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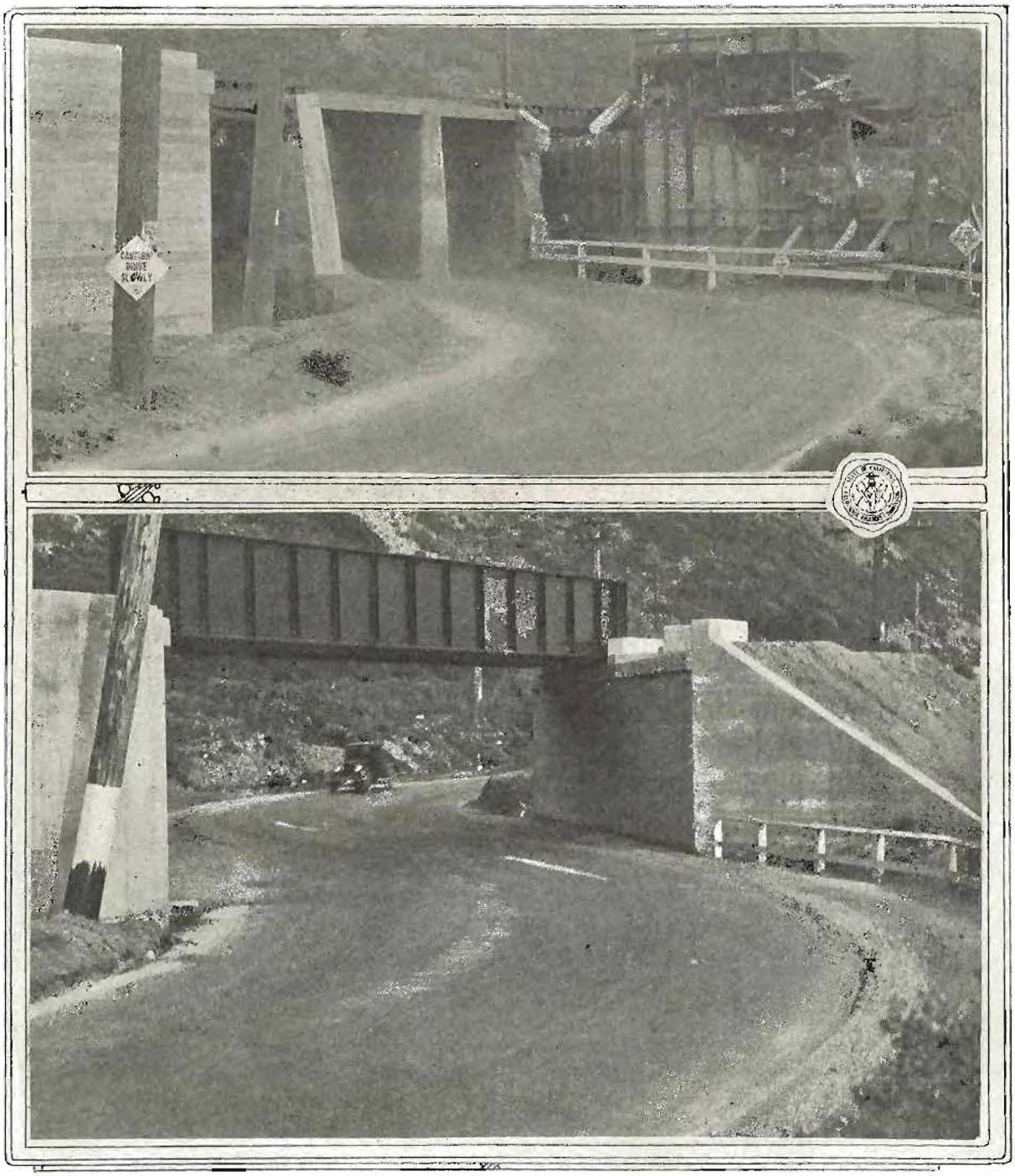

VENTURA SUBWAY, BEFORE AND AFTER—Views showing a recent improvement completed on the Coast route, north of the city of Ventura, where the highway passes under the Southern Pacific railroad. The center pier of the old subway has been removed and the underpass considerably widened to give more room and better sight distance. (Division VII.)

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Results of Tests of Air Cleaners on Trucks in Service

By R. H. STALNAKER, Equipment Engineer.

TESTS of air cleaners on trucks in service on the Redwood highway, in Division I, preparations for which were outlined in the May, 1924, issue of the bulletin, were completed early in December and the results were presented by Professor A. H. Hoffman, of the College of Agriculture, University of California, at the recent meeting of the Society of Automotive Engineers in Detroit.

While inconclusive as to the relative value of the several types of cleaners under test, the information secured was well worth the effort, and the difficulties encountered furnished a guide for the formulating of future tests of like nature.

Eight Class B, the so-called Liberty dump trucks, to be used with a steam shovel for widening the Redwood highway, near Cummings, Mendocino County, were selected for the test. Five of these trucks were equipped with commercial air cleaners, and one with a special dust collector designed and supplied by Professor Hoffman. For the purpose of comparison, the remaining two trucks were operated without cleaners.

Motors Carefully Checked.

Both before and after the tests, the engines were torn down and measurements taken of cylinder bores, piston diameters, ring widths and gaps, and crank pin diameters, and the pistons and rings were cleaned and weighed.

During the progress of the test, the usual data of hours of operation, mileage, and gas and oil consumption were carefully kept, and in addition the crankcase oil was changed at frequent and regular intervals, and samples of the used oil forwarded to Professor Hoffman for analysis.

During the progress of the test, it was necessary to remove the cylinder heads from four of the trucks and the crankcase lower halves from five of them, in order to allow the making of necessary repairs and adjustments. For this reason, the deposits of crankcase sludge and of carbon in the combustion chambers were comparable only on the remaining trucks which had not been distributed during the test. These deposits were collected and analyzed at the end of the test. In addition to the above, the dust collected by one of the cleaners, which is so constructed as to retain all dust entrapped by it, was analyzed.

Results of Analyses.

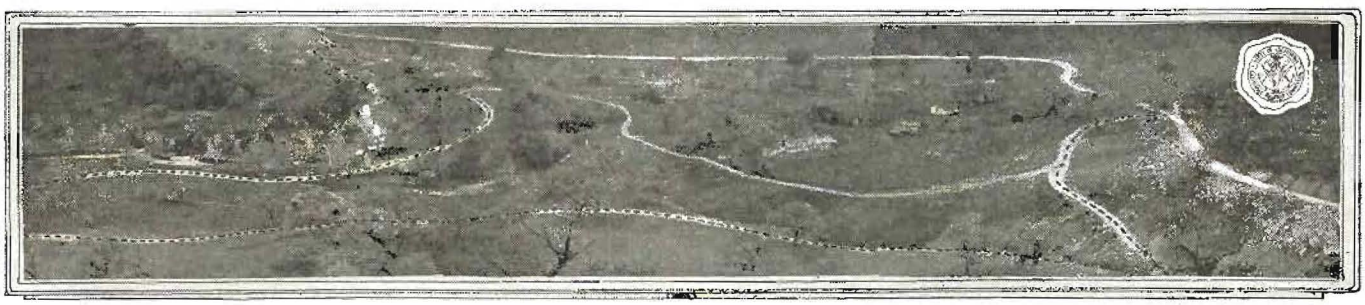
The results of these analyses are discussed briefly:

The piston and ring weights were originally taken with a Troemner-type balance, and the loss of weight in the pistons by wear was found to be within the limits of error in the original weighing. Hence these weights were discarded in the wear data. The piston ring weights were relatively more accurate. In several cases it was found that the piston diameters were larger at the conclusion of the test than at its inception. The measurements were carefully taken in both cases with micrometer calipers, which were checked against secondary standards that were apparently in as good condition as when received from the manufacturers.

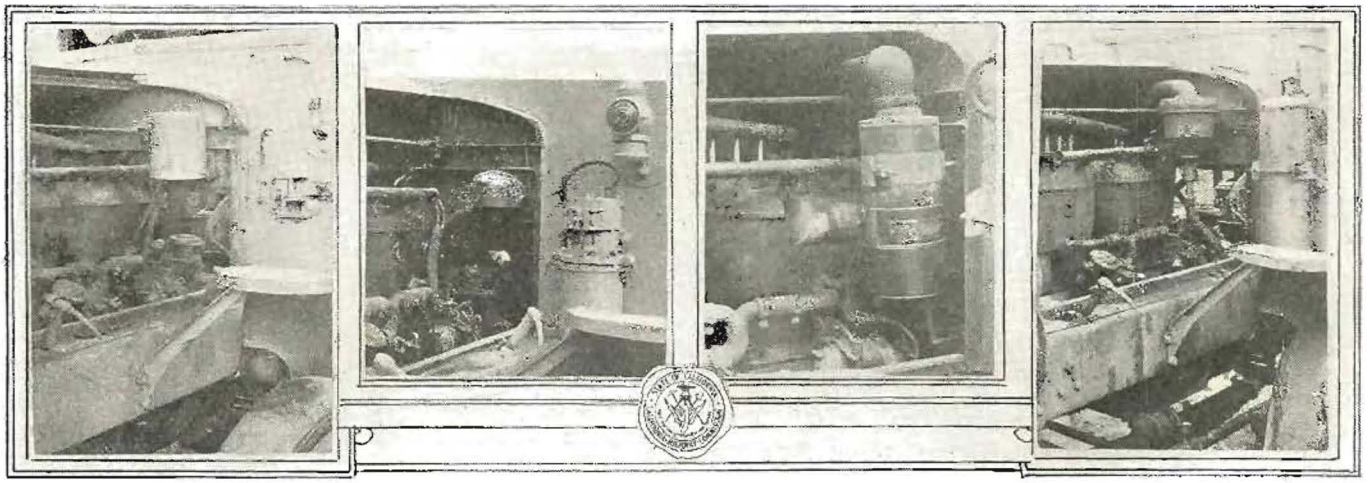
Since tests by others have shown that a new cast-iron piston will increase in size when subjected to the normal temperature changes it encounters when in use in an internal combustion engine, it seems probable this increase in size was actual, and not caused by errors in either the original or final readings. For the above reasons, neither the weights nor the diameters of the pistons were used in the analysis of the results of the test.

It should be further noted that the actual wear, even on the trucks not equipped with air cleaners, was small as compared with that often found in trucks operating under no more severe dust conditions. Professor Hoffman is of the opinion that the chief reason for this is the fact that the crankcases were drained once a week for the first two months and at about ten-day intervals during the remainder of the time, thus promptly removing the accumulated dirt and maintaining the oil viscosity high, as shown by the analyses of the used oil. At any rate, the maximum increase of cylinder diameter was only .0035 inch, and the minimum .0025 inch, although the trucks were operated from 1160 to 1345 hours apiece during the test. The ring groove and piston ring wear were also comparatively small but with considerable more variation in the amount of wear.

On one of the trucks the tube connection to the air cleaner was found broken at the conclusion of the test, thus rendering the cleaner inoperative. As no information was available



STRAIGHTENING OUT THE PACHECO PASS LATERAL—A striking example of realignment in southern Santa Clara County. The dotted line represents the old county highway in its meanderings around and over the hillsides. The new state highway is shown in the background in the upper part of the picture. The road has been considerably shortened and grades and curves improved or eliminated. (Photo by Division IV.)



Close up view of four of the commercial air cleaners tested out on state trucks operating on the Redwood highway, Division I. The Equipment Department cooperated with the College of Agriculture of the University of California in making these interesting and important experiments. Further tests of air cleaners are planned for next summer.

as to the date of the accident, all wear data relative to this truck were discarded in the final analysis.

Wear on Grooves and Piston Rings.

On the remaining five trucks equipped with air cleaners, the average increase per 1000 hours of operation in the width of the top ring groove was .0022 inch, while on the two without cleaners the corresponding quantity was .0047 inch. The average decrease in width of the top piston ring, for the trucks with air cleaners, was .0030 inch, and for the two without cleaners .0053 inch. The variation, as well as the total wear, was much more pronounced in the tip clearance of the top rings, the average increase per 1000 hours operation for the trucks with cleaners being .0293 inch, and for those without cleaners, .0941 inch. The average loss in weight per 1000 hours operation on the top rings was, for the trucks with cleaners, 2.867 grams, and for those without cleaners, 7.229 grams. The wear on the second and third rings was, on the whole, much smaller in amount, but exhibited about the same variation.

The analysis of the dust taken from one of the cleaners, as mentioned above, showed some rather interesting features. It was found that nearly 93 per cent of the dust passed a 200-mesh screen, and that less than 1 per cent was retained on a 100-mesh screen. It was further found that over 85 per cent of the dust consisted of so-called abrasives, mostly silica and silicates, and that over one-half of the abrasives was silica.

Analysis of Carbon Deposits.

The analysis of the carbon deposit removed from the piston heads, on the three trucks on which the cylinder heads were not disturbed during the test, showed carbon comprising about 80 per cent of the solids in deposit in all three cases. Abrasives averaged 1.86 per cent of the solids on two of these three trucks equipped with air cleaners, and amounted to 3.38 per cent on the truck not so equipped. Iron averaged 1.42 per cent of the solids on the trucks with air cleaners, and was 3.76 per cent on the truck not so equipped.

The analyses of the crankcase sludge taken from three trucks equipped with cleaners gave an average of 12.66 per cent of abrasives in the solids, while the sludge from the fourth truck without an air cleaner contained 20.65 per cent of abrasives in the solids.

The presence of the air cleaners seems to have had no marked effects on either the gasoline or oil consumption, the individual peculiarities of the trucks and the personal equation of the drivers apparently overbalancing any possible influence of the cleaners upon these items.

As a matter of fact, the oil-dilution percentage showed rather wide variations, ranging from 4.93 per cent to 9.22 per cent. This increased dilution may be reflected to some extent in the wear data.

Professor Hoffman's Summary.

Professor Hoffman concluded his paper with the following summation:

"Accidents must be expected in any work. That there were not more from falling rocks and trees and from caving mountainsides is remarkable. Several accidents or troubles occurred that may have had a marked influence on the wear in the engines concerned, and two cases of leaks because of warped cylinder-heads. Five out of the eight engines had the cylinder-heads off for one cause or another. One had the cylinder-blocks removed. Two exchanged crankcases so that one of them might continue in service. The shovel fell on one truck and broke its frame, decreasing very considerably its mileage total and hours of service.

"The different personalities of the twenty-five men who drove the eight trucks enter as another indeterminable factor. One truck went through the season with a single driver; another had seven. Even if the carburetor adjustments had been sealed, it seems easily possible that the driver may have been the only reason for a case of greater dilution of oil and therefore greater wear. Some of the trucks were on the morning shift, from 4.00 a.m. to noon; the remaining trucks worked from noon to 8.00 p.m. This difference possibly had little, if any, effect.

"As to the nature of the work, there was little difference. Other than hauling rock and earth from the shovels to the dumps at the edges of the fill, the work purposely was distributed among the trucks. This special work was infrequent and consisted of trips to town for cement, coal and

steel, and to the rock crusher and gravel-washing plant for the aggregates to be used in the concrete work.

Air Cleaner Test Secondary.

"Moving earth at minimum cost and in maximum amount was the very laudable objective of the engineer in responsible charge of the road-construction job. The taxpayers footing the bill would require no less of him. The air cleaner test was an interesting and worthwhile matter, but a secondary one. Hence, it would have been surprising had the test resulted in every respect as one might have hoped. No one in particular is to blame for the fact that direct comparisons of air cleaners can not be based with any fairness on the results of this test. On the contrary, the engineer in charge has undoubtedly made possible a considerable increase in the store of knowledge on the subject, and he is certainly to be commended for the fine spirit of cooperation which was apparent throughout the tests.

"The curiosity of the American traveling public is another unknown factor that can not be evaluated in this case. Any newfangled contraption arrests the attention and interest of the passerby. Possibly this may account for the fact that one cleaner had been dismantled at some time during the test and was not reassembled properly, thus causing a considerable leak of dusty air. It would seem that, to guard against such contingencies and against possible malicious interferences, the engine hoods should be padlocked securely; but, on a test that is secondary to the main objective, this clearly would be out of the question.

Essentials of a Satisfactory Air Cleaner Road Test.

(1) "The test itself must be the main object in the operation of the vehicles.

(2) "The test must be in responsible control of one person who carries out a well-considered plan designed to secure uniformity of conditions in and for all the vehicles concerned.

(3) "The tests on any air cleaner should be run at least in duplicate, preferably in triplicate.

(4) "The several drivers should exchange vehicles according to a definite plan. They should be instructed as to the general nature and objects of the tests, and particularly as to their part and its importance. Their interest and loyalty to the program are highly important.

(5) "All air cleaners and unequipped carburetors must take their air from a standard place under the hood. The inlet opening, unless it be a multiple one, must face toward the rear of the vehicle. When necessary, flexible metal tubing well taped can be used to extend from the inlet on the air cleaner to the standard inlet position.

(6) "Engine hoods must be sealed or locked against unwarranted interference.

(7) "Every vehicle and every air cleaner must be inspected daily, and a complete record kept of any troubles or accidents. Air-tightness of all cleaner and carburetor connections is of prime importance. Accidental troubles or defects must be remedied before the vehicle reenters the test.

"Since, in a number of respects, as already has been pointed out, the tests here reported did not meet these requirements, it evidently would be unjust to make direct comparisons on the basis of the wear in the several engines. For this reason, the names of the air cleaners have been withheld so far as comparisons are concerned. It was indicated by this test that:

(1) "In a service test involving several uncontrollable variables, no just comparisons can be drawn among air cleaners not differing greatly in efficiency.

(2) "Nevertheless, such a service test may yield valuable data, especially if, instead of one, several air cleaners of a kind are entered and the results averaged.

(3) "Frequent changing of crankcase oil and consequent maintenance of higher viscosity markedly reduces engine wear.

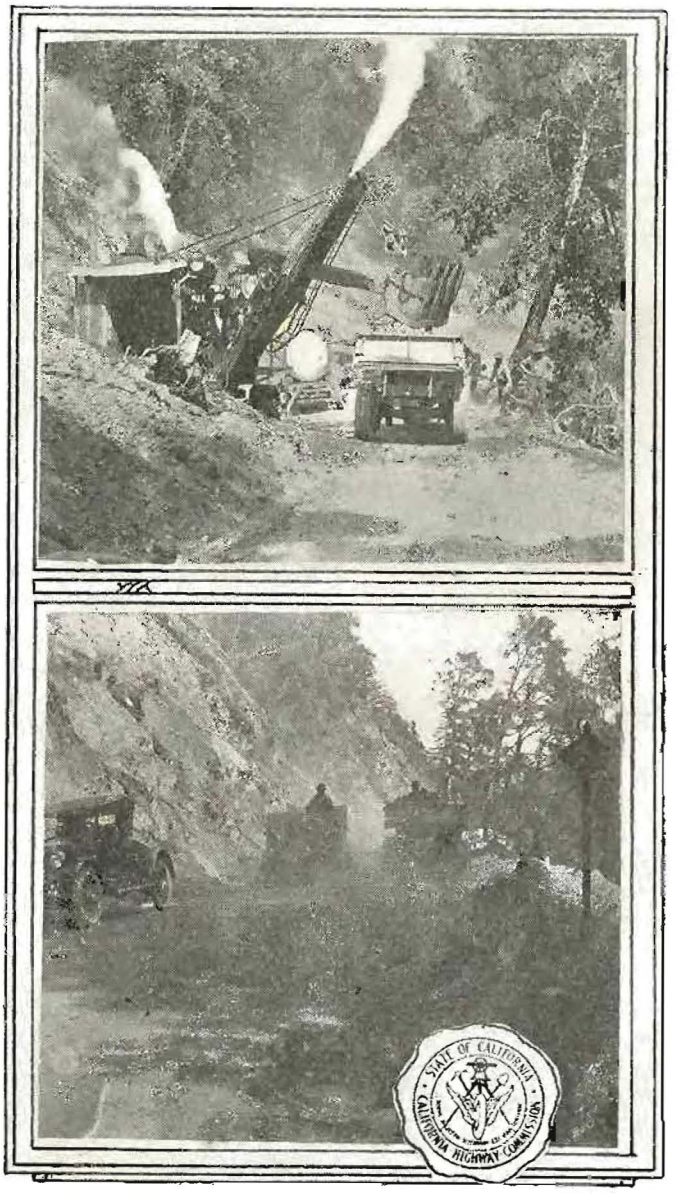
(4) "Placing the air inlet high up and well back under the hood lessens the quantity of dust encountered.

(5) "The air inlet should not face forward. A rearward opening acts as an inertia-type dust-separator.

(6) "An air cleaner is a needed and worthwhile truck-engine accessory.

(7) "For certain types of air cleaner, a short-duration laboratory test of efficiency is inconclusive, unless supplemented by one or more long-time tests."

(Continued on page 13.)



Views showing character of widening work performed on the Redwood highway by trucks on which air cleaners were placed during recent test.

NEW SANTA ANA RIVER BRIDGE LINKS BEACH CITIES IN SOUTH—Scenes at the recent dedication of the Santa Ana River bridge on the Coast boulevard, Orange County. UPPER LEFT, Commissioner N. T. Edwards with silver plated shovel just after he had removed the last barrier of earth; UPPER RIGHT, the new bridge built by the county under joint state and county inspection; LOWER LEFT, another view of the bridge showing wide roadway; LOWER RIGHT, Miss Belle Bennett, screen star, and officials of beach chambers of commerce who took part in the ceremonies.

NEW BRIDGE AND HIGHWAY LINK SOUTHERN COAST CITIES

By L. M. Ranson, Assistant Division Engineer.

ONE of the greatest events of the year for the communities along the Coast boulevard, south of Los Angeles, was the formal opening on March 21st of the new steel and concrete bridge across Santa Ana river between Huntington Beach and Newport. In the words of Commissioner Nelson T. Edwards, "It was a great day for the South Coast."

Opening of the bridge permits use of the new state highway pavement recently completed between Huntington Beach and Newport Beach, and affords a direct connection along the coast between the cities of Newport Beach, Balboa, Costa Mesa, Huntington Beach, Sunset Beach, Seal Beach, Long Beach and Los Angeles harbor. It will shorten the time of automobile travel from Newport Beach to Huntington Beach by 20 minutes, to Long Beach by 25 minutes, and to Los Angeles by 35 minutes.

The new bridge and highway were dedicated with an elaborate ceremony in which the mayors and large delegations from each of the beach communities and Los Angeles took part.

Formal presentation of the bridge on behalf of Orange County was made by Supervisor T. B. Talbert. It was accepted by Commissioner Edwards on behalf of the state. Prior to the ceremony, the commissioner was presented by the Associated Chambers of Commerce with a silver shovel which he used in removing the last of the earth covering from the bridge.

The barrier, fashioned from bands of ribbon, was broken by Miss Belle Bennet, screen star, who was present as a special guest of the Orange County Chamber of Commerce.

(Continued on page 8.)

RESULTS OF FIELD TESTS OF BRIDGE CONCRETE

By Harlan D. Miller, Bridge Engineer.

CAREFUL tests have been made during the last year and a half of the strength of concrete used in the construction of state highway bridges in various sections of California. These tests are of considerable interest because they show the strength of concrete obtained under actual working conditions, using variable aggregates and different brands of cement.

In all, about 800 samples of concrete were taken during the construction of fifty bridges. These samples were secured on the job as the concrete was poured from the mixers; precautions being taken in each case to see that the samples were typical of all of the concrete to the run, and that, in every respect, they represented average conditions. About one-half of these samples were tested at the end of ten days and the remainder after twenty-eight days of curing.

Pasteboard cartons, in the shape of cylinders six inches in diameter and twelve inches long, are used in casting samples, which are kept on the job under the same conditions as the concrete in the structures until of the desired age for breaking. They are then shipped to the state testing laboratory at Sacramento. The ultimate strength of the concrete in compression at the particular age is thus determined.

Tests Fair Representation.

In making the concrete covered by the tests completed to date, there were used seven different brands of cement and aggregates from many sections of the state and of considerable variableness; twenty resident engineers participated in the supervision of the work. Taking these factors into consideration, it may be assumed that the tests fairly represent actual field concrete as it is now being produced in California state highway bridges.

The bridge department is making a very earnest effort to secure uniformity of results in its concrete, rather than exceptionally high strength. With this in view, the resident engineers are drilled in the theory of proportioning of aggregates, careful measurement of water content, bulking of sand, etc. Aggregates are proportioned according to the Abram's theory to produce the greatest workability with the least amount of water.

The average slump of the concrete used in the fifty bridges, built during the last year and a half, was about 2¼ inches. This includes concrete for columns, beams, girders, slabs, arches, railings, posts, and piles.

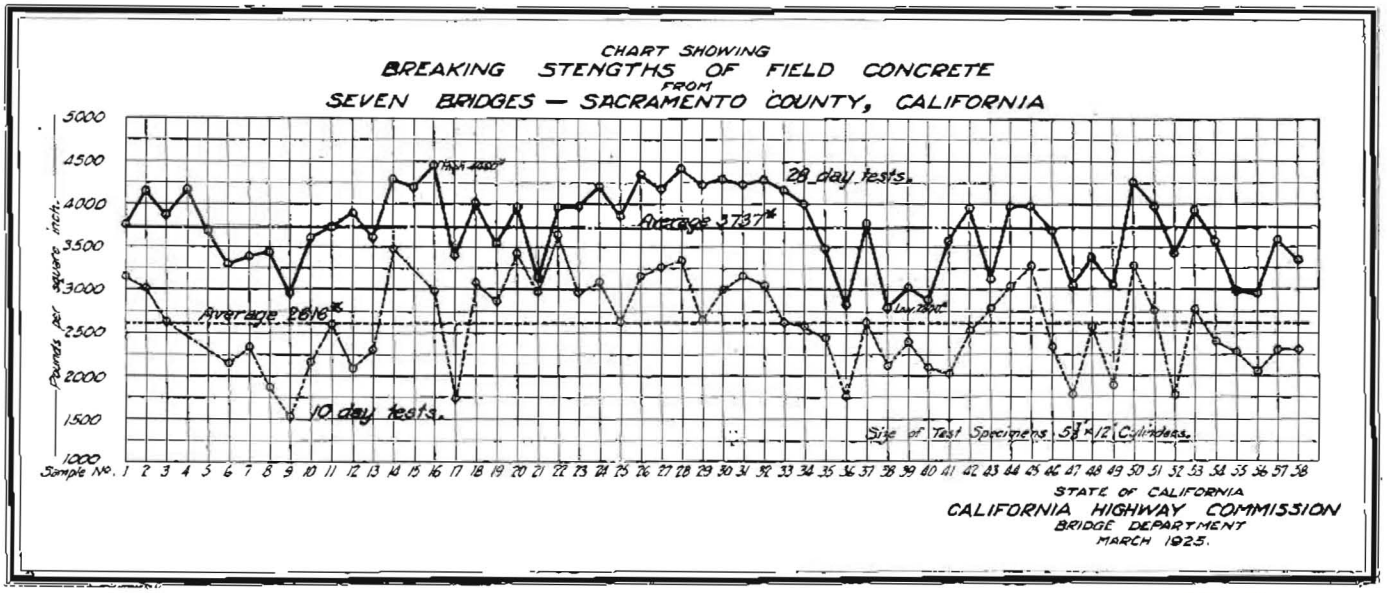
On the accompanying chart is plotted the results of field tests of concrete going into seven bridges on the state highway trunk line between Sacramento and Stockton (X-Sac-4-B). This chart is typical of our bridge concrete.

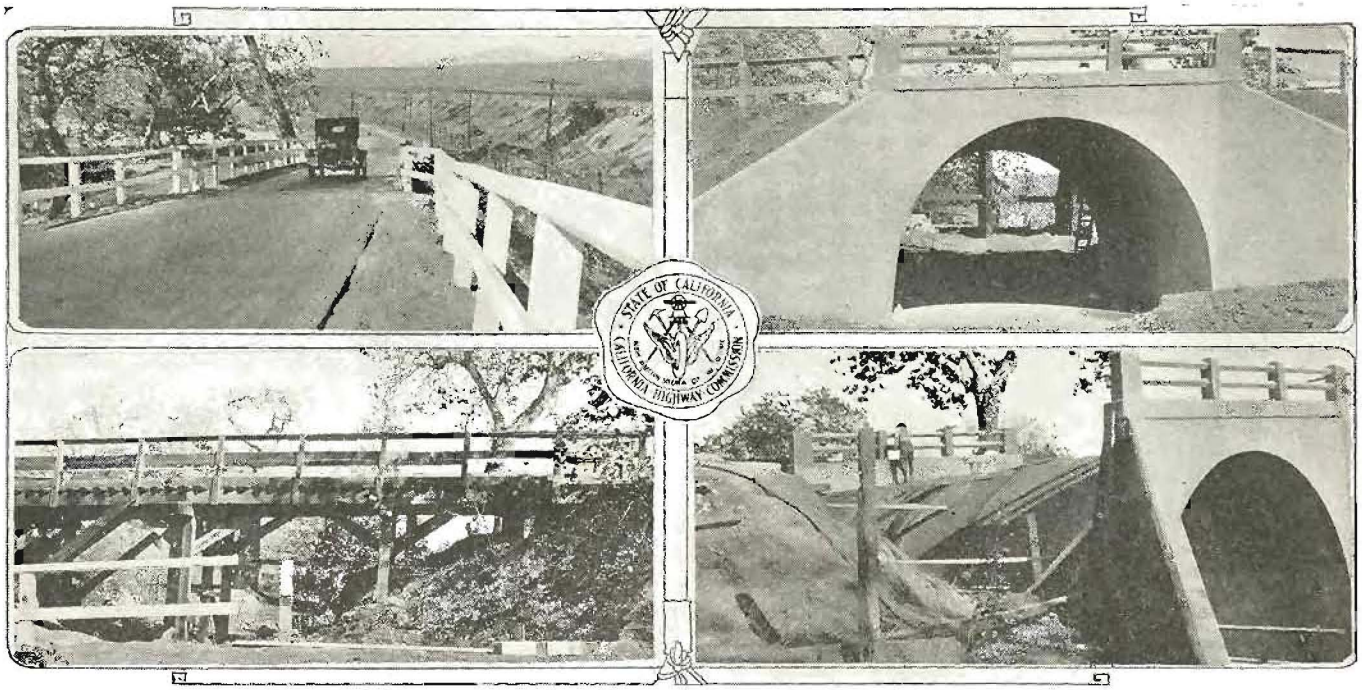
Tests Show High Strength Concrete.

If the average strength of concrete produced in the bridges covered by this chart were used as a basis for the allowable unit stresses in design, as recommended by the Joint Committee on Standard Specifications, the allowable stress would be 1500 pounds per square inch. If the lowest break, namely 2800 pounds per square inch, were used, the allowable unit stress for design in compression would be 1120 pounds. This compares favorably with the allowable unit stress of 650 pounds per square inch used in the design and approved in the committee's specifications.

The bridges covered in the chart were built under the supervision of A. J. Meehan, resident engineer, with D. C. Willett, assistant bridge engineer, assisting in the proportioning of aggregates. The tests were made by the testing laboratory under the supervision of C. L. McKesson, research engineer for the Construction Department, and E. T. Maddocks, testing engineer.

The contractors on this project were T. H. and M. C. Polk of Chico.





THE OLD AND THE NEW—At left, the old Sycamore Creek bridge on the Coast highway, north of Oceanside, San Diego County. RIGHT, new concrete structure which has taken its place. Note the narrowness and light construction of the old bridge which made it a menace to traffic. Plans by bridge department of the California Highway Commission.

SMITH RIVER HIGHWAY OPEN

THE TERRORS of Gasquet mountain, impassable mud in winter and a hard, dusty pull in summer, are ended forever for the user of the Crescent City-Grants Pass highway in Del Norte County. The new water level highway from Adams Station to Patrick's Creek has been opened to travel by Division I, eliminating the narrow, winding grade over the mountain.

The new section is now being surfaced but this work is not expected to seriously interfere with its use during the summer season. The building of this unit of the state highway was financed in part with forest highway funds, and the work was done under the direction of the Bureau of Public Roads, acting for the Forest Service. Between Patrick's Creek and the Oregon line, grading is now underway but it is not expected that this section will be ready for travel during 1925.

The new highway along Smith River, a stream of unusual beauty and undiminished flow, has a grade of approximately 1 per cent. Its opening greatly improves traffic conditions on the Grants Pass interstate connection.

PLAN CELEBRATION IN SOUTH

WITH the 8.2 miles of new grading and pavement between Huntington Beach and Corona Del Mar opened to traffic and in service, the Los Angeles and Orange County coast cities are planning another big road celebration to be held at Laguna about May 15th, to mark the completion of the grading on the coast state highway, between Corona Del Mar and Laguna Beach.

Orange County is now acquiring rights of way for the continuation of construction on this route between Laguna Beach and Serra, the southern terminus of the Oxnard-San Juan Capistrano state highway, better known in southern California as the Coast boulevard.

Heavy travel for this highway is predicted, as soon as it is completed, as it will provide not only a scenic drive along the ocean front but a means of avoiding traffic congestion in the up town sections of Los Angeles.

NEW SANTA ANA RIVER BRIDGE

(Continued from page 6)

S. V. Cortelyou, division engineer, was unable to attend owing to illness. He was represented by Assistant Division Engineers J. C. More and L. M. Ranson.

The new bridge is a combination reinforced concrete and steel structure 524 feet in length, consisting of two 21-foot and ten 35-foot spans of concrete with three middle spans of steel, each 60 feet long. The roadway width is 24 feet. The bridge was built by the McKay Engineering Company under contract with Orange County. The inspection was handled by the bridge department of the California Highway Commission, represented by Joseph Hodges as resident engineer. The cost of the structure was $63,131.

The new highway and bridge are important links in the Oxnard-San Juan Capistrano route added to the state highway by the 1919 bond issue.

Roads as we now construct them promote and develop interstate commerce.—*Senator Smith.*

The Nation must be looked on as a unit. Our policy is wise, is not to be abandoned. There is left no doubt as to what is the policy of the government as far as Federal Aid to the building of roads goes. It is a nonpartisan movement, or, rather, an omnipartisan movement, all parties favoring it.—*Senator Fess.*

Many Problems Involved in Highway Tree Planting

DURING recent months, 2643 shade and ornamental trees, furnished the commission by the state nursery at Davis, have been planted along the state highways of California. The work has been done by the maintenance forces, and represents replacements in previous plantings where trees have died during the recent dry season.

The trees received by the commission, according to the report of State Forester M. B. Pratt, are as follows:

Arizona ash 612; arborvitae 18; elms 35; eucalyptus 12; locust 885; poplars 340; sycamores 134; walnut 607. The market value of these trees the forester estimates at $1,000.

Plantings were made in the vicinity of the following communities: Redding, Fresno, Rio Vista, Gridley, Willits, Goshen, Rodeo, Petaluma, San Jose, Maxwell, San Juan Bautista. Red Bluff. Bakersfield, Sacramento, Arbuckle, Williams, Madera, Stockton, Merced, and Perkins.

Considering the lack of rainfall in many parts of the state for several seasons, the number of replacements necessary this year, 2643 out of approximately 30,000 plantings, is considered comparatively small and is indicative of the care given the trees by the maintenance men. The budget for tree maintenance for 1925 is $60,000.

Replacement is but one of many problems involved in the planting of trees along the highways. In past years, many trees have been planted by inexperienced persons and without proper supervision. Holes have not been dug to the proper depth or trees have been planted without blasting the hardpan, where such exists. In some locations it has proved exceedingly difficult to make trees live under these conditions, and the cost to the commission for watering plants and equipment has been considerable.

In other places, trees have been replaced too close to the existing pavement and will have to be removed when traffic demands widening of the roadway. To overcome these mistakes, the commission for several years has employed W. E. Glendenning, a tree expert, to supervise all plantings and to advise maintenance crews in the care of trees. The state forester assists with this work in an advisory capacity.

The commission has no funds available for extension of plantings and such as have been made have been the work of individuals and organizations interested in the beautification of the highways. The commission requires, in addition to the planting, a deposit of one dollar per tree for their care during the first year. After that they are maintained at state expense.

BIDS ASKED FOR IMPORTANT LINE CHANGE IN SOUTH

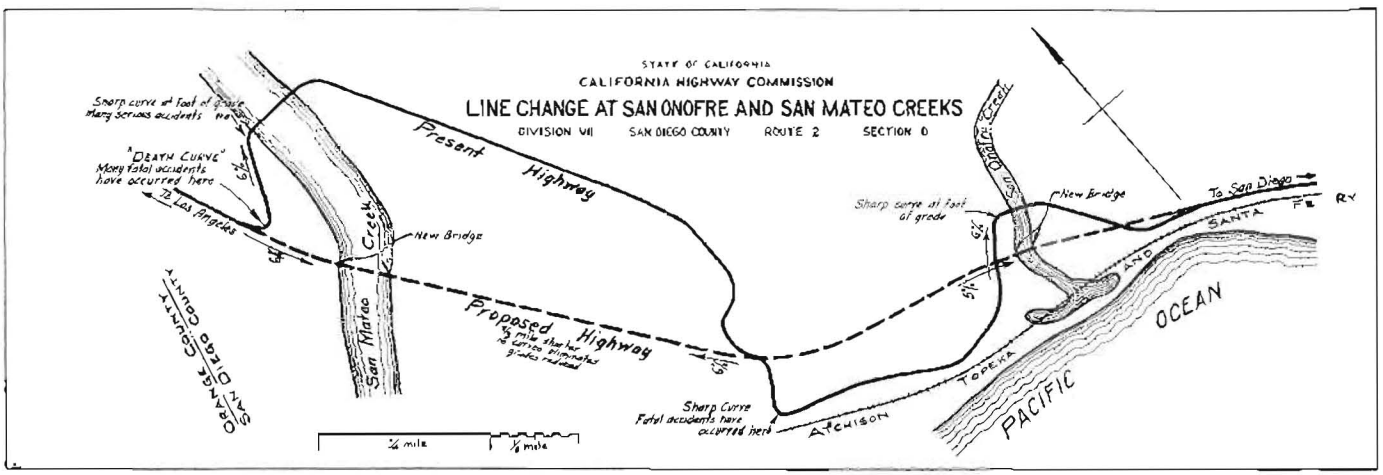
SHORTENING of the state highway two-thirds of a mile, elimination of sixteen curves and the reduction of grades are some of the results which will follow the rebuilding of the Coast state highway between San Onofre Creek and the northern boundary of San Diego County, bids for which have been asked by the commission. The most important feature of the project will be the elimination forever of sharp curves which have taken a heavy toll of human life.

In addition to the grading and paving of the highway on the improved alignment, as shown in the above map, new bridges will be built across San Onofre and San Mateo Creeks. Bids for these structures also have been asked and it is expected the work will be under way in the near future.

Original Pavement on County Grade.

When the highway was first paved along the San Diego coast it was placed on the roadbed originally graded by the county. Engineers of the commission for years have been hoping for the elimination of these death traps but until the gasoline tax became a law funds for the work were not available.

The grading and paving on the new line will be paid for out of the gasoline tax fund; the bridges will be financed with federal aid. San Diego County, however, has agreed during the next two years to refund to the state the cost of the structures.



MOTOR VEHICLE FUND CONTRACTS (Including Gasoline Tax Fund)

CONTRACTS COMPLETED SINCE JULY 16, 1924, OR UNDER WAY ON APRIL 6, 1925.

Cont. No.	Division	County	Route	Sec.	From	To	Miles	Type	Contractor	Estimated cost	Date Contract approved by Attorney General	Contract time, days
M-28*	V	San Benito	67	A	1-5 mile south of San Benito River	Pajaro River Bridge	3.04	Grading and Asphalt Macadam Surface	Granite Construction Co.	$87,184 71	Sept. 20, 1923	180
M-29*	I	Mendocino–Humboldt			Route 1			Painting 17 Bridges	Chas. L. East	11,453 48	Nov. 6, 1923	135
M-30*	III							Painting 5 Bridges	Jenkins & Elton	10,087 98	Nov. 20, 1923	90
M-31*	V	Monterey	2	I	Bridge across Salinas River at Nacimiento Station			Floor Repairs	Theo. M. Maino	22,270 75	Nov. 20, 1923	90
M-32*	II	Siskiyou	3	C	Hornbrook	Yreka	11 60	32,340' Guard Rail	Calvert & Calvert, Schroeder & Pearce	25,289 48	Dec. 1, 1923	100
M-33*	II	Siskiyou	3	C	¼ mile north Shasta River	Oregon Line	14.30	Grade and Gravel Surface	Dunn & Baker	351,360 00	Dec. 5, 1923	150
M-34*	VII	Los Angeles	4	D	Quail Lake	Northerly boundary	10.43	Grade and Widen Roadbed	Williams & Singletary	42,595 73	Jan. 17, 1924	150
M-35*	X	Sacramento	4	B	McConnell Station	Sacramento	13.03	Concrete Base	Kaiser Paving Co.	430,337 63	Jan. 17, 1924	200
M-36*	VII	San Diego	2	A & B	San Diego	Oceanside	18 7	Concrete Base	John & Bressi	550,688 77	Jan. 24, 1924	250
M-37*	II	Shasta	3	B & C	Bayha	Halfway Creek	9.92	Grade and Gravel Surface	Nevada Contracting Co.	553,442 76	Jan. 21, 1924	300
M-39*	VII	Los Angeles	2	B & C	Shoup Avenue	Westerly boundary	13.06	Grade and 11.56 miles Concrete Slab and shoulders	Geo. H. Oswald	431,831 37	Feb. 4, 1924	200
M-40*	VII	Ventura	2	A & B	Southerly boundary	Camarillo	13.50	Grade and 7.4 miles Concrete Slab and Shoulders	Sam Hunter	339,270 89	April 3, 1924	200
M-41*	IV	Santa Clara	5	A	Milpitas	Coyote Creek	3.84	Waterbound Macadam Shoulders and Asphalt Concrete Surface	Federal Paving Co.	90,318 84	April 11, 1924	90
M-42*	VII	Los Angeles	2	D	Pasadena Avenue	Montebello	2.78	Concrete and Asphalt Surface	Geo. H. Oswald	189,216 71	April 29, 1924	150
M-43*	X	Sacramento	4	B	Old Elk Grove	Sacramento		Twelve Bridges	T. H. & M. C. Polk	47,052 24	May 9, 1924	100
M-44*	X	Solano	7	D	Vacaville	Batavia	8.20	Concrete and Asphalt Pavement	Foree & Currigan	250,961 51	May 27, 1924	175
M-45*	VII	Orange	2	A	Easterly boundary	San Juan Bridge	9 45	Widening Roadway	Williams & Singletary	37,424 60	June 4, 1924	150
M-46*	IV	Marin-Sonoma	8	A	Across Petaluma Creek			Painting Bridge	Jenkins & Elton	4,768 60	June 24, 1924	60
M-47*	IV	Contra Costa	14	A	Garrity Creek Bridge			Reinforced Concrete Bridge	John Phillips	4,690 75	June 17, 1924	60
M-48*	I	Lassen	29	C	Susanville	Johnstonville	4.54	Asphalt Macadam Pavement	T. H. & M. C. Polk	50,851 22	June 23, 1924	120
M-49*	IV	San Mateo	2	B	Redwood City	Southerly boundary	3.46	Shoulders and Asphalt Concrete Surface	Freeman & Whiting	132,215 77	June 23, 1924	120
M-50*	X	Sacramento–San Joaquin	4	A & D	Dry Creek Bridge			Floor Repairs and Painting	M. B. White	15,785 68	June 16, 1924	100
M-51*	II	Shasta	3	A	Olney Creek, Clear Creek and China Gulch Bridges			Painting Bridges	J. A. Mohr & Sons, Inc.	5,001 65	June 20, 1924	90
M-52*	IV	Alameda	5	A	Greenville	Livermore	4.33	Portland Cement Concrete Shoulders	W. A. Dontonville	54,528 46	June 23, 1924	75
M-53	VII	Ventura	2	F & G	Sea Cliff	Rancho El Rincon	1.20	Sea Wall	The J. H. Tilman Co.	429,865 31	June 23, 1924	500
M-54*	X	Solano	7	B	Rockville	Fairfield	3.96	Gravel and Portland Cement Concrete Shoulders	Tibbals, Percival & Cress	48,283 94	July 8, 1924	90
M-55*	V	San Benito	67	A	San Juan Creek Bridge			Reinforced Concrete Bridge	Rocca & Caletti	4,835 34	July 14, 1924	75
M-56*	X	San Joaquin	5	A	Westerly boundary	Banta	8.07	Asphalt Concrete Pavement	Valley Paving & Const. Co.	178,709 90	July 17, 1924	120
M-57	II	Shasta	3	C	Halfway Creek	Dog Creek	10.84	Grade and Gravel	Nevada Contracting Co.	454,628 25	Jan. 29, 1925	300
M-58	VII	Los Angeles	2	D	Rio Honda Br.			Sidewalk	Kurt O. Wetzel	3,722 06	Jan. 20, 1925	100
M-59	III	Glenn	45-7	A	Central Irrigation Canal			Concrete Culverts	Otto Parlier	17,195 63	Jan. 15, 1925	60
M-60	X	Amador	34	C	Jackson	Three miles East	2.62	Grading	R. N. Murdoch	18,171 86	Jan. 24, 1925	100
M-61	VIII				San Bernardino			Maintenance Shop	Houghton & Anderson	27,937 13	Feb. 24, 1925	65
M-62	III–X	Yolo	6-7	A	Southerly boundary	Woodland	12.79	Concrete Shoulders	Kaiser Paving Co.	152,904 02	Mar. 23, 1925	150
M-63	II	Shasta	3	C	Salt Creek			Bridge	Nate Lovelace	19,386 34	Mar. 27, 1925	150
M-64	VI	Merced	4	C & D	Merced River	Buhach	6.4	Concrete 2d Story	H. H. Peterson	156,844 97	Mar. 23, 1925	150
M-65	X	San Jose	4	A & B	Southerly boundary	Turner Station	11.55	Concrete Pavement and Shoulders	J. F. Knapp	290,851 88	Mar. 31, 1925	175
M-66	X	San Jose	5	B	At Mossdale			Bascule Bridge	McKay-Schruth Eng. Co.	217,857 25		300
						Subtotal	201 10			$5,759,901 42		
					PENDING AWARD—							
	VI	Fresno	4	C	Two miles north of Fresno	Herndon	5.94	Concrete Shoulders		$45,685 91		90
	III	Sacramento	3	B	W. P. Crossing			Undergrade Crossing		44,881 88		125
	III	Sacramento	3	B	S. N. Crossing			Undergrade Crossing		23,319 00		125
	I	Humboldt	1	E	Eel River Bridge			Sidewalk and Pavement		19,890 00		100
						Subtotal	5.94			$133,776 79		
						Total Motor Vehicle Fund	207.04			5,893,678 21		
						Grand total	430.28			$14,128,752 91		

NOTE—The above obligations charged against the motor vehicle and gasoline tax funds do not include funds from these sources obligated for general maintenance and for specific betterments not being done under contract.
*Completed.

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

CONTRACTS COMPLETED SINCE JULY 16, 1924, OR UNDER WAY ON APRIL 6, 1925.

Cont. No.	Division	County	Route	Sec.	From	To	Miles	Type	Contractor	Estimated cost	Date Contract approved by Attorney General	Contract time, days
331*	V	S. L. Obispo-M.	56	A	6 miles north of San Simeon	Salmon Creek	12.30	Grading	Blake & Heaney	$316,825 26	Oct. 21, 1921	300
377*	I	Humboldt	1	J	Trinidad	Freshwater Lagoon	16.53	Grade and gravel	Pacific Construction Co.	604,408 60	July 12, 1922	325
395*	V	Monterey	56	E	Anderson Canyon	Sur River	13.06	Grading	George Pollock Co.	1,076,049 19	Sept. 12, 1922	400
414	VII	Ventura	60	A	Heuneme Road	Rindge Ranch	11.44	Grade and gravel	Hauser Const. Co.	880,517 82	Dec. 29, 1922	450
419*	IV	Nevada	37	C	Donner Summit	Donner Lake	3.32	Grading	Wilmshurst & Manetas	104,965 02	Jan. 19, 1923	200
427*	II	Lassen-Plumas	29	A	3 miles east of Chester	3 miles east of Westwood	12.66	Gravel Surface	T. H. & M. C. Polk	69,788 11	Oct. 13, 1923	250
431*	II	Shasta	3	B	Redding	Bayha	9.88	Concrete Base	Kaiser Paving Co.	453,708 75	Dec. 29, 1923	250
432*	III	Nevada	38	A	Truckee	Boca	7.22	Grading	Irey & Holden	118,707 68	Jan. 24, 1924	300
433*	IV	Sonoma	51	B	Beltane	Schellville	11.50	7.23 miles Grade and Gravel Surfacing—4.27 miles Concrete Base	Galbraith & Janes	325,896 00	Jan. 26, 1924	250
434*	II	Tehama	3	D	Los Molinos	Red Bluff		Six Reinforced Concrete Bridges	McKenzie & Pollard	45,076 68	Jan. 24, 1924	300
435*	VII	Orange	60	A & B	Huntington Beach	Corona Del Mar	8.20	8.20 miles Grading—3.52 miles Concrete Base	W. F. Beal	208,344 00	Jan. 30, 1924	200
436*	V	Monterey	2	F	Across San Lorenzo Creek			Reinforced Concrete Girder Bridge	Rocca & Caletti	31,636 79	Jan. 30, 1924	275
437*	IV	Santa Clara	82	B & C	Across Cedar Creek and North Fork Pacheco Creek			Reinforced Concrete Bridges	John Simpson & Co.	41,849 92	Feb. 29, 1924	150
438*	VIII	Imperial	27	B	Sand Hills	Colorado River	14.05	Grade and Gravel Surface	Kisselburg, Schmidt & Hitchcock	202,360 24	Mar. 3, 1924	200
439	IV	San Mateo	55	C	Half Moon Bay Road	La Honda Road	12.36	Grade and Gravel Surface	J. P. Holland	584,968 91	Mar. 24, 1924	175
440	I	Humboldt	1	F	Across Van Duzen River near Alton			Reinforced Concrete Bridge	Bordwell & Zimmerman	110,937 25	April 23, 1924	250
441*	II	Lassen	27	C & D	Janesville	4 miles west of Milford	9.71	Gravel Surface	Warren Construction Co.	52,663 13	May 5, 1924	200
442	III	Placer	37	C	¼ of a mile north of Colfax	Gold Run	8.03	Grading	C. R. Adams	345,096 05	June 20, 1924	450
443	I	Del Norte	1	A	Klamath River Bridge			Reinforced Concrete Bridge	F. Rolondi	440,707 50	July 8, 1924	450
444*	I	Humboldt	1	G & H	Eureka	Arcata	6.45	Concrete Pavement	J. F. Knapp	273,896 44	July 17, 1924	150
445	III	Nevada	38	B	Boca	Floriston	5.32	Grading	Irey & Holden	300,869 20	July 25, 1924	300
446	III	Nevada	38	A	Across Truckee River about 1 mile north of Polaris			Reinforced Concrete Bridge	Proctor & Cleghorn	56,728 13	Aug. 8, 1924	150
447*	II				Redding			Division Office	J. P. Brennan	22,152 02	Aug. 8, 1924	90
448	IV	San Mateo	68	B	South San Francisco	Broadway Station	5.21	Grading	D. A. Foley & Co.	387,000 00	Aug. 19, 1924	300
449	VII	Orange	60	B	Corona Del Mar	Boat Canyon	5.56	Grading	W. D. McCray	150,834 37	Sept. 5, 1924	150
450	II	Lassen	29	A, C & E	Across Robbers, Baxter and Long Valley Creeks			Bridges	Lord & Bishop	21,967 88	Oct. 1, 1924	100
451*	III	Butte	47	A	2.5 miles northwest of Chico	Sacramento Ave.	1.72	A. C. Pavement	Chico Contracting Co.	30,420 17	Sept. 24, 1924	60
452	II	Lassen	28	A	Pit River			Seven Bridges and Weir	Horn, Hart & Savage	56,325 98	Sept. 24, 1924	150
453	VI	Kern	57	E	Cottonwood Creek			Bridge	J. L. Webster	32,962 50	Oct. 9, 1924	100
454*	III	Butte	3	B	Cherokee Canal			R. C. Bridge	R. B. McKenzie	15,017 46	Sept. 26, 1924	75
455	X	Solano	53	A	2 miles east of Suisun	Denverton	6.91	Grading	Leventon & Heintze	21,708 00	Oct. 19, 1924	75
456	III	Colusa	15	E	½ mile west of Freshwater Cr.	Williams	6.87	Grade and Gravel	Giddings and Whyte	72,138 92	Oct. 16, 1924	200
457*	VII	San Diego	2	C	Sycamore Creek			R. C. Bridge	H. H. Peterson	9,299 81	Oct. 30, 1924	80
458	VIII	San Ber.-Riv.	26	B-A	1-3 mile north San Ber. county line	Beaumont	7.10	Concrete Pavement	Basich Bros. Co.	212,594 96	Dec. 2, 1924	150
459	V	San Luis Obispo	33	B	Simmons Creek			Bridge	C. C. Gildersleeve	5,745 15	Dec. 2, 1924	90
460	VIII	San Bernardino	31-58	F-E	½ mile west of Barstow	1 mile east of Barstow	2.32	Grading	H. M. Henning	15,046 83	Dec. 29, 1924	60
461	VIII	Imperial	27	B	Yuma Project Main Canal			Timber Trestle	W. M. Ledbetter & Co.	7,371 00	Dec. 29, 1924	90
462	VI	Madera	4	C	Chowchilla River			R. C. Bridge	Proctor & Cleghorn	13,348 13	Dec. 29, 1924	100
463	VII	Los Angeles	60	A	Arroyo Sequit	Los Flores Canyon	16.13	Grading	S. Wright Jewett	282,008 50	Mar. 2, 1925	300
464	VIII	Riverside	26	C	San Gorgonio Wash			R. C. Bridge	De Witt & Morine	18,993 38	Mar. 23, 1925	125
465	VIII	Imperial	26	F-G	Imperial	Brawley	9.39	Grade and Gravel	H. G. Fenton	113,547 83		175
						Total	223.24			$8,235,074 70		
						PENDING AWARD—None.						

NOTE.—Primary construction covered by the above contracts does not include funds obligated on cooperative forest highway projects or prison road camp activities.
*Completed.

WHAT THE DIVISIONS ARE DOING

LARGE RECONSTRUCTION PROJECTS IN DIVISION II COMPLETED AND ACCEPTED

TWO LARGE reconstruction projects on the Pacific highway in Division II, which have been under way since last summer, have been completed and accepted. They are the Dunn and Baker contract for widening and straightening fourteen miles of the Pacific highway immediately south of the Oregon line and the contract of the Nevada Contracting Company for similar work on ten miles between Bayha and Half Way Creek.

During 1925 it is probable only one widening contract will be under way on the main line in Division II, that of the Nevada Contracting Company for work between Halfway Creek and Dog Creek, in northern Shasta County.

Surveys Progressing.

Survey work for the straightening of the remainder of the highway through the Sacramento canyon is progressing rapidly and will be completed during the present year.

Plans are being made to treat the newly graded sections of the highway with calcium chloride. With a smooth surface on the two big contract jobs of last year and ten miles of new pavement open north of Redding, traffic conditions between Redding and the Oregon line during the coming summer should be much improved over last year.

Mountain Routes Open.

Maintenance forces have been busy removing slides and have all routes in the division open to traffic with the exception of the Susanville lateral and the Trinity lateral, west of Weaverville. The latter route is closed by the washout of a bridge over Trinity River at Cedar Flat.

Plans have been completed to erect a temporary structure at this point as soon as the spring rains have ceased and danger of further high water has passed. By the time this is in print, it is probable the Susanville lateral will have been opened to traffic.

Beautification of the grounds about the new division headquarters in Redding is now being completed. Trees and shrubbery have been set out and a lawn planted.

FINAL PLANS UNDER WAY FOR LAST LINK IN TRUCKEE CANYON

DIVISION III reports relocation of the Truckee River highway is under way between Floriston and the Nevada state line, grading of which has been included in the commission's budget for 1925. Many problems are involved because of the prior location of the Southern Pacific railroad through the canyon, power company ditches and the like. The work is in charge of W. H. Irish.

Grading operations have been resumed on the Tahoe-Ukiah highway, west of Williams, where work was suspended during the winter months. Giddings and Whyte are grading 6.9 miles which will be surfaced by Colusa County.

With the coming of spring weather grading operations between Colfax and Gold Run and between Boca and Floriston, in the Truckee canyon, are going ahead with greater rapidity. Both contracts are about half completed.

North Sacramento Fill Under Way.

Work is progressing on the building of the fill at the north end of the American River bridge, North Sacramento, the first step in the elimination of two dangerous railroad grade crossings at this point. A dredger is pumping sand from the river for the fill.

Recent flood damage on the Oroville-Willows lateral, in Glenn County, and on the Chico-Orland lateral, in Butte County, has been repaired and traffic over these routes resumed.

In Glenn County, 7½ miles of the Willows-Glenn section have been resurfaced with fine crushed rock, two inches thick and twelve feet wide.

Ditches have been dug for a mile along the Auburn-Nevada City lateral to better drainage where storm water has been affecting the oil macadam base.

The division has now completed the shaping and rocking of 45.9 miles of shoulders, largely on routes through the Sacramento Valley.

SAN JOAQUIN WORK STARTS.

H. H. PETERSON, awarded the contract for the repaving of 6.4 miles of the trunk highway in Merced County, started grading early in April and expects to begin paving operations about May 1st. Division VI is glad to get this urgently needed reconstruction work under way.

State forces are engaged in placing rock shoulders alongside the fifteen-foot pavement for a distance of 4¼ miles between Goshen and Visalia, Tulare County.

GRADING OF COAST ROUTE THROUGH MALIBU RANCH WELL UNDER WAY

EXCELLENT progress is reported by Division VII on the grading of the sixteen-mile unit of the Coast highway through the Malibu Ranch north of Santa Monica, Los Angeles County. S. Wright Jewett, the contractor, recently moved in a new gasoline shovel which is now in operation.

Williams and Singletary, subcontractors on this project, have a new P and H shovel and a number of head of stock at work.

On the Hauser contract farther north along the Ventura coast, smoothing and finishing of the roadbed is now under way. Line changes are being made at Point Mugu and at Pelican Point. Additional steam shovel work is required by a recent slide in Big Sycamore Canyon.

Construction on the McCray contract, at the southern end of the Oxnard-San Juan Capistrano route, is nearing completion. A few culverts remain to be finished. This work extends from Corona Del Mar to Laguna Beach, along the Orange County coast.

NEWS FROM DIVISION X.

SURFACING of the Denverton-Suisun section of the Rio Vista lateral has been resumed with the coming of good weather. The work is being done by the county. the state having done the grading.

Reconstruction of two curves on the main line highway between Dixon and Putah Creek with the addition of standard superelevation is now under way. Repaving of these curves and resurfacing of the Putah Creek-Winters Y section soon will be completed.

Rebuilding of two bridges across the south fork of the Tuolumne River, on the Big Oak Flat road into the Yosemite, and the replacing of two small wooden bridges on the same route with metal pipe culverts is about completed. The earth backfill necessary has been secured by daylighting nearby points.

Laterals Being Improved.

Daylighting of sharp turns on the Jackson-Ione road and the Sonora lateral between Jamestown and Knights Ferry is recent maintenance work of the division.

Graveling is under way on sections of the Alpine state highway east of Pine Grove, Amador County.

Maintenance funds have been allotted for placing wheel guards on several concrete bridges in Solano County and for extending box culverts in the same county. Both are safety measures.

Funds also have been allotted for placing crushed rock shoulders on six miles of highway in Solano, Yolo, and San Joaquin counties.

Drift carried against the Sacramento River bridge at Rio Vista during the highwater of last winter disclosed a number of weak piles. Funds have been allotted to make repairs.

Raising of the wing walls at the Paradise Cut bridge between Mossdale and Banta, San Joaquin County, will be under way shortly. Wheel guards also will be placed.

BRIDGE DEPARTMENT NEWS

THE NEW Van Duzen River bridge in Humboldt County, opened to traffic last month, is receiving much favorable comment from users of the Redwood highway. Albert A. Lernhart was resident engineer on this project.

Proctor and Gleghorn have resumed construction operations on

the Polaris crossing in the Truckee River canyon, Nevada County, after a layoff of several months, due to winter weather.

Horn, Hart and Savage are again at work on the bridges being built over overflow channels of Pit River on the Alturas lateral in Big Valley, Lassen County.

The new Sycamore Creek bridge, north of Oceanside, San Diego County, has been completed and opened to traffic. This structure was built under the direction of Division Engineer S. V. Cortelyou.

Progress on Newport Bay Bridge.

Construction is progressing rapidly on the new state highway bridge over the north arm of Newport Bay, on the Coast boulevard, Orange County.

Completion of the bridge, which is a contribution of Orange County to the state highway system, will remove the necessity for using the ferryboat when crossing the bay at this point. The state is supervising construction. J. B. Hodges is resident engineer.

The new bridge on the westside state highway at the Willows city limits, Glenn County, has been completed and opened to traffic. The county cooperated with the state in financing the work. An arch with the word, "Willows," in large letters is a feature of the bridge

THE HIGHWAY ENGINEER'S CREED

I BELIEVE that transportation is the keynote of the structure of civilization which is built of school, and church, and court, and market place, upon the twin foundations of the home and productive industry.

I believe that highway transportation is a necessary and integral part of this connecting stone in civilization's arch and is co-equal with other forms of transportation in sustaining the body of the structure.

I believe that my mission, as a highway engineer, is to assist in shaping and improving the highways of my country, in harmony with those who provide the vehicles which are their necessary complement, to the end that joined with other means of transportation, they may meet the need of our people for easy, quick and untrammelled transportation.

—*Public Roads.*

AIR CLEANERS TRIED OUT

(Continued from page 5.)

While, as stated above, these tests were inconclusive as to the relative merits of the different cleaners tested, it is believed that they have shown that some sort of an air cleaner is a very desirable adjunct to an internal-combustion engine used under severe dust conditions. The advantage is, of course, much less marked in vehicles used mostly on hard-surfaced roads, where comparatively little dust is encountered.

It appears from the results of the test that several makes of cleaners now on the market are capable of efficient dust-separation, and the problem seems to be rather one of selecting cleaners which require a minimum of attention, with due consideration of the ease of installation, cost of renewals, etc.

Additional Tests Planned.

It is planned to conduct further experiments during the coming season along these lines, without attempting any very great degree of accuracy in the measurements of actual wear, and also to make some "endurance tests" on various cleaners, by installing them on several different vehicles, and observing how long they will function satisfactorily without attention.

No small part of the burden of conducting these tests fell upon Professor Hoffman and his associates of the College of Agriculture, and credit should be given them for the results obtained.

HAYWARD CHAMBER OF COMMERCE APPROVES WIDENING WORK

THE MAINTENANCE forces of Division IV recently completed the widening of the shoulders along the state highway between Haywards and Niles, in Alameda County. The work was done with decomposed rock. That it met with the approval of citizens directly in contact with the work, is evidenced from the following letter received at the headquarters of the division:

HAYWARD CHAMBER OF COMMERCE
HAYWARD, CALIFORNIA

March 17, 1925.

JNO. H. SKEGGS, Division Engineer,
California Highway Commission,
San Francisco, Cal.

DEAR MR. SKEGGS: The Hayward Chamber of Commerce (500 members) take this means of showing our appreciation of the great work that your organization has done for the traveling public of the bay region in widening the highway from Hayward south. It is a work that is appreciated more and more each day by motorists and property owners of this entire section of the bay region.

We hope that in the near future you will be able to continue the work.

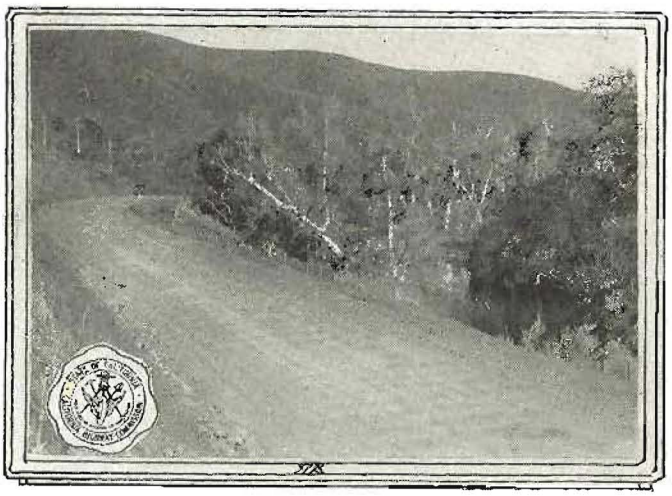
By order of the Board of Directors.

(Signed) W. W. HALEY,
President.

JACOB HARDER, JR.,
Secretary.

HIGHWAY ESSAY CONTEST.

"Economics Resulting from Highway Improvement" is the subject this year of the annual essay contest conducted under the auspices of the Highway Education Board with headquarters in Washington, D. C. May 1st is the closing date for the contest, the national winner of which will receive the Harvey S. Firestone four-year college scholarship.



A MODERN LATERAL HIGHWAY—Scene along Pacheco Creek, on the Pacheco Pass lateral. (Photo by Division IV.)

NEW REPORT FORMS FOR RESIDENT ENGINEERS ISSUED

By H. A. Waterman, Construction Department.

IN CONFORMITY with plans outlined by the State Highway Engineer, the Construction Department has prepared and distributed to the divisions a supply of new forms for the use of resident engineers in the preparation of daily reports. The new forms take the place of those that have been in use since the inception of state highway construction. The old forms required many hours of work in the preparation of reports of little practical value; this time may now be devoted to more beneficial uses.

The new forms are simply daily memorandums of the work performed by the contractor, labor and equipment days only being noted. The old laborious task of keeping a record of what the resident engineer thinks the contractor is spending on his work is abolished, but provision is made for reporting the job's progress and, except for grading work, an accurate daily record is kept of the pay quantities. From the latter, the resident engineer is able to quickly make up his progress pay estimates.

Must Obtain Schedules.

To provide a means of estimating the contractor's cost, should occasion demand, the resident engineer is required to obtain a schedule of labor and equipment rates at the inception of each job and thereafter when new equipment is put in use or rates materially changed. This schedule, with the daily memorandums, complete the file.

The new forms are convenient, pocket-size printed pads and are held, check-book fashion, in a detachable leather folder. Each major work item, or related work items, is covered by a separate form, and the assistant assigned to that particular work may readily make out his report each night when the work shuts down and hand it to the resident engineer.

On large construction jobs, this system permits the resident engineer to devote his time exclusively to overseeing the work and to solving the many construction problems constantly arising; and last but not least, makes it possible for him to have a Sunday to himself once in a while.

For the present, the oil daily and weekly reports are required on all day labor work.

VISITORS FROM NEW ZEALAND.

C. J. McKenzie and J. R. Marks, engineers of the Public Works Department of New Zealand, spent some time during the month inspecting California state highways. At headquarters, they visited the shops and laboratory and discussed construction methods with heads of departments. They were also greatly interested in the California plan for the employment of convict labor on state highway construction.

ENGINEER COMMENDS HIGHWAYS.

T. J. Wasser of Newark, New Jersey, former state highway engineer of that state, was visitor at the headquarters of the commission recently. He commended state highway maintenance in California and expressed much interest in reconstruction methods in use by the department.

MORE REDWOOD TO BE SAVED ALONG HIGHWAY IN HUMBOLDT

THE SAVING of a considerable additional acreage of very desirable redwoods bordering and near the state highway in Humboldt County seems probable as a result of the activities of the Save the Redwoods League. In a recent announcement, the league says:

> "Probably the greatest single achievement yet announced by the Save the Redwoods League is the raising of a fund in excess of $750,000, with which it is expected it will be possible to save the Dyerville Flats and a portion of Bull Creek Flat. These groves, located at Dyerville, Humboldt County, near the northern limit of the present Humboldt State Redwood Park, are among the very finest in existence. The preservation of the Bull Creek and Dyerville Flats is essential to the proper rounding out of the first unit of the Humboldt State Redwood Park.
>
> "The League has reached a satisfactory basis for negotiations with the Pacific Lumber Company, owners of these matchless tracts of redwoods, and through the mediation of Major David T. Mason, noted forestry expert, a plan is being worked out whereby these areas will be preserved for park purposes, with assurance that the owners will receive a fair price for their timber and that the plan of preservation will involve the minimum inconvenience to the company in its logging operations."

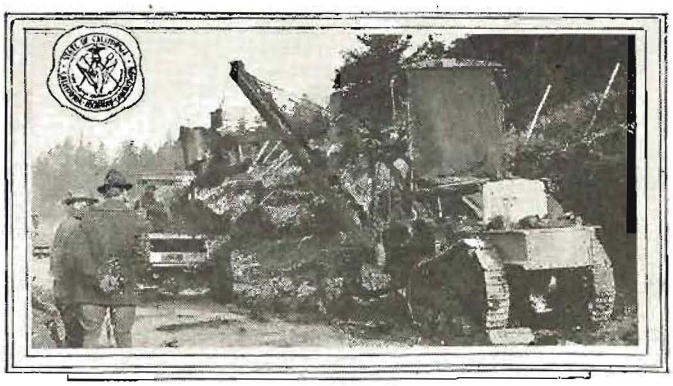
NEW EXCAVATOR TRIED OUT

THE new light type excavator, purchased in January for use in moving slides on the Redwood highway, Division I, from all reports, is proving a satisfactory piece of equipment. It was in use for 172 hours in January and handled over 3800 yards of material, or an average of about 22 yards per hour, at an average cost (including hauling and dumping the excavated material) of 47 cents per yard. However, this was exceptionally easy digging and a short haul.

During the first ten weeks the excavator was in operation—including the above quantities—it handled 7312 yards of material, at an average cost of 57 cents per yard. It has loaded as high as 267 yards in one day of eight hours.

The outfit is light and compact, weighing only 13,000 pounds. It can be loaded on a trailer for hauling from place to place without exceeding the legal load limit. It is of the Insley-Fordson make.

A second machine has been ordered by the Equipment Department for use in the south end of Division I.



NEW EQUIPMENT ON THE REDWOOD ROUTE—Insley-Fordson excavator at work near Trinidad, Division I.

CALIFORNIA HIGHWAYS

OFFICIAL PUBLICATION OF THE
CALIFORNIA HIGHWAY COMMISSION
SACRAMENTO, CALIFORNIA

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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HIGHWAY NEWS NOTES

To Head Survey Party.

H. K. WARD, who has been doing desk work in Division II headquarters during the winter months, will head a party in Trinity County in the near future.

E. H. Wier, for six years draftsman in Division II, has resigned and moved to southern California.

News From Division III.

J. C. North, maintenance superintendent in Division III and an employee of the commission since 1918, has resigned to accept a position with a powder company. He will be located in Reno, Nevada.

H. C. Darling, resident engineer, has been granted a year's leave of absence requested because of the illness of his father.

Miss Rose Milligan, clerk and cashier in Division III, has transferred to the children's bureau of the State Board of Control.

Division Engineer F. W. Haselwood was a speaker recently before a meeting in Placerville of the American River Home Owners' Association. He told of the plans of the commission for the improvement of the Placerville route to Lake Tahoe.

Engineers Assigned.

DIVISION VII reports C. V. Kiefer and J. P. McAndrew have been assigned as assistant resident engineers to the Jewett grading contract on the Coast boulevard through the Malibu Ranch.

Grant Resigns.

George D. Grant, superintendent of the prison road camp on Smith River, Del Norte County, has tendered his resignation, effective June 1st. Mr. Grant plans to build a wharf at Crescent City to be used as a public utility. He has been a prison camp superintendent for four years.

Joseph L. Richmond and C. F. Oliphant, assistant resident engineers, have been transferred from Division I to reconstruction work near Livingston, in Division VI.

W. K. Reed, for the past year resident engineer on the Merced River convict job, has been assigned to reconstruction work in Fresno and Kern counties.

J. W. Greely and M. H. Reed have been reappointed rodmen on the Kern River canyon project.

The principle of this legislation (Federal Aid) is the establishment of national routes, reduced transportation cost of postal service, transportation of farm products to market—products of the manufacturer to the farm.—*Senator Phipps.*

HIGHWAY ENGINEERS PROTECT TAXPAYERS

NOW AND THEN we hear someone complain about the high cost of engineers employed on our roads, says *Colorado Highways,* a state publication, and a word or two of explanation may not be amiss.

In the first place, to have good roads—and good roads means modern roads—roads that will sustain modern traffic—it requires the services of good engineers. The old system of building a road by the winding route was scrapped long ago.

Today roads are built as straight as possible and over the shortest route possible between two given points. Modern traffic demands that they be built on easy grades. To get easy grades and good alignment necessitates the employment of engineers.

Engineers are the best protection the taxpayer has in getting his money's worth in roads. Thousands of dollars are saved the traveling public in reduced travel costs on the roads now being constructed.

Not every road that is surveyed is actually built. Sometimes it is necessary to make two or three surveys to find the cheapest and best route. Surveys are necessary to eliminate costs. A prominent railroad chief engineer in his instructions to field men says that a survey intelligently made, but not used, is just as valuable to his road as one that is used.

The engineer is the agent of the people. He is on the job every minute from the time a project is started until it is finished, and sees to it that the people get their money's worth.

THE JOKE WAS ON THE GAME WARDEN

FRANK A. GREENE, deputy fish and game commissioner for the Sacramento River Canyon district, recently made a special week end stay in the neighborhood of Lamoine to nab offenders.

Getting out at the crisp hour of 5 o'clock, he was on the scene of supposed illegal operations by daylight, waiting for the evildoers. Soon, he saw a group of men hurrying along with poles and other supposed fishing equipment on their shoulders.

Greene crawled on his stomach through the brush for a hundred yards. When he had the drop on the supposed culprits, he ordered them to give themselves up. A surprised laugh greeted his command. Greene scrambled to his feet, and for the first time saw the equipment belonged to engineers of the California Highway Commission, headed by Chief of Party E. L. Seitz.

Abashed, the warden shook hands and scurried away.

New maintenance station, repair shop and warehouses recently completed at Red Bluff—This is one of the major maintenance stations of Division II. Maintenance funds build these permanent state-owned stations. (Photo by Division II.)

The map above does not show all of the state highways in California but only those included in the federal aid system, representing approximately 7 per cent of the total road mileage of the state, outside of cities.

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