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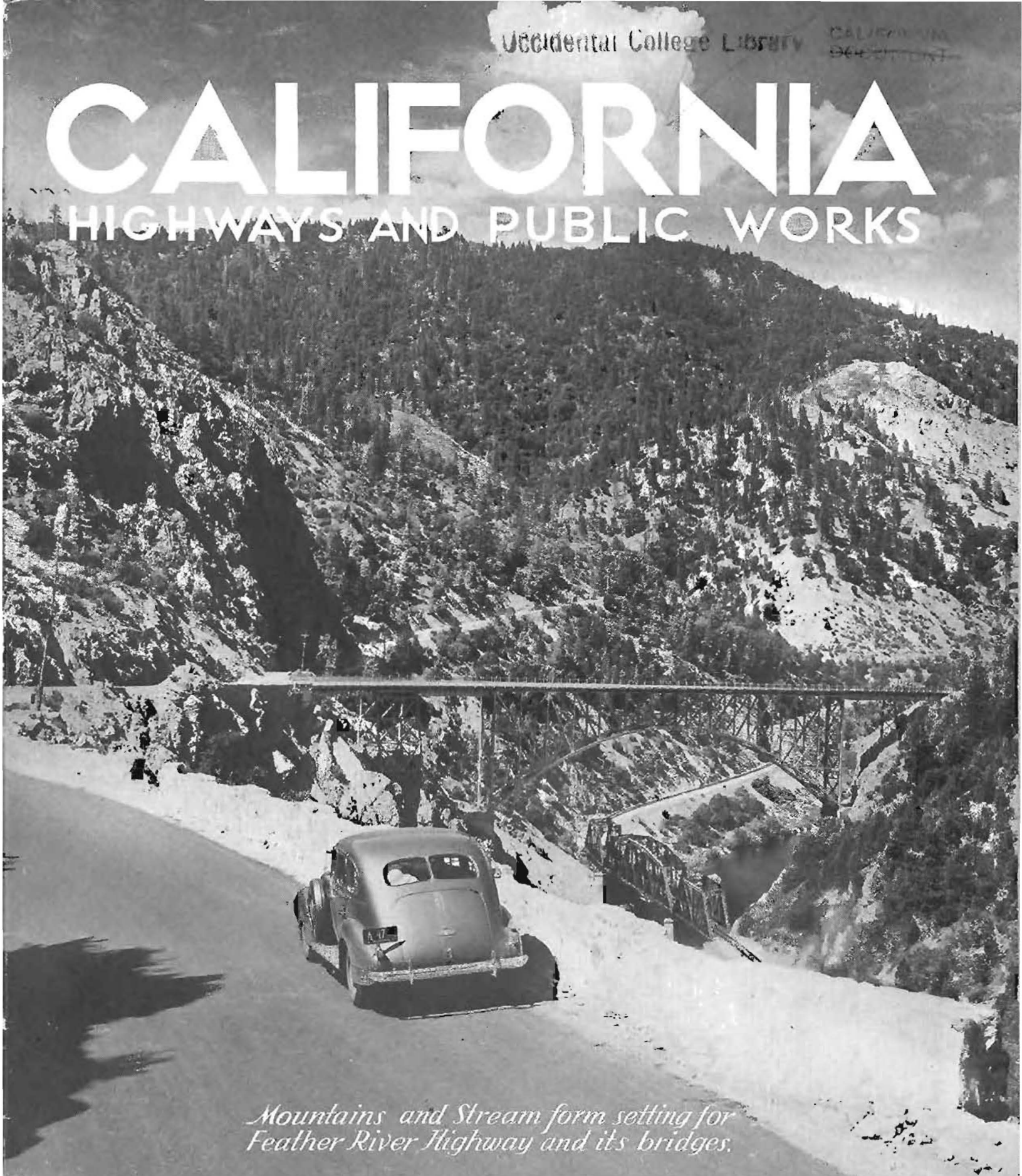

Mountains and Stream form setting for Feather River Highway and its bridges.

Official Journal of the Department of Public Works

AUGUST · 1937

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official Journal of the Division of Highways of the Department of Public Works, State of California

EARL LEE KELLY, Director | C. H. PURCELL, State Highway Engineer | JOHN W. HOWE, Editor

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Engineers Conquer Cliffs and Deep Gorges to Construct New Scenic State Road

Feather River Route Opens

By F. W. HASELWOOD
District Engineer

CARVED out of solid rock, hewn through granite cliffs, crisscrossing mountain streams, the eight million dollar Feather River Highway, State sign route No. 24, was dedicated to public service by Governor Frank F. Merriam with impressive ceremonies held in the shadow of Grizzly Dome in the canyon of Rio de las Plumas on August 14.

First surveyed for a wagon road by the pioneer engineer Arthur Walter Keddie in 1867, the Feather River Highway, a dream of seventy years, built at a cost of $100,000 a mile, is a reality.

California and Nevada, the counties of Butte and Plumas and many sections of the State represented by officials and the California State Chamber of Commerce participated in a three-day celebration in observance of the opening of this splendid new highway, one of the most picturesque in the west.

CHIEF WINNEMUCCA ATTENDS

A banquet and dance at Oroville on Friday night, August 13, colorful dedication ceremonies the following morning at Grizzly Dome, an outdoor luncheon tendered to Governor Merriam and his party and representatives of Governor Richard Kirman of Nevada and the Reno Chamber of Commerce at Quincy Saturday noon, followed by a program of speech making, and a banquet in Reno Saturday night featured the highway jubilee, which closed with a rodeo at Portola on Sunday.

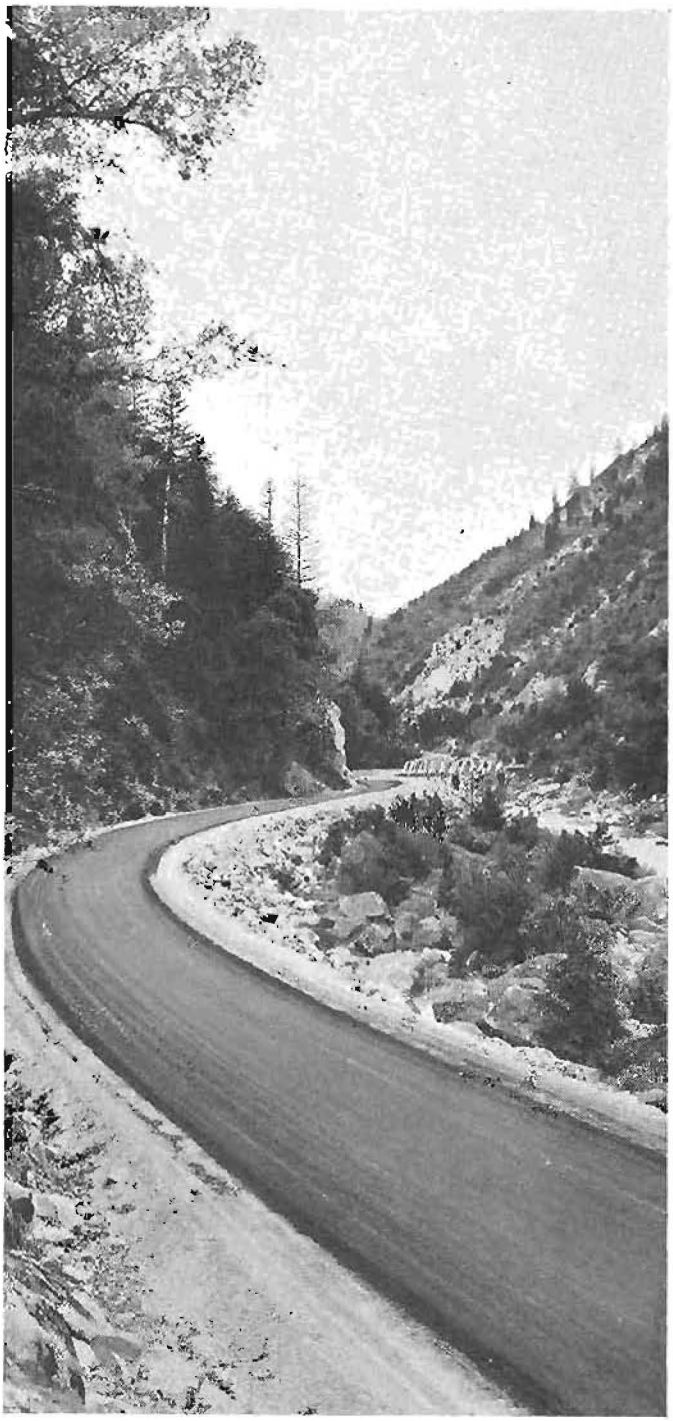
To the dedication at Grizzly Dome came Chief Winnemucca, sole surviving chieftan of the Piute tribe of Indians, who once ruled the wilderness domain through which runs the Feather River Highway. With Winnemucca were the boys' band of the Carson City Indian School in Nevada, and braves, squaws and papooses of the tribe, representatives of a vanishing nation of redmen.

SMOKE PIPE OF PEACE

The chief and his people camped on the highway at Grizzly Dome and after Governor Merriam, Director of Public Works Earl Lee Kelly and State Highway Engineer Robert A. Allen of Nevada had made short dedicatory talks. Governor Merriam left the speakers' platform, went to the tepee of Chief Winnemucca and there smoked a pipe of peace with the aged chieftan, signalizing the Indians' recognition of the march of progress of their white brothers.

In his talk, Governor Merriam praised the engineers of the Division of Highways who built the road and dwelt upon the magnitude of the task they tackled. Director Kelly took occasion to pay tributes to Bert B. Meek, former Director of Public Works, under whose supervision the actual construction of the highway was launched, and to Attorney General U. S. Webb, whose wise legal decisions made it possible to start the work of building the road.

To Fred C. Tatton of the California State Chamber of Commerce; Eric Cullenward, Publicity Director, and to Chairman L. B. O'Rourke and the members of the general committee in charge of the celebration is due credit for the successful and unusual ceremonies attending dedication of the new highway.



Delightful stretch of Feather River Highway approaching Storrie Creek Bridge.

BEFORE

This picture shows start of highway tunnel operations on face of Grizzly Dome, huge granite pile, in Feather River Canyon.

ANOTHER GREAT HIGHWAY

The dedication and formal opening of the Feather River highway signalized the completion of another of California's truly great highway projects.

This highway opens the door to another phase of development for the mountain area that it will serve and brings to reality the dreams long cherished by residents of Plumas County for closer contact with their neighbors in the great Central Valley. It marks the fulfillment of the mandate of the people as expressed at the polls in 1909, when $18,000,000 was voted to lay out and begin construction on the State's great highway system.

The Oroville-Quincy county seat lateral, or Feather River highway, follows the Feather River and its tributaries for 77.75 miles. The portion completed and now dedicated to public service is 70.75 miles between Oroville and Keddie. It was necessary to complete this entire unit before through traffic could be served. The seven miles between Keddie and Quincy is traversed by a usable road that is yet to be developed into a standard highway.

ELIMINATES OLD ROADS

Plumas County, like other mountain counties of California, rich in mineral deposits and timber, and with fertile valleys and abundant water supply, was settled early in the history of the State and was served by the usual narrow and crooked mountain roads over which the six- or eight-horse freight wagons slowly moved. These were mostly one-way roads even for wagons, and it is recalled that no longer ago than 1903, not far out of Beckwourth, our survey line wagon had to be let over the grade to permit a freight wagon to pass.

This survey was for the Western Pacific railroad which came into the county over Beckwourth Pass, followed the Middle Fork to Spring Garden and the North Fork to Oroville, breaking through for the first time, the commercial isolation of the county and opening the way for development of the natural resources.

Railroad operation began in the same year that the people of California decided that a system of improved highways was necessary to provide for the growing demands of the new type of traffic resulting from

the phenomenal development and use of the motor vehicle.

PLUMAS COUNTY INSISTENT

But the narrow wagon roads of Plumas County were of little or no use to the motor vehicle, and as this type of traffic rapidly developed, Plumas County again relapsed into a state of comparative isolation. Its people were never quiescent, however, but always firmly and respectfully demanded their birthright. And highway commissions consistently, but without sufficient funds, tried to do something about it.

A highway between Oroville and Quincy, fulfilling the mandate of the constitution for connecting county seats to the main trunk highways, if constructed along the Feather River or any of its tributaries, would cost more than contemplated by any financing provided for highway work and would be of no value unless entirely completed.

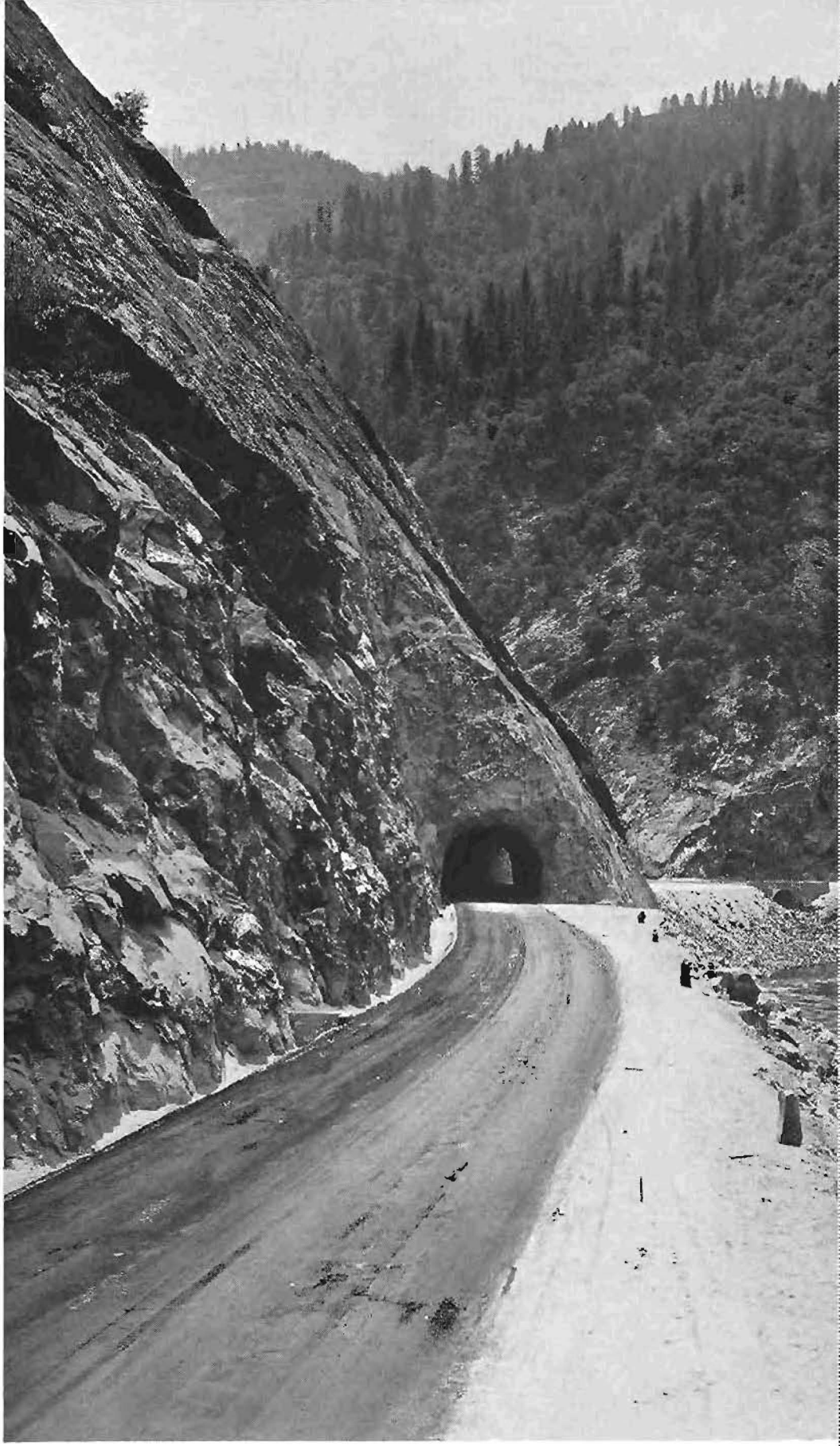
MERRIMAC GRADE TACKLED

Along about 1918, however, a proposal was under way to start construction on this highway following, in general, the existing ridge route by way of Bidwells Bar, Berry Creek, Merrimac, Letter Box, Bucks Ranch, Tollgate and Meadow Valley. This route has been the principal road serving Plumas County and since 1926 has been maintained by the State, serving as a detour during the construction of the river road. Surveys were started in the vicinity of Merrimac, and preparations were made for the establishment of a convict camp whose first work would be the development of a new route to eliminate the steep and difficult Merrimac grade.

Before this camp was established, the new $40,000,000 bond issue of 1919 was launched with the intent of its supporters that the Oroville-Quincy county seat lateral should be a low level road along the Feather River and its tributaries, with particular emphasis on the North Fork as *the* tributary.

"NORTH FORK OR NOTHING"

Plumas County wanted her isolation broken by an adequate highway and was never in doubt as to where she wanted that highway. The ridge road was closed by snow half of the year, and snow removal was not yet current practice. The divide crossed by this road at Letter Box, at the top



AFTER

And this picture shows how Division of Highway engineers conquered Grizzly Dome and pierced it with a tunnel and highway.

of Frenchman's Hill, was over 5800 feet high, and snowfall was heavy, came early and stayed late. Around Letter Box are axe marks high in the trees, said to have been made by mail carriers on skis. Plumas County didn't want its highway to be built over the ridge, and, in preparation for the 1940 bond issue, developed the slogan "North Fork or Nothing." But at no time was anyone ever misled into thinking that "nothing" would be acceptable.

Surveys via the North Fork were started in 1919, and the impossibility of constructing the road with funds that could be made available was immediately obvious. An estimate for the completed road made in 1924 placed the cost at $7,938,333.

GAS TAX STARTS ROAD

It was known at this time that the cost of grading the Western Pacific through the canyon between Keddie and Oroville was about $7,616,000. This cost is exclusive of tunnels and bridges. The advent of the gas tax in making possible a continuous supply of funds provided the opportunity to start work on this road. New estimates submitted after further studies in 1927, placed the cost at $6,890,046, and a reasonable period of construction, if finances could be provided at a sufficient rate, as six years. The figures given are for net construction costs.

For a long-continued job in a remote and unsettled area, the use of convict labor was advantageous. Early in May, 1928, Camp 16 was established near Virgilia, on the East Branch, 13 miles below Keddie, and, later in the same month, Camp 17 was established in Potters Ravine, near Oregon City, 9 miles above Oroville. For nine years after the establishment of camps, an average of $800,000 per year or $2,700 per working day, has been expended by convict labor and by contract for grading, constructing bridges and for providing a temporary oiled surface on 70.75 miles between Oroville and Keddie.

COST IS $7,380,150

The net construction cost of the 70.75 miles dedicated to public use on August 14 is $7,080,150, or slightly over $100,000 per mile. The estimated cost of the remaining seven miles between Keddie and Quincy, including a standard surface and bridge across Spanish Creek is $300,000, bringing the total cost, exclusive of right of way and engineering, of a usable road through the Feather River Canyon to $7,380,150.

Preliminary surveys cost $252,310; right of way, $87,678, and construction engineering, $331,386, adding $671,374 to the cost total.

In the course of time, as necessity arises, a higher type of surfacing will be required. It is probable that over a period of ten years, an additional expenditure of $1,000,000 will be required for surface improvement. The present surface, except for the first four miles out of Oroville, which has a base course of crushed rock, is selected local material with a bituminous surface treatment.

HEAVY GRADING

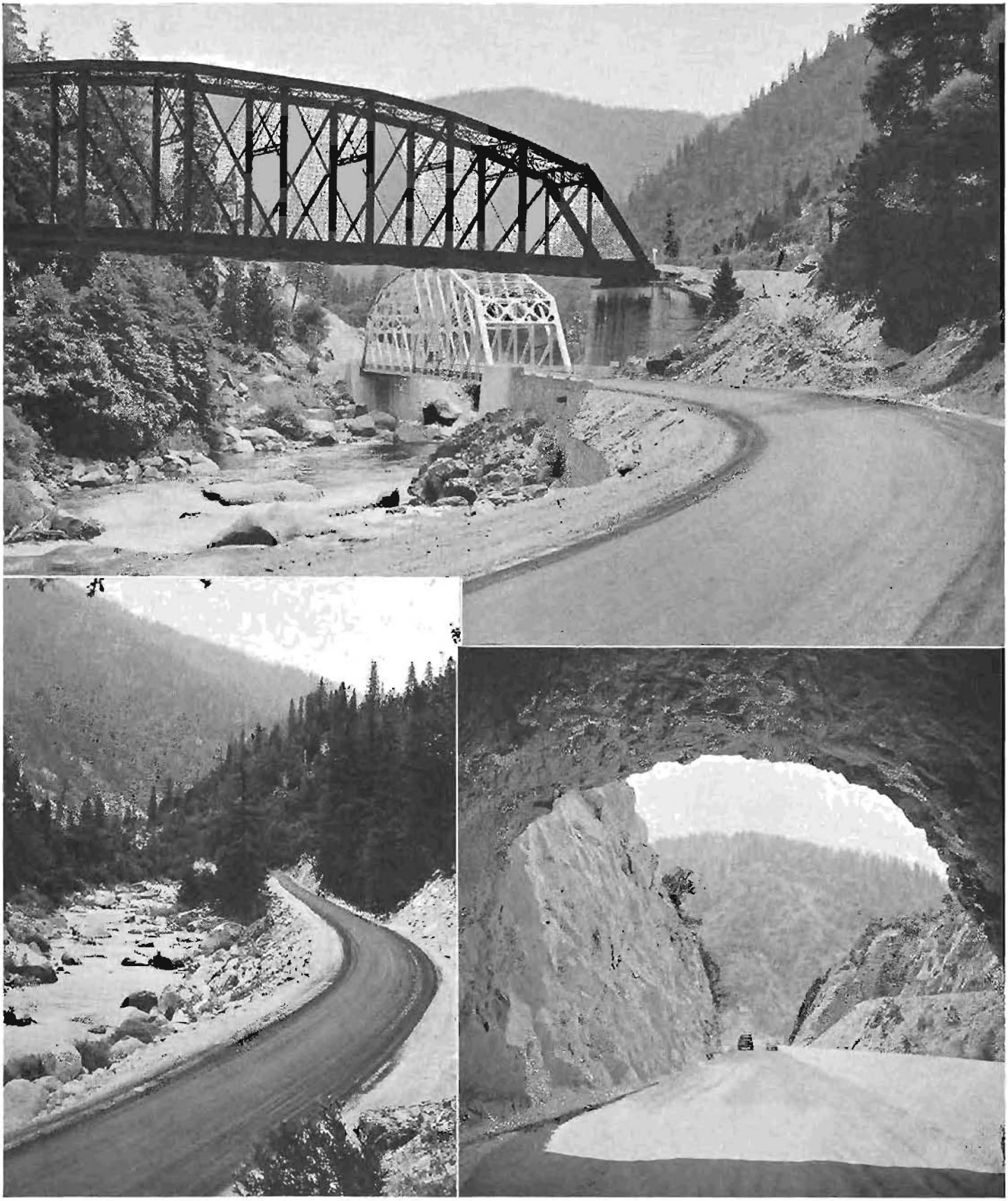
The construction of the entire route involved consistently heavy grading. The total excavation was 7,709,744 cubic yards, an average of about 109,000 cubic yards per mile. And most of the excavation, at least 85 per cent, was solid rock. Somewhat consistent with the formations encountered in any cross-section of the Sierras, there were belts of porphyry, diabase, granite, serpentine and schist. Except for portions of the latter formation, all of the rock was hard.

The Feather River highway is the only transmountain road that cuts through the heavy snow area of the Sierras on a water level grade. Such a road has many advantages from the standpoint of public service, but low initial cost or speed of construction are not among them. In construction through a river canyon, advantages in alignment, as well as in serviceability and cost, are usually secured by keeping the grade as close to the highwater as practicable. Possible though doubtful water storage schemes, Federal power reserves, the existence of a transcontinental railroad, power houses and transmission lines through the narrow canyon, controlled the location to a greater extent than did the rugged topography.

JARBOE GAP ELEVATION

The greatest climb on the road is from the crossing of West Branch, 14 miles out of Oroville, to Jarboe Gap, six miles farther. The road at Jarboe Gap reaches an elevation of 2330 feet, the purpose being to avoid the long detour made by the river at Big Bend. The descent is on a light grade back to the river at Pulga.

Since the Western Pacific Railroad is constructed through the canyon on a low grade line, it is impracticable for most of the way to construct a highway on the same side without being high above the railroad, and at such elevations deep ravines and sharp points compel a tortuous alignment and increased distance without saving in cost. Therefore, at Pulga, where the Western Pacific crosses the river from south to north, the highway reverses and, with a steel arch bridge located directly over the railroad bridge, crosses to the south side. The total length of the Pulga bridge is 680 feet. The central arch is 350



As illustrated on the cover page of this issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS, bridges "leap frog" on the Feather River Highway. Here, upper picture, the highway bridge at Tobin is underneath the Western Pacific bridge. Lower left—Section of scenic route between Storrie Bridge and Rock Creek Bridge. Lower right—Highway as seen from west portal of tunnel through Grizzly Dome.

feet long, and the grade is 216 feet above the river.

FOLLOWS RIVER FORTY MILES

Beyond the Pulga bridge, the road follows the south bank of the river not too far above the water and justifies its classification as a river road. For 40 miles it follows the North Fork and its tributaries as close to the river as topography and other controls will permit.

This proximity to the river offers the advantage of better alignment, more attractive scenery and cheaper construction, because fills of blocky rock can safely encroach on the river channel. The canyon walls are steeper, and polished areas of bare granite are encountered. The rocky walls of the canyon appear so firm and enduring that one can readily believe that they have changed but little since the beginning of time.

Geologists, who tell us differently, divide the past into ages measured in terms of millions of years and read in the rock formation, a different story. During one of these geological ages, a mighty river flowed southerly across the area that is now the western slope of the Sierras. The processes of nature leached the gold out of the granite and deposited it in crevices with solutions that crystalized into quartz.

WORK OF AGES

Through millions of years of weathering and by the aid of the river current, the softer rock was worn down and carried away, and the heavier quartz particles carrying gold were rounded and polished and deposited in the immense gravel bars that later became the mecca for the gold seekers who were California's early settlers. Then an upheaval disturbed the course of this river, and a great mass of ice covered the earth.

Glaciers moving westerly carved great gashes through the solid rock, and in these depressions flowed the streams originating in the higher mountains and discharging into the Sacramento and San Joaquin rivers.

Temperature changes resulting in contraction and expansions of the surface layers and the action of wind, water and frost disturbed most of the polished slopes left by the glaciers.

The Arch Rock and Grizzly Dome areas of the North Fork Canyon have most effectively resisted these forces of disintegration.

Arch Rock derives its name from a large, arch-shaped piece of the outer layer of the bare granite slope. Below the arch, the layer had fallen into the river and had disintegrated and been washed away long before anyone ever saw the canyon.

Strange to say, the original arch fell into the river of its own accord one night after the drill crew working underneach it, had gone home. Had the slip occurred a few hours sooner, more than the tools would have been lost. The same arch effect, however, is preserved in the remaining slab above the original arch.

GRIZZLY DOME

Grizzly Dome is higher, steeper and apparently sounder than the Arch Rock area. It is capped by a high, rounded mass of granite known as Elephant Butte. Faith in the apparent soundness of Grizzly Dome was shattered in 1935, before any construction work was started near the dome, by the spalling of a slab of rock from the front of Elephant Butte. Falling over 500 feet and crumbling as it fell, this 75,000 cubic yard mass of rock filled the river for a depth of 30 feet and a length of about 500 feet.

These more precipitous areas through the rugged canyon with its steep and bare granite walls, presented some rather formidable problems of design. Many alternate locations were investigated, and innumerable methods and types of construction were studied before the present low level location with three tunnels was adopted.

For ten miles between Pulga and Rock Creek, the road follows a niche cut in the solid walls of the canyon with three tunnels through precipitous, projecting points. Tunnel No. 1 is 265 feet long, 31 feet wide and 21 feet high, without lining. These dimensions contemplate lining which is not believed to be necessary at this time. To eliminate the hazard from falling rocks, rubble masonry portals were built on this tunnel.

TUNNELS REQUIRED

At one time the plans contemplated two short tunnels through projecting granite points in the two miles between tunnel No. 1 and Grizzly Creek. These points, however, proved to be loose, blocky formations rather than solid, and unsuitable for tunneling.

Grizzly Creek, the major tributary of the river from the south, after a precipitous drop from the high elevation near Frenchman's Hill, enters the North Fork at the base of Grizzly Dome. In the period of melting snows, this stream carries a large flow. It is now conveyed through a projecting rock point in a drainage tunnel 14 feet wide and 25 feet deep, and the channel is filled with coarse, blocky granite. A considerable portion of the flow prefers the original channel and finds its way through the rock fill.

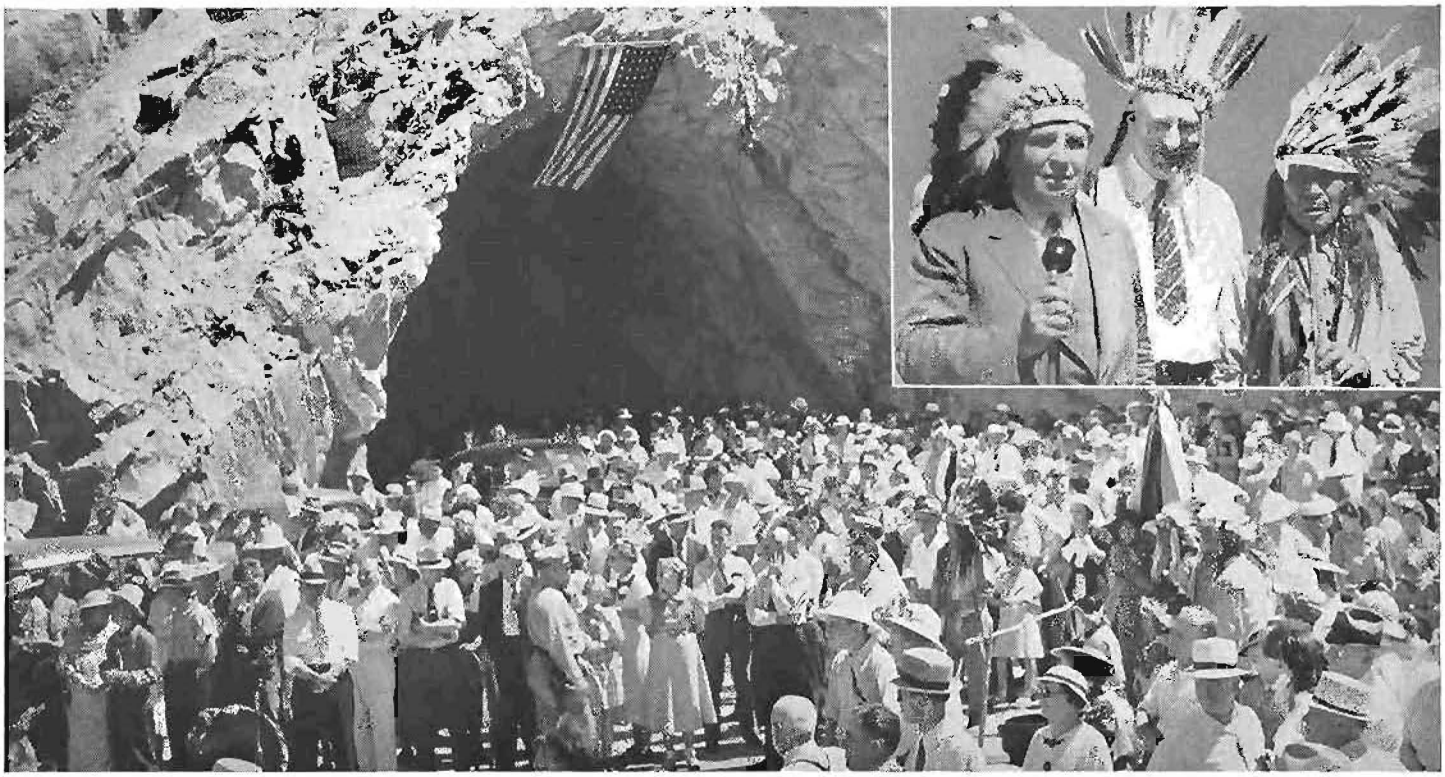
Beyond Grizzly Creek, Grizzly Dome rises high above the river, with slopes ranging from vertical to about 60 degrees with the horizontal. The dome is capped with a huge rounded mass of granite known as Elephant Butte from which a piece of the face spalled off, as previously described. The shattering of Elephant Butte also shattered any faith that may have existed in the possibility of constructing or maintaining a road on the surface of the area below the Butte, and in the matter of safety of the men during construction or of traffic after the road was built.

TUNNEL 1187 FEET LONG

Numerous plans from the practical to the fantastic for building a road through the Grizzly Bluff area were studied. As finished, the road enters a 390-foot unlined tunnel after crossing Grizzly Creek. A short distance beyond this tunnel, the sweep of broken rock from the Elephant Butte slide left the slope in too dangerous a condition to risk the construction of a road on the surface. Consequently, a third tunnel 1187 feet long was constructed under the dome. Four adits contributed to economy and speed of construction and provide light and ventilation.

Two miles above Grizzly Dome, the highway crosses the North Fork on a steel truss bridge just above the mouth of Rock Creek.

In spite of the problems involved in constructing a road on the same side of the river as the Western Pacific, they were less between Rock Creek and Storrie than those encountered on the other side, among which was the passing of the Feather River power house at Storrie. Just above the power house the road crosses back to the south side and a mile and a half beyond, at Tobin, crosses again and under the Western Pacific bridge simultaneously.



Portion of large crowd of celebrants gathered at portal of Grizzly Dome tunnel to participate in dedication of Feather River Highway—Insert—Governor Merriam, Director of Public Works Earl Lee Kelly and Chief Winnemucca conclude ceremony of smoking pipe of peace.

HARD ROUTE TO KEDDIE

Twenty-seven miles more of continuously heavy construction through formations of granite, schist and serpentine, lead to Keddie. Just before Keddie is reached the highway crosses Spanish Creek on a high, steel viaduct and plays hide and seek with the Western Pacific railroad, crossing back and forth over the railroad tunnels.

During construction the camps moved ahead as the work progressed. Each camp occupied three locations during the nine-year construction period. Construction by convict labor covered a total length of 55.27 miles, of which the net construction cost was $4,886,610. Included in this was one bridge across Indian Creek, which cost $38,000, and three tunnels aggregating 1,742 feet in length, constructed at a net cost of $175,342. There were 48,772 cubic yards of tunnel excavation moved at a cost of $3.60 per cubic yard. The day labor work included 6,234,700 cubic yards of excavation.

There were six grading contracts for constructing 14.7 miles of road, involving among other items, the movement of 1,475,044 cubic yards and an aggregate cost of $1,305,206. There were also eleven contracts for bridges aggregating 0.78 miles. Total construction cost of these bridges was $775,334.

A TRIBUTE

"I would like to pay a tribute to the American road engineer. I think he has done a more beautiful and more durable job of road building than any road engineers who have ever lived. No one can look at one of the modern bridges, travel over the wide curves of one of the modern roads without marveling at the efficiency and beauty of the work. I am hoping that the same genius which the road engineers have lavished on our main highways will be displayed in terms of service although perhaps in a less striking manner to the eye on our *secondary highways.*"—*Henry A. Wallace, U. S. Secretary of Agriculture.*

No discussion of this road would be complete without a tribute to the construction organizations of the camps directed by Superintendents Ed Rawson, W. B. Stout and Harry Waste.

Starting with an experienced crew as a nucleus, new men were trained as the work progressed and expanded. It is safe to say that no more efficient construction organization can be found in the country than the one which, after nine years of development, recently moved from Camp 30 to Southern California.

DREAM COMES TRUE

During the nine-year construction period, many engineers have had responsible charge of different phases of the work. At the conclusion of the work by the convict camps, R. E. Ward was resident engineer at Camp 28 and George M. Webb at Camp 30. P. R. Lowden maintained close contact between the camps and the district office.

For the people of Plumas County this completion of the Feather River highway is a dream come true. For the engineers it is the completion of a task, the magnitude and complexity of which is rarely encountered. For the people of California the Feather River highway, to which they have long looked forward as a link in a magnificent highway system, is a reality and forevermore an instrument of increasing service.

Largest Earth and Rock Fill Dam Dedicated by Governor Merriam

By EDWARD HYATT, State Engineer

MARKING the completion of the largest earth and rock fill dam of its type in the world, San Gabriel Dam No. 1—constructed by the Los Angeles County Flood Control District at a cost of approximately $17,000,000—was dedicated on July 21, 1937, at impressive ceremonies attended by over 2500 distinguished guests and citizens. Governor Frank F. Merriam gave the signal sending the last load of earth and rock into the dam, and was the principal speaker at the dedicatory exercises.

"This is a happy occasion for all of the people of Los Angeles County and particularly for those in the plains below the mouth of this great canyon," said Governor Merriam. "San Gabriel Dam is a tribute to the broad vision of those who built it. It is a monument to those who supported it. It not only harnesses a menace to the residents of the valley below, but provides a tremendous resource in water during the arid seasons. It is dedicated to foresight and thrift. May I congratulate those who started this great project, those who carried on and those who completed it."

SPEAKERS LAUD PROJECT

With Vice President W. S. Rosecrans of the Los Angeles Chamber of Commerce acting as master of ceremonies, the program was broadcast by radio. The speaker's stand, erected on the crest of the towering structure, was packed with distinguished guests, including present and former members of the Los Angeles County Board of Supervisors, Federal and State officials, and civic leaders.

Other speakers in addition to Governor Merriam included Supervisors Roger W. Jessup, Chairman of Board; Herbert C. Legg, Chairman, Flood Control Committee; Gordon L. McDonough, Leland M. Ford and John Anson Ford; Byron C. Hanna, President, Los Angeles Chamber of Commerce; J. Louis Matthews, Editor, Covina Argus and often referred to as the "Father of flood control in San Gabriel Valley"; H. S. Gilman, President, Conservation Association of Los Angeles County; Marshall R. Bowen, President of the San Gabriel Valley Protective Association; Major Theodore Wyman, Jr., of the United States Army Engineers in Charge of Federal Flood Control Projects in Los Angeles County; Earl B. Backman, representing S. B. Show, Regional Forester; E. T. Foley, official of the Western Slope Construction Company, builders of the dam; C. H. Howell, Chief Engineer of Los Angeles County Flood Control District; and Edward Hyatt, State Engineer.

All who spoke joined in lauding the project and paying well-deserved tribute alike to civic leaders, county officials, engineers, contractors and the army of workmen whose combined efforts were responsible for its successful consummation.

BUILT BY FLOOD CONTROL DISTRICT

San Gabriel Dam No. 1 is the most recent and largest of nineteen flood control and conservation dams built by the Los Angeles County Flood Control District. This District was created by an act of the State Legislature passed on June 12, 1935. As a result of extended investigations, a plan for flood control and water conservation was adopted by the District, and construction was started in 1918. Work has proceeded almost continuously since that time but with revisions in and additions to the original plan.

The dam is located in the lower mountain reaches of San Gabriel River about 3 miles below the junction of the West Fork with the main stream and about 9 miles upstream from the city of Azusa.

This dam on the San Gabriel River will serve the dual purpose of controlling floods and conserving flood waters which would otherwise flow unused to the ocean. This stream is the largest in Los Angeles County. It rises in the San Gabriel Mountains with many branches, the chief of which is the West Fork which joins the main stream about 3 miles above the location of San Gabriel Dam No. 1. Below these forks the river flows through a deep gorge and enters the San Gabriel Valley at a point near the city of Azusa. It has a mountain catchment area of 313 square miles, 205 square miles of which are above San Gabriel Dam No. 1. Upon leaving the mountains the stream flows in a southwesterly direction through the San Gabriel Valley and thence across the coastal plain to empty into the ocean near the city of Long Beach.

The stream is the main source of supply for the 278 square mile area of the San Gabriel Valley and for a portion of the coastal plain as well—an intensively developed and heavily populated region embracing scores of cities and towns and many thousands of acres of highly productive farm lands. When the stream is in flood, lands and improvements along its course from the mountains to the sea are subject to inundation, and have suffered serious flood damages in past years. The reservoirs created by the San Gabriel dams are to provide the necessary storage for controlling the floods and conserving the waters of this stream.

PROJECT LONG DELAYED

The historical background of San Gabriel Dam No. 1 is perhaps without parallel in any similar project. Although control of floods on the San Gabriel River was first urged over 40 years ago by J. L. Matthews, Editor of the Covina Argus, it was not until after the disastrous flood of 1914 occurred with damages estimated at $10,000,000 in Los Angeles County that sufficient impetus was gained to bring about the organization of the

Governor Frank F. Merriam gives signal for dumping of last truckload of rock at dedication of San Gabriel Dam. Left to right: Flood Control Engineer C. H. Howell, Supervisors Leland Ford, John A. Ford, Herbert C. Legg; E. T. Foley and W. A. Rogers, West Slope Construction Co., Supervisor Roger Jessup, Governor Merriam.

Los Angeles County Flood Control District and the active consideration of flood control plans for the San Gabriel River and other streams in the county.

Initially, disagreement arose as to the best plan of storage development on the San Gabriel River. There was a great diversity of opinion not only among the general public but also among recognized experts. Conflicts between many interests added to the confusion.

ORIGINAL PLANS ADOPTED IN 1924

The first plans for a dam on the San Gabriel River, prepared by the then Chief Engineer J. W. Reagan, were adopted by the District in 1924 and construction authorized with a bond issue voted that same year. A massive concrete dam was proposed to create a reservoir with a storage capacity of 240,000 acre-feet, involving an estimated cost of $25,000,000. The site chosen was the so-called "Forks Site" located immediately below the junction of the West Fork with the main stream.

Due to questions raised as to economic feasibility and safety of the proposed structure, no construction was started. Numerous investigations and reports by engineers and expert geologists were made during the next few years in an effort to settle the continued controversy as to location and design. E. C. Eaton replaced Mr. Reagan as Chief Engineer of the District in April, 1927. Following his appointment, plans were proposed for a smaller dam on which contract bids were actually received but rejected in 1927. Litigation ensued in the controversy of "high" versus "low" dam culminating in a decision of the Superior Court in March, 1928, enjoining the District from constructing a dam to store any less than 240,000 acre-feet.

CONTRACT LET IN 1928

Following this period of investigation and litigation, new plans and specifications were prepared and contract bids received in November 1928 for a concrete masonry dam at the Forks Site to provide a storage capacity of 240,000 acre-feet. Contract was awarded to Fisher, Ross, McDonald and Kahn and signed in December 1928.

Actual construction was started in March 1929, chiefly in the excavation of the west abutment. Weaknesses in the foundation rock at this site became apparent soon after excavation work started. Following the oc-

(Continued on page 21)

Improved Sherwin Hill Grade Increases Lure of High Sierra

By C. Cleman, District Maintenance Engineer

AFFORDING motorists a more attractive route into the recreational areas of Inyo and Mono counties, the Sherwin Grade improved alignment project has been completed by the State Division of Highways.

Traffic over this route has been constantly increasing for years due to the fact that it is the only road over which the beauty spots of the High Sierra, immediately to the north of Sherwin Hill, can be reached from Los Angeles and other cities in the southern part of California. It serves a section in which are located many beautiful lakes and streams where camping, fishing, hunting and outdoor life can be enjoyed during the summer months and where skiing and snow sports provide winter pleasures.

Since the early mining days Sherwin Hill, which rises from the comparatively level lands of Owens Valley to the higher bench lands on the north, has been an obstruction to travel and transportation, which, to date, has not been satisfactorily overcome.

EARLY TOLL ROAD

About 1860 Mr. James L. C. Sherwin constructed a toll road up Sherwin Hill, which the present route of U. S. Highway No. 395 approximately parallels about one-half mile to the east, between the Inyo-Mono County line and the summit. At these points the location of the two routes converge.

The construction of the toll road was incident to the development of a large mining camp at Mammoth Mines, about 25 miles to the north, which at one time had a steady population of from four to five thousand people, increasing to as many as ten thousand for a few days at a time, it is estimated. Much heavy mining machinery was hauled over the road on horse drawn wagons in the first few years of its existence. This heavy traffic made a severe demand on the road constructed up the tuffa rock slopes, where the only other material for road building purposes consisted on fine sand. The result was that the road surface soon became very rough, consisting mostly of solid rock points and holes where the sandy filling had been washed out during rain storms, or cut out by the steel tired wagon wheels.

ACCIDENT PRODUCED RESULTS

One day a large fly-wheel, which was to be used in the construction of a mill, was being hauled up over this toll road. Twisting and bouncing over the rough, rocky, deeply rutted surface of the road was too severe a strain on the load fastenings so soon after having passed the summit and starting the descent into the Rock Creek Gorge along the road built on the steep hill side, the load shifted, tipped the wagon over, broke loose and rolled some five hundred feet to the bottom of the Gorge below. To retrieve this wheel was a difficult and expensive task at that time.

This event was the deciding factor with the mining interests, which depended upon the toll road for transportation to their mines and were the most constant users of the road. They immediately initiated the construction of a road known as the "Dry Road" which was routed up the Sherwin Hill slope to the east of the Rock Creek Gorge. This road and the Sherwin toll road were in competition for favor of the traveling public for about twenty years. The "Dry Road" was favored by the mining interests while the Sherwin toll road had the patronage, for the most part, of others. The tolls were abandoned on Sherwin road about 1885.

HARD ON EARLY MOTORISTS

The first automobiles over Sherwin Hill followed the toll road; however, due to the projecting rocks and deep ruts on the steep grades, this was a difficult trip to make and motorists soon adopted the use together with the balance of Highway Route 23 in Mono County, South of Bridgeport, of the Dry Road and this road was taken into the State Highway system, by the State Highway Act of 1909.

In the early days of the automobile, to drive up Sherwin Hill was a difficult feat, especially during hot weather. It was the practice in those days to drive to the foot of the grade, about fourteen miles north of Bishop, and camp for the night. An early start would then be made the next morning to make the drive up the five mile grade, rising in elevation about two thousand feet in this distance, before sunrise. Even at the present time with an improved highway and more powerful automobiles, it is desirable, on a hot summer day, to make this climb before 11 o'clock in the morning, as usually after this hour there is a warm breeze blowing up the grade from the south. On any summer day it is not unusual to find one or more heavily laden trucks and automobiles stalled due to overheating of motors and fuel pumps.

In view of the unsuitability of both the Sherwin Toll Road and the Dry Road, the State located the present highway in 1914, on which the construction by State forces was completed in 1917, at a cost of $45,140. This road remained with only a dirt surface until 1928, when an application of light fuel oil was spread on the roadbed as a dust palliative.

INCREASE IN TRAFFIC

The increase in automobile traffic over Sherwin Hill, which made the oiling necessary, resulted from the improvement of the roads leading from the populous southern part of the State. This increase in traffic has also made it imperative, for safety and convenience, that the alignment of the grade constructed between 1914 and 1917 be straightened, the roadbed widened and the surface improved.

The highway as originally constructed, having a sixteen-foot roadbed, and no grade over eight per cent, followed somewhat closely the contour of the face of the hill, going out

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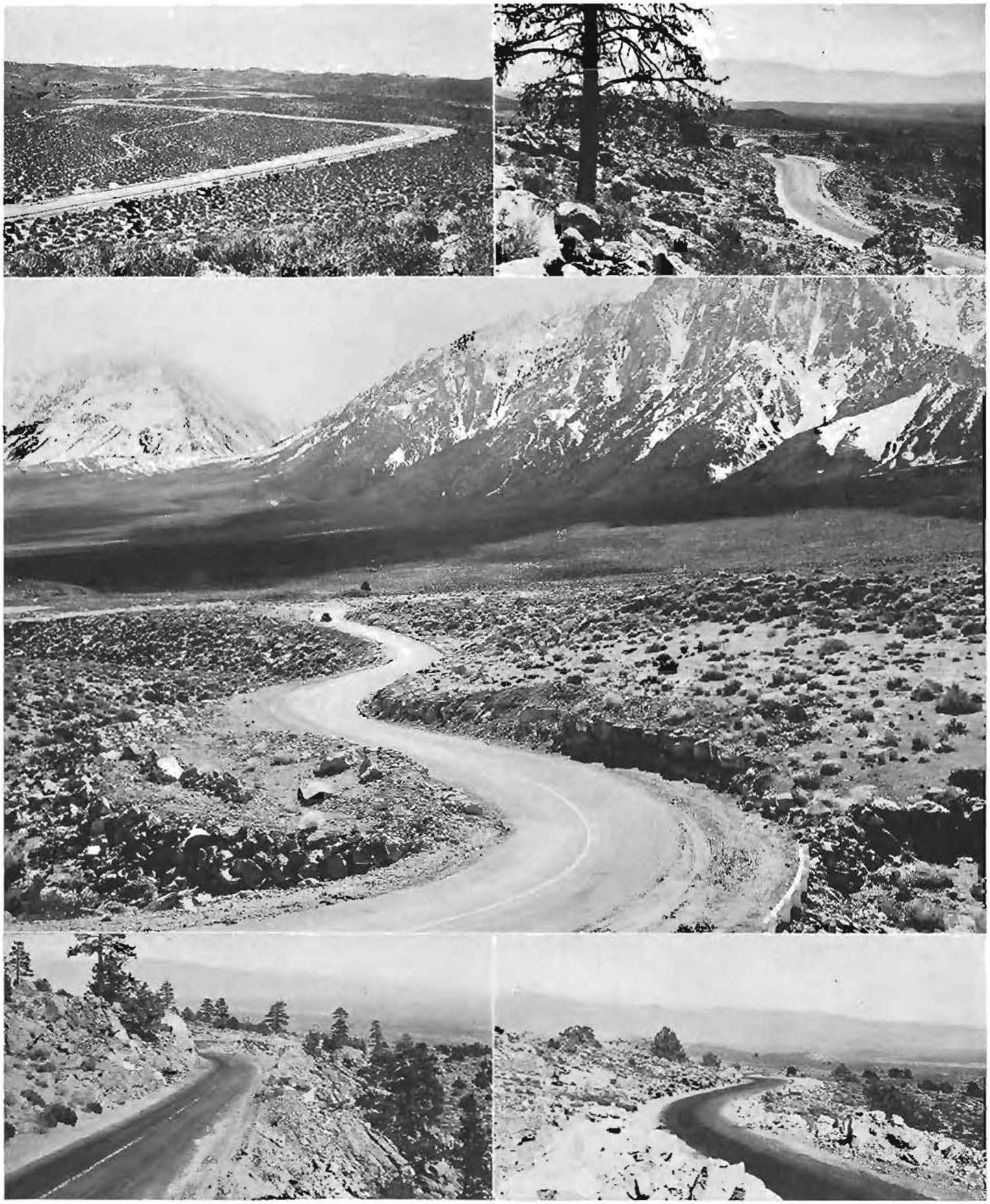

Curves are doomed on Sherwin Grade. Upper left—Looking north from a point 3 miles south of Sherwin Hill Summit showing the switchback alignment up Sherwin Hill at this point. Upper right—Looking south from Sherwin Hill showing curves which will be eliminated. Center—Looking south from Sherwin Hill into Round Valley. Lower left—This curve and one on right are being realigned out of Sherwin Grade.

Award of Contract Dooms 59 Bad Curves on Cuesta Grade

By LESTER H. GIBSON, District Engineer

CUESTA GRADE on the Coast Highway (U. S. 101), with its seventy-one hazardous curves, is doomed.

Reconstruction of this dangerous section of the coast route between San Francisco and Los Angeles has been launched with the awarding by the State Department of Public Works of a contract for $646,027.90 for the proposed improvement.

A modern four-lane divided roadway will replace the existing winding Cuesta Grade highway. Built in 1915, improved in 1923, the present road, although adequate at the time it was constructed and for some years thereafter, is too lacking in modern day standards to satisfy the requirements of the larger, heavier and faster traffic that has developed. Due to limited sight distance, fast traffic often has to maintain the speed of slow-moving trucks. This creates an extreme hazard because of the impatience of some drivers who are too prone to take a chance in passing vehicles ahead.

TORTUOUS ALIGNMENT

Cuesta Grade is just north of the city of San Luis Obispo, in San Luis Obispo County. This project is 3.282 miles long and will be 0.72 mile shorter than the present highway between the same termini.

With the opening, in early May of this year, of the new Conejo Grade, in Ventura County, Cuesta Grade remains the only stretch on U. S. 101 between Los Angeles and San Francisco where traffic is required to traverse a combination of tortuous alignment, mountain grade and narrow roadbed.

Early in 1936 the District V staff of the Division of Highways began the job of preparing plans for reconstructing Cuesta Grade on standards consistent with the present day requirements. Exhaustive preliminary studies showed the side of canyon traversed by the present road to be the best suited for the type of highway proposed.

SUBSOIL SURVEY MADE

From experience in the past years maintaining the existing road it was evident that some of the terrain, over which the project would pass, was of an unstable nature. This, together with a pretty comprehensive idea of the magnitude of some of the required cuts and fills, made it pertinent that we know a great deal more about the underlying soil conditions than could possibly be determined from surface indications. At a conference with the department heads in Sacramento it was decided to make a complete subsoil survey over the entire project.

The Central Office Laboratory immediately sent a crew of testing engineers, equipped with a power well drilling rig, hand soil testing apparatus and an electrical resistivity sounding device, to make this survey. It is believed this is the first time the electrical device has ever been utilized for shallow depth tests. The findings of this device were verified by tests made with the well drilling rig and later by tests made by the Bureau of Public Roads' engineers using a seismographic testing apparatus.

SOIL SURVEYS JUSTIFIED

This work was done under the direct supervision of Mr. O. J. Porter, Associate Testing Engineer, connected with our Central Office Testing Laboratory. Mr. Porter was in responsible charge in connection with the testing work for the foundations of the San Francisco Bay Bridge. His work on Cuesta Grade was well planned and well executed. The cost, comparatively speaking, and considering the benefits derived, was nominal.

This type of soil survey will probably become a regular part of the preliminary studies in the future on highway projects where heavy work is anticipated. It should be stressed how important it was to determine the treatment necessary in unstable areas where heavy fills are proposed. In these areas it is planned to excavate transverse and in some cases additional longitudinal trenches, 10 feet in width, through the unstable material and backfill these for a minimum depth of 5 feet with broken rock, of various sizes, to serve as blind drains. In addition, an 8-inch perforated metal pipe is to be placed in the transverse trenches to accelerate drainage.

These tests were also important in determining the slopes to be used in cuts. At the summit cut, which is to be 30 feet deeper than at present, it is planned to use a 1½:1 cut slope on the right side and a 1¼:1 cut slope on the left. Other cut slopes are to be 1:1 and 1½:1. Conventional fill slopes will be used throughout.

PLANS TO HANDLE TRAFFIC

The new road will closely follow the existing road on a plane about twenty feet lower, except where it has been necessary to deviate in order to get proper alignment. This will make an interesting set up for those who travel it during the construction period, as it is now planned to keep traffic on the existing road, or at the same level, until the later stage of the actual dirt moving. The traveling public will have an opportunity to view the methods employed in constructing the roadbed of a modern highway.

Where the new construction is in conflict with the existing road, the existing road will be widened out to the new cut slopes and the excavation of the new road confined, in order to leave a detour bench at the level of the existing road. It naturally follows, this detour bench will be removed when a portion of the new road is constructed to grade and made usable for traffic. All detour roads will have a minimum width of 25 feet. There will be little interference with the movement of traffic except where it will be necessary to carry through construction at the summit.

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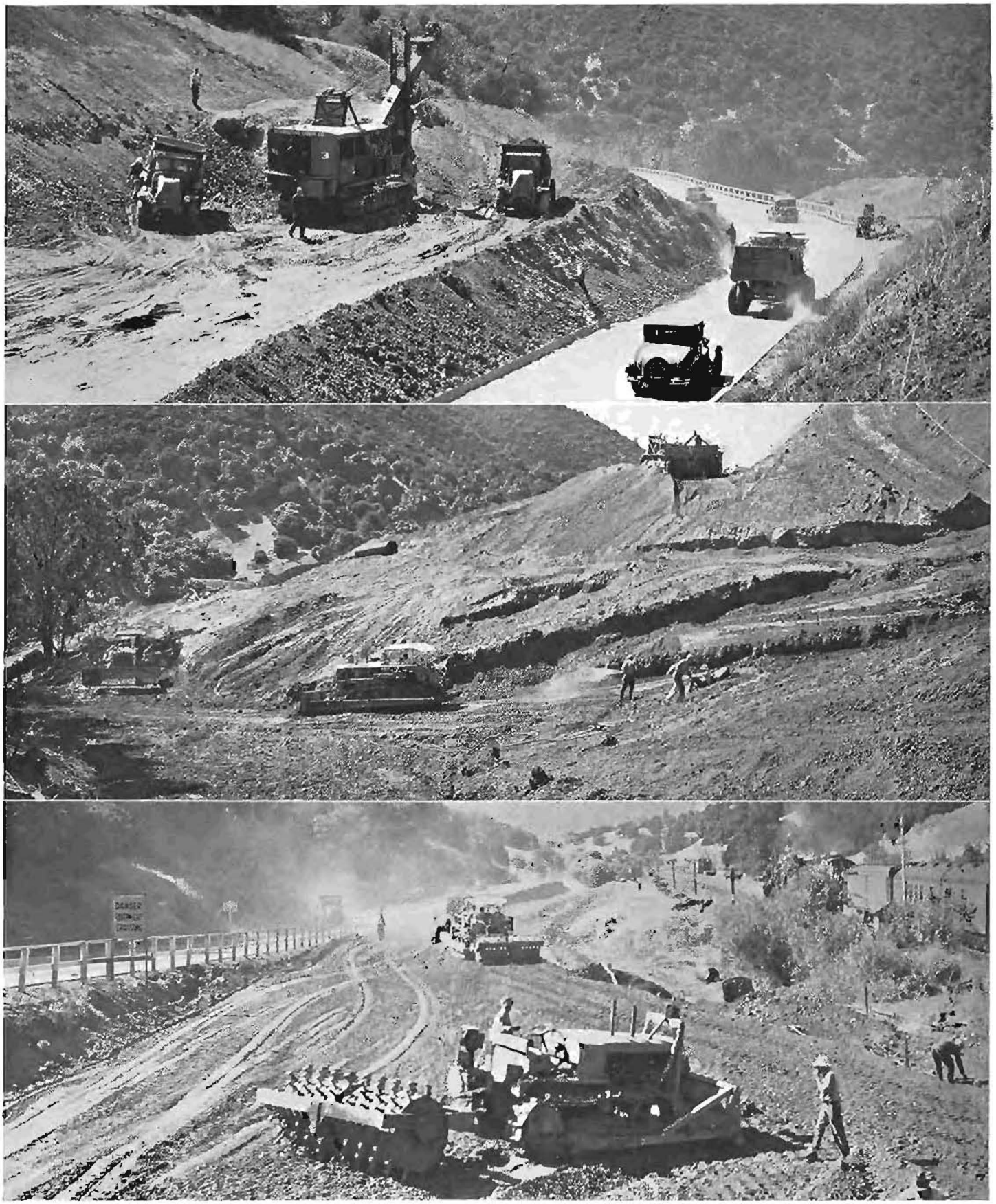


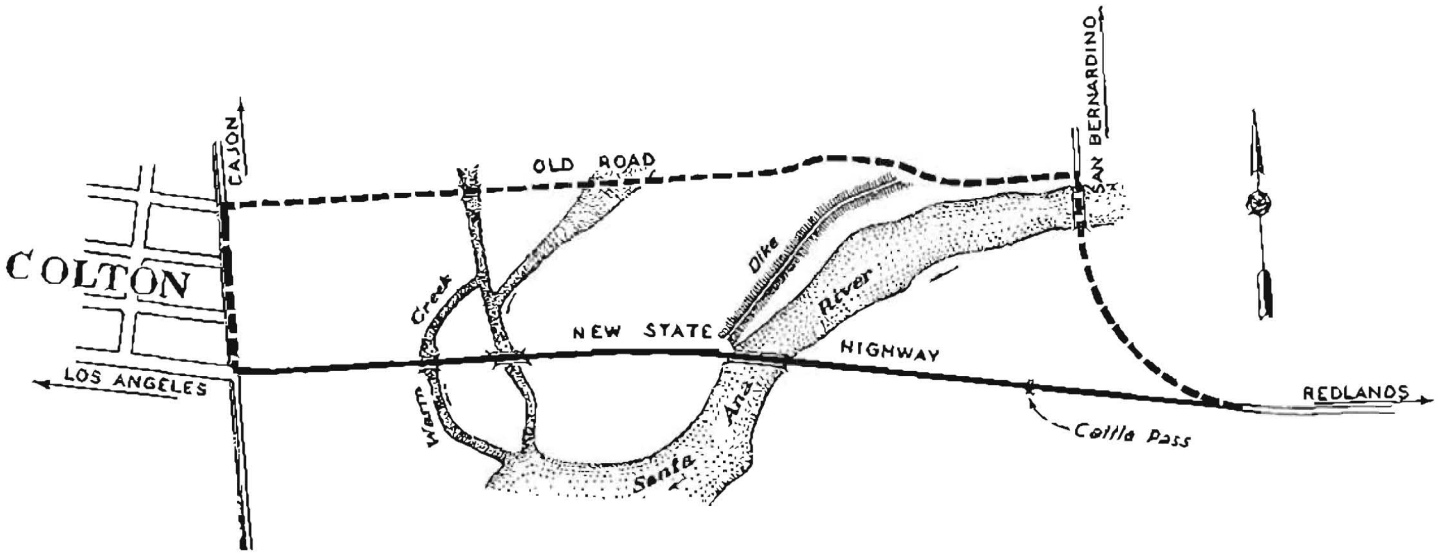
New Cuesta Grade in the making. Upper—Trucks excavating Summit Cut and hauling material down existing highway to fill north approach of overhead crossing Southern Pacific tracks. Center—Two tractors and master bulldozers and a roller pioneering one of fills. Lower—Leveling and compacting fill at north approach to proposed overhead crossing.

Highway Progress Puts End to Obsolete Road East of Colton

By E. Q. SULLIVAN, District Engineer

MAJOR construction activities have written "Finis" to an obsolete portion of the Los Angeles-Imperial Valley Highway east of Colton, commonly called the "Valley Boulevard," and replaced it with a modern standard highway on new location.

The new highway extends from the east city limit of Colton 1.3 miles easterly, to a point where the portion of State Highway connecting with South "E" Street, San Bernardino, intersects this highway in a long sweeping "Y."



This project, together with three others, the widening of I Street within the Colton city limits, the completion of Route 26 west of Colton, and completion of the South Eighth Street Underpass, Route 43, connecting Colton and Riverside, was dedicated by Governor Frank F. Merriam at ceremonies held in Colton July 28.

Participating in the dedication were Director of Public Works Earl Lee Kelly, Assistant Public Works Director Justus F. Craemer, Highway Commissioner Phil A. Stanton, Senator Ralph Swing of San Bernardino, Mayor Harford of Colton and mayors of surrounding cities, and State, county and city officials. City Attorney Waldo Willhoft was master of ceremonies at a banquet tendered to Governor Merriam.

The new highway just completed was the result of two contracts under way simultaneously. Under one contract, three bridges were constructed, one across Warm Creek, consisting of two spans of 54 feet each, the second bridge across an overflow channel consisting of four 50 foot spans and two 16 foot cantilever spans, the third across Santa Ana River consisting of six 61 foot spans and two 20 foot cantilever spans. In addition to these bridges, a cattle pass structure was built to provide for the free passage of domestic animals without interruption to traffic.

EROSION PREVENTION

Under the other contract, the highway, excepting the bridge portions, was constructed. This consisted of making an embankment across the low river-bottom land and constructing a protective dike along the northerly side of the Santa Ana River. Material for the dike and embankment was taken from the river channel.

In addition to paving and placing drainage structures, willow cuttings were planted in the surface of the southerly slope of the dike, and have already started a sturdy growth that will be instrumental in protecting the dike against erosion.

A forty-five foot width of asphaltic concrete pavement was placed on a seventy-six foot roadbed from Colton City limits to the Warm Creek Bridge. This conforms to the standard of the recent adjoining improvement through Colton.

From Warm Creek to the eastern terminus of this project a thirty foot width of Portland cement concrete pavement bordered with eight foot oil treated shoulders was constructed on a forty-six foot roadbed. The bridges were constructed to a clear roadway width of thirty-four feet, with a four foot sidewalk on each side.

THREE TRAFFIC LANES

This roadway bearing three traffic lanes, conforms to the pavement width of the section of highway extending easterly from this project to Redlands. It further conforms with the project included in the current budget to widen the existing two lanes

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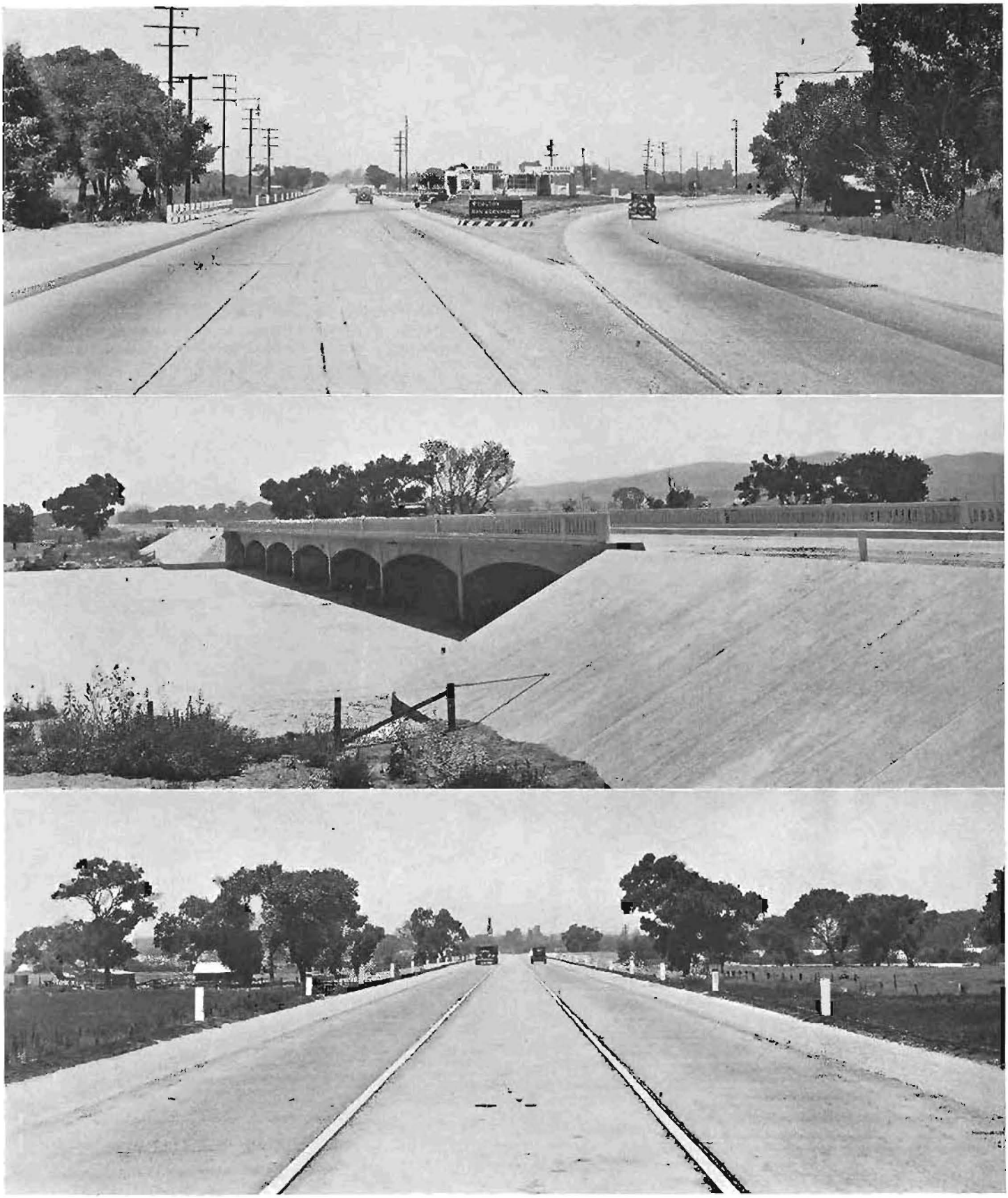


Views of newly completed Redlands-Colton Highway. Upper—New road pictured on left at junction of highway to San Bernardino. Center—Bridge on new highway across Warm Creek. Lower—Section of improved highway looking towards Colton.

Modern Highway Replaces Old Winding Jack Rabbit Trail

By A. EVERETT SMITH, Assistant Highway Engineer

THE Jack Rabbit Trail, noted for its twisting and winding alignment and its steep grades, is now entirely replaced for through traffic to Riverside by a new highway of modern standards, extending from Box Springs to Beaumont. The old Jack Rabbit Trail reverts to Riverside County and it will continue its long useful life as a connection for the lighter traffic to Hemet and San Jacinto.

For east bound traffic, the old road left the "Inland Route" at Alessandro, passed by March Field, and continued easterly through Moreno to the west slope of the Moreno Bad Lands. Here it skirted these irregular mountains in a southeasterly direction until a location was found, where with early day methods of construction a road could be pushed through the jagged peaks to Beaumont.

This section of the old Jack Rabbit Trail through the Bad Lands was very tortuous and perilous to traffic, with severe grades, steep slopes, and numerous sharp curves having short sight distance.

NEW HIGHWAY IN THREE LINKS

The new highway was constructed in three links as follows:

The first link was the carving of a modern highway through the Bad Lands. This feat was accomplished in 1935, resulting in a picturesque road with high cut slopes, deep fills, and gentle curves where cars glide through the broken mountains, as if in mockery to their once impregnable ruggedness.

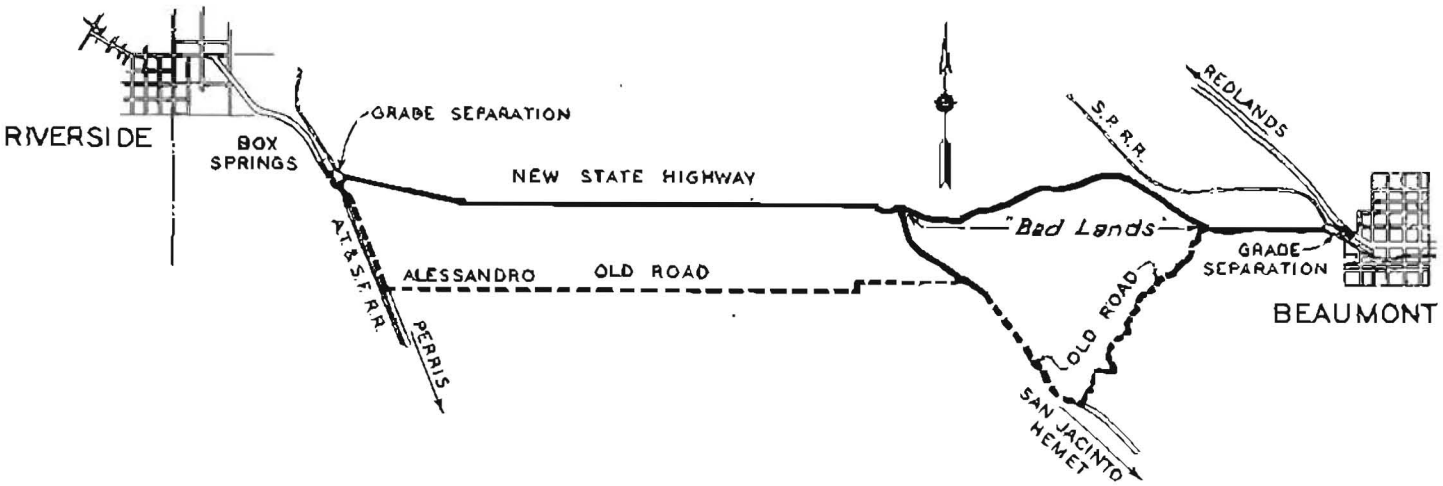
The second link lying to the west of the first was completed last May and extends from Box Springs to the Bad Lands. This section is featured by long tangents and a mild gradient. It crosses over the tracks of the Atchison, Topeka and Santa Fe Railway on a new overhead concrete structure at Box Springs completed in October, 1936, and extends easterly over the table land across the north side of the Moreno Valley.

The last link begins at the east side of the Bad Lands and extends easterly to Beaumont, where it connects with the heavily traveled State highway route 26 that carries a large volume of interstate and commercial traffic. This link crosses San Timoteo Creek on a concrete bridge and crosses over the Southern Pacific Railroad tracks on a new concrete structure, thus eliminating the old, inadequate, and dangerous overhead structure.

FIVE MAJOR CONTRACTS

The completion of this route was accomplished by five major contracts, one each for the three roadway links, and one for each of the grade separation projects. Under these five contracts, approximately 1,577,000 cubic yards of roadway excavation were made, 3,170 cubic yards of structure concrete were poured, and 18.55 miles of oil treated surfacing were placed. These projects also embody the construction of two reinforced concrete overhead grade separation structures, one reinforced concrete bridge, and various drainage structures and facilities to care for the "flash floods" from cloudbursts that are prevalent in this section.

Completion of the third link, early in July, gives the motorist a highway ample for modern high speed traffic. This highway will provide a vastly improved alignment, gradient, and riding quality. It will also provide a total net saving in distance of four miles between the cities of Riverside and Beaumont.

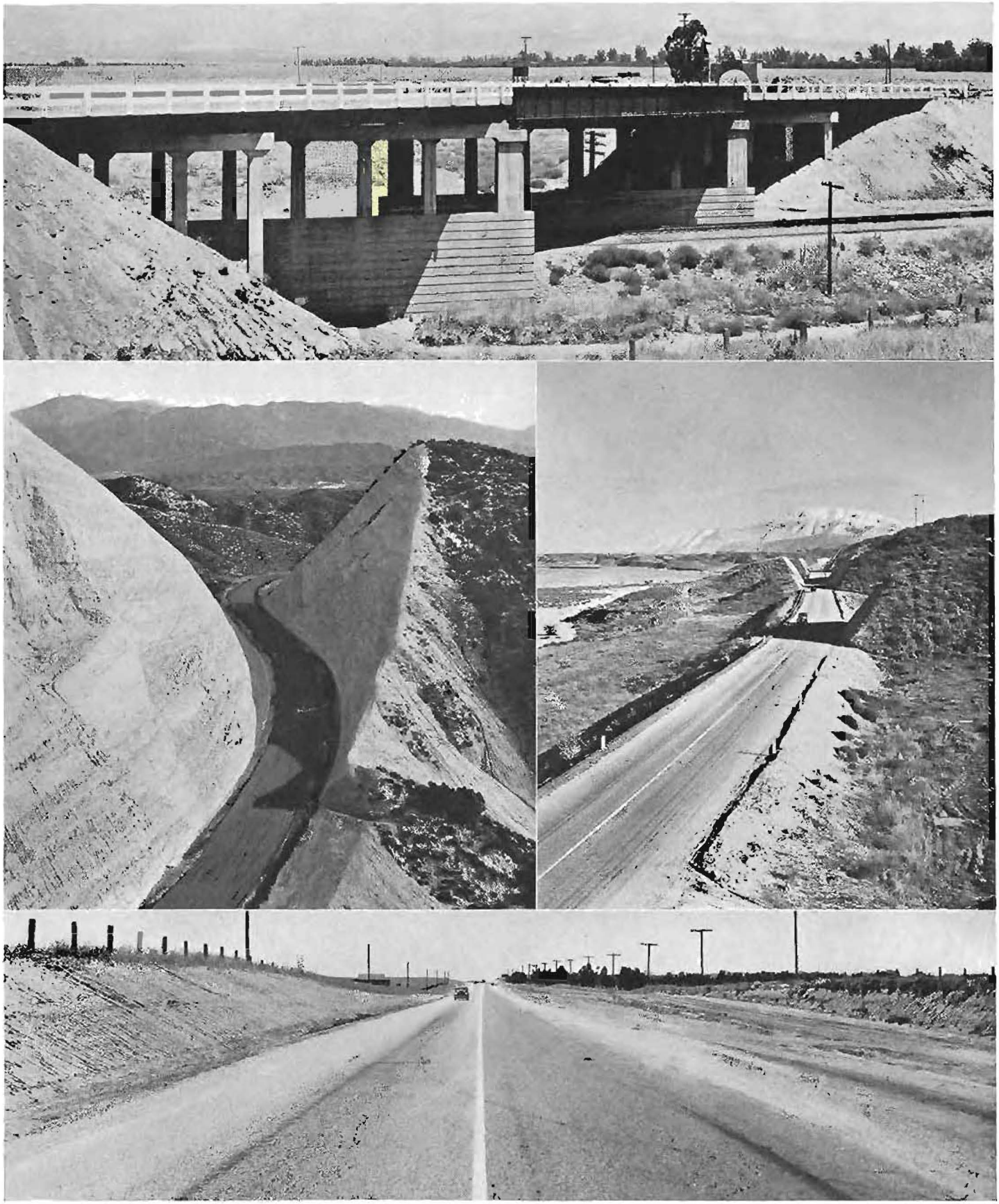


Angler: "You've been watching me for three hours. Why don't you try fishing yourself?"

Onlooker: "I ain't got the patience."

Beach Peach: "It must have taken a lot of courage to rescue me the way you did."

"Smiles" McGill: "You bet it did! I had to knock down three other sailors who wanted to do it."



What new jack rabbit trail looks like. Upper—Grade separation overhead at Box Springs near Beaumont. Center left—Deep cut on new highway looking towards Gorgonia Range. Center right—Another view looking towards Beaumont with Mt. San Jacinto in background. Lower—View of realigned highway west of Beaumont.

Traffic Flows While Highway Is Being Built

By R. M. GILLIS
District Engineer

A VERY much needed eight and four-tenths miles of three lane highway from Fresno north to Herndon on U. S Highway 99 was completed for public use in June, when the Division of Highways without formal celebration or ceremony accepted the second and final contract on this section.

This work, carried out under two contracts extending over a year's time and costing over $413,000, has given to the City of Fresno an adequate and modern approach on the north.

The old pavement on a sixty foot right of way, built fifteen feet wide twenty-four years ago and later widened to twenty feet, in addition to being badly broken was inadequate to properly handle the seven to ten thousand cars a day using this road.

NEW 30-FOOT PAVEMENT

The new thirty-foot pavement built on a ninety-foot right of way, follows the same alignment as the old road, but the new grade line has been entirely revised to insure proper drainage, eliminate bad dips in the old road, and contributes to safety by providing long sight distances.

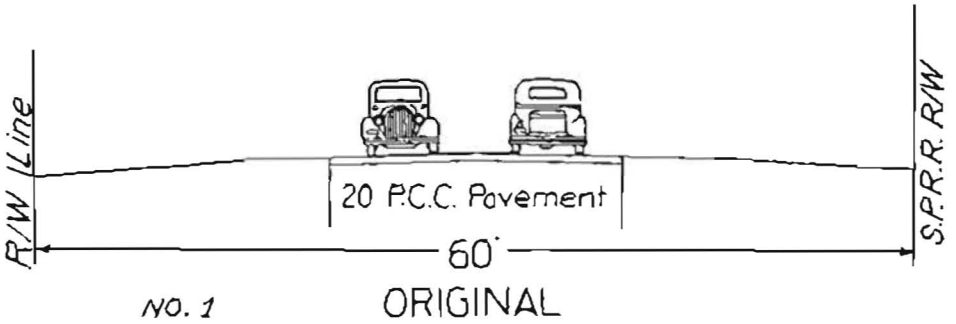
An added safety factor is offered by the contrasting colors of the three ten-foot pavement lanes; the two outside ten-foot strips are of Portland cement concrete while the center ten-foot passing lane is of black asphaltic concrete.

The major reason for the design chosen was the construction problem with which the Division of Highways was faced in planning this improvement.

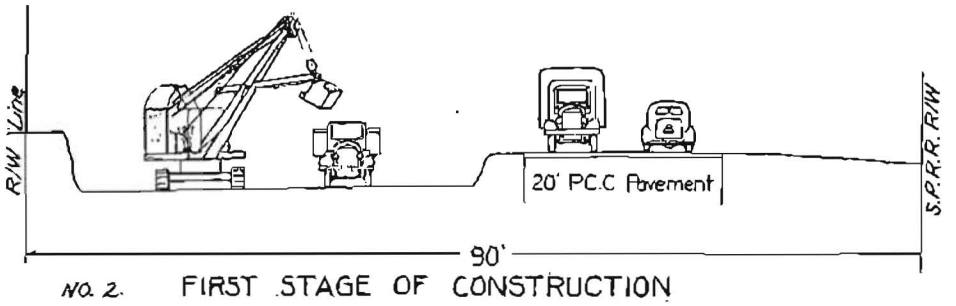
INNOVATION IN DETOURS

No satisfactory detour roads were available so that for the entire period of building a daily traffic averaging about eight thousand cars every twenty-four hours had to be carried through the construction work. This was accomplished satisfactorily and without serious accidents by taking one side of the road at a time, confining construction operations to that side and using the other side for traffic. The fact that the maximum cut for the new pavement was five feet below the old and the maximum fill was seven feet made this arrangement possible.

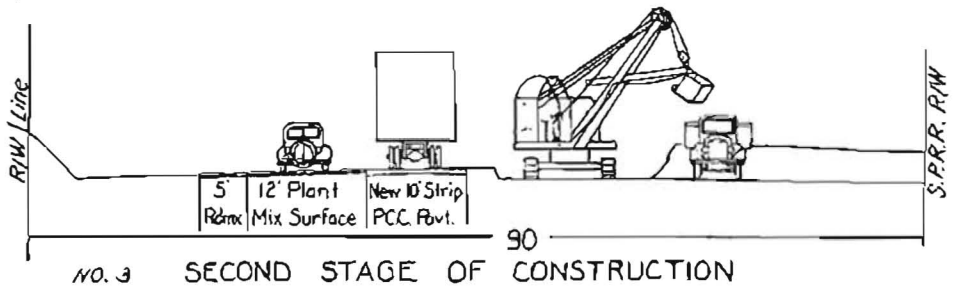
The method of construction is illustrated by the accompanying sketches. Credit for its successful operation in handling the heavy traffic without delays or inconvenience throughout the long period of construction is largely due to the efficiency and cooperation of the Hanrahan Company and the Union Paving Company, which were the contractors.



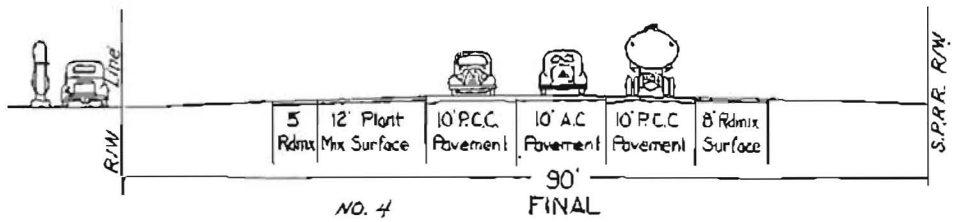
No. 1—The original road was a 20-foot pavement on a 60-foot right of way. The first step in improvement was to acquire 30 feet additional right of way to give a 90-foot width.



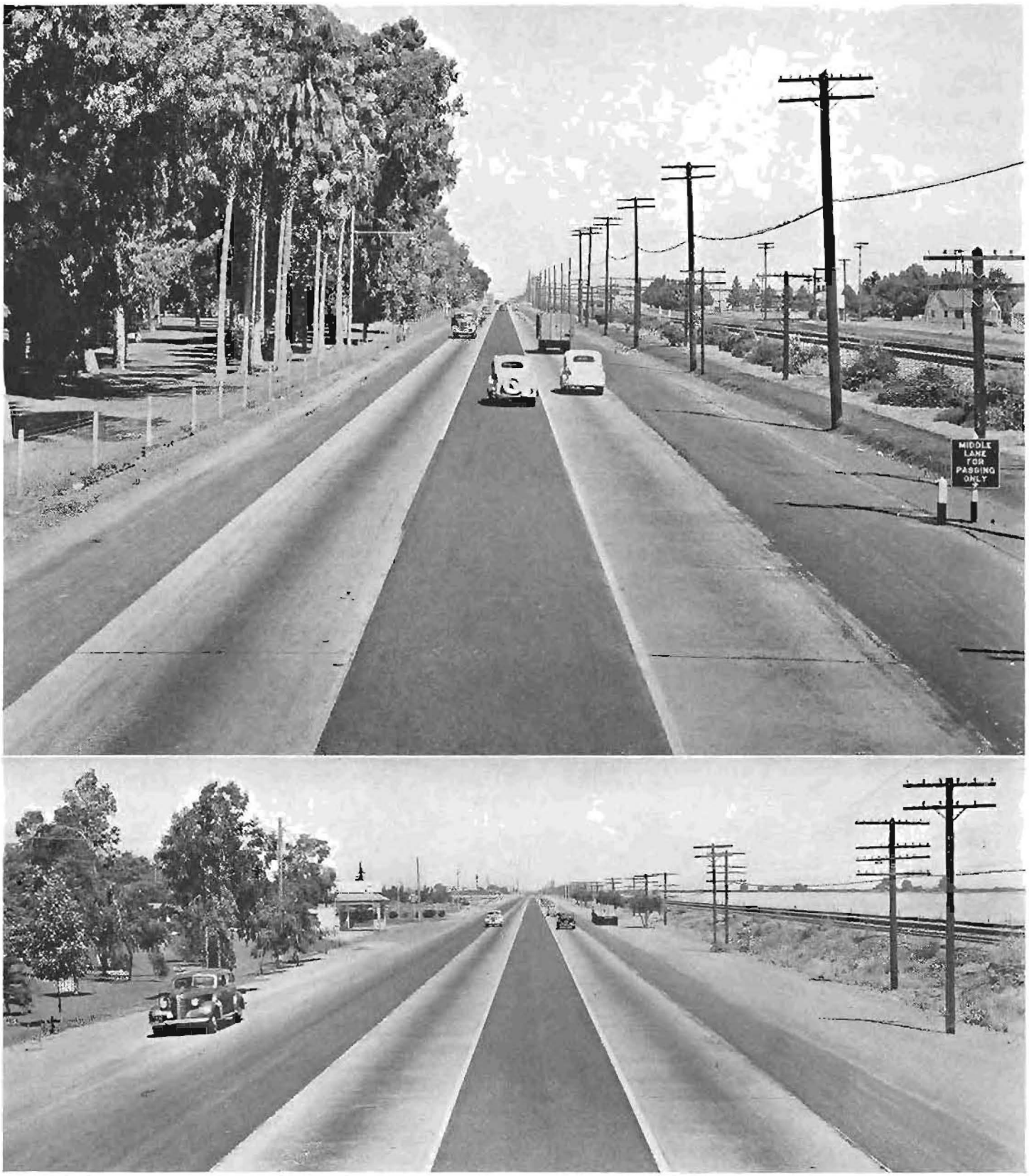
No. 2—Traffic was confined to old pavement on right hand side of roadway. The left side was brought to grade; the left 10-foot lane of Portland cement concrete pavement was constructed and with a 12' x 4" shoulder of bituminous treated rock, together with a 5-foot roadmixed oil shoulder, gave two traffic lanes for the next construction operation.



No. 3—Traffic was turned on completed left half of roadway, the right half was graded and the right 10 feet of Portland cement concrete placed. The final paving done was to fill in the 10-foot asphaltic concrete passing lane and finish the shoulders.



No. 4—The final section gives a 30-foot pavement with 8-foot roadmixed oil shoulders on the right side, and a 17-foot bituminous treated rock and dirt shoulder on the left side, making a wide turn-out area for the business houses on this side.



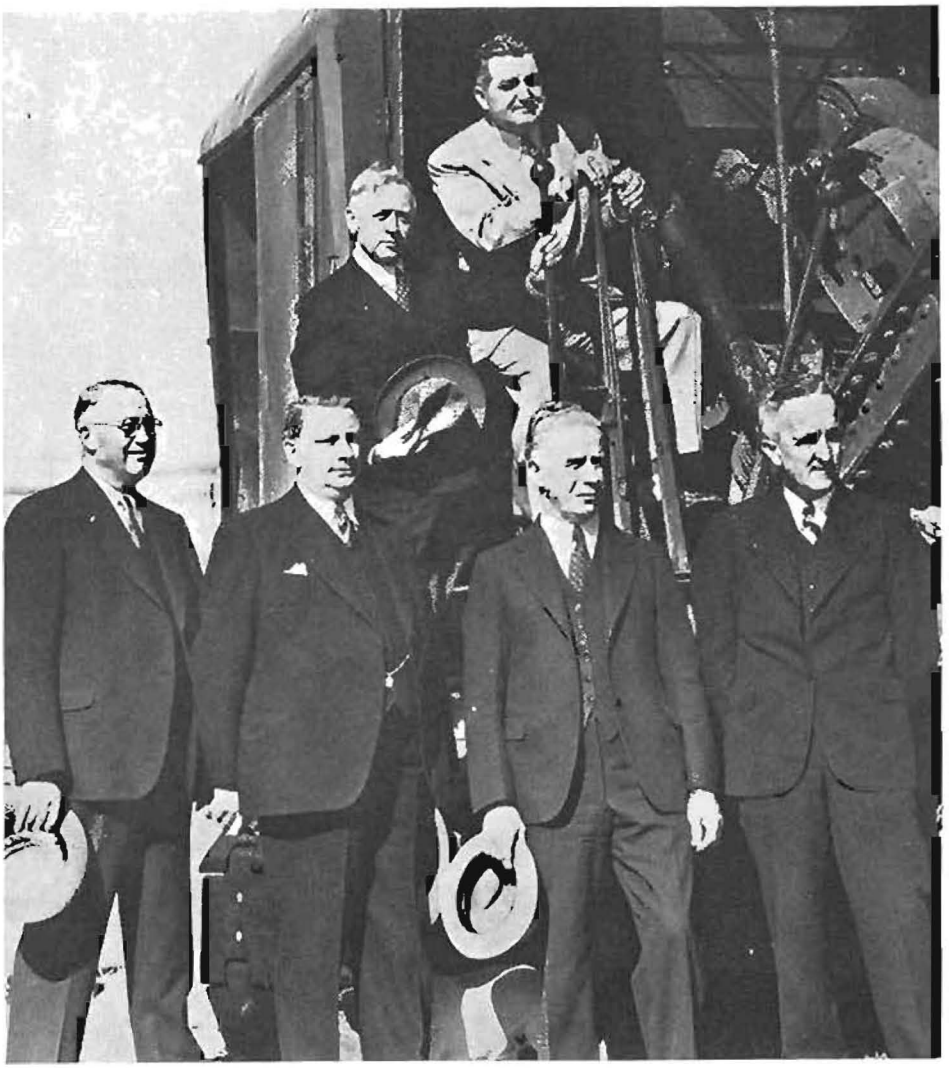
Upper picture shows newly improved section of Route 4 at the north boundary of the city of Fresno. An added safety factor is offered by contrasting colors of the three 10-foot pavement lanes. The two outside strips are of Portland cement concrete while the center passing lane is of black asphaltic concrete. Lower—Typical section of completed highway between Fresno and Herndon.

Construction Work on Altamont Pass Highway Project Launched

DESCRIBED by Edward J. Neron, Deputy Director of the Department of Public Works, as the "biggest dirt-moving job ever undertaken by the Division of Highways," the work of realigning Altamont Pass in Alameda County, eliminating 45 dangerous curves, was officially launched with ground-breaking ceremonies in the foothills at the eastern end of Livermore Valley on July 17.

Actual construction operations were started two days later and next September the new $1,260,000 highway will be dedicated to the public.

More than 1000 persons witnessed the ceremonies attending the start of the Altamont Pass project. Mrs. Neron, wife of the Deputy Director of Public Works, broke a bottle of Livermore Valley champagne against a huge steam shovel and Mr. Neron, who represented Governor Frank F. Merriam and Director of Public Works Earl Lee Kelly, was at the controls of the giant machine when it dug out the first scoop of earth, signalizing the starting of work.



Deputy Director of Public Works Edward J. Neron at controls of steam shovel which broke ground for new Altamont Pass project. Chairman William J. Hamilton of Alameda County Board of Supervisors beside him. Grouped in front of shovel are (left to right) County Surveyor Burnett Hamilton and Alameda Supervisors Thomas E. Caldecoit, George Janssen and George Hellwig.

SERIOUS TRAFFIC CONDITION

Dr. F. L. Herrick, president of the Livermore Chamber of Commerce, presided at the ceremonies. Mr. Neron was the principal speaker.

"Construction of this new highway on the main artery between San Francisco and Stockton and the upper San Joaquin Valley," Mr. Neron said, "climaxes an exhaustive study to relieve a serious traffic condition which is becoming more acute each year.

"Traffic during the past ten years has steadily increased. In 1926 a traffic count indicated a travel of 2600 vehicles daily. A similar count in 1936 showed a count of 9000 cars daily.

"It is interesting to note that in 1926 approximately 10% of the 2600 cars were trucks. In 1936 this average had increased to 20% with heavy units predominating—a ratio of about two to one.

"This condition, of course, has been brought about by volumes of San Joaquin Valley products shipped to the coast by trucks rather than by rail. These heavy trucks, with trailers of all sizes, necessarily travel slowly, going through the winding pass on the old two-lane roadbed. The faster cars, of course, are unable to pass, which has been largely responsible for terrific congestion practically continuously during the past few years.

"The old road from Livermore easterly is so situated that it became impracticable for the Division of Highways of the Department of Public Works to reconstruct short stretches, so it was decided at a meeting held by the Highway Commission in Oakland, California, in August, 1936, that this all important stretch of road, eight and one-half miles in distance between Greenville

(Continued on page 36)

San Gabriel Dam Dedicated by Governor Merriam

(Continued from page 9)

currence of a slip on the west abutment in September 1929, work was stopped pending further investigation of the situation.

At this point the State Engineer entered the picture in his official duty of dam supervision, in accordance with an act passed by the State Legislature (Chapter 766, Statutes of 1929) which became effective August 14, 1929. This legislation came as the direct result of agitation following the failure of St. Francis Dam on March 12, 1928. Having for its purpose the safeguarding of life and property, it provides for State supervision of the construction and maintenance of all dams (with the exception of those owned by the United States), and invests these duties in the Department of Public Works to be administered and exercised by the State Engineer.

STATE ENGINEER DISAPPROVES

One of the first applications for approval of plans and specifications covering the construction of a dam, received under this act, was that submitted by the Los Angeles County Flood Control District for the Forks Site Dam, on October 26, 1929. Thereupon a careful investigation was made by the State Engineer, assisted by a consulting board of eminent engineers and geologists comprising Charles P. Berkey, G. A. Elliott, M. C. Hinderlider, George D. Louderback, J. L. Savage and Ira A. Williams. After careful consideration the application was disapproved on November 26, 1929.

Following this action the idea of a concrete dam at the Forks Site was abandoned and the District's engineers undertook new studies to determine the best type and location of dams for flood control and conservation on the San Gabriel River. As a result, plans were recommended in 1931 and subsequently adopted for the construction of two reservoirs in place of the one large reservoir originally proposed with the dam at the Forks Site. Both of the dams, designated as San Gabriel No. 1 and No. 2, were planned as rock fill structures.

The plans and specifications for San Gabriel Dam No. 1 were submitted to the State Engineer for approval in February 1932. They provided for a rock fill dam at a site

(Continued on page 28)

View of San Gabriel Dam No. 1 showing stepped face of dam. This picture shows magnitude of this flood control project, largest earth and rock fill dam of its type in the world.

Traffic on State Highways Shows 6.7 Per Cent Increase Over 1936

By T. H. DENNIS, Maintenance Engineer

ALTHOUGH at a somewhat lessened pace, the traffic on California's State highways continues to increase.

The annual summer traffic count taken on Sunday and Monday, July 11 and 12, shows a State-wide increase of 6 7 per cent over the corresponding period in 1936. This compares with an increase of 10 per cent in 1936 and 15.3 per cent in 1935 over preceding years.

Increases were quite uniform in all the various route groups and little difference is noted between the increase in Sunday traffic and that of Monday.

NEW HIGHWAYS RESPONSIBLE

However, the completion during the past year of major construction projects has very markedly influenced the traffic volume upon certain individual highway routes. Route 1 (Sausalito-Oregon Line) shows an increase of 26.45 per cent for Sunday and 12.25 per cent for Monday.

Similarly, on Route 56 (Route 2 at Las Cruces to Route 1 near Fernbridge) increases of 17.23 per cent and 18.18 per cent were recorded for Sunday and Monday respectively. The bulk of this increase was found south of Monterey and resulted from the opening of the Carmel-San Simeon highway to through travel.

USUAL COUNT MADE

In contrast, the heavy decrease shown on Route 74 (Napa Wye to Cordelia via Vallejo and Benicia) was brought about by the opening of the American Canyon, which provides a much more direct route for traffic between the Sacramento Valley and San Francisco Bay areas.

The regular procedure of previous years was followed in making the actual count. This covers the 16-hour period from 6 a.m. to 10 p.m. for both Sunday and Monday. Traffic was segregated by hourly periods into the following vehicle classifications:

California passenger cars, out-of-State passenger cars, busses, light trucks, heavy trucks, trailers drawn by trucks, trailer coaches, and other passenger-car trailers.

At certain points new stations were established for this year's census and in some instances former stations were discontinued or relocated. While all of these will be useful for future comparison, they have been excluded in compiling the percentages of increase or decrease for the present year.

The comparisons for the various groupings are as follows:

Per Cent Gain or Loss for 1937 Count as Compared with 1936

	Sunday	Monday
All Routes	+6.76	+6.58
Main North and South Routes	+8.25	+6.82
Interstate Connections	+7.65	+6.84
Laterals Between Inland and Coast	+3.96	+3.96
Recreational Routes	+5.78	+9.32

The gain or loss of traffic volume for State Highway Routes 1 to 80, inclusive, which constitute the basis for the foregoing summary, is shown in the following tabulation:

Route	Termini	1937 Per cent gain or loss Sunday Gain	Sunday Loss	Monday Gain	Monday Loss
1.	Sausalito-Oregon Line	26.45		12.25	
2.	Mexico Line-San Francisco	6.25		7.88	
3.	Sacramento-Oregon Line	4.88		5.98	
4.	Los Angeles-Sacramento	4.21		1.67	
5.	Santa Cruz-Jc. Rt. 65 near Mekalumpe Hill	0.64		8.19	
6.	Napa-Sacramento via Winters		6.80	12.57	
7.	Crockett-Red Bluff	7.85		12.64	
8.	Ignacio-Cordelia via Napa	10.56			3.86
9.	Rt. 2 near Montalvo-San Bernardino	6.30		2.69	
10.	Rt. 2 at San Lucas-Sequoia National Park	3.31			2.18
11.	Rt. 76 near Antioch-Nevada via Placerville		2.11		3.63
12.	San Diego-El Centro	0.45			3.55
13.	Rt. 4 at Salida-Rt. 28 at Sonora Jc.	15.95		15.39	
14.	Albany-Martinez	8.45		7.10	
15.	Rt. 1 near Calpella-Rt. 37 near Cisco	4.02			9.35
16.	Hopland-Lakeport		5.51		17.32
17.	Rt. 3 at Roseville-Rt. 15, Nevada City	8.39		9.17	
18.	Rt. 4 at Merced-Rt. 46 near Sequoia	0.58		8.32	
19.	Rt. 2 at Fullerton-Rt. 76 at Beaumont	13.36		13.13	
20.	Rt. 1 near Arcata-Rt. 83 at Park Boundary	14.56		9.78	
21.	Rt. 3 near Richvale-Rt. 29 near Chilcoot via Quincy		13.23		10.35
22.	Rt. 56, Castroville-Rt. 28 via Hollister	9.12		14.49	
23.	Rt. 4 at Tunnel Sta.-Rt. 11, Algine Jc.		0.41	2.63	
24.	Rt. 4 near Lodi-Nevada State Line	10.23			1.78
25.	Rt. 37 at Colfax-Rt. 83 near Bartley	4.13			6.87
26.	Los Angeles-Mexico via San Bernardino	8.49		7.79	
27.	El Centro-Yuma	15.72		16.19	
28.	Redding-Nevada Line via Alturas	16.99		11.04	
29.	Peanut-Nevada Line near Purdy's	32.34		15.42	
31.	Colfax-Nevada State Line	2.66		5.63	
32.	Rt. 56, Watsonville-Rt. 4 near Calif's	11.78			1.24
33.	Rt. 56 near Cambria-Rt. 4 near Famosa	4.14		14.56	
34.	Rt. 4 at Galt-Rt. 28 at Pickett's Jc.		21.82		8.61
35.	Rt. 1 at Alto-Rt. 20 at Douglas City		4.46	3.73	
37.	Auburn-Truckee	2.11		4.30	
38.	Rt. 11 at Mayc-Nevada Line via Truckee River		1.04		4.20
39.	Rt. 38 at Tahoe City-Nevada State Line	11.98		7.12	
40.	Rt. 43 near Montezuma-Rt. 76 at Benton	15.80		9.67	
41.	Rt. 5 near Tracy-Kings River Canyon via Fresno	26.82		17.67	
42.	Redwood Park-Los Gatos		7.08	7.68	
43.	Rt. 60 at Newport Beach-Rt. 31 near Victorville	8.75		14.64	
44.	Boulder Creek-Redwood Park	10.83		18.56	
45.	Rt. 7, Willows-Rt. 3 near Briggs	0.42		1.84	
46.	Rt. 1 near Klamath-Rt. 3 near Cray		2.64		13.11
47.	Rt. 7, Orland-Rt. 29 near Maxwell	26.28		16.31	
48.	Rt. 1 N. of Cloverdale-Rt. 56 near Alblan	2.11		4.55	
49.	Napa-Rt. 15 near Sweet Hollow Summit		6.55	1.11	
50.	Sacramento-Rt. 15 near Wilbur Springs		10.89	15.05	
51.	Rt. 8 at Schellville-Sebastopol	8.14		15.87	
52.	Alto-Tiburon	11.36		2.25	
53.	Rt. 7 at Fairfield-Rt. 4 at Lodi via Rio Vista	2.48		1.77	
54.	Rt. 11 at Perkins-Rt. 65 at Central House		1.33		10.58
55.	Rt. 5 near Glenwood-San Francisco		10.46		13.80
56.	Rt. 2 at Las Cruces-Rt. 1 near Fernbridge	17.23		18.18	
57.	Rt. 2 near Santa Maria-Rt. 23 near Freeman via Bakersfield	12.85		10.34	
58.	Rt. 2 near Santa Margarita-Arizona Line near Topock via Mojave and Barstow	3.86		15.71	
59.	Rt. 4 at German-Rt. 13 at Lake Arrowhead		2.95		0.42
60.	Rt. 2 at Sierra-Rt. 2 at El Rio	5.63		10.85	
61.	Rt. 4 S. of Glendale-Rt. 59 near Phelan	10.25		5.18	
62.	Rt. 71 at Northam-Rt. 61 near Crystal Lake	31.97		21.88	
63.	Big Pine-Nevada State Line	90.18		66.32	
64.	Rt. 2 at San Juan Capistrano-Blythe	23.80		25.26	
65.	Rt. 18 near Mariposa-Auburn		6.84		7.16
66.	Rt. 5 near Moradale-Rt. 13 near Oakdale		2.07	4.05	
67.	Pajaro River-Rt. 2 near San Benito River Bridge	4.30		No change	
68.	San Jose-San Francisco	15.62		14.29	
69.	Rt. 5 at Warm Springs-Rt. 1, San Rafael		4.30		23.13
70.	Ukiah-Talmage	5.16		14.84	
71.	Crescent City-Oregon Line	14.54			1.37
72.	Weed-Oregon Line	9.66		16.85	
73.	Rt. 29 near Johnstonville-Oregon Line	28.69		13.77	

(Continued on page 36)

This picture shows how oak trees on highway in Monterey County were protected from erosion by state road builders.

Highway Engineers Preserve Roadside Growth

THE amount of extra work that highway engineers are willing to undertake in an effort to preserve native roadside growth is aptly illustrated in the accompanying photograph, which shows two trees on State highway V-Mon-2-H, directly south of San Ardo in Monterey County.

These California live oaks, although not particularly fine specimens of their species, were allowed to remain on the slope above a cut because both trees overhang the roadway and create a pleasing skyline effect from each approach on the traveled way.

Susequent erosion of the cut slope, however, bared the anchor roots on the road side of the trees and caused the death of feeding roots on that side. It was obvious that unless preventive means were taken this erosion would continue until the trees became a hazard to traffic and had to be removed. As this was not desired, Herb Cooper, district maintenance engineer at San Luis Obispo, requested Maintenance Superintendent R. S. Peck to accomplish the work necessary to prolong the life of the trees.

To this end, roots were first filled around with soil to a natural repose slope. A wet rubble wall of broken concrete was then placed from the gutter line into the eroded slope and approximately five feet in height. This wall was stepped at eighteen inches to provide greater stability and to break up the unattractive appearance that a straight wall would have presented, especially on the approach from the north. The remaining area within the wall was then filled with soil and brought up to the approximate original ground level.

A certain amount of erosion will continue, but the ill effects to the trees have been checked. An examination of the photograph will show the growth of natural ground cover, seeds of which will undoubtedly lodge in the loose earth of the new fill and help to stabilize this surface.

(Continued on page 32)

New Road Conquers Waste Lands From Mountain Pass to Nevada

By C. V. KANE, Resident Engineer

COMPLETION recently of that portion of the interstate highway, connecting Los Angeles with Las Vegas, Nevada, and Salt Lake, from Mountain Pass to the Nevada State line in San Bernardino County directs attention to the continual progress being made by the California Division of Highways in providing better facilities for transportation within this state.

This important route has just been brought up to modern standards of grade and line. The improvement has advanced by sections through the rough mountain and desert wastelands of northeastern San Bernardino County over a period of years.

While this interstate highway has long been an important route into Southern California, construction of the Boulder Dam and development of modern road facilities to Bryce Canyon and Mt. Zion National Parks have greatly increased both recreational and commercial travel over the 186 miles between San Bernardino and Nevada.

BIG DROP IN ELEVATION

The contract just completed provided construction to standards of alignment and grade compatible with present day engineering practice for mountain road construction.

Connecting with the section of road completed a few years ago at Mountain Pass about 34 miles northeast of Baker the new highway drops from about elevation 4700 along a line which involved much heavy grading to the bed of Ivanpah Lake some 2000 feet below.

The line of the highway on this portion of the route has a minimum curvature of 1760 feet and the maximum grade is 6%. The roadbed is a standard 36-foot width with bituminous surfacing 20 feet wide.

For the four miles across the dry lake bed to the State Line the roadbed was constructed on a 3½-foot fill. The embankment across the lake was constructed of fine silt taken from the lake bottom and blanketed completely, including the slopes, with a limestone shale rock, equivalent in grading to a crushed ledge rock; the blanket material was secured from a naturally fractured local ledge, which, when placed over the roadway, produced a solid foundation to efficiently prevent damage to the oil surfacing.

Culverts placed in the fill at 1000 foot intervals across the lake prevent the embankment's becoming a dam, and it is intended that water flow in either direction through the culverts, depending on which side of the lake the usual summer torrential cloudbursts occur. Crossings of dry washes were made with 75 and 90 inch multiplate culverts and timber bridge openings were provided for the storm waters to be concentrated from the expansive alluvial cone by a system of parallel ditches and dikes.

ROAD-MIX SURFACE

The surfacing was road-mixed type, placed five inches thick. Where roadside material was unsatisfactory, aggregate for the surfacing, without grading, crushing or scalping, was secured from adjacent pits and the roadway excavation. It was required that rocks over 2½ inches be removed from the surface of the pavement. To afford adequate blade finishing with this large-size aggregate, and incidentally improve the quality of the pavement, a sheepsfoot tamper was used to force the large rocks below the surface and to secure compaction from the bottom up.

The earthwork on the project amounted to 485,000 cubic yards, of which 20% was solid rock, and 12,000,000 station yards of overhaul were necessary. Two thousand tons of road oil were shipped in by rail and heated with retorts as used on the job.

This project was authorized in the Highway Budget for the 87th and 88th fiscal years, and was partially financed with Federal funds. The contract was held by George Pollock Company of Sacramento, award being made in August, 1936, and the work completed in June, 1937. Again engineers had won against desert odds.

Arizona Thinks California Road Signs Excellent

Editor,
California Highways
and Public Works,
Sacramento, Calif.

Dear Sir: I have just completed reading an article in your May magazine by F. M. Carter, Assistant Maintenance Engineer, in regard to directional road signs.

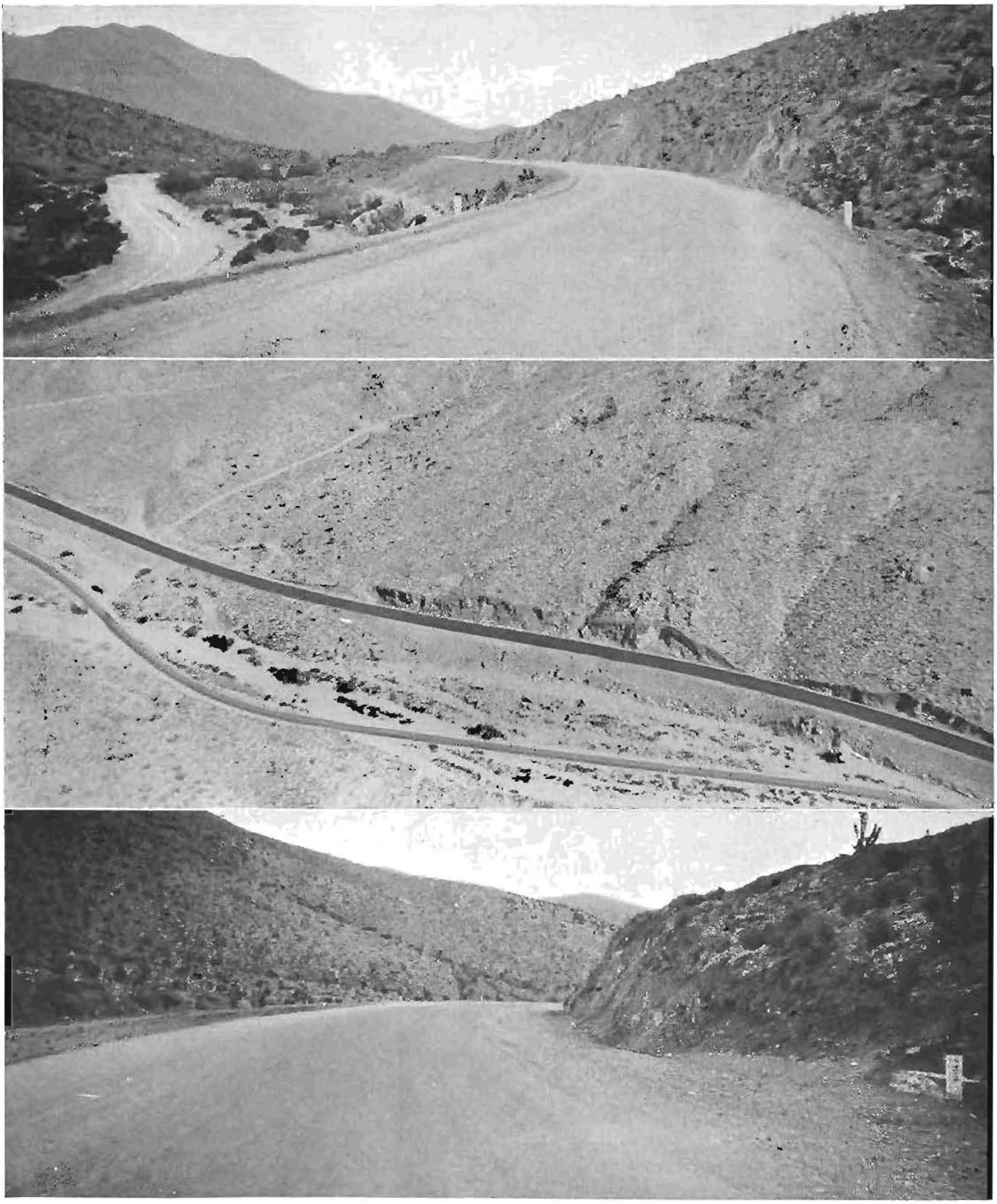
I was much impressed with the article but I believe it did not give due credit to the completeness with which most of your roads are signed.

I just returned from a trip through Southern California where I had to contact a number of widely scattered persons in regard to land they owned in Arizona and I was truly amazed at the accuracy with which the California road signs located the places I was looking for. Some of them were quite out of the way.

It is my opinion that California is years ahead of any other Western State and most of the Eastern states in so far as their road signs are concerned.

Cordially,

JACK D. SHELEY,
Right of Way Agent,
Arizona State Highway
Department.



The upper picture shows section of Mountain Pass to Las Vegas route before and after realignment. New road is on the right. Center—Aerial photograph of completed highway through Mountain Pass. Note old road meandering along creek bottom. New highway is on higher ground where it will be safe from floods. Lower—Another view of finished highway.

Vehicles Using Bay Bridge Reach Total of 6,723,948 in July

AN INCREASE in practically every type of vehicle crossing the San Francisco-Oakland Bay Bridge for the month of July was announced by Director of Public Works Earl Lee Kelly, with the accumulated count totaling 886,054.

Only exception was in the truck trailer division due to a change in rating, which now classifies the semi-trailer as a single truck.

July's traffic brings the total number of vehicles to cross the great span since its opening to 6,723,948, according to Mr Kelly from figures revealed in the monthly traffic report of State Highway Engineer C. H. Purcell.

"Highest day's traffic was on Sunday, July 4, when 36,280 vehicles crossed the bridge," Mr. Kelly said. "Second high point was Sunday, July 25, which had 35,647 vehicles. Lowest day was July 7, when 24,967 vehicles crossed the structure."

DAILY AVERAGE 28,582

The daily average number of vehicles for last month was 28,582 with the total collections for July amounting to $469,258.81.

The number of auto trailers crossing the bridge continued to increase, with a total of 2,726 for July, compared to 1,826 for the preceding month. Trucks and freight pounds also showed an encouraging increase with 68,409,499 freight pounds for July in comparison with 65,169,333 pounds for June.

There were 28,436 trucks crossing the San Francisco-Oakland Bay Bridge in July, showing an increase over the 28,024 trucks for the preceding month.

Comparative figures are:

	Passenger Autos	Auto Trailers	Motor Cycles	Tri-Cars
June	785,524	1,826	3,361	676
July	839,231	2,726	3,716	824

	Trucks	Buses	Truck Trailers
June	28,024	9,109	2,347
July	28,436	9,819	1,302

	Total Vehicles	Extra Passengers	Freight Pounds
June	830,867	193,118	65,169,333
July	886,054	209,971	68,409,499

Bay Bridge Terminal Construction Under Way

CONSTRUCTION of the San Francisco-Oakland Bay Bridge railway terminal in San Francisco is under way.

Electric trains will be operating over the transbay system of the span by November, 1938, according to Chief Engineer C. H. Purcell.

With the awarding of bids by Director of Public Works Earl Lee Kelly last month, the work of demolishing buildings remaining on the terminal site was hastened.

Contracts awarded total $2,283,377 and call for general construction of the terminal, structural steelwork for it and the street crossings of the train viaduct approach and mechanical and electrical work on the terminal.

MILLIONS OF POUNDS OF STEEL

Approximately 4,000,000 pounds of structural steel will be required for the street crossings of the viaducts, 2,800,000 pounds of steel roof framing for the terminal and 560,000 pounds for the catenary bridges.

Mechanical work on the terminal will include installation of plumbing fixtures and service piping, water piping and gas piping systems, boilers, oil tanks, radiators, etc.

The electrical installation will include a public address system for calling trains, fire alarm system, general lighting, clocks, signs, power wiring, etc.

PROVIDES FOR TRAFFIC INCREASE

The proposed terminal building will face Mission Street and the entire area including the head house and viaducts will extend just east of Second Street on the west boundary and east of Beale Street on the east boundary.

The terminal has been designed to provide for a fifty per cent increase over present commuter traffic between San Francisco and the East Bay and is expected to be sufficient to accommodate with ease all traffic for the next thirty years on the basis of every passenger being seated.

Tracks and loading platforms will be entirely roofed over a length of 700 feet with large skylights and windows providing ample lighting. Trains will come in to the terminal over six tracks which will be arranged in pairs with platforms between alternate trains.

LARGE WAITING ROOM

The main station width will be 164 feet. A fence will be placed between adjacent tracks in order to prevent hazards to passengers from incoming and outgoing trains.

The terminal will contain a large waiting room in the center of the station on the ground floor with access to four streets—Mission, Fremont, First and Natoma. Passengers leaving the bridge trains which come in on the elevated train level above the mezzanine floor need not pass through this waiting room but may leave the concourse by means of outdoor or indoor ramps to be located in front of the head house and at each end of the station.

Rest rooms, restaurants, first aid rooms, concessions, telegraph offices and telephones will be situated around the waiting room. On the mezzanine floor, between the ground floor and the track level, information booths, ticket offices, directional signs and concessions will be located.

NOISE ELIMINATED

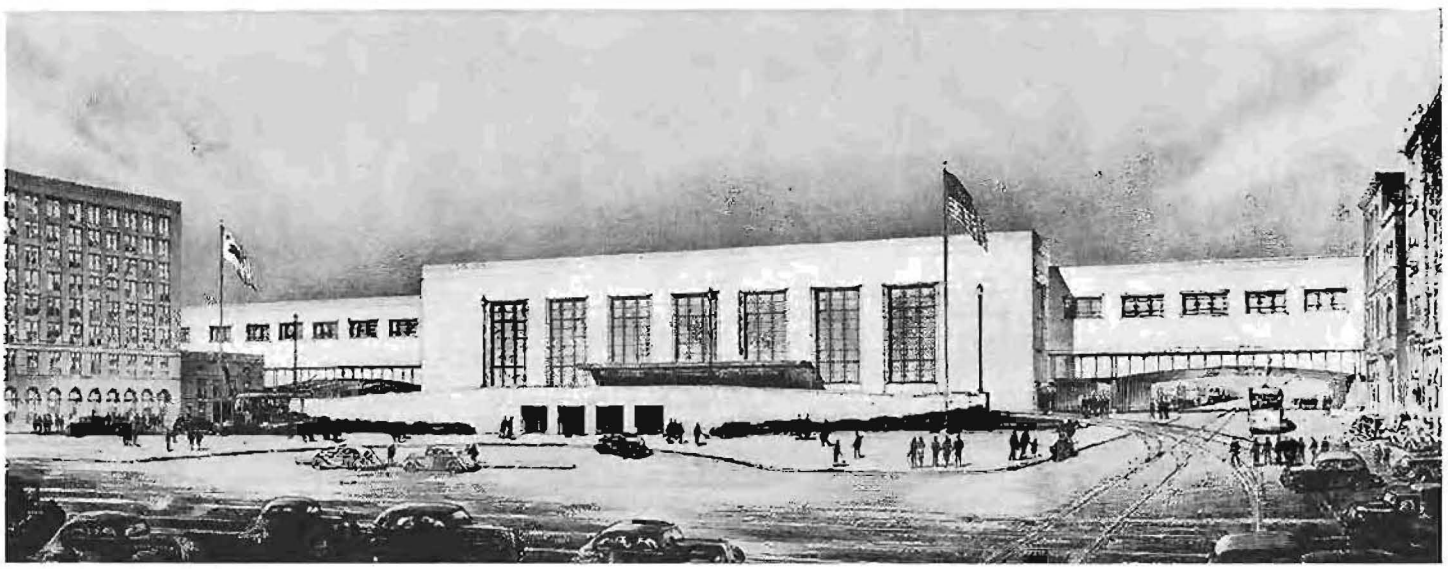
From this mezzanine floor, passengers may travel directly to the street cars which will stop just outside the station on the same level as the mezzanine floor.

All the terminal will be of reinforced concrete or structural steel. It will have acoustical treatment in order to eliminate all noise possible. Floors will be of terrazzo and the walls of the waiting room of terra cotta tile.

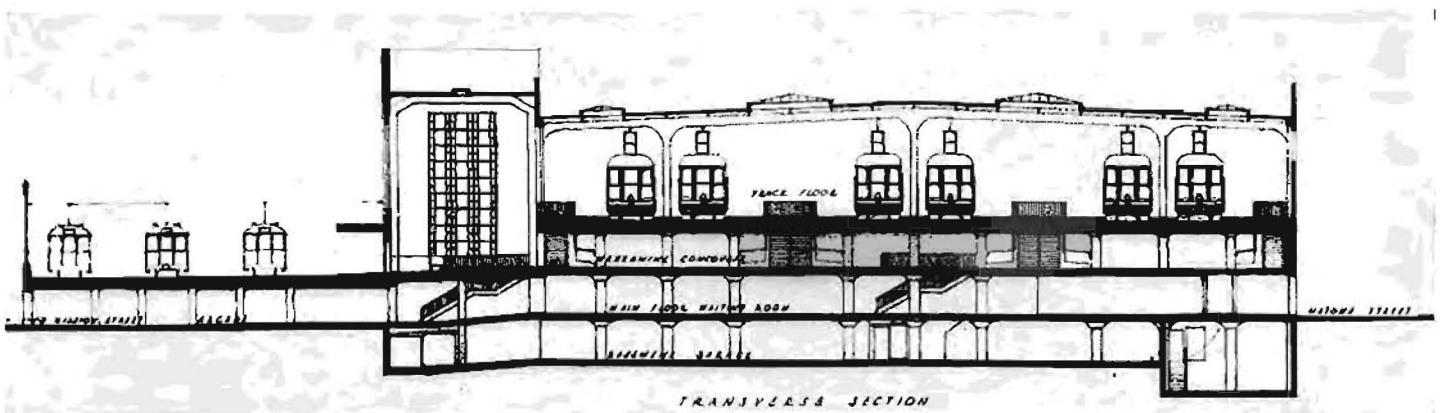
Low bidders for the terminal work are: General Construction, MacDonald and Kahn, Ltd., $1,658,510; Structural Steelwork, Columbia Steel Company, $442,360; Mechanical, Scott Company, Inc., $109,257; and Electrical, Radelfinger Bros., $73,250. All are San Francisco firms.

The children always know when there's company downstairs—they can hear mother laughing at father's jokes.

Artist's view of Bay Bridge terminal building and approaches. Ferry Building and Market Street in right foreground.



Most recent architect's drawing of Bay Bridge terminal through which it is expected 35,000,000 persons will pass annually.



Drawing showing interior of terminal with interurban train track floor, mezzanine concourse, main waiting room, garage and arcade leading to Mission Street trolley cars on extreme left.

San Gabriel Dam Dedicated by Governor Merriam

(Continued from page 21)

located about 3 miles downstream from the original Forks Site. These plans were approved by the State Engineer on June 14, 1932. Actual work was started in February, 1933.

WORK SUSPENDED ON ROCK FILL DAM

Work continued into the fall of 1934 but only limited progress was made owing to the lack of suitable specification rock in the designated quarries in the vicinity of the dam. It became apparent that sufficient rock of suitable quality could not be obtained, within the funds provided, to complete the dam in accord with the plans proposed. Realizing that further attempts to build a rock fill dam under the contract specifications would be futile, the District ordered the contractor to temporarily suspend work on November 13, 1934.

Studies were initiated immediately by the District to revise the plans for the structure. Because of the unusual complexities involved, numerous alternate plans were prepared and carefully considered. The final plans for the completed earth and rock fill dam were adopted only after exhaustive study and mature deliberation.

During the course of their preparation, Director of Public Works Earl Lee Kelly, the State Engineer and dam supervision staff headed by Deputy State Engineer Geo. W. Hawley, ably assisted by the State's consultants, F. C. Herrmann, C. D. Marx and W. L. Huber, closely cooperated and collaborated with the District's engineers. These plans, prepared under C. H. Howell who replaced Mr. Eaton as Chief Engineer of the district in February 1935, were approved by the District on July 26, 1935, and by the State Engineer on August 12, 1935. Work was immediately resumed by the contractor.

DESIGN IS UNIQUE

The design for San Gabriel Dam No. 1 is unique among high dams of the embankment type. It is predicated chiefly upon utilizing, in such a manner as to obtain the maximum of safety and stability, the existing rock and earth materials available in the vicinity of the site.

For this purpose the adopted plan provided for the construction of the embankment in six zones of different material, comprising in general an upstream section (Zone 1) of quarry-run rock to resist wave action and to support and protect the main body of the dam; a sloping section (Zone 2) of selected impervious material connecting with a concrete cutoff wall and resting upon a gunite surfacing over the canyon walls and foundation; a central section (Zone 3) forming the main body of the dam, consisting of a rolled earth fill with side slopes of 2:1 upstream and 1:1 downstream to provide an unyielding and relatively impermeable support for Zone 2; and three sloping sections (Zones 4, 5, and 6) downstream to provide support and consisting of porous material ranging from small rock to the largest rock available in the farthest downstream section. The fine material placed in impervious Zones 2 and 3 was spread in layers and sprinkled and rolled to required compaction. The coarser material in Zones 1, 4, 5 and 6 was placed with the aid of sluicing operations.

381 FEET HIGH

The dam as constructed has a maximum height of 381 feet from the lowest point on the foundation to the crown. Its crest length across the canyon is 1500 feet. Its top width is 40 feet while its width on the base is 1950 feet or nearly three-eighths of a mile. The up and downstream slopes average 3:1, but as constructed rise in steps as shown in the accompanying photograph.

Ample spillway capacity is provided which is especially essential for this type of dam. The spillway which is now under construction will have a discharge capacity of 80,000 second-feet with 15-foot freeboard and an estimated 200,000 second-feet or more before the dam is overtopped.

The construction of this dam required the moving of a veritable mountain of earth and rock material from the adjoining hillsides into the canyon. 10,572,000 cubic yards of earth and rock were excavated from the quarries by giant shovels, transported by a large fleet of trucks, and placed in the dam. All previous records were smashed by the contractor in the rapidity and efficiency with which this work was carried out. As much as 965,000 yards was placed in a single month. The entire earth fill structure was completed in about 11½ months. One of the speakers at the dedication ceremony illustrated the vast amount of material in the dam by this comparison. "If the rock used were loaded in flat cars, 45 tons to a car, and combined into one train, this train would be 11,300 miles in length."

OUTSTANDING ACHIEVEMENT

Completion of San Gabriel Dam No. 1 constitutes an outstanding engineering achievement—a triumph of engineers' genius and constructors' skill over unusually difficult physical conditions. But also it is a monument to the farsighted vision, careful planning and determined aggressiveness of a community that carried on in spite of complications, unforeseen difficulties and discouraging delays until the dam was successfully completed.

After years of effort, storage development on the San Gabriel River providing necessary flood control and water conservation has been completed—with the two dams built by the Flood Control District and a third (Morris Dam) built by the City of Pasadena a few miles downstream from San Gabriel Dam No. 1.

All of these dams were designed and constructed under State supervision. In the interest of safety, the greatest care was exercised by the State Engineer not only in checking the sufficiency of the plans but also by constant and painstaking inspection of every detail of the work as it proceeded, particularly with respect to the preparation and treatment of the foundation and cut-off. Consequently, the citizens of Los Angeles County and the residents along the San Gabriel River downstream who are more vitally concerned, have the assurance that the State's supervision has required the application of every known means and the utmost of precaution to insure the safety and stability of these dams.

Work of Straightening Curves On Cuesta Grade Is Under Way

(Continued from page 12)

On the southerly slope there will be sustained 7% gradient 2.27 miles long. Passing over the summit the new road will continue along the supporting easterly slope on a down gradient of 7% for one-half mile, and will cross the Southern Pacific Railroad on an overhead structure. This bridge will have a width between wheel guard of 50 feet.

The plans call for a 52-foot width of roadbed in cuts and a 58-foot width in fills. This provides for a 21-foot surfacing on each side of a center parting strip with 3-foot shoulders in cuts and 6-foot shoulders in fills. Opposing lines of traffic are to be separated by a 4-foot neutral strip along the center. This neutral strip will be 0.5 foot higher than the traffic lanes and the top will be sealed to prevent water percolating through into the subgrade. As the surfacing is to be in the nature of "Stage Construction," due to possible fill settlement after construction, this neutral strip will be curbed with a temporary curbing which will be broken at intervals to provide cross-overs.

The wearing surface is to be 0.25-foot of plant mixed surfacing placed on a .42-foot thickness of crusher run base placed under the traffic lanes. The plant-mixed top course will extend out over the shoulders and embankment dykes on fills, and on the shoulders and over the side ditches in cuts.

NUMEROUS TURNOUTS

Numerous turnouts, large enough to accommodate the largest of transportation units, will be provided. In order to make this provision it is planned to "ball nose" (round the ends) the cuts and widen the adjoining fills accordingly.

The maximum fill on the project will contain 122,000 cu. yds. It will be 350 feet long, have a maximum center height of 92 feet, and a maximum height at the toe of 169 feet. The summit cut is 1400 feet long and the maximum cut at this location at top of slopes, is 70 feet.

Further down the southerly slope one side hill cut contains 165,866 cubic yards, and has a maximum slope cut of 183 feet. At this location there is planned a catch bench 20 feet wide about one-half way between the roadbed and the top of slope. This is the heaviest concentrated cut yardage on the project.

YEAR'S WORK AHEAD

The following tabulation gives a comparison of design features between the existing road and the one now planned:

	Present	Planned
Number of Curves	71	12
Minimum Radius	60 feet	800 feet
Total Delta of Curves	3633°	408°
Average Grade	6.222%	7%
Maximum Grade	7%	7%
Minimum Vertical Sight Distance	275 feet	440 feet
Distance Saving		0.72 Mile

All work should be completed and the road opened for traffic in the latter part of 1938. This will make it available for the heavy traffic expected on U. S. 101 with the opening of San Francisco's Golden Gate Exposition in 1939.

HIGHWAY PROGRESS PUTS END TO OBSOLETE ROAD

(Continued from page 14)

of the Valley Boulevard from Colton to Ontario to a three lane highway.

The project, approximately one and three-tenths miles in length, decreases the distance of the old and more circuitous road by five-tenths of a mile. It eliminates three approximately right angle turns at street intersections, eliminating in all about 360° of turns and curvature. It eliminated a dangerous bridge of narrow width and of low load carrying capacity.

It gives the motorist for the first time a route, on this heavily traveled highway, that does not involve impeded progress between Colton and Redlands.

Traffic Menaces on Sherwin Hill Are Eliminated

(Continued from page 10)

around projecting points and back into the ravines. Cutting through points and filling across ravines were not attempted. The result was that alignment in the rougher topography near the summit consisted almost entirely of a series of short radius curves on an eight per cent grade. About one-third of the distance up from the foot of the grade there was a series of eight curves connecting seven switchbacks.

In 1935 the work of improving the alignment, widening the roadbed from 16 feet to 24 feet, and increasing the traveled way surface from 14 feet to 18 feet, was started. This work, after being closed down in June, 1935, was resumed in December, 1936.

The improvement of the alignment consisted of cutting off projecting points and building or widening embankments across ravines in order that adequate sight distance for the passing of slow moving vehicles by faster moving traffic will be secured wherever feasible. These numerous alignment changes are generally not over 200 feet in length and do not involve a shift in the center line of the highway of more than 50 feet. With the completion of the work, it is felt that a highway of sufficiently high standard will result, to meet the needs of the traveling public until such time as funds become available for the relocation and reconstruction of this section of highway in accordance with up-to-date standards on easier alignment and grades.

RELOCATION NEEDED

From the surveys and studies which have been made of the possible routes for such a relocation of this highway from the Inyo-Mono County line to Yerby's, a distance of 10.8 miles, it is estimated that approximately $400,000 will be required for its construction.

Old Colored Mammy: "I want a ticket for Magnolia."

Ticket Agent (after ten minutes of weary thumbing over railroad guides): "Where is Magnolia?"

Old Colored Mammy: "She's settin' over dar on de bench."

Michigan Uses General Fund For Highways

IN order to enlarge the scope of its highway building program, the State of Michigan through legislative enactment has appropriated $5,000,000 from its general fund for expenditure on roads and highways.

Writing to State Highway Engineer C. H. Purcell, Michigan's Highway Commissioner, Murray D. Van Wagoner, says his state has established a precedent in highway finance. Mr. Van Wagoner wrote:

"The Michigan legislature, which adjourned a short time ago, established a precedent in highway finance by enacting a continuing appropriation of $5,000,000 a year from the state's general fund to the Michigan State Highway Department.

"I believe that this is the first instance in the United States of the establishment of the principle that revenues other than specific motor vehicle taxes should be allocated for highway purposes. Here, for the first time, an appropriation from the general fund has been made supplementing motor vehicle revenue. In this instance, the revenue is obtained from the state's 3 per cent sales tax.

"Hence, in Michigan there is not only no diversion of highway revenues for other than highway purposes but also the use of revenues from general taxation for these purposes. It is my thought in transmitting these bills that they, together with the broad, underlying principle they embody, will be of interest to highway authorities throughout the country."

The act passed by the Michigan legislature reads as follows:

Section 1. There is hereby appropriated from the general fund from moneys not otherwise appropriated the sum of five million dollars for the fiscal year ending June thirty, nineteen hundred thirty-eight, and each fiscal year thereafter, for the construction, maintenance and improvement of highways. Such appropriations shall be disbursed as provided by the laws of this state.

This act is ordered to take immediate effect.

Yorba Linda Link Of the Imperial Highway Open

IN Yorba Linda, Orange County, on the evening of July 31, 1937, Governor Frank F. Merriam dedicated Road VII-Ora-176-A, through Yorba Linda. This highway is commonly called Imperial Highway and when completed will run from El Segundo at the ocean to Imperial Valley.

Yorba Linda is located in the northeasterly corner of Orange County and did not have any through highways prior to the completion of Imperial Highway.

The feature of the dedication was a dinner held at the Woman's Club at 6.30 p.m., sponsored by the local Chamber of Commerce and the Imperial Highway Association at which dinner the Governor made the address of the evening.

THREE MILES LONG

The newly completed project for which dedication ceremonies were held, extends from Carolina Avenue easterly of the city of Brea to Lakeview Avenue in the town of Yorba Linda, or a total length of 3.6 miles. The project is graded throughout to a uniform width of 36 feet and surfaced with plant-mixed surfacing.

Through the close cooperation of property owners, the Pacific Electric Railway Company and the State Division of Highways, it was possible to locate this section of highway directly north and adjacent to the Pacific Electric tracks extending, as it does, in a direct line from the city of Brea to Yorba Linda. To accomplish this the State obtained a width of 56 feet from the railroad company right of way plus an additional width of 24 feet from the adjoining private property, making a total right of way width throughout of 80 feet.

ORANGE COUNTY COOPERATED

Orange county officials also cooperated to the extent of allocating $13,000 of county funds for this project in addition to the Highway Commission allocation of $130,000 of the major project allocation for construction for the 87th-88th fiscal years, to complete financing of this highly important project.

Highways Serve To Boost State Fair Attendance

ALL CALIFORNIA roads lead to the State Fair Grounds at Sacramento and this year the traffic over these roads is expected to surpass all records as the great State Exposition opens its gates for ten days, September 3 to 12.

No part of the state is better situated in regard to roads for the people from each and every part of California. Direct arterials from the north and south, east and west, are ready to bring what is expected to be more than 760,000 people into the grounds of the State Agricultural Society.

During Fair time the people of every county of the state are made conscious of the benefits of a unified highway system which permits easy travel from every section of California right to the gates of the fair grounds.

Under the administration and control of the Division of Highways of the Department of Public Works and the California Highway Commission, the network of highways which focus in Sacramento has been brought to standards compatible with the development of modern motor vehicles.

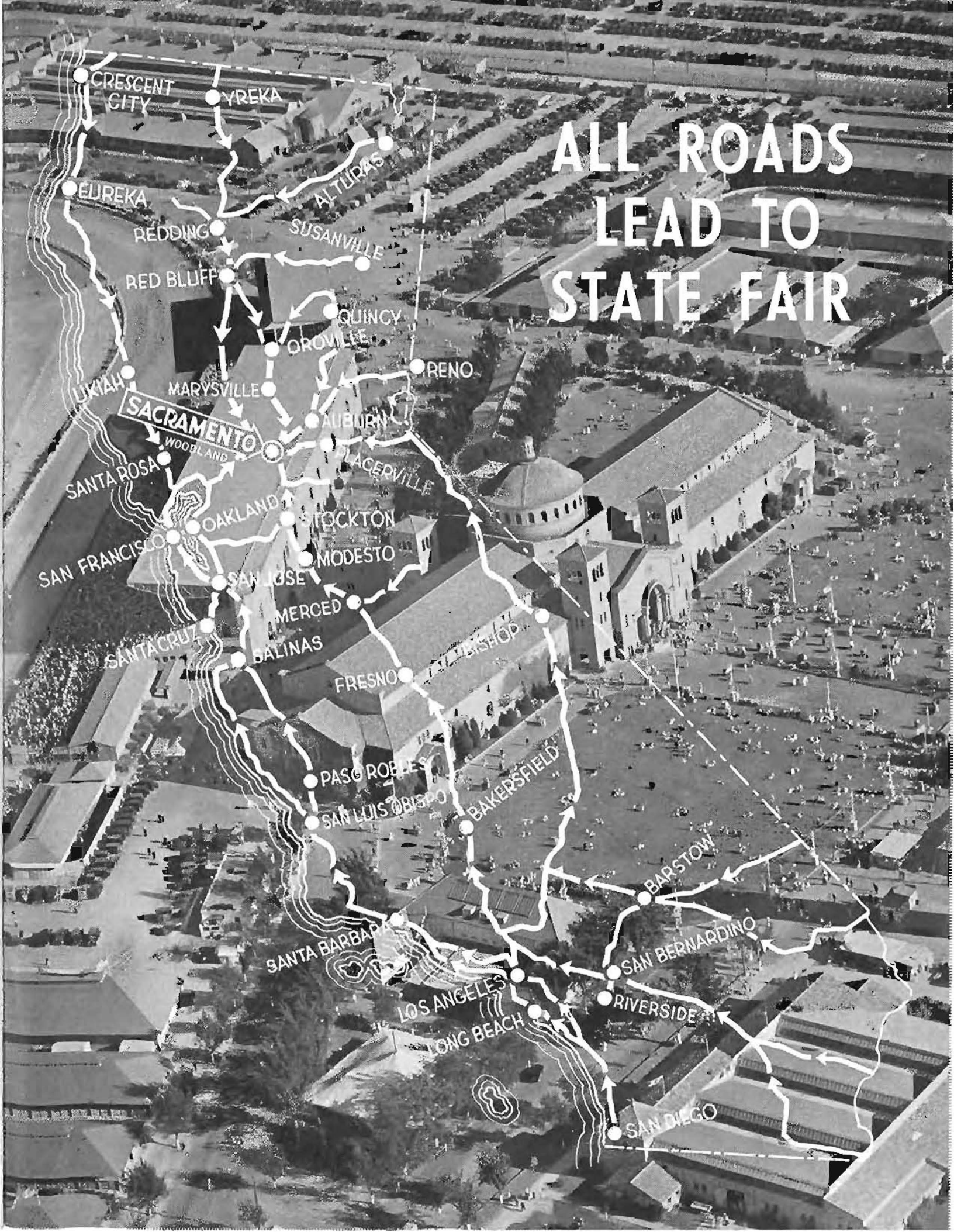
EASY TRANSPORTATION

Present day standards of road construction, providing wide, well-built pavements, superelevated curves of long radius and grades held to a low minimum, enable modern cars and trucks to safely travel the great distances from the far corners of the state to Sacramento in a relatively short time.

Easy transportation of exhibits is bringing a record increase in entries, especially from small individual ranchers and live stock men.

The state-wide web of highways whose units tap even the most outlying sections, will thus draw a traffic flow to the wide arterials and laterals which traverse the state from Oregon to Mexico that will come to rest in but a few hours time in Sacramento during the Fair.

Largely as a result of highway improvement, State Fair attendance has grown almost as rapidly as the increase in improved highway mileage over a period of nearly three decades.


ALL ROADS LEAD TO STATE FAIR
CRESCENT CITY
YREKA
EUREKA
ALTURAS
REDDING
SUSANVILLE
RED BLUFF
QUINCY
OROVILLE
RENO
UKIAH
MARYSVILLE
SACRAMENTO
WOODLAND
AUBURN
PLACERVILLE
SANTA ROSA
OAKLAND
STOCKTON
SAN FRANCISCO
MODESTO
SAN JOSE
MERCED
SANTA CRUZ
SALINAS
FRESNO
BISHOP
PASO ROBLES
SAN LUIS OBISPO
BAKERSFIELD
BARSTOW
SANTA BARBARA
SAN BERNARDINO
LOS ANGELES
RIVERSIDE
LONG BEACH
SAN DIEGO

New Travel Records Predicted This Year

Travel in the United States this year will average more than 2,000 miles per inhabitant, according to Roy F. Britton, Director, National Highway Users Conference.

The estimated average for this year is more than four times as great as the 1920 average compiled by the Federal Coordinator of Transportation. It also exceeds the average established in 1929, when the number of passenger automobiles was at least 1,000,000 less than the present total.

The annual total of passenger miles traveled in private automobiles now is at least eight times as great as the passenger-mile total recorded for the railroads in 1920, when rail travel was at its peak, Mr. Britton states.

LOW ACCIDENT RECORD

The lowest number of accidents for any month since the opening of the San Francisco-Oakland Bay Bridge was announced for July by C. H. Purcell, State Highway Engineer. Although approximately 880,000 vehicles, averaging more than 28,000 a day, crossed the span in the 31-day month of July, there were only 4 accidents, one of which resulted in injury. Three accidents occurred on the bridge proper and one on the approaches.

Meanwhile, 675 vehicles were serviced last month by the Bay Bridge Roadside Service, or an average number of 21.8 vehicles serviced per day. This brings the total number of vehicles serviced since the opening of the bridge to 5,632.

ENGINEERS PRESERVE HIGHWAY GROWTH

(Continued from page 23)

Such work as this can not be measured in actual cost of construction but must be regarded as having saved the Maintenance Department the considerable expenditure of funds that would have been required had the trees remained untreated and their removal been necessary as a safeguard to the traveling public. Also, we may consider that an actual asset to the appearance of the highway has been preserved, the value of which can be measured only by the appreciation of the individual of natural beauty.

New Viaduct Adds Link in Highway 60

WITH the recent completion of the paving of the approaches to the N and O Street Viaduct in Wilmington, between Wilmington Boulevard and Alameda Street, in Los Angeles County, another link in the Coast Highway was opened to traffic and unrestricted use of the grade separation was made available to the traveling public.

The contract for the grade separation, which included the structure and immediate approaches, was completed in September, 1936. The balance of the approaches, 1.58 miles in length, was graded and surfaced under a separate road contract which was completed June 30, 1937.

NEW LINK IN HIGHWAY

This grade separation, across the yards of the A. T. and S. F. Railway Company, an important grade separation in the metropolitan area of Los Angeles, constitutes a new link in Highway 60.

Traffic which previously had been routed through the business districts of Long Beach and Wilmington now may pass freely through the outlying sections of these cities with relative ease and considerable saving in time. This highway, Route 60, which is better known as Roosevelt Highway, carries traffic from the north and south around the business area of Los Angeles proper by following along the coast. It affords a convenient route to and from the many pleasure beaches along its course, extending from Ventura on the north to San Diego on the south.

Roosevelt Highway along this section of coast was primarily built as an artery for the public to gain access to the beaches. Its final alignment and gentle grades, however, have made it attractive to commercial vehicles.

STEADY TRAFFIC GROWTH

Traffic has steadily grown; in fact, its general use has been such that it has been necessary to widen it again and again to meet the ever increasing demand. Costly right of way was acquired, buildings were removed, existing roads were widened, new pavement placed and grade crossings eliminated.

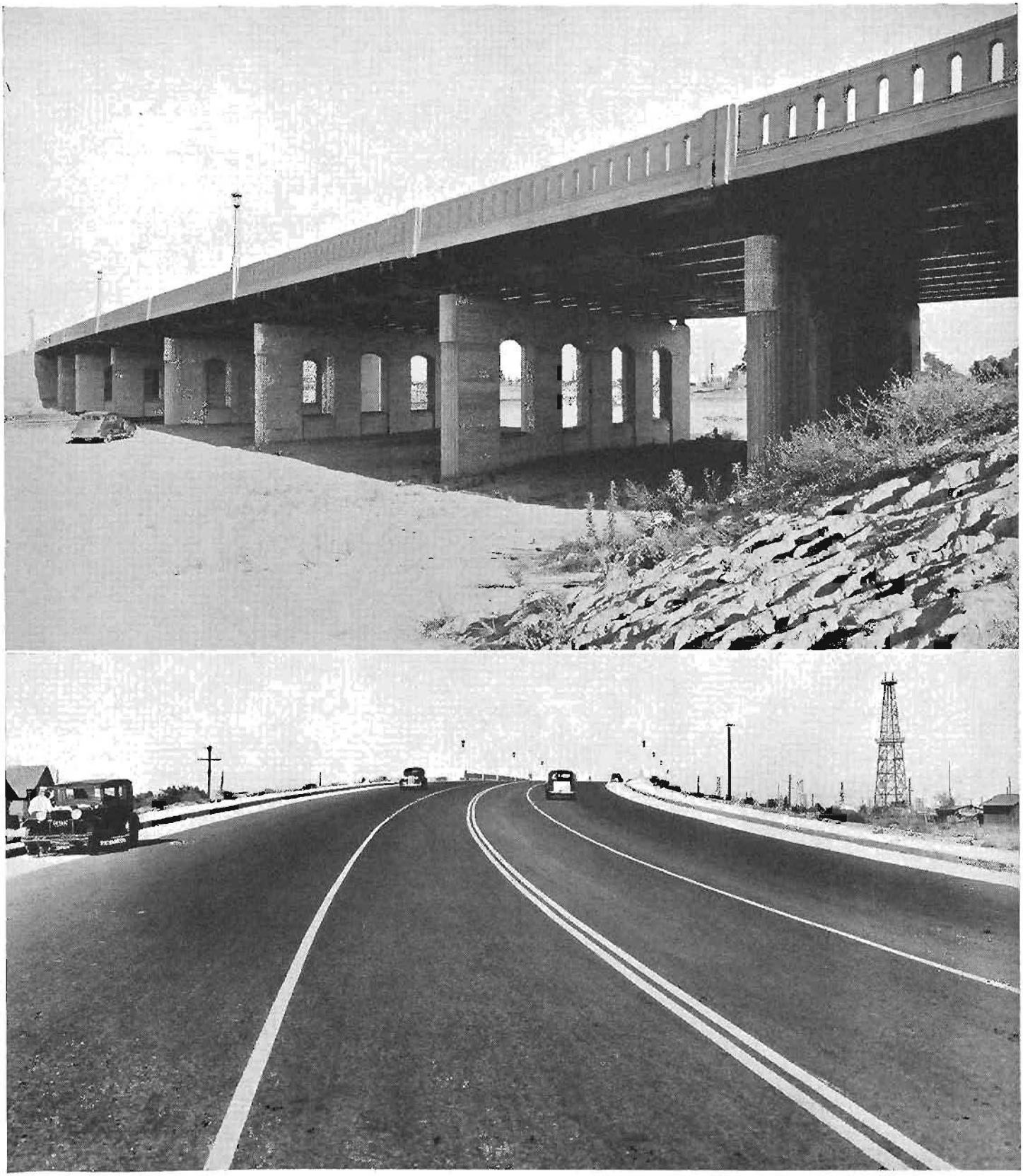
In accordance with this latter idea, the N and O Street overhead was undertaken. The N and O Street grade separation, which is the last major structure built on this highway, is immediately south of Banning Park and carries the highway over the yards of the Santa Fe tracks at Wilmington. At present these yards have six tracks, and the structure has been designed to provide for the expansion of these railroad yards to approximately twice their present size.

The viaduct itself, 411 feet in length, is built on concrete piers and abutments with steel "I" beams carrying the deck. The deck is a combination of reinforced Portland cement concrete and wearing surface of asphaltic concrete. To protect the under side of the deck and structural members from the detrimental effects of the smoke from the railroad trains, blast plates were placed along the lower side of the beams.

The width of the highway is 64 feet from curb to curb with 5 foot sidewalks on both sides. On the approaches of earth fill the roadway is widened to 74 feet.

FEDERAL AID IS GIVEN

Preliminary studies and final designs for both projects were made by the city of Los Angeles working in conjunction with the State Division of Highways. The contract for the approaches, costing approximately $155,000, was financed jointly from the gas tax money and Federal aid. This work was done by the United Concrete Pipe Corporation of Los Angeles. District VII Engineer, S. V. Cortelyou, was represented on the construction work by F. R. Pracht, Resident Engineer. The separation project, costing $226,000, was financed by the Federal Government under the Grade Separation Program. The construction work was done by the contracting firm of Sharp and Fellows of Los Angeles. Resident Engineer W. B. Piper represented F. W. Panhorst, State Bridge Engineer, on the active construction.



The N and O Street Viaduct in Wilmington in Los Angeles County, shown in upper picture, completes another important link in State Highway 60 and will be an important grade crossing for many years to come. Lower—View of west approach to viaduct showing splendid alignment.

RETIREMENT OF COL. ROBERT B. MARSHALL IS LOSS TO PUBLIC WORKS DEPARTMENT

COLONEL Robert B. Marshall, an employee of the Division of Highways at Central Office, has retired from State service, having reached retirement age.

While Colonel Marshall had only been in the State service since 1928, his public service started in 1889, when he was appointed Assistant Topographer in the United States Geographic Survey. In 1891, he was assigned to California. He advanced through the various grades of the Geographic service until, in 1908, he was appointed Chief Geographer. In 1915, he became Superintendent of National Parks, in addition to his duties as Chief Geographer. In 1917, he was commissioned in the Engineers Corps of the United States Army with rank of Major, and advanced the next year to rank of Lieutenant Colonel. During this period he supervised military mapping work, along with his geographic duties.

COL. R. B. MARSHALL

FATHERED MARSHALL PLAN

From 1919 to 1925, Colonel Marshall was Consulting Engineer for the California State Irrigation Association, fathering the Marshall Plan for the comprehensive, coordinated development, conservation, and use of water resources of California. This is now called the State Central Valley Water Plan, and actual construction is getting under way at Kennett, Friant, and in Contra Costa County.

Colonel Marshall had charge of establishing the Geological Survey office in the Post Office Building in Sacramento, and, also, the establishing and inauguration of cooperation with the State of the topographic survey in California. He also organized the topographic surveys for the Hawaiian Islands. He was a member of the Yosemite National Park Commission, appointed in 1904 to change the boundaries of the Park. In 1906, he had charge of the $100,000 fund raised for relief of the sufferers in the San Francisco earthquake.

During his topographic service, he became familiar with every feature of California. He was able to put this knowledge to especially valuable public use in the preliminary development and promotional work connected with the Valley Water Plan.

Colonel Marshall was appointed Landscape Engineer in 1928, attached to the office of Mr. B. B. Meek, Director of Public Works. During the last five years, he has been assigned to the Maintenance Department of the Division of Highways in connection with roadside development, preparation of maps, and a variety of special assignments on which his specialized knowledge of the State has been of great value. Colonel Marshall's retirement is a distinct loss to the Department of Public Works, where he will be missed by his co-workers of years.

The automotive industry in the United States last year led all other industries in consumption of gasoline, rubber, steel, malleable iron, mohair, lubricating oil, plate glass, nickel, and lead.

An Editorial and a Letter

States' Splendid Highway Work

Long Beach feels even more than a neighborly interest in Wilmington's celebration of the opening of a two-mile link in the State Highway. Only a few weeks ago Long Beach witnessed, but did not celebrate formally, the completion of a one-mile section of State Street which, with the Wilmington improvement, gives a continuous broad boulevard extending from San Diego to Malibu, along the coast. Now there remains but one stretch, about ten miles in length, north of Malibu, which is less than three lanes in width, until the west line of Santa Barbara is reached.

When one considers the progress that has been made during the past five years in the improvement of the Roosevelt Highway there is good reason to congratulate the State, from the Governor down to the most humble employee of the California Highway Commission, on the splendid showing. True enough, this work was in response to public need and demand; but it is not only the recognition of these calls, but the manner in which the construction has been carried on, including the engineering service, that deserves commendation.

—*Long Beach Press-Telegram*

Mr. Julien D. Rousset,
California Highway Commission,
Sacramento, California.

Dear Mr. Rousset:

Your kindness in writing to commend our editorial on the State Street festivities of June 5th is most gratefully acknowledged. Your Board is doing a great work in many localities, as it is a pleasure to note and to enjoy in one's travels. Our comment on the completion of the Wilmington link had, in fact, a much wider background than those two miles of fine new pavement and a splendid viaduct. More power to you. May you have the support you need to reach the success which you deserve, and which all Californians and their visiting friends will continue to applaud.

Very truly yours,

W. F. PRISK
Editor-Manager
Long Beach Press-Telegram

Highway Bids and Awards for July, 1937

COLUSA AND GLENN COUNTIES—Between Delevan and Logandale, 5.8 miles to be graded and paved with asphalt concrete. District III, Route 7, Section C, A. D. McDonald, Sacramento, $223,961; A. Teichert and Son, Inc., Sacramento, $218,938; N. M. Ball Sons, Berkeley, $238,897; Union Paving Co., San Francisco, $202,666; Chas. L. Harney, San Francisco, $222,647. Contract awarded to Hanrahan Co., San Francisco, $199,425.60.

HUMBOLDT COUNTY—Between Beatrice Overhead and Eureka, 5.2 miles to be surfaced with plant-mix surfacing, shoulders to be constructed of untreated crushed gravel or stone and apply Class "B" seal coat to be applied to the full width of the roadbed. District I, Route 1, Section G. Pacific States Construction Co., San Francisco, $79,867.50; Piazza and Huntley, San Jose, $66,385; Independent Construction Co., Ltd., Oakland, $61,610; A. Teichert and Son, Inc., Sacramento, $66,824; N. M. Ball Sons, Berkeley, $65,667; Hanrahan Company, San Francisco, $110,987. Contract awarded to Hemstreet and Bell, Marysville, $59,920.

IMPERIAL COUNTY—Between Brawley and Mulberry Avenue, 4.0 miles to be graded and surfaced with plant-mix surfacing. District XI, Route 187, Section Brw., D. B. G. Carroll, San Diego, $74,182; V. R. Dennis Construction Co., San Diego, $72,312; O. W. Ellis, North Hollywood, $76,250; D. W. Thurston, Los Angeles, $82,104. Contract awarded to R. E. Hazard and Sons, San Diego, $65,973.40.

INYO COUNTY—Between Death Valley Junction and State Line, 7.3 miles, road-mix surface treatment to be applied to existing roadbed. District IX, Route 12S, Section A. Geo. Herz and Co., San Bernardino, $14,363; A. S. Vinnell Co., Los Angeles, $13,917; Oilfields Trucking Co., Bakersfield, $13,531. Contract awarded to J. A. Casson, Pheonix, Arizona, $12,221.20.

LASSEN COUNTY—Between Lake Leavitt and Litchfield, 3 miles to be graded and surfaced with road-mix surfacing and multiplate arch culverts constructed. District II, Route 73, Section A. Fredericksen and Westbrook, Lower Lake, $53,882; Geo. French, Jr., Stockton, $51,975; Hanrahan Co., San Francisco, $54,815; Union Paving Co., San Francisco, $55,651; A. Teichert and Son, Inc., Sacramento, $56,291; Isbell Construction Co., Reno, $60,541; Hemstreet and Bell, Marysville, $61,380; D. McDonald, Sacramento, $68,253; A. Soda and Son, Oakland, $73,843. Contract awarded to Harms Bros., Litchfield, $51,171.90.

LOS ANGELES COUNTY—Water supply well to be drilled at Saugus Maintenance Station site. District VII, Route 23, Section A. Barber and Bridge Drg. Corp., Los Angeles, $1,412.07; Newton Palm, Ventura, $1,412.07. Contract awarded to Roscoe Moss Co., Los Angeles, $1,412.07.

LOS ANGELES COUNTY—A reinforced concrete slab bridge across Eaton Canyon Wash 1 mile east of San Gabriel consisting of one 58-foot 2½-inch slab span on concrete abutments with timber wing walls and grading and surfacing approaches with plant-mix surfacing. District VII, Route 168, Section C. Oscar Oberg, Los Angeles, $18,821; Geo. J. Bock Co., Los Angeles, $21,942; Claude Fisher Co., Ltd., Los Angeles, $19,871; J. R. Lippincott, Los Angeles, $21,496; Carlo Bongiovanni, Beverly Hills, $19,950; D. A. Loomis, Glendale, $23,010; C. O. Sparks and Mundo Engineering Co., Los Angeles, $22,714; W. H. McCune, Monrovia, $21,988; R. R. Bishop, Long Beach, $23,836; J. E. Haddock, Ltd., Pasadena, $19,003. Contract awarded to Dimmitt and Taylor, Los Angeles, $18,647.70.

MONTEREY COUNTY—A reinforced concrete bridge across Big Creek about 49 miles south of Monterey. District V, Route 56, Section D. C. W. Caletti and Co., San Rafael, $152,398; R. R. Bishop, Long Beach, $163,884; John Rocca, San Rafael, $166,015; M. B. McGowan, Inc., San Francisco, $176,313; Peter J. McHugh, San Francisco, $177,198; Barrett and Hilp, San Francisco, $211,694; Lindgren and Swinnerton, Inc., San Francisco, $242,673. Contract awarded to C. O. Sparks and Mundo Engineering Co., Los Angeles, $146,268.

NEVADA COUNTY—Near Grass Valley, mineral aggregate for road-mix surfacing to be furnished and stockpiled. District III, Routes 15 and 25, Sections B,B. Independent Construction Co., Ltd., Oakland, $14,986; Rock and Gravel Trucking Co., Oakland, $19,470; Harold Smith, St. Helena, $14,042; E. B. Bishop, Orland, $11,564; George Pollock Co., Sacramento, $12,508; Tieslau Bros., Inc., Berkeley, $12,862. Contract awarded to Fredericksen and Westbrook, Lower Lake, $10,502.

ORANGE COUNTY—Between north city limits of Orange and 2 miles north, 2 miles in length to be surfaced with plant-mix surfacing and borders to be constructed. District VIII, Route 43, Section B. Griffith Company, Los Angeles, $10,652; Oswald Bros., Los Angeles, $11,404. Contract awarded to C. O. Sparks and Mundo Engineering Co., Los Angeles, $9,552.98.

RIVERSIDE COUNTY—Between San Jacinto and Moreno, 12.5 miles to be surfaced with plant-mix surfacing and seal coat applied thereto. District VIII, Route 194, Section C. George Herz and Co., San Bernardino, $61,108; R. E. Hazard and Sons, San Diego, $57,850; C. O. Sparks and Mundo Engineering Co., Los Angeles, $67,620; E. L. Yeager, Riverside, $74,747; D. W. Thurston, Los Angeles, $54,585; A. S. Vinnell & Co., Los Angeles, $62,937; United Concrete Pipe Corporation, Los Angeles, $68,069; Bodenhamer Construction Co., Oakland, $68,084. Contract awarded to Oswald Bros., Los Angeles, $54,235.

RIVERSIDE COUNTY—Between Orange County line and Elsinore and between Temecula and San Diego County line, about 32.2 miles, seal coat to be applied to existing pavement. District VIII, Routes 64, 78, Section J,AB. George Herz and Co., San Bernardino, $13,598; R. E. Hazard and Sons, San Diego, $13,835; Matich Bros., Elsinore, $14,428; A. S. Vinnell Co., Los Angeles, $15,909. Contract awarded to Oswald Bros., Los Angeles, $12,465.

SAN BERNARDINO COUNTY—Between Los Angeles County line and San Bernardino, about 20.8 miles to be graded and paved with asphalt concrete. District VIII, Route 0, Section D, Upl., A,B,Ria., O and SBd. C. O. Sparks and Mundo Engineering Co., Los Angeles, $455,567; W. E. Hall Co., Alhambra, $306,846.10; J. E. Haddock, Ltd., Pasadena, $430,029; Griffith Co., Los Angeles, $413,182; Oswald Bros., Los Angeles, $409,286; Daley Corporation, San Diego, $410,394; D. W. Thurston, Los Angeles, $419,921. Contract awarded to United Concrete Pipe Corporation, Los Angeles, $369,153.10.

SAN BERNARDINO AND RIVERSIDE COUNTIES—Various locations, 8.6 miles to be surfaced with plant-mixed surfacing and seal coat applied thereto. District VIII, Routes 193, 190, 77, and 26. George Herz and Co., San Bernardino, $43,714; C. O. Sparks and Mundo Engineering Co., Los Angeles, $42,080; E. L. Yeager, Riverside, $40,776; Oswald Bros, Los Angeles, $38,726. Contract awarded to United Concrete Pipe Corp., Los Angeles, $37,813.60.

SISKIYOU COUNTY—Between Moffet Creek and Route 3, 10.7 miles of road-mix surfacing. District II, Route 82, Section D. Garcia Construction Co., Irvington, $15,000. Contract awarded to Leo J. Immel, Berkeley, $14,187.50.

SONOMA COUNTY—Between 1.2 miles and 3.0 miles east of Petaluma, about 1.8 miles in length to be graded and surfaced with plant-mix surfacing and a timber bridge to be constructed. District IV, Route 104, Section D. Harold Smith, St. Helena, $32,515; A. Soda and Son, Oakland, $41,983; A. G. Raisch, San Francisco, $30,859; Chas. L. Harney, San Francisco, $31,867; Claude C. Wood, Stockton, $32,298; Pacific States Construction Co., San Francisco, $35,961. Contract awarded to Peter J. McHugh, San Francisco, $30,089.50.

TEHAMA COUNTY—Between Proberta and 1 mile south of Red Bluff, 6 miles to be surfaced with road-mix surfacing. District II, Route 7, Section B. Garcia Construction Co., Irvington, $12,097; Tieslau Bros., Berkeley, $13,872; Lee J. Immel, Berkeley, $14,010; Piazza and Huntley, San Jose, $15,075. Contract awarded to Fredericksen and Westbrook, Lower Lake, $11,967.50.

TULARE COUNTY—Between Visalia and Staffords Corner, 10.3 miles to be surfaced with armor coat and road-mix surface treatment of shoulders. District VI, Routes 133 and 129, Sections A and E. John Jurkovich, Fresno, $24,450; L. A. Brisco, Arroyo Grande, $25,537; N. M. Ball Sons, Berkeley, $25,647; Granite Construction Company, Ltd., Watsonville, $26,900; Stewart and Nuss, Inc., Fresno, $28,100; Piazza and Huntley, San Jose, $29,347. Contract awarded to Union Paving Co., San Francisco, $24,250.

(Continued on page 36)

Construction Work Starts on Altamont Pass

(Continued from page 20)

and Mountain House, be included in the 1937-1939 biennial budget.

EASY GRADE

"Since that meeting, the engineers of the Division of Highways have been busy surveying and going over the entire situation and a complete new alignment was selected. The prevailing grade will be approximately 5% with a maximum not exceeding 6%. This new route will be nearly one mile shorter than the old between Greenville and Mountain House, the number of curves being reduced from sixty to fifteen, total curvature from 1500 degrees to 427 degrees, and the minimum curve radius on the new permanent relocation will be 2000 feet as against the short 250′ radius existing on the old road.

"When the Governor approved the budget late this spring, all preliminary work had been completed and just fifteen days after the beginning of this new biennium we are here assembled for this ground-breaking ceremony."

The pavement of the new highway will consist of a two-lane divided road, to be separated by a raised strip 4 feet wide. This strip is to have redwood curbs 6 inches high on each side of the dividing strip.

The contract for the construction of the new Altamont Pass route involves the largest quantity of grading ever included in one contract of the Division of Highways, Department of Public Works.

It is estimated that the roadway excavation will amount to nearly 1,900,000 cubic yards of earth and rock, and the overhaul on this material will be more than 25,000,000 station yards. Over 10,000,000 gallons of water will be required for embankment compaction and other construction purposes, and nearly 18,000 lineal feet of various sizes of corrugated metal pipe will be needed for drainage purposes.

The cost of the road construction will amount to $920,000.00. Plans for the completed project provided for the construction of four grade separations of the highway with tracks of Southern Pacific and Western Pacific railroads.

While these grade separations, built with Federal aid funds, will be constructed under separate contracts, the Department of Public Works plans to have them completed at the same time as the road construction. The estimated cost is approximately $340,000.00. Highway construction and the four grade separations will amount to approximately a grand total of $1,260,000.

In Memoriam

HARRY J. PEARCE

The unexpected death, on August first, of Harry J. Pearce, assistant chief of the Division of Highways central office accounting staff, has left a great void in the Division's personalities. Not only will the large force of employees in the accounting department who were his close associates, miss his kindly supervision, but the entire Division of Highways staff in Sacramento regrets the end of the friendly contacts with Harry Pearce with a feeling of deep personal loss.

Born in Denver, Colorado, on November 28, 1897, Mr. Pearce received his early schooling in Denver and Sparks, Nevada. After graduating from the Sparks High School, he attended the Nevada Commercial Business College in Reno to receive the foundation of his training in accountancy. He moved to Sacramento in 1913 and on October 10, 1917, joined the staff of the California Highway Commission.

Since that time, with the exception of the months spent in military duty at one of the officers training camps in the bay area in 1918, Mr. Pearce has been continuously connected with the Highway Department. During these twenty years of service to the State his proficiency as an accountant, his industrious application to his work, and his marked executive ability carried him high in his chosen field.

It is with all sincerity that the Division of Highways organization extends its deepest sympathy to Mrs. Pearce and her daughter, Barbara Jeanne, in their bereavement.

HIGHWAY BIDS AND AWARDS FOR JULY, 1937

(Continued from page 35)

VENTURA COUNTY—Between Route 2 and 2.5 miles east of Moorpark and between Camarillo and Bectox, 28.7 miles road-mix surface treatment to shoulders. District VII, Routes 0 and 2, Sections AB, BC. Oilfields Trucking Co., Bakersfield, $30,451; Southern California Roads Co., Los Angeles, $29,009; Dimmitt and Taylor, Los Angeles, $28,710; Oswald Bros., Los Angeles, $28,901; A. S. Vinnell Co., Los Angeles, $31,049. Contract awarded to J. E. Haddock, Ltd., Pasadena, $27,851.50.

YOLO AND COLUSA COUNTIES—Between Zamora and Bretona and between Arbuckle and Geneva, 4.3 miles to be surfaced with bituminous macadam. District III, Route 7, Sections C.A. Lee J. Immel, Berkeley, $20,880; E. A. Forde, San Anselmo, $22,476; J. P. Brennan, Redding, $22,316; A. Teichert and Son, Inc., Sacramento, $28,500. Contract awarded to Granite Construction Co., Ltd., Watsonville, $19,897.60.

YOLO, COLUSA, YUBA, PLACER, NEVADA, EL DORADO COUNTIES—About 43.2 miles seal coat to be applied to existing roadbed. District III, Routes 7, 15, 3, 11, various sections. Granite Construction Co., Watsonville, $28,987; Hayward Building Material Co., Hayward, $29,639; E. A. Forde, San Anselmo, $30,897; Lee J. Immel, Berkeley, $33,194; Pacific Truck Service, Inc., San Jose, $34,023; A. Soda and Son, Oakland, $34,898. Contract awarded to Healey-Moore Co., and E. F. Hilliard, Sacramento, $28,221.50.

"There are really a lot of smart people in my family," boasted the bore. This caused the girl-friend to reply, "Well, I'd like to meet one of them."

HIGHWAY TRAFFIC SHOWS INCREASE OVER 1936

(Continued from page 22)

Route	Terminal	1937 Sunday Gain Loss	1937 Per cent gain or loss Monday Gain Loss
74.	Napa Wye-Cordelia via Vallejo and Denlela	42.50	40.74
75.	Oakland-Jct. Rt. 55 at Alleyville	9.50	6.57
76.	Rt. 125 at Shaw Ave.-Nevada State Line near Boston	55.19	35.89
77.	San Diego-Los Angeles via Pomona	11.30	5.28
78.	Rt. 12 near Dozanno-Rt. 19 near March Field	14.80	9.85
79.	Rt. 2, Ventura-Rt. 4 at Castaic	6.43	18.82
80.	Rt. 51, Rincon Creek-Rt. 2 near Zara	19.33	13.56

Her mother—I believe that daughter is looking for a husband.

Her father—For goodness' sake! Whose?

Denslow had just bought a second-hand car.

"You w'dn't think it was second-hand, would you?" he said proudly.

"No," said Walker. "I really thought you'd made it yourself."

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Twelfth and N Streets, Sacramento

FRANK F. MERRIAM.....Governor

JUSTUS F. CRAEMER.....Assistant Director

EARL LEE KELLY.....Director

EDWARD J. NERON.....Deputy Director

CALIFORNIA HIGHWAY COMMISSION

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PAUL G. JASPER, Fortuna
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