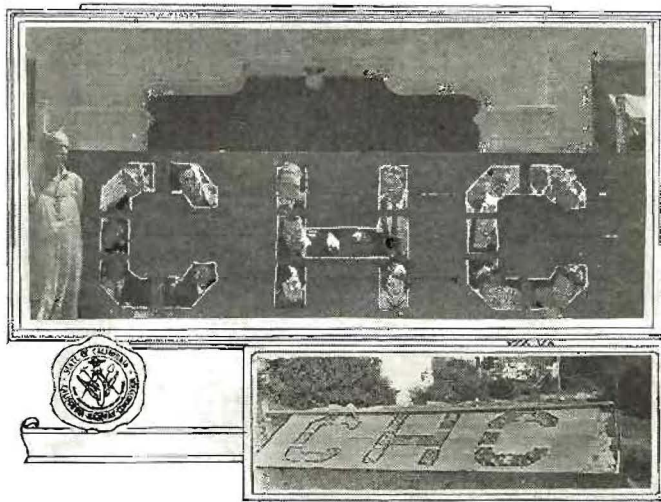
Fred R. Belknap has been promoted from instrument man to assistant resident engineer on the San Onofre-San Mateo creek line change in San Diego County, reports Division VII.

E. J. Saldine has been transferred from the Los Angeles office to the Mountain Springs grade project, as acting resident engineer.

It has just been learned that Miss Mayme Sullivan of the Purchasing Department recently became the bride of Mr. Earl Janak.

DIVISION I PROUD OF LAWN AND FLOWERS ABOUT OFFICE

THE BEAUTIFUL lawn and flower garden which surrounds the headquarters office of Division I at Willits, Mendocino County, is the special pride of the entire staff, but none takes greater interest in its appearance than T. H. Taylor, its caretaker. Taylor has just started the growing of a large C H C on the front lawn. He had prepared a large wooden form for the background of the letters until they are well started, but before it was put in place Mr. Bedford and his staff planted it to human faces.



DIVISION STAFF AT WILLITS—Mr. Bedford's helpers appropriate the caretaker's flower plot border to have picture taken.

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	Contract time, days
446	III	Nevada.....	38	A	COMPLETED AND ACCEPTED SINCE OCT. 9, 1925. Across Truckee River 1 mile north of Polaris.....		Reinforced Concrete Bridge.....	Proctor and Cleghorn.....	\$56,728 13	July 16, 1924
485	V	San Luis Obispo.....	2	E	AWARDED SINCE OCTOBER 9, 1925. Pismo to 1 mile south.....	0.88	Grade and Rock Surfacing.....	Collins and Seppi.....	68,602 50	Oct. 23, 1925	200
486	VI	Mariposa.....	18	G	Across Merced River.....		Reinforced Concrete Bridge.....	Otto Parlier.....	36,894 38	Oct. 23, 1925	150
487	VII	Los Angeles.....	60	A	Latigo Creek to Las Flores Canyon.....	6.70	6.3 miles P. C. Conc. Pavement; 0.4 miles Bit. Mac. Pavement.....	Ed Johnson and Sons.....	235,649 25	Nov. 13, 1925	125
					Sub-total.....	7.58			\$397,874 26		
	VIII	Riversido.....	64	C	PENDING AWARD. Desert Center to 4 miles west of Hopkins Well.....	21.00	Grading.....		31,207 50		200
					Total State Highway Fund Contracts Awarded and Pending Award.....	28.58			\$429,081 76		

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	Contract time, days
M-63	II	Shasta.....	3	C	COMPLETED AND ACCEPTED SINCE OCT. 9, 1925. Across Salt Creek.....		Reinforced Concrete Girder Bridge.....	Nate Lovelace.....	\$19,386 34	Mar. 12, 1925
M-79	VII	Ventura.....	2	D	Across Ventura River.....		Reinforced Concrete Bridge Extension.....	Otto Parlier.....	26,997 19	May 20, 1925
M-80	I	Humboldt.....	1	C, E, G	Various.....		Painting Five Bridges.....	R. Zehnsky.....	56,962 00	May 20, 1925
M-88	VI	Merced.....	32	C	6 miles east of Los Banos to San Joaquin River.....	10.00	Rock Borders.....	Kaiser Paving Company.....	26,289 00	June 17, 1925
M-89	III	Placer.....	39	A	Tahoe City to Nevada State line.....	11.60	Crushed Stone Surface.....	Bishop and Brooks.....	26,901 00	June 17, 1925
M-103	V	Santa Barbara.....	2	J	AWARDED SINCE OCTOBER 9, 1925. Summerland to Montecito.....	1.40	Grade and Rock Surfacing.....	McCray Company.....	77,885 15	Oct. 23, 1925	100
M-104	VII	Ventura.....	2	F	At Middle Causeway.....	0 10	Grade and Rock Surfacing.....	Edward W. Dahl.....	14,688 00	Oct. 23, 1925	76
M-105	VIII	Riversido.....	26	B	Beaumont to Banning.....	8.00	Portland Cement Concrete Pavement.....	Geo. Herz and Company.....	91,476 90	Nov. 18, 1925	75
M-106	VII	Ventura.....	2	B, C	Camarillo to Ventura.....	18.20	9.8 miles P. C. C. Pavement; 3.4 miles P. C. C. widening.....	H. H. Peterson.....	364,209 89	Nov. 13, 1925	200
					Sub-total.....	39.30			\$704,785 47		
	VIII	San Bernardino, Riverside	19	B-A	PENDING AWARD. Ontario to Riverside.....	14.60	Asphalt Concrete Pavement.....		232,912 08		150
					Total State Highway Maintenance Fund Contracts Awarded and Pending Award.....	53.90			\$937,697 55		

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.

PRACTICALLY all projects included in the 1925 program of the California Highway Commission, announced in detail last spring, have been placed under contract or advertised for bids. Various matters have delayed the work that remains to be undertaken. Engineering problems involved have required intensive study and have made it advisable, in some instances, to hold back work until the engineers were certain the best possible plan had been adopted. In other instances, rights of way have been difficult to obtain and condemnation suits, which required the preparation of lengthy descriptions of property, have had to be instituted.

It will be many months before all of the work placed under contract during the present year is completed. Already, the commission is working on plans for 1926, and bids have been asked on one project in order that construction may be started early in the spring. Careful consideration is being given the work to be undertaken next year on both new projects and reconstruction of existing highway. The detailed program will be announced by the commission in the near future.