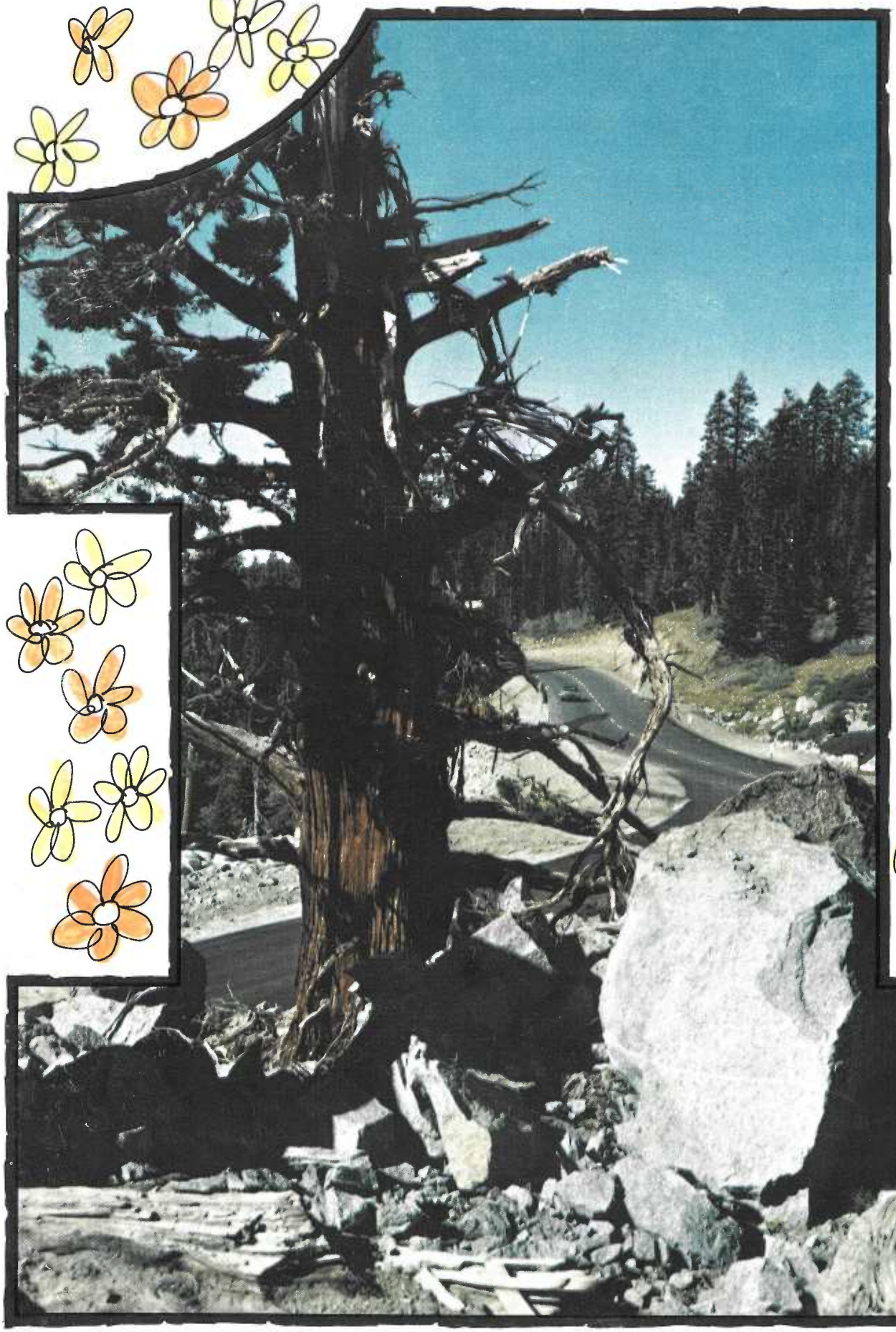
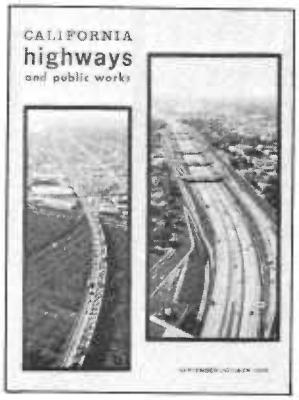
CALIFORNIA highways and public works

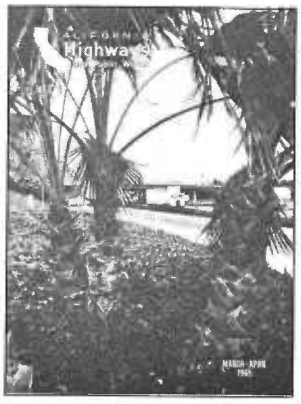


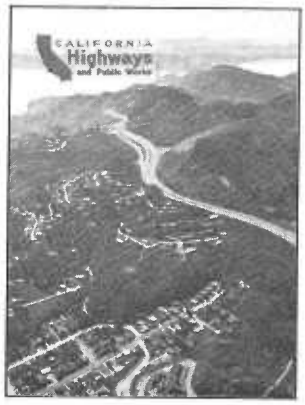
CALIFORNIA IS NUMBER ONE

Parade MAGAZINE **chooses realigned section of Route 88 as** BEST U.S. DESIGN IN 1965

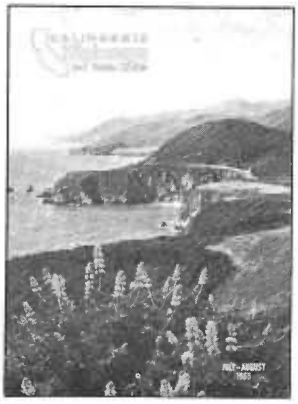
March - April 1966







The yearly index will no longer be printed as part of the magazine but on separate pages punched so that they can be inserted into a three-ring binder. Readers who want copies of the index covering the issues for 1965 should send their requests to the editor.



CALIFORNIA
highways
and public works

OFFICIAL JOURNAL OF THE DIVISION OF HIGHWAYS, DEPARTMENT OF PUBLIC WORKS, STATE OF CALIFORNIA

VOLUME 45 MARCH-APRIL NOS. 3-4

"An outstanding network of state highways is essential to the future growth of California's economy"
—*Governor Edmund G. Brown*

Editors are invited to use information contained herein and to request prints of any black and white photographs.

Address communications to:
BOB NANCE, INFORMATION OFFICER
CALIFORNIA HIGHWAYS AND PUBLIC WORKS
P.O. BOX 1499
SACRAMENTO, CALIFORNIA 95807

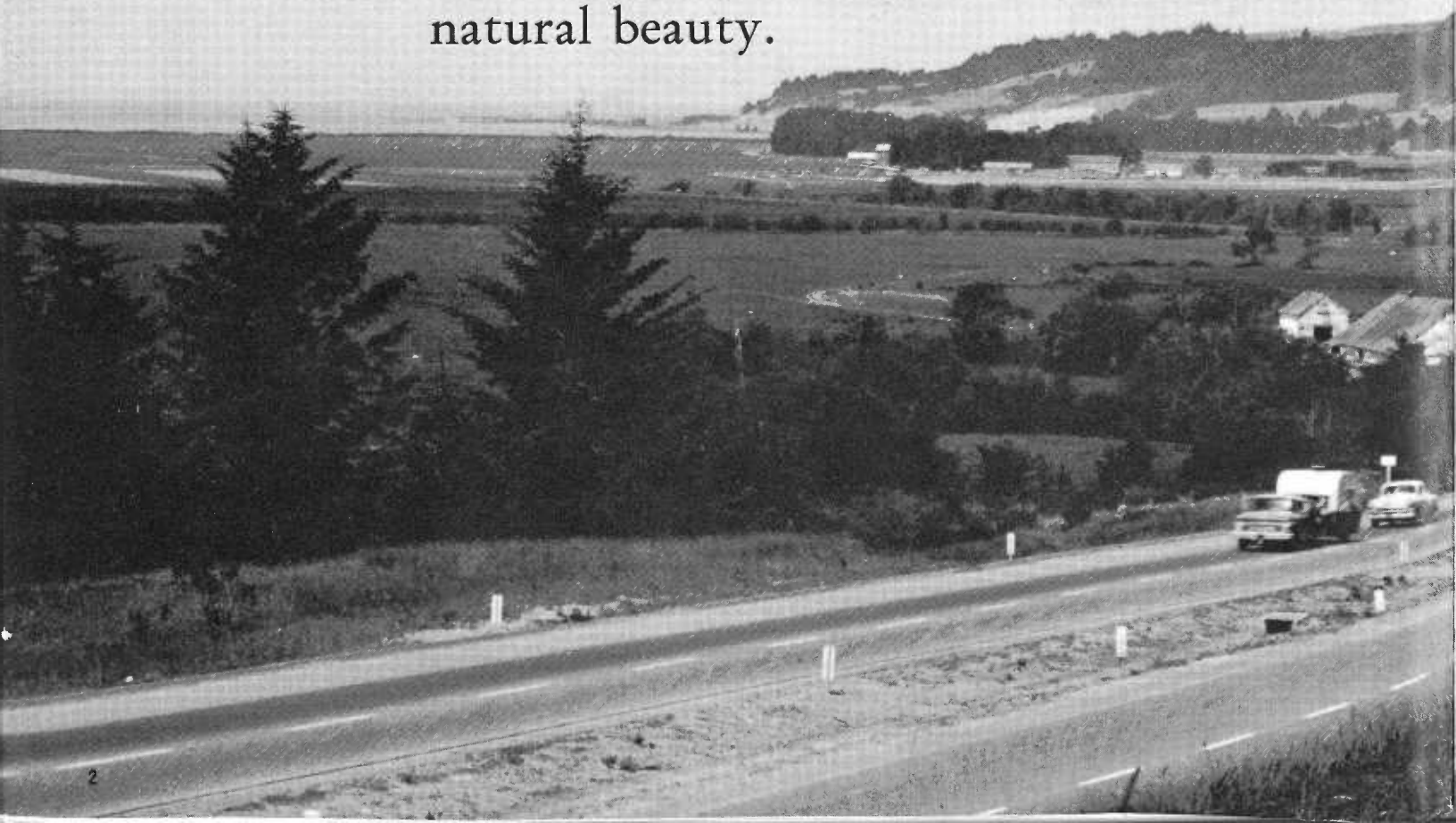
FRONT COVER: California is No. 1! Section of Route 88 near Carson Pass summit wins PARADE Magazine annual contest for best designed highway project completed in 1965. (See page 28.) In the words of Ed Kiester, PARADE's Managing Editor, ". . . the PARADE Scenic Highway Award annually designates the new highway which best embodies the principles of good design, beauty, and utility." (Jack Meyerpeter, photographer)

BACK COVER: Evening in Los Angeles. Looking northeast toward Civic Center across Third Street overcrossing of Harbor Freeway. Building on left is Department of Water and Power, building on right is the Music Center. (Sam Smith, photographer)

HIGHWAY BEAUTIFICATION

By J. C. Womack, State Highway Engineer

The preservation and enhancement of scenic features along the highways of our state and our nation have in recent years become subjects of intense interest. With our expanding population enlarging the urban areas, there is greater need to conserve open space and natural beauty.



When we speak of the general term "highway beautification," just what are we really talking about?

The beautification program is, to quote a phrase, "a many-splendored thing" that includes both constructive and control considerations. On the constructive side, we have the many factors that become a part of the highway plan or design, such as special location considerations to provide appropriate viewing of scenic features; locations which blend the roadway into the area to minimize scarring of the landscape; special design techniques for bridges and other structures; provisions for restoring native plant growth; provisions, especially in our urban areas, to beautify by appropriate landscaping and screen-type planting; and provisions for roadside rests, vista points, and other facilities to meet the needs and provide comfort for the traveling public.

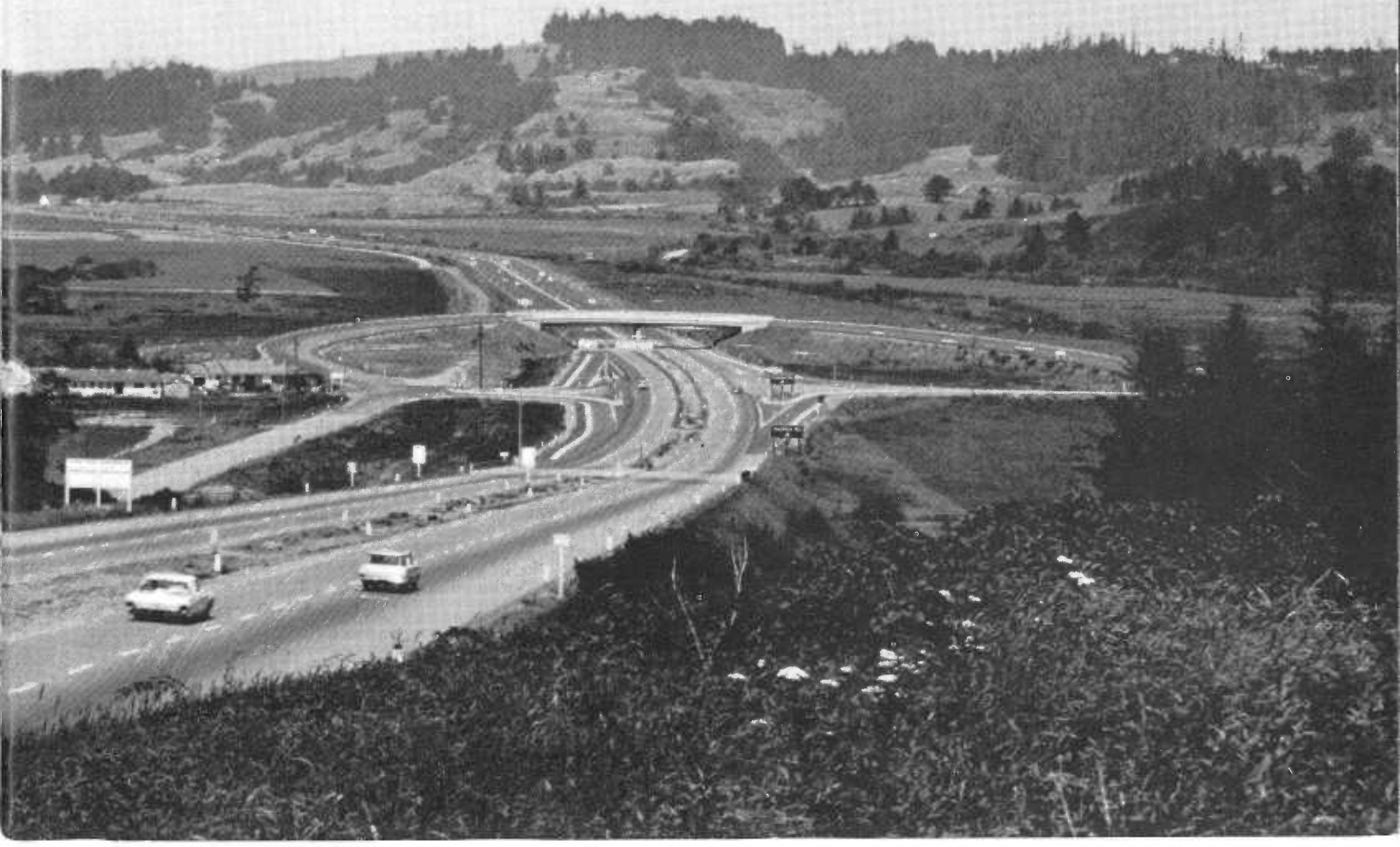
In our highway beautification program, too, we must consider not only the motoring public but also those who live and work near the highway. Appropriate screen planting and other beautification efforts can greatly enhance the surroundings of these state highway system neighbors.

On the control side, provisions are necessary for restricting and, in many cases, eliminating junkyards and billboard displays that mar the view of the motoring public.

The problem of highway location and design today is a search for the ideal solution to meet the requirements of traffic service, safety, economics, local area benefits, and the preservation and enhancement of scenic and historic values.

The highest human value is life itself, and our greatest challenge is to reduce the toll of deaths and injuries associated with automobile accidents. The fact that this year probably 50,000 persons will lose their lives as a result of automobile accidents in this country demands that we build maximum safety into our highways.

Very often in discussing roadway construction through scenic areas, people discuss capacity and safety aspects of geometric design as separate and distinct from aesthetic considerations. This, we believe, is an erroneous approach. Aesthetic considerations must include all factors which influence the emotions.



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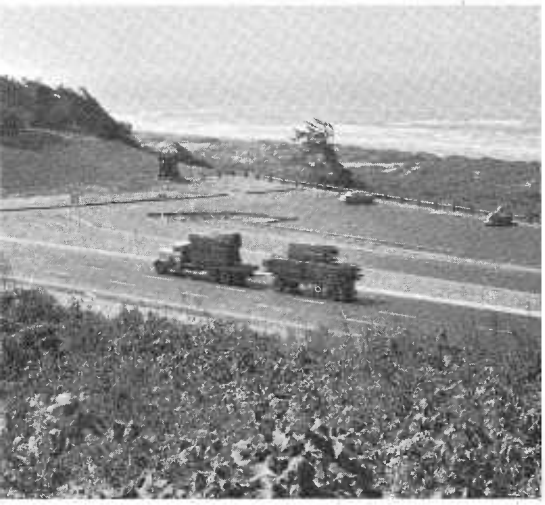

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1. Vista Point on Redwood Highway along Pacific near Arcata. 2. Vista Point on US 101 just north of Golden Gate Bridge. 3. Golden State Freeway, Los Angeles. 4. Redwood Creek Bridge on US 299, Humboldt County. This replacement bridge after the floods of 1964 is now open to traffic.

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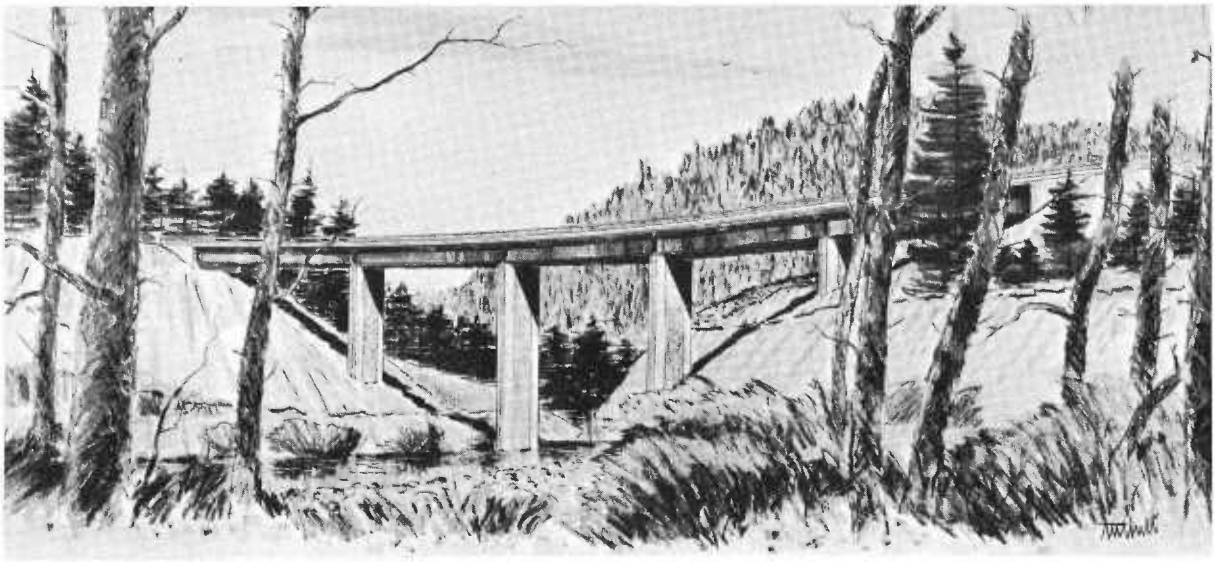

Security and an Absence of Irritation . . .

A sense of relative security and an absence of irritation must exist if the scenic features of the area are to be appreciated. By irritations, it is meant such factors as severe and changing curvatures, narrow roadway width, apprehension regarding traffic attempting to pass and creating unpredictable safety conditions, and bumper-to-bumper traffic. It is our belief that the roadway should be designed to accommodate the traveler in a relaxed manner at an appropriate speed.

An important factor in any plan to preserve scenic features is to control the access along the highway. Access control was initiated as a means of preserving the effectiveness of the roadway by limiting the points of entry and exit and thereby preventing future congestion created by traffic movement to and from adjacent properties. This access control feature, however, also has a very desirable byproduct in that commercial and other development is minimized along the area immediately adjacent to the highway. Generally accepted standards for scenic highways and parkway development have specified this access control feature. In this regard, recently enacted legislation in California relative to a possible future parkway system also stresses this access control feature as a necessary means of preserving the scenic areas adjacent to such parkway development.

The topic of roadside beautification is not new to the Division of Highways. Efforts along these lines extend back half a century or more, although funds have traditionally been a problem as the state struggled to keep abreast of ever-increasing highway traffic service demands.

During the 1950's, added emphasis was placed upon highway beautification, and more extensive landscape projects were undertaken, especially on freeways through urban areas. The results can be seen in the lush growth along many of our established freeways.

In 1957, the Legislature adopted Assembly Concurrent Resolution No. 132 pointing out that expenditures for landscaping and design that enhance the attractiveness of highways are legitimate highway development purposes for which the traveling public may be expected to pay. The resolution further stated that it was the intent of the Legislature that the landscaping program be moderately increased and all aspects of attractive design appropriate to conditions in this state be regarded as integral features of the California freeway program.

In the evolution of California's roadside policy, three types of planting have been developed—functional planting, landscaping, and tree planting. In general, functional planting, as its name implies, is basically for utilitarian purposes with, of course, aesthetic side effect benefits. One example of functional planting is the use of oleanders in the median of many divided highways to screen oncoming headlights. Landscaping goes beyond pure function and is specifically directed toward aesthetic appeal. Tree planting is for the primary purpose of aesthetic improvement in undeveloped areas where a higher type planting is not justified, and also, in some cases, to provide natural appearance by replacement of trees removed for roadway construction.

From the beginning of highway beautification efforts through the current 1965–66 fiscal year, the installation of all classifications of planting (landscaping, functional and tree planting) has amounted in original dollar value to approximately $45,000,000. These projects have required an almost equal amount of funds for maintenance. Funds provided for the coming 1966–67 budget ($9,500,000 for planting, $7,700,000 for maintenance) will boost the total expenditure for roadside planting and maintenance to well over $100,000,000. Future fiscal programming calls for ever increasing annual amounts for highway beautification purposes. The professional landscaping staff of the Division of Highways has been expended through the years and is now a separate major department within the Division of Highways.

Highway aesthetics or beautification is, however, far more encompassing than landscaping. While landscaping and the restoration of native vegetation can provide the finishing touch, our total program approach stresses such factors as appropriate route corridor selection, contour grading, the blending of the roadway into the terrain, scenic vistas afforded the motoring public, and a multitude of other vital factors.

To further these objectives, the Division of Highways has established centralized control of aesthetic considerations in all phases of its work by the creation of a special Committee on Aesthetics and Highway Beautification. This committee is developing requirements for aesthetic treatment in the various phases of highway work and is conducting aesthetic training throughout all offices of the division. The training is aimed toward the continuing awareness of aesthetics among all personnel engaged in highway planning and design activities.

Greatly accelerated emphasis is being given to the topic of highway beautification by recently enacted federal legislation. The federal program made possible through enactment of the Highway Beautification Act of 1965 provides for the control of outdoor advertising and junkyards along specified federal-aid highways. Additional funds will also be available for landscaping and other scenic enhancement projects on these routes. In terms of roadway mileage, this means that the 2,166 miles of interstate highways and over 7,000 miles of primary (U.S. highway designations) routes within California

will be eligible for additional highway funds specifically for highway beautification. The act provides both an incentive for beautification in the way of additional funds for that purpose and also penalties in reduced roadway development funds for those states that do not undertake billboard and junkyard control programs.

States are required to control outdoor advertising signs, displays, and devices which are, with certain exceptions, within 660 feet of the highway right-of-way and visible from the main traveled roadway.

Certain areas will be specified on interstate highway routes where signs of particular interest to the traveling public may be erected and maintained. Standards will be established as to the type and size of such signs.

In regard to junkyards, the act provides for either effective screening by natural objects, fences, trees, or other appropriate means, or if this is not possible, then for removal. The distance guideline in junkyard control is 1,000 feet, contingent upon its being visible from the main traveled portion of the highway.

The billboard and junkyard control programs do not apply to areas designated for industrial use or determined to be predominantly industrial in nature. In addition, a similar exception applies to billboards in commercial zones or areas.

In the case of billboards and junkyards that are presently in existence or which come into existence before controls are established, the final deadline for removal or screening is July 1, 1970. Just compensation is to be paid the owners of billboards and junkyards thus affected, with the federal government providing 75 percent of necessary funds.

A third phase of the federal beautification program provides additional funds annually for landscaping and roadside development. This includes acquisition and improvement of strips of land (in easement or fee) necessary for the restoration, preservation, and enhancement of scenic beauty adjacent to such highways.

All of the federal government's financing for the billboard and junkyard programs and the additional money for landscaping are from general funds which are in addition to roadway funds now being received.

Another topic closely associated to the highway beautification program is a plan to designate some of our existing highway routes as scenic highways. The general plan was authorized under legislation enacted in 1963, and the program is now only in the preliminary stages. In future years it should, however, provide a very desirable means of touring the more scenic and historic areas of the state.

Prior to the enactment of the legislation establishing the scenic highway system, a series of studies and plans was developed through the coordinated efforts of a citizens advisory committee and representatives of various affected state agencies. The resulting scenic highway plan comprises approximately 6,000 miles of highways through our most beautiful natural scenery.

The law authorizing the scenic highway system included provisions for a permanent advisory committee, the members of which are appointed by the Governor. This committee, composed of persons with demonstrated interest and dedication to highway beautification and scenic enhancement, has now established standards and criteria for scenic highways.

A 72-mile-long portion of Highway 1 in Monterey County was designated on June 11, 1965, as an official California scenic highway, thereby becoming the first highway in the state to receive the official scenic highway designation.

The staff of the Division of Highways is working very closely with the advisory committee and is engaged in numerous field reviews regarding scenic highway routes. This new system should, in future years, provide a source of scenic motoring enjoyment for the people of California.

In 1963 the Legislature enacted a bill which became effective on September 20, 1963, authorizing the Division of Highways to construct a system of safety roadside rests throughout the state.

Prior to this time a very limited number of such facilities had been constructed and operated by the Division of Beaches and Parks. Fund limitations under the old program had severely restricted development of such facilities.

Under the new Division of Highways program, these roadside rest areas, in conjunction with facilities provided in communities of over 10,000 population and with existing state parks and other recreational areas, will provide an opportunity for motorists to avail themselves of some type of rest facility approximately every 30 minutes of driving time.

Master planned are 257 safety roadside rests, of which 40 are constructed or under construction and another 58 are programmed for construction in the near future. Most of these areas include toilet facilities, picnic tables, natural or constructed shade, drinking water, and park areas. Public use of and reaction to the completed facilities have been overwhelmingly favorable.

Highway Aesthetics . . . More Than Landscaping

1

2

1. Rendering of design for San Mateo Creek Bridge now under construction on Junipero Serra Freeway. 2. Structures on San Diego-Santa Monica Freeway interchange, given special award for design by Portland Cement Association. 3. Simple line of Hot Springs Creek Bridge, Monterey County, which uses prestressed concrete girder construction. 4. Architectural study for Magdalena Avenue Undercrossing, Junipero Serra Freeway.

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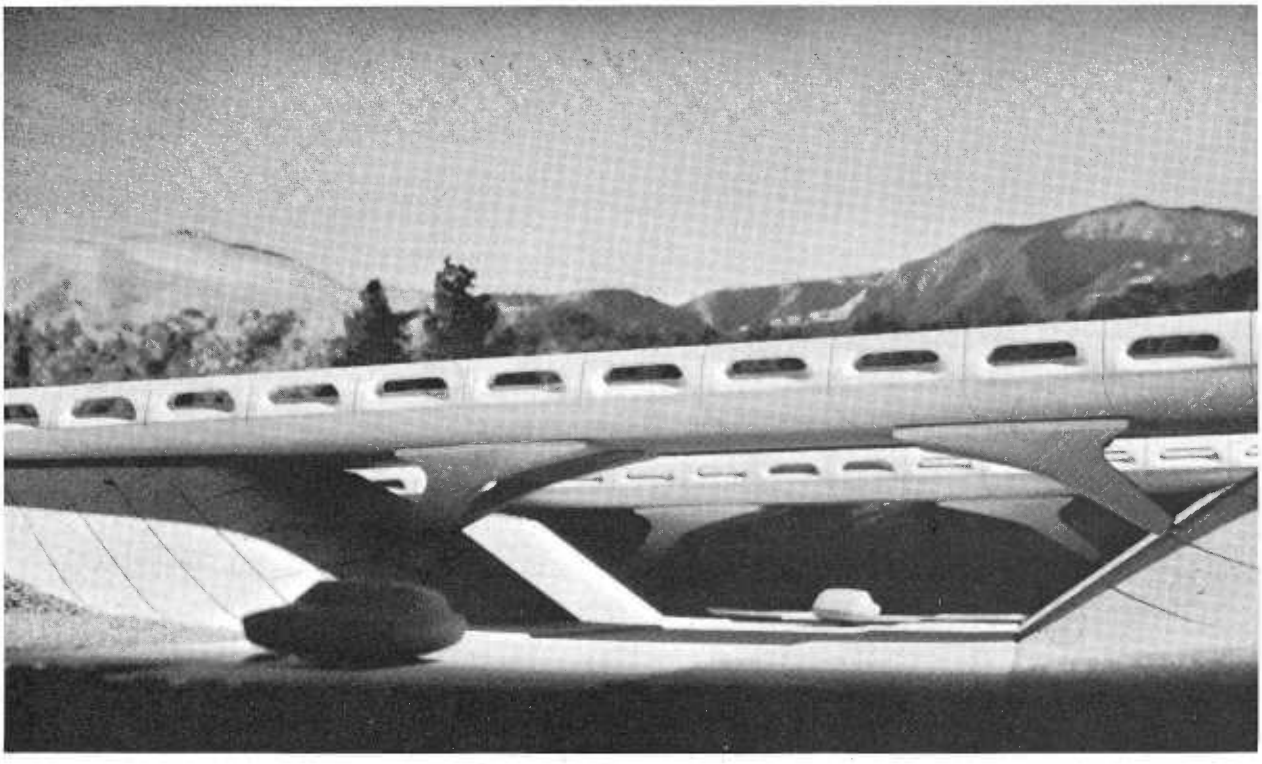

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Aerial photograph shows entire Donner Pass country. At far end of Donner Lake is place where Donner Party was trapped, and just beyond town of Truckee. New Interstate 80 route winds along slopes, upper left, and old route is seen lower center.

INTERSTATE 80 A CHAMP

one of BEST 1965 Engineering Achievements

Division was proud of concrete arch bridge on old US 40 when it was built in 1920's, but it is inadequate for today's traffic.

California's trans-Sierra freeway has been named one of the three most outstanding engineering achievements of 1965 by the American Society of Civil Engineers in their annual competition. The merit award was for the entire stretch of I-80 from immediately east of Sacramento to the Nevada state line, but particular emphasis is placed on the new section over the Sierra summit.

First place in the national competition was awarded to a space vehicle launching pad at Cape Kennedy. Interstate 80 and the ultrasophisticated Seattle Metro Comprehensive Sewage Program were runners-up and both will receive merit awards.

Ten years were required for the planning, design and construction of the highway. Although it is only a comparatively short 115-mile portion of the 2,920-mile intercontinental highway which connects San Francisco Bay and New Jersey's Atlantic seacoast, the new section represents a major accomplishment because of the terrain.

It spans the rugged Sierra at a seemingly modest elevation of 7,239 feet, but the winter weather is often vicious. Snowpacks are 30 feet deep some years and an annual snowfall of 65 feet is not unknown. The record is 80. At least once each winter 80-mile-an-hour winds can be counted upon to strike the summit.

Snow removal is a complicated procedure that uses a whole gamut of heavy equipment and costs $850,000. But it is worth the cost, for traffic is seldom interrupted. Such closures as are occasionally necessary are more likely to be from blizzard conditions and impaired visibility, rather than snow and ice on the pavement.

Portions of the new construction are four-lane divided freeway, but the highway separates into two roadways in the snow belt to allow space to dump snow removed from the right-of-way.

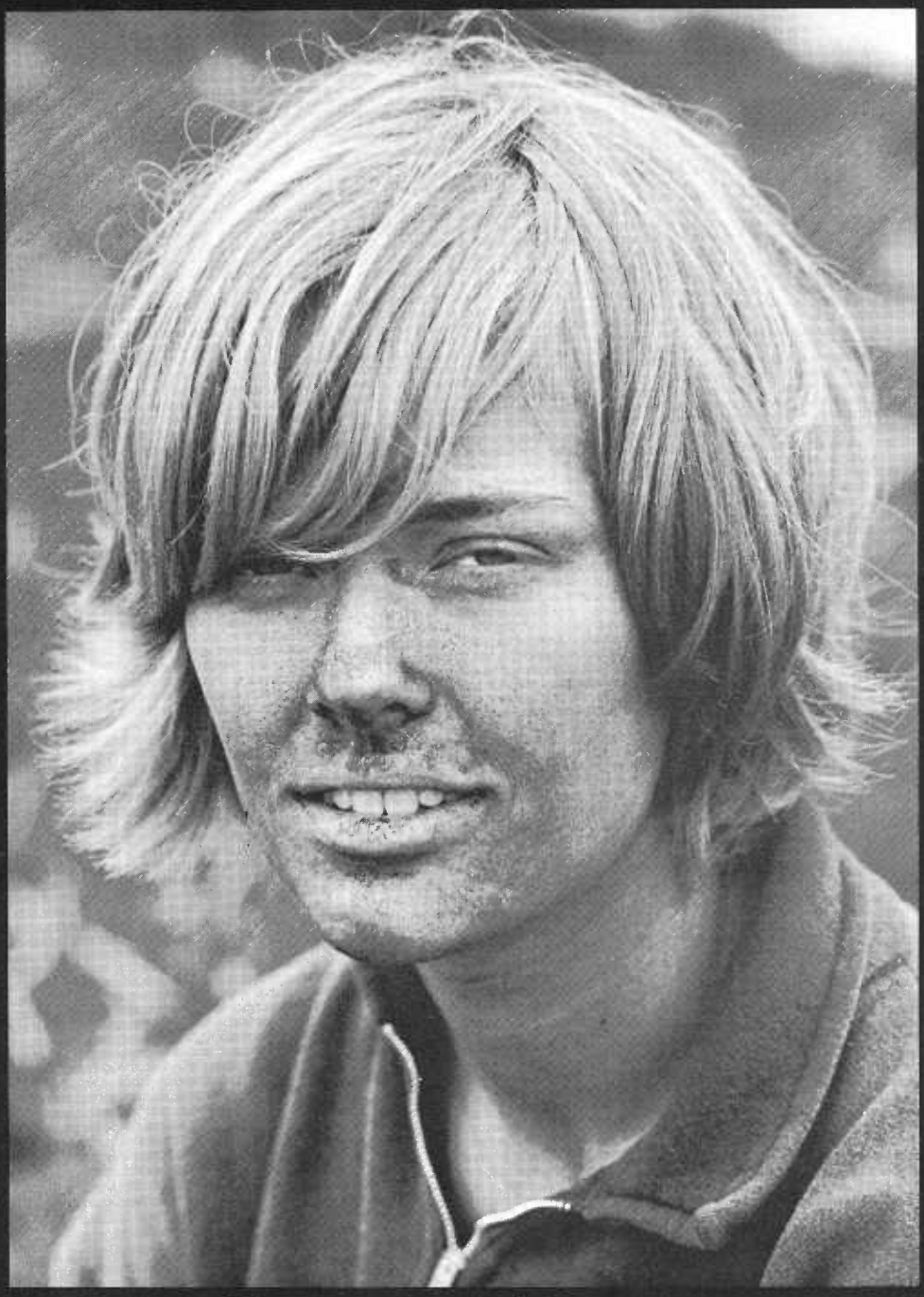
Construction was under the supervision of the California Division of Highways' District 3, headquartered at Marysville. The same unit maintains the route.

District records reveal 2,500,000 pounds of explosives was required to blast rock and other obstructions from the right-of-way across the top 10 miles of the mountain. One 22-mile section involved removal of nine million cubic yards of rock and dirt, and it took 282,000 barrels of portland cement to mix the paving.

The award-winning highway was sponsored by the Sacramento Chapter of the A.S.C.E. It is believed to be the first highway construction ever to win a national award from the A.S.C.E.

The judges cited it as "a project which demonstrates the greatest in engineering skills and represents a great contribution to civil engineering progress and mankind."

Other entries that reached the final judging were the Harris County Domed Stadium at Houston, Texas; the Northern California Flood Rehabilitation Work; the Chicago Circle Campus Development of the University of Illinois; and the hurricane barrier at New Bedford Harbor, Massachusetts.



STUDENT ARCHAEOLOGISTS GLEAN HIGHWAY SITE

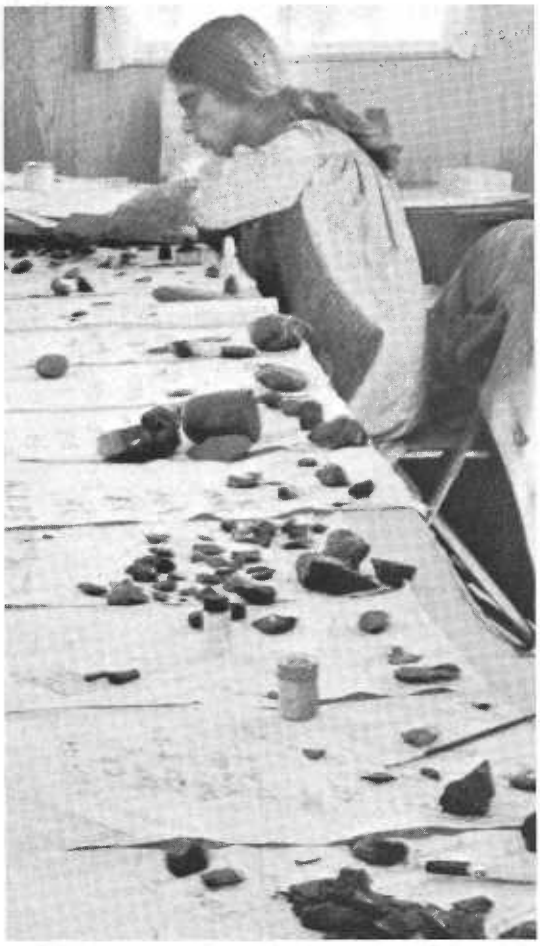
Girls and boys both man business end of shovels, make dirt fly.

Test pits go down slowly; sometimes are handful at a time.

U. C. L. A. Archaeology Students Make "Dig" on Highway Right of Way

The preservation of valuable sites for paleontological or archaeological exploration and study is a joint endeavor between the State Division of Beaches and Parks and the State Division of Highways. Federal-aid highway funds are authorized as payment to site workers who are preserving artifacts of scientific value. By the nature of the cooperative agreement, these contracts are arranged for by the Beaches and Parks agency, and the Division of Highways then makes the funds available.

The happy photos on the accompanying pages were made of a group of U.C.L.A. students engaged in an archaeological "dig" on the Highway 1 right-of-way a few miles north of Cambria. It is obvious such a "dig"



Judith Uram here is cataloging material for shipment to U.C.L.A. for further study.

Photos courtesy San Luis Obispo County *Telegram-Tribune;*
JACK WILSON, photographer

can be a valuable outdoor recreational experience as well as an educational one in the lives of these young people. In addition, some more bits of scientific knowledge have been added to humanity's store, and many artifacts collected for cataloging and study by other students.

In the dig pictured, 18 of the U.C.L.A. students worked a month at two sites in the vicinity, living in big dormitory tents, with two large trailers for laboratories. They dug dozens of their neat 5-foot-by-5-foot-square holes, a six-inch layer at a time, carefully screening the dirt. When they were finished they had thousands of artifacts to take back to Los Angeles, all neatly packed in paper bags and labeled.

Students here are working in pairs—one digging in the pit, the other screening the dirt and recovering artifacts.

MAC ARTHUR FREEWAY

Relief for the Nimitz Freeway

By D. C. RYMAN

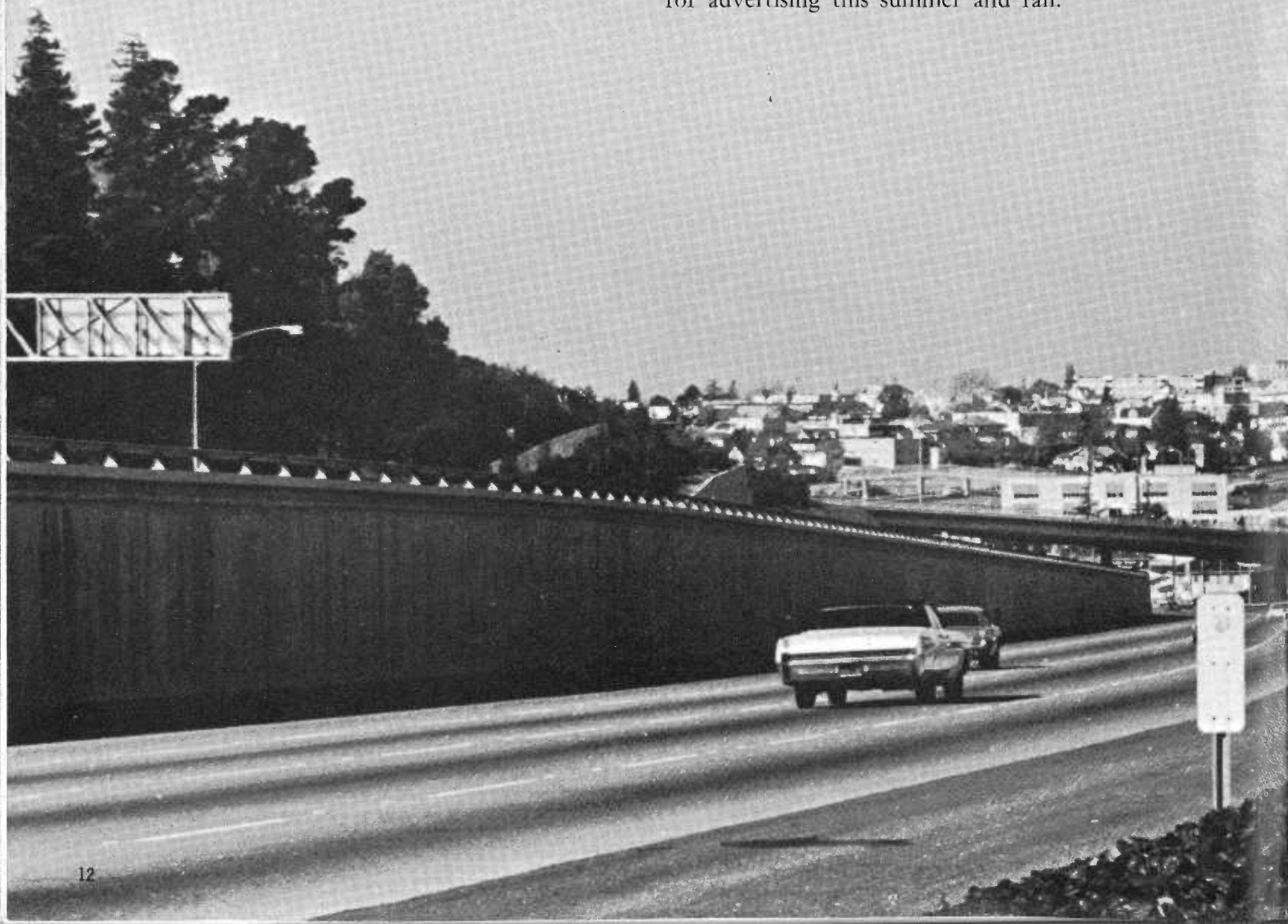
Sometime this spring, when the eighth and final unit of the MacArthur Freeway is opened to traffic, motorists will be able to enjoy 16 miles of signal-free driving between the San Francisco-Oakland Bay Bridge and Castro Valley Junction in Hayward.

Built at a cost of $100,000,000, this section of Interstate Route 580 will provide relief for the Nimitz Freeway, giving east bay motorists a faster, safer, more enjoyable route. Effect on traffic patterns became markedly noticeable last November, when the freeway was extended to San Leandro.

Right-of-way cost for this eight-lane urban facility, which included buying the property, clearing buildings and relocating utilities, was $54,000,000.

Construction costs for the eight contracts totaled $44,000,000.

Three landscape contracts have been completed, another is underway, and three others are scheduled for advertising this summer and fall.



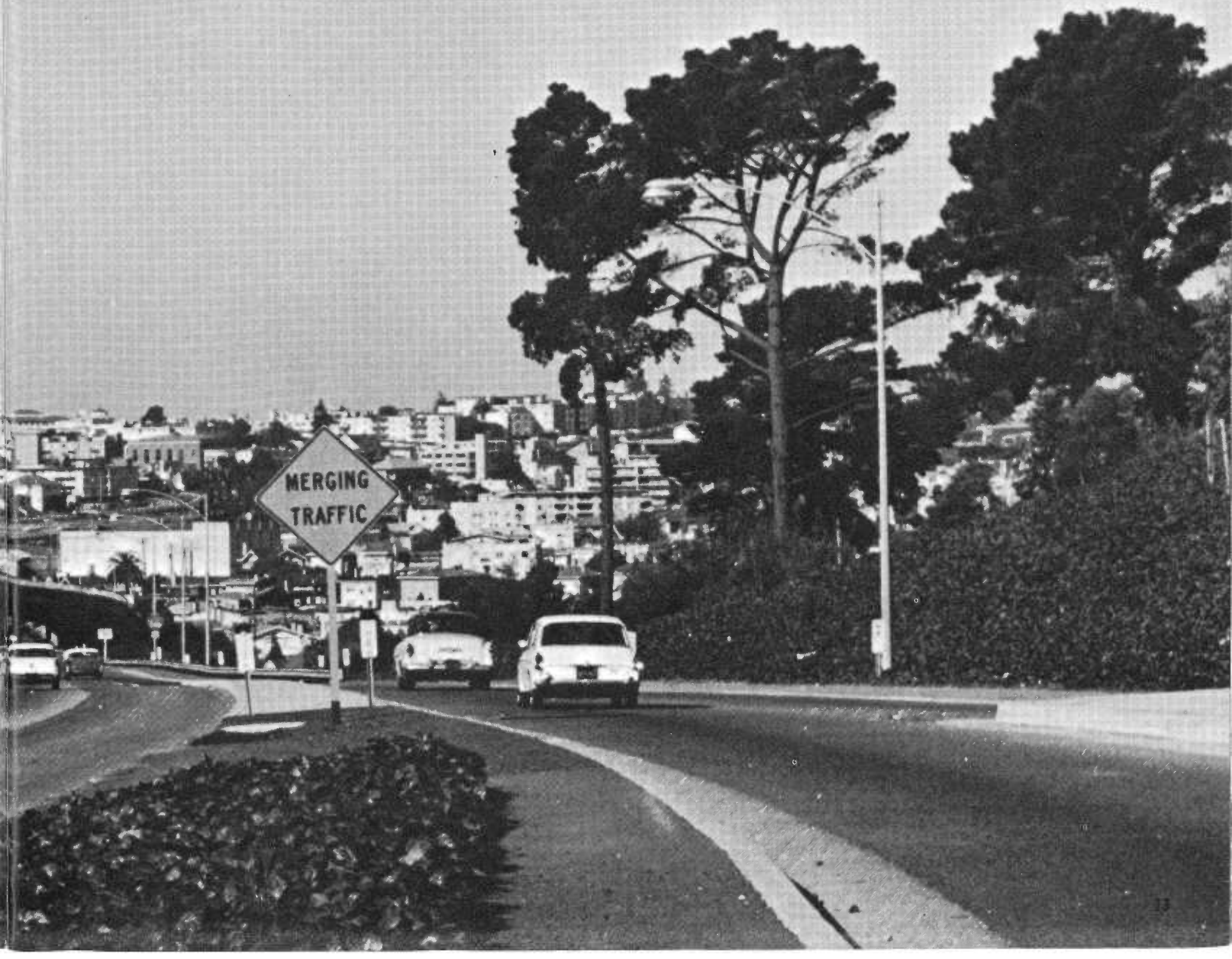
The first section of the MacArthur Freeway from the distribution structure to Park Boulevard was adopted in January 1955 and completed in December 1962.

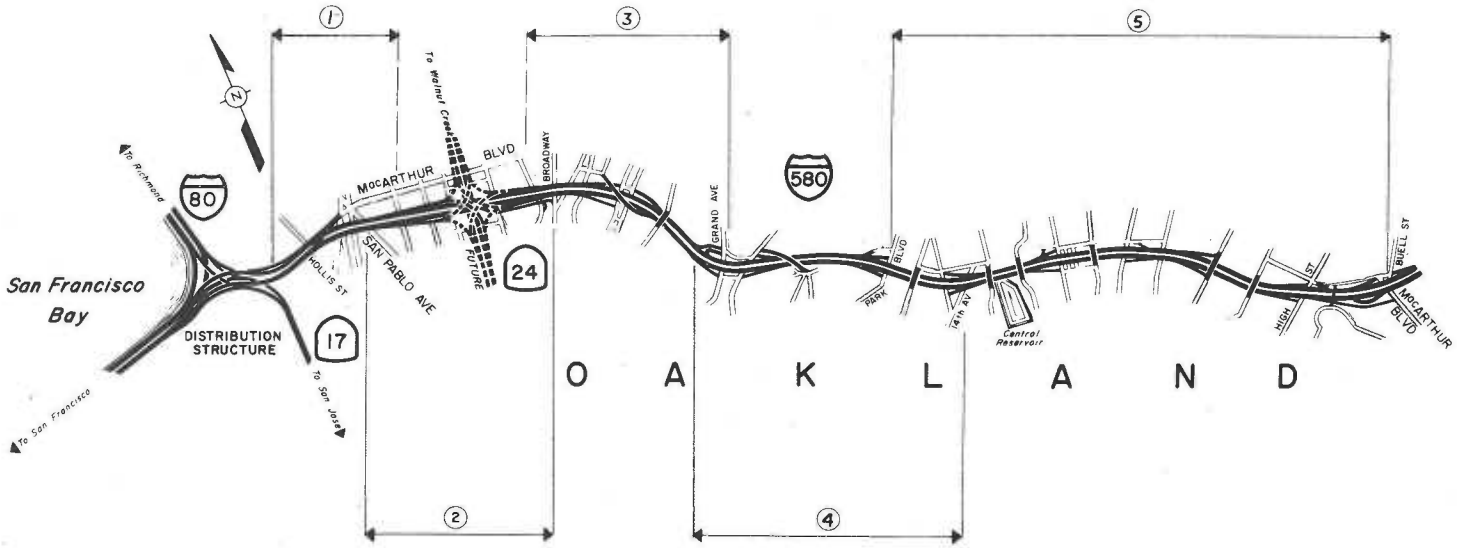
The route was adopted from Park Boulevard to Durant Avenue in May 1957, and from Durant Avenue to 173rd Avenue the following month. The planning, design, and right-of-way of this section were written up in the March–April 1960 issue of *California Highways and Public Works*.

Construction on the first MacArthur Freeway project was started in February 1960. It traversed a fully developed area on embankment and structure to allow the local streets to cross underneath. Six retaining walls were used to save taking additional improvements.

The $2,982,000 project included additions to the distribution structure, MacArthur on- and off-ramps, the MacArthur Boulevard undercrossing, and two 1,100-foot-long parallel undercrossings at Adeline Street. It was completed in May 1962.

The second contract (completed April 1962; cost, $4,329,000) from Webster Street to Grand Avenue ran through a metropolitan area of residences, apart-





Construction Progress. Contracts one to five covered construction of the MacArthur Freeway from the distribution structure to Buell Street.

The trees and shrubs planted along the MacArthur Freeway four years ago have now matured to where they add considerably to the appearance of the surrounding right-of-way and median strip.

This aerial photo of construction on the MacArthur Freeway was taken last August. In the foreground is the interchange with Route 13, which extends through the center of the photo towards the Warren Freeway in the distance. View is northward.

ment buildings, and small businesses.

Construction of 19 retaining walls saved a lot of valuable property including a school. The job included the double 1,046-foot-long Broadway-Richmond undercrossing, four bridges in the Oakland-Harrison Street interchange, and the Chetwood Street overcrossing.

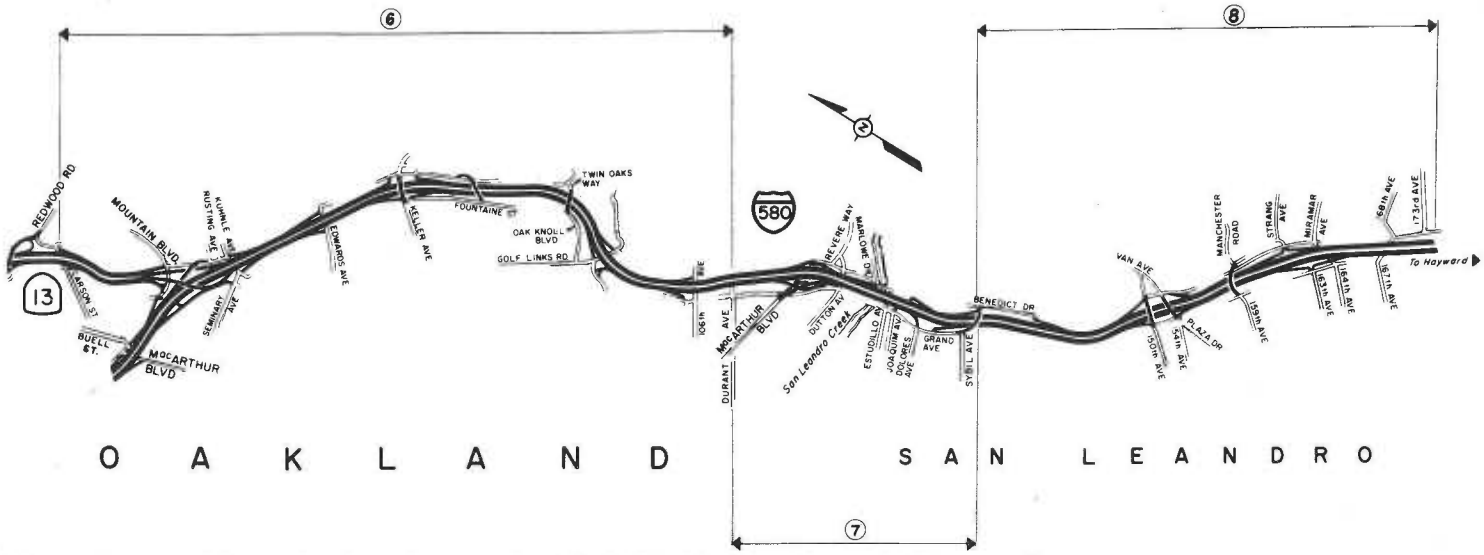
Construction began in August 1960, on the third contract, a 1.1-mile section between San Pablo Avenue and Broadway (completed January 1962; cost, $4,000,000).

This job included the foundations for the future major interchange for the MacArthur and Grove-Shafter (Route 24) Freeways. At the time coordinated planning studies were underway with the Bay Area Rapid Transit. Six years later, this cooperative planning resulted in a joint engineering design placing the rapid transit rails in the median area of the Grove-Shafter Freeway. This rail construction will start this summer.

The fourth contract (completed December 1962; cost, $4,178,000) extended the freeway past Lake Merritt and the Grand-Lakeshore area on structure and on sidehill cut-and-fill to Park Boulevard.

It includes the Lakeshore Park undercrossing, a reinforced concrete bridge with round columns, 838 feet in length, carrying freeway traffic across Grand and Lakeshore Avenues. The space under and adjacent to the bridge between the streets allowed an extension of the adjacent Lake Merritt Park area.

On the sidehill portion, a split-level grade was used for both directions of freeway traffic. This required a 3,900-foot-long median strip retaining wall. Also, an 800-foot-long wall was placed on the cut side and a 355-foot wall on the hill side. These two walls saved many adjacent improvements throughout this



Contracts six to eight continued the freeway from Buell Street to 173rd Avenue in San Leandro.

business and residential area.

(A detailed report of the first four contracts appeared in the July–August 1962 issue of *California Highways and Public Works*.)

The fifth contract (completed June 1964; cost, $7,290,000) of the MacArthur Freeway covered three miles from Park Boulevard to Buell Street through residential and small business areas.

The sixth contract (completed October 1964; cost, $4,663,000) was from Durant Avenue in Oakland to Sybil Avenue in San Leandro. Most of this two-mile section is on a graded-earth fill. Several high retaining walls constructed next to MacArthur Boulevard preserved it as a business street for the local merchants and manufacturers.

The seventh contract (completed November 1965; cost, $11,530,000) extended the freeway from near Mills College to the east city limits of Oakland and included a full directional interchange to the Warren Freeway near Calaveras Avenue.

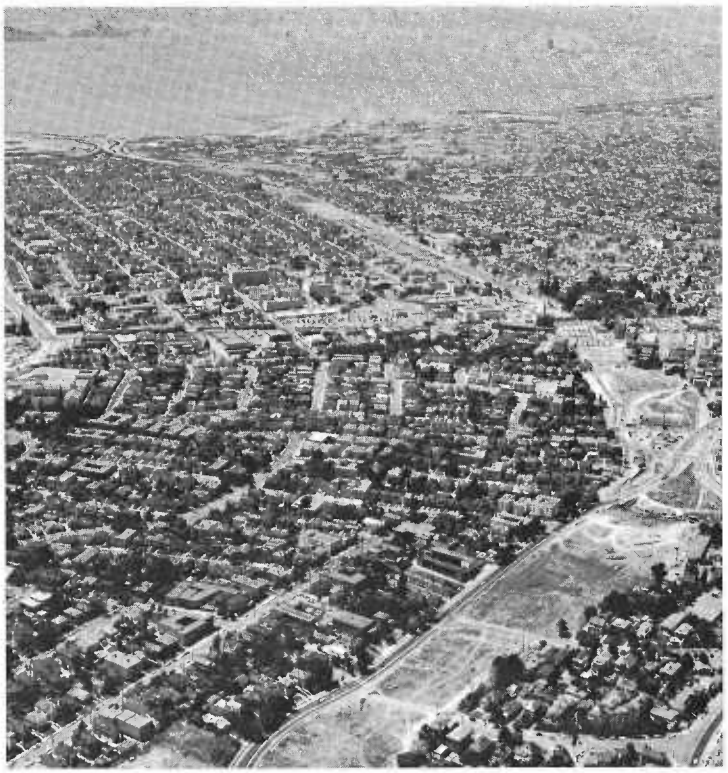
When Governor Brown inspected the project last October, prior to its opening to traffic, he pointed out the graceful curvilinear route and noted that the new 4.5-mile freeway segment will save motorists eight minutes in comparison to the old city street route. The Governor also stated that the view from the freeway is "far better than streets lined with buildings built in 1900."

The job required three years to construct, cost $11,530,000 and was completed November 1965.

The eighth and last contract was for the three-mile section from Sybil Avenue in San Leandro to 173rd Avenue near the Castro Valley interchange and follows the general route of Foothill Boulevard (the extension of MacArthur Boulevard).

The project, when completed, will cost $5,174,000.

Coordinated planning resulted in a design placing the Rapid Transit rails in the median.



The work begins. This 1960 photo shows the cleared right-of-way through Oakland for the MacArthur Freeway leading to the distribution structure and San Francisco Bay in the background.

Dean Creek to Miranda

By H. W. Benedict

Completion was marked recently of the final unit of a 25-mile section of the Redwood Freeway in southern Humboldt County, which not only provides the motorist with a shorter, faster, safer drive but also offers an added bonus of breathtaking vistas of redwood forests, the turbulent Eel River, and rolling green hills dotted with hardwood groves. These scenes are constant reminders that modern highways can be built in a way that need not detract from the natural grandeur of the surrounding country.

The new freeway forms the completed section of a 43-mile freeway routing adopted by the California Highway Commission in 1956 from the Mendocino-Humboldt county line to Jordan Creek. It is seven miles shorter than the old highway.

Within months after adoption, construction was started on the first unit of the freeway when Guy F. Atkinson began work in early 1957 on a contract between Dyerville and Englewood. Construction of this and the next two units of the Redwood Freeway were described in the January–February 1962 issue of the *California Highways and Public Works*.

A contract to build the fourth unit of the freeway was let in May 1962 to Morrison-Knudsen Company, Inc. The 5.7-mile job was completed in October 1964 at a cost of $6,000,000.

For over four miles the fourth unit follows the west side of the river, across the canyon from the old road. Only the south end of the project is on the east side of the river where the old highway was located. The freeway has been built far enough up the canyon wall to reduce the danger of inundation by future floods.

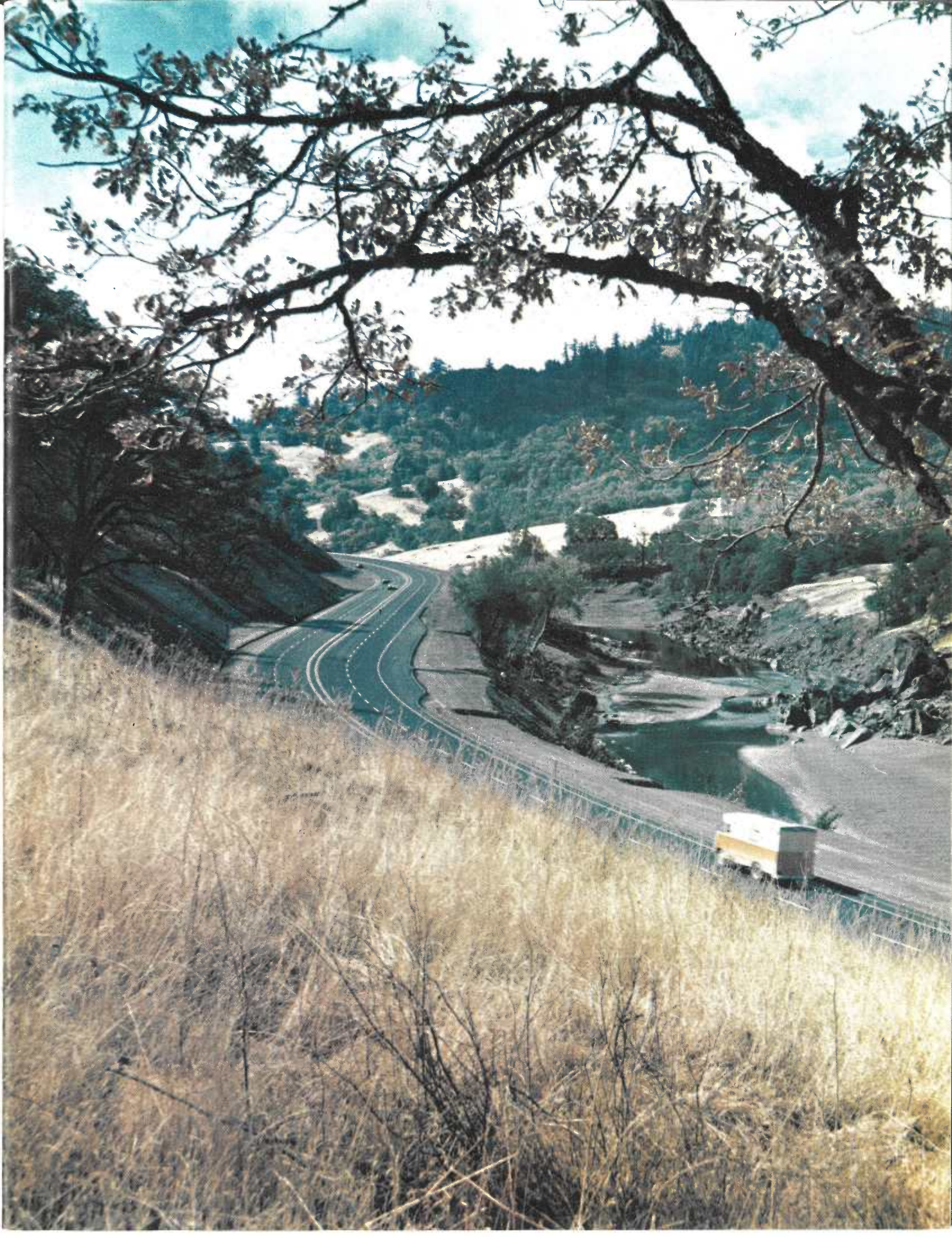
In many areas the foot of the embankment slope is right at the river's edge, requiring the extensive use of rock slope with deep foundation trenches and other protective measures during construction. Despite the heavy cost of such protective work it is still much cheaper than locating the freeway higher up the slopes.

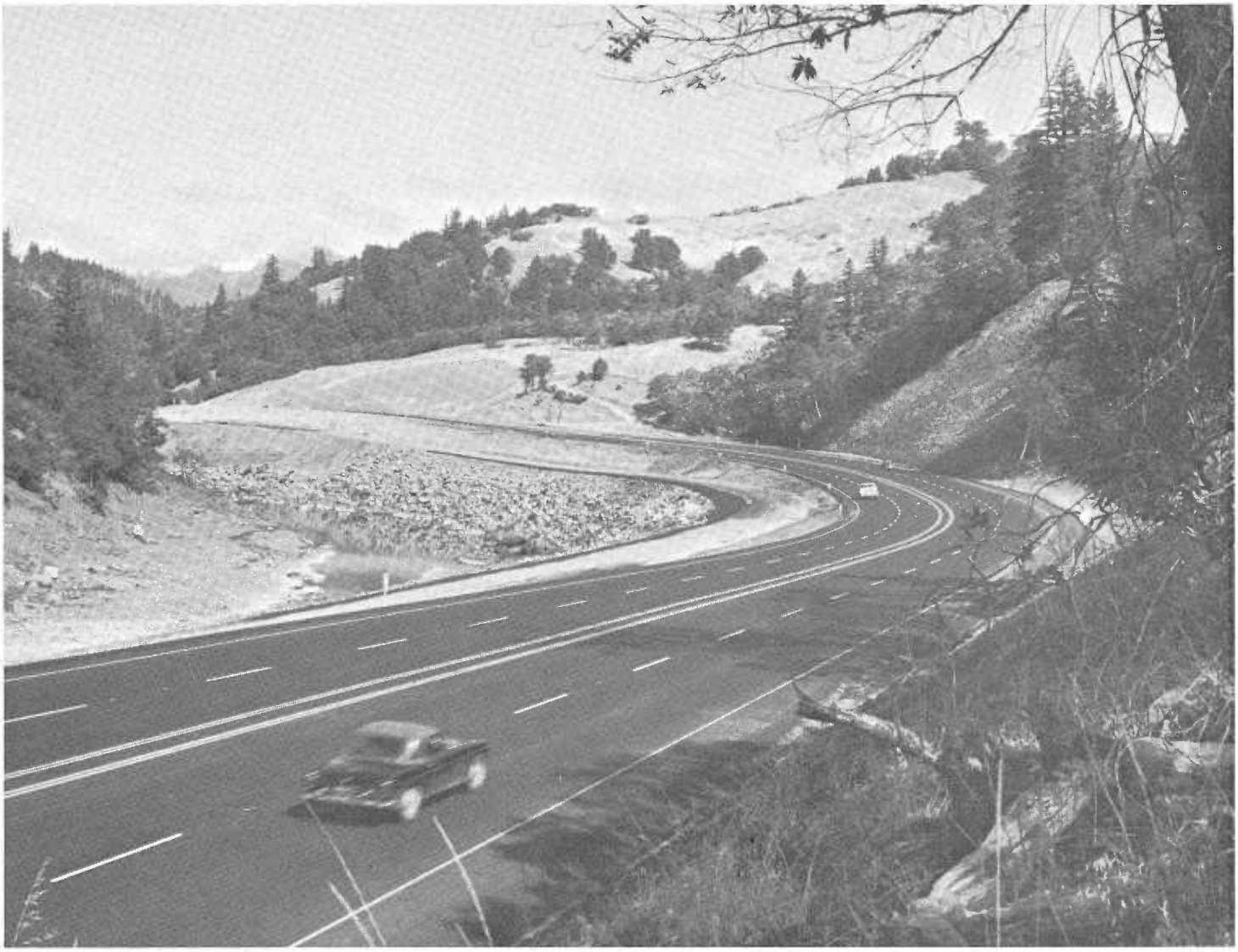
To stabilize embankment foundations, almost 250,000 tons of gravel and six miles of metal pipe underdrains were used.

Three bridges were included in the project. The largest, a composite steel girder structure across the South Fork of Eel River at Sylvandale, is five lanes wide to accommodate an acceleration ramp. The two others are separation structures: one at the Dimmick Road and the other part of the Maple Hills Interchange.

The Sylvandale Bridge was in the news recently when the State Legislature, in its 1965 session, dedicated it to the

This new scenic section of the Redwood Freeway along the South Fork of the Eel River in Humboldt County replaces a slow, outmoded, two-lane highway.





Northward view along recently completed fifth unit of the Redwood Freeway a few miles downstream from Garberville. Eel River, seen here at summer low, is accessible from frontage road to left of freeway.

memory of Charles R. Barnum, an early pioneer and developer of the southern Humboldt region. The bridge received additional honors when the American Institute for Steel Construction awarded it second place among all bridges of that size opened to traffic in 1964 in the United States.

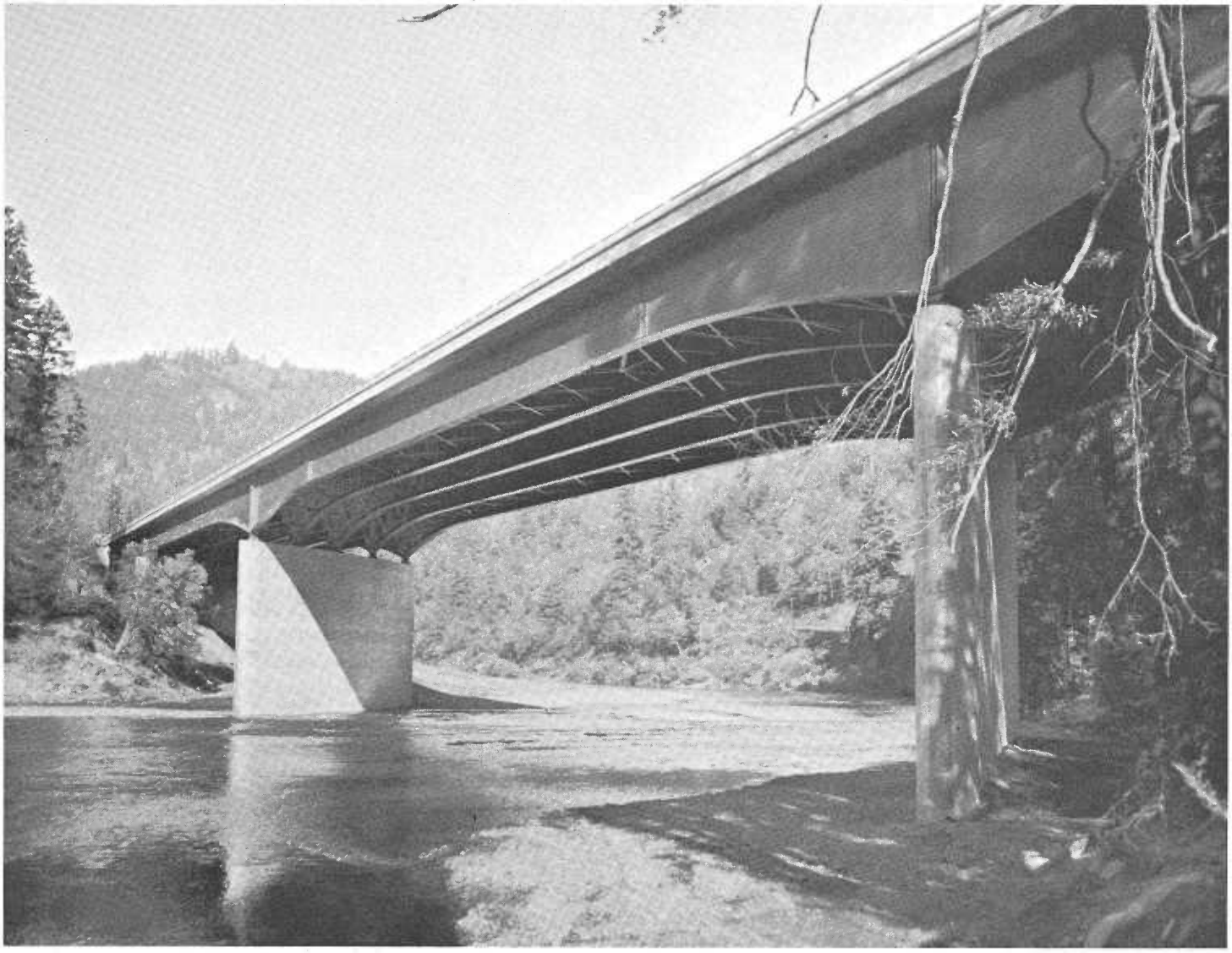
The project carried through two winter seasons between 1962 and 1964. Heavy rains, coupled with the notoriously unstable soils in the Eel River canyon, caused slides in every major excavation area. Extensive reconstruction and repair of excavation slopes had to be undertaken after each winter season. The most spectacular of these slides is the Hurlbutt slide, so named after the adjacent land owner. When first observed, this slide, by conservative estimate, had caused at least a million yards of material to start moving into the freeway cut.

To obtain at least marginal stability across this massive slide area, several corrective measures were undertaken. The level of the freeway was raised about ten feet to add more weight to the bottom of the slide. In addition, the bottom of the excavation was widened and the cut sloped was flattened. Several thousand feet of horizontal drains were placed in the fact and the flanks of the slide and other drainage installations constructed. These measures have arrested practically all movement in the slide.

In completing the slope protection work it was necessary to encroach slightly into the river bed area. Since the South Fork of the Eel is a tourist attraction and a popular fishing and swimming stream it was vital that the work disturb the stream as little as possible. The contractor was able to place 129,000 tons of rock slope protection with attendant trenching and build the Sylvandale Bridge without unduly muddying the stream.

On April 1, 1964, the state took bids for the construction of the fifth unit of the Redwood Freeway. This contract, to grade and pave a 2.4-mile stretch of freeway, was awarded also to Morrison-Knudsen Company, Inc.

On this contract, parking areas were built wherever possible to provide resting places for weary motorists and a



Prize-winning bridge, a "composite steel girder structure," crosses the South Fork of the Eel at Sylvandale as part of the new freeway unit and is five lanes wide to accommodate an acceleration ramp from the Sylvandale Interchange.

chance to view the magnificent scenery of the area.

This section followed the east slope of the canyon along the same general location as the old road.

The 1964 flood caused heavy damage to the partly completed contract. All but one of the overside drains on the contract were carried away, miles of guard railing were destroyed, the partly completed structural section was ruined by siltation, major crossdrains were badly choked with debris and great chunks of embankment were washed out. Repair work was begun as soon as possible and all damage was repaired by the time the rest of the contract was completed.

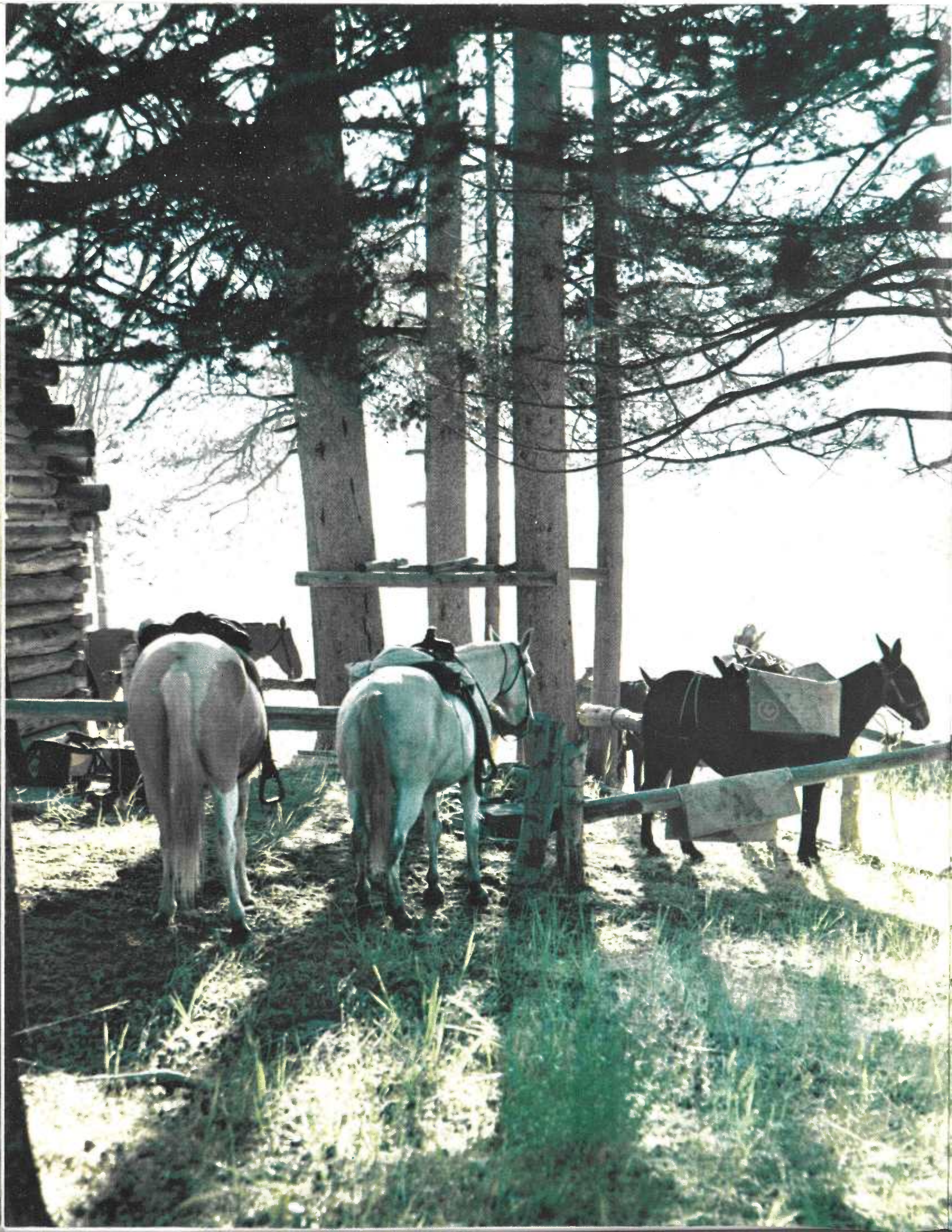
Slides both large and small occurred in all major excavation slopes. Of these, one deserves special mention. Though only 300 feet wide it extended over 1,100 feet up the mountainside. Its depth appears to be between 60 and 100 feet. It has moved slowly but perceptibly, like a huge mud glacier, ever since the excavation was started 18 months ago.

After considerable study it was decided that the most economical method of handling the slide was to widen the area along the freeway about 50 feet through the slide area. As the slide descended, material could be removed before it reached the edge of the freeway, using the widened space as a work area. To date, over 100,000 cubic yards of material have been removed in this manner.

The fifth contract also required of two channel changes in the river.

Another contract, let in May 1965, will extend the freeway another 7½ miles north from the town of Redcrest to Jordan Creek. Estimated completion date for this job is fall, 1967.

Funds are in the 1966–67 highway budget for construction of another 4½-mile section of the Redwood Freeway from south of Garberville to the south end of Unit No. 5. This contract, which will probably be advertised in February, should be completed the fall of 1967.



A photographic preview of a new

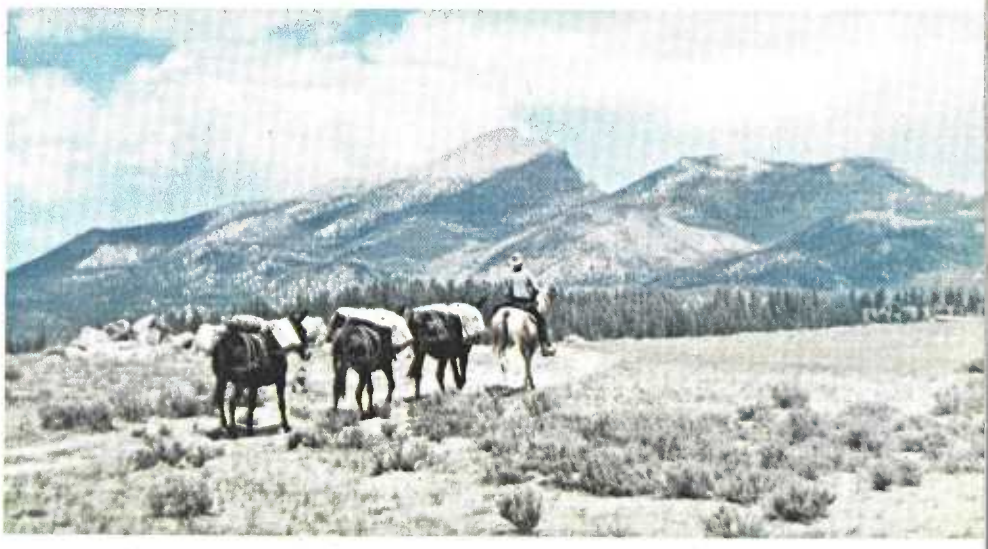
SIERRA CROSSING

"Route 190 is from Route 99 near Tipton to Route 127 near Death Valley Junction, via the vicinity of Porterville, Camp Nelson, Olancha, and Death Valley."

So reads the law, and the California Highway Commission therefore adopted the last 47 miles of this route last fall.

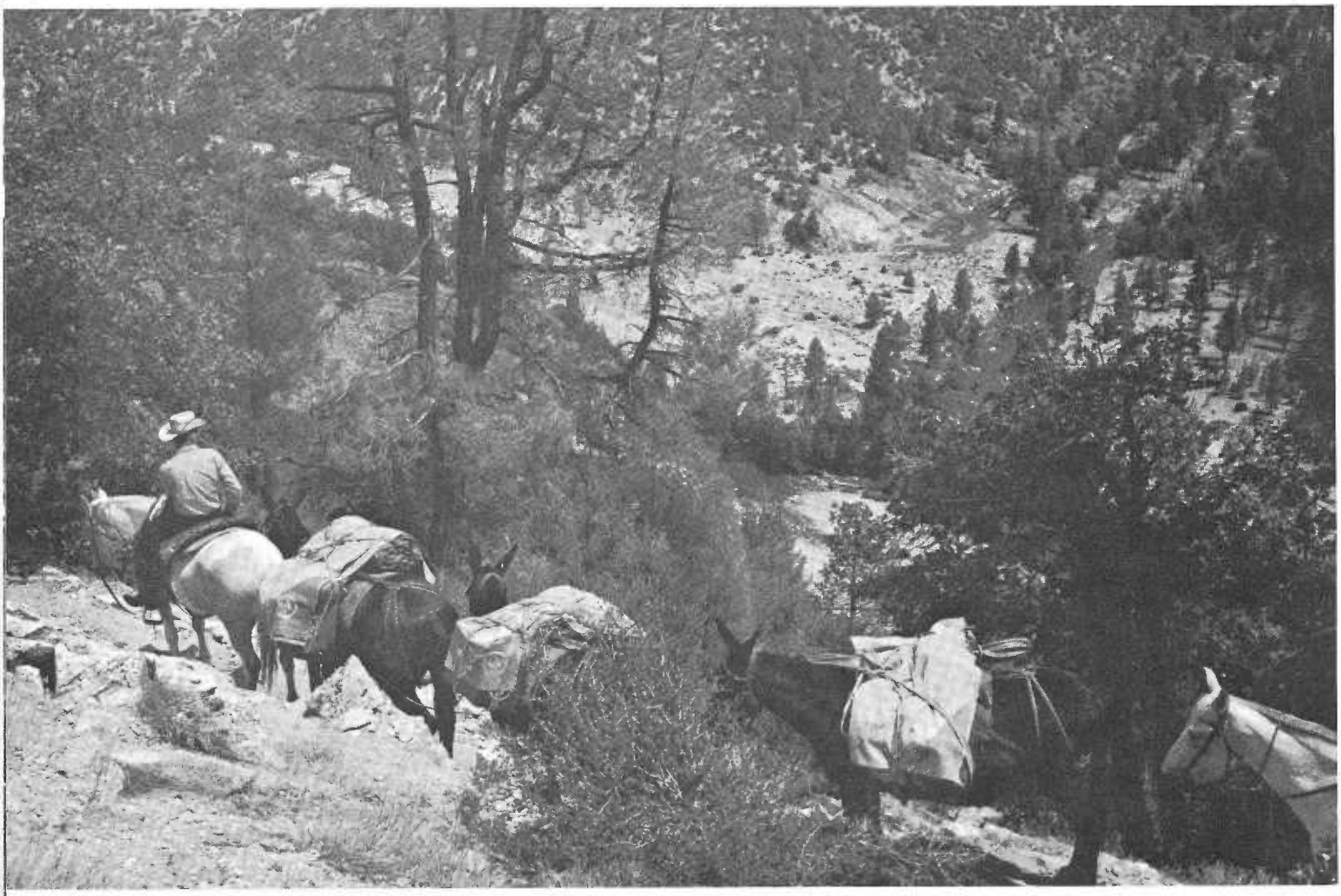
Adoption in this case is a long way from construction, but at least the precise location of the road is now known, and everyone can plan accordingly.

These pages show some of the rugged beauty of the Sierra along California 190 that will one day be opened up to the highway traveler and his family.



Packer and train (shown above) entering Monache Meadows heading west, about one mile north of Broder Meadows near Snake Creek. In rays of setting sun (left) pack train is unloaded at Beach Meadow Guard Station on edge of high plateau country.

Scenic Beauty



Packer Pete Mooch pauses at head of pack train along side of Kern River Canyon.

When it is completed, it will carry them from Tipton, Porterville and Springville in the rich central valley; through Quaking Aspen Meadow and Haiwee Pass in the High Sierra; then down through such thirsty prospectors' precincts as Panamint Springs, Stovepipe Wells and Furnace Creek to Death Valley Junction.

It is one of the future trans-Sierra routes that will "render accessible the mountain regions of the Pacific Coast," to borrow the words of the Sierra Club bylaws.

Another will be a road to Mineral King 25 miles to the north, which will make possible a multimillion-dollar ski and all-year mountain resort whose development the U.S. Forest Service will turn over to Walt Disney.

California 190 now runs from Tipton to Aspen Meadow, both in Tulare County, and stops. It picks up again 60 miles east, at Olancha in Inyo County on the Three Flags Highway, a nickname given to U.S. 395 because it connects Mexico, the United States and Canada.

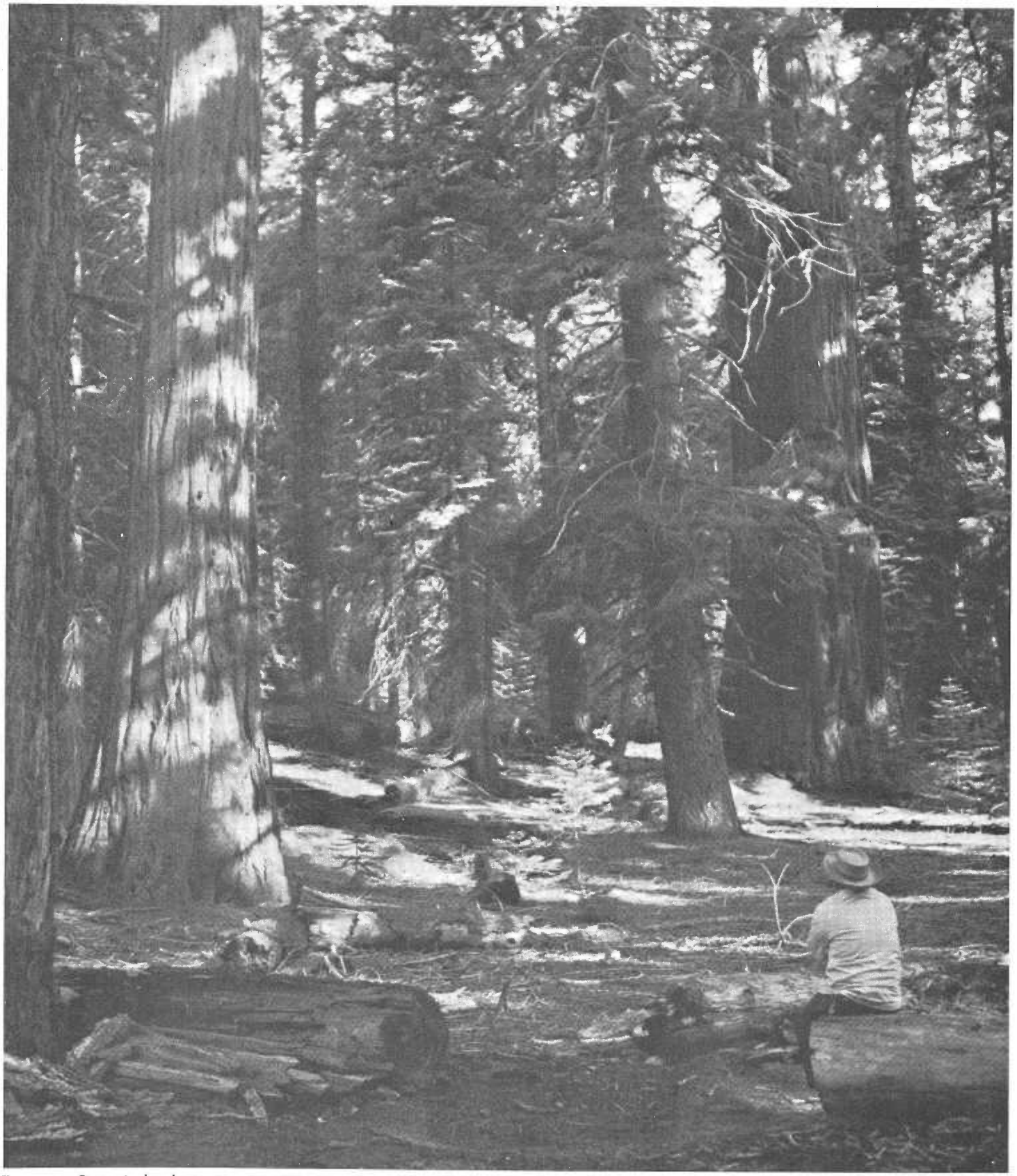
Except for those who live in the region, the 60-mile gap is open only to those who can afford the time and expense of a pack-train trip, or who have lots of leisure and the price of a four-wheel-drive wagon.

When chief photographer Bill Chaney made his photo reconnaissance of the route before the commission made the final adoption, he made it in the classic manner—by packhorse.

And packhorses, wranglers, diamond hitches and shelter tents will be the order of the day in this country even after the far-off day when the highway is finished, because it will run between two wilderness areas in a corridor purposely left to furnish access to them.

The highway will just make it that much easier for the city dweller to get to the packhorse country.

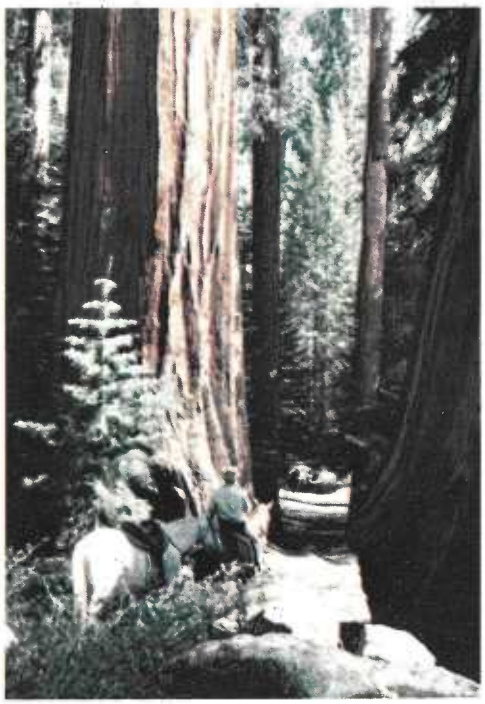
that will someday be made available to all

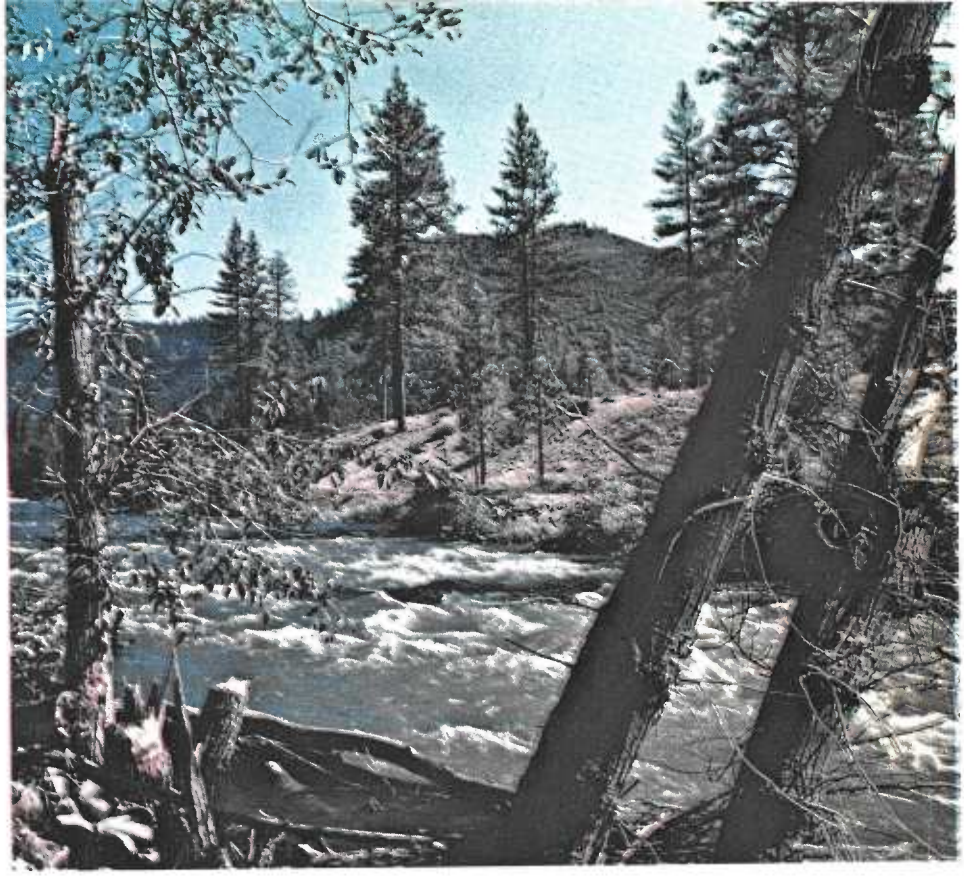


Trees are Sequoiadendron gigantea *(Sierra redwoods) and white firs, located in Freeman Creek Grove, a few miles and about two hours on the trail, northeast of Quaking Aspen.*

NEW VISTAS
for the recreational travelers

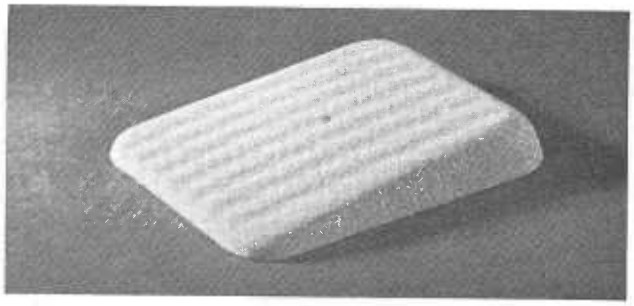
Packer Pete Mooch (above) is Stanford University student who works as packer-guide in summer. Left, California colors in blue of mountains and gold of grass. Train crossing Monache Meadows near Deer Island, not far from Kern River, altitude about 8,000 feet. Below, left, Freeman Creek redwood (Sequoiadendron gigantea) is little known grove not far from Quaking Aspen and existing road's end. Below, view downstream along the upper Kern River, near Summit Creek at east side of Monache Meadows and not far from Haiwee Pass.



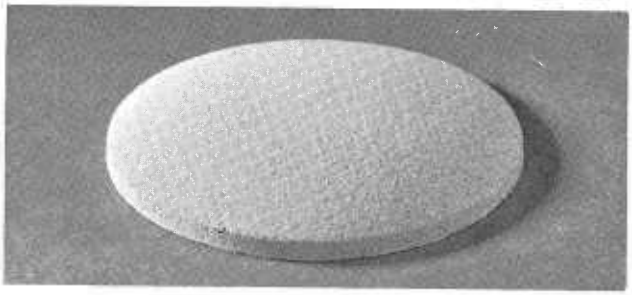


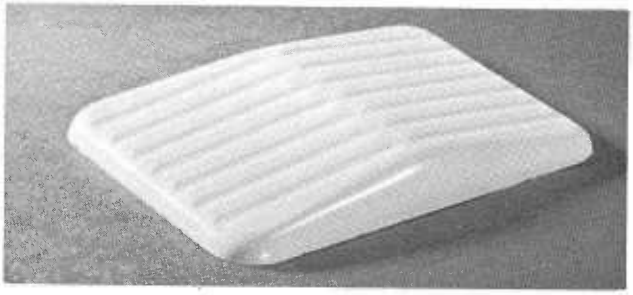
Ford on trail, right, across Kern River at about 5,200 feet, close to western end of route. Well-shod and competent-looking Boy Scouts, below, hiking along trail in Lloyd Meadows near Freeman Creek. Bottom, Edward Montes of California Division of Highways at campfire in Monache Meadows as morning mists arise around him.

PHOTOGRAPHED BY WILLIAM R. CHANEY



A NEW MARK FOR SAFETY





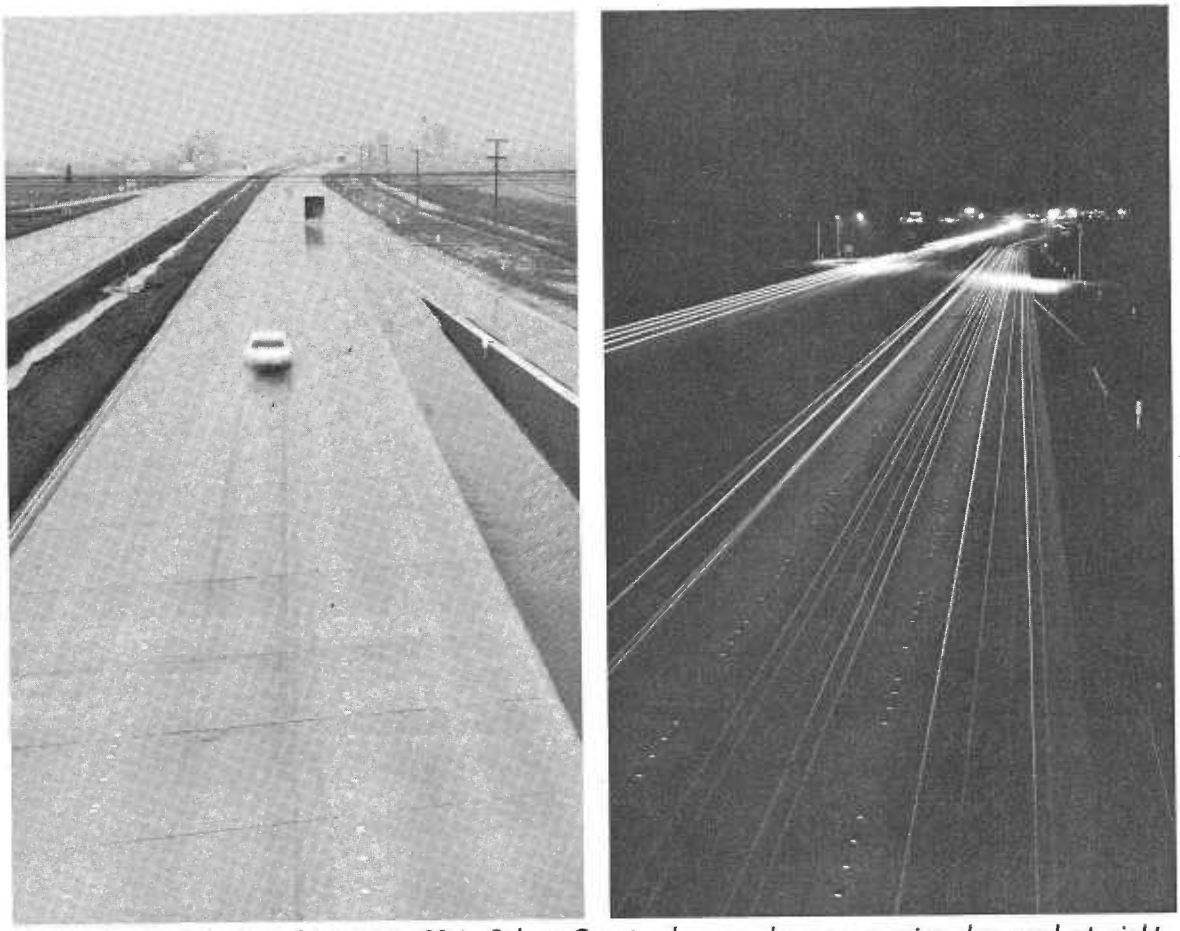
Photos above show various kinds of wedge and circular markers tested. Double wedge is smooth plastic; single wedge and circular type both contain reflective beads. In bottom photo Dwight Morrow of Headquarters Traffic Section shows markers which are currently being used—four nonreflective dots, and a reflective wedge white on one side, red on the reverse.

DIVISION ADOPTS BOTTS DOTS

In January the California Division of Highways scooped the world by announcing it was abandoning the painted white line on the state's highways. Henceforth, on all new construction, and in a gradual conversion program on other highways, raised markers will be used to separate driving lanes.

Since the painted white line tends to disappear in rainy and foggy weather when it is needed most, the Division of Highways has long been seeking a better lane-marking device. The markers adopted have been under study for more than 10 years. (See article in *California Highways and Public Works Magazine*, May–June 1963, by Herbert A. Rooney, senior chemical testing engineer.)

Officially the devices are to be termed "raised pavement markers" but they are known in some quarters as "Botts dots." The alliterative name comes from their association with one of their developers, the late E. D. Botts of the Division of Highways Materials and Research Laboratory. One company has chosen this for a trade name.



Photos above of section of Interstate 80 in Solano County show markers on a rainy day, and at night. Continuous white lines are headlights and taillights recorded in time exposure.

Both reflective and nonreflective types are to be used. Most of the markers called for in the new specifications will be nonreflective, of white epoxy, and laid on the pavement four in a line, three feet apart. Between these short nine-foot strips there will be an unmarked 15-foot space, then another group of markers. In every other open space, or, in other words, every 48 feet on straight sections of highway, there will be a reflective marker. On curves they will be placed every 24 feet.

The reflective markers presently accepted for use are two sided and made from a shell of clear acrylic material, filled with white epoxy. The exterior shell has "recessed cubed corners" molded into it which create a multitude of tiny mirrors to reflect the light back to its source.

Some of these reflectors will be white on one side, red on the other, to be used on freeways and other divided highways. They will be installed in such a manner they will reflect white light to normal traffic, but, should a wrong-way driver get on the roadway, he will see a row of red lights to warn him immediately.

Epoxy glues are being used to fasten the markers to the pavement. This material has been used for this purpose on a number of test installations and has proven to be virtually a permanent adhesive. A marker with a short spike has been developed for use on asphalt roads, the spike being designed to reinforce the fastening. The epoxy glue will not pull free, but conceivably a section of the asphalt might pull loose.

Although the markers will cost perhaps a dollar a piece installed, they actually will prove cheaper in the long run than paint. The painted white line must be renewed every six months on many routes, while the tests show the raised markers probably will remain in place for 20 years at least, with very few replacements.

The new markers not only will make driving easier, but they can be expected to cut down on accidents. In the Fresno area two similar sections of freeway on US 99 were studied over a two-year period. One was fitted with raised markers, the other marked only with the conventional striping. The markers, with the mild rumble effect they cause, were found to cut down lane changing 40 percent.

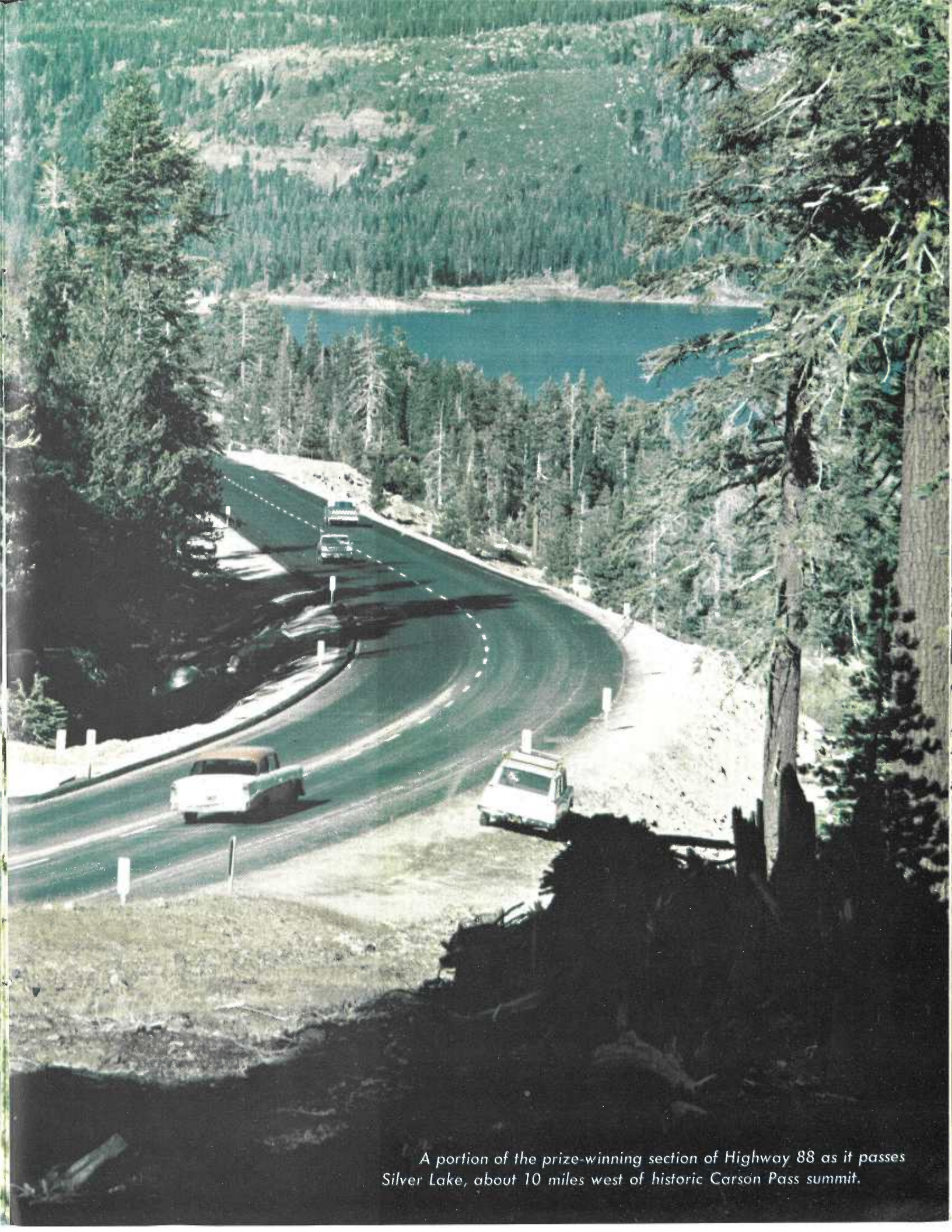
With reduced lane changing, the accident rate was reduced 27 percent. Injuries and fatalities were reduced even more, due to the elimination of many rear-end collisions. Indications also were the rumble often wakened dozing drivers when they drifted out of their proper lane.

Under consideration are yellow markers for centerlines. Also being sought is a harder cover for the reflective markers, which suffer from abrasion in desert sandstorms. A special recessed design must be developed for use in the mountains where snow removal equipment operates.

Being studied as more usable materials are polyesters and certain ceramics. These latter would be ideal if they had better tensile strength. They are cheap, whitest of all the materials under consideration, and properly installed should last almost forever. Permanently positioned in a manner that allows no movement, breakage should be low. Several test sections with ceramic markers are under study.

CALIFORNIA NUMBER ONE

CARSON PASS
WINS
NATIONAL
AWARD



A portion of the prize-winning section of Highway 88 as it passes Silver Lake, about 10 miles west of historic Carson Pass summit.

The rules for the PARADE Scenic Highway Contest:

1. **The highway must be a new or rebuilt highway which opened to traffic after September 1, 1964, but before September 1, 1965.**
2. **It must be a highway for general use, not a special route for sightseers only.**
3. **It must "drive well," with gentle curves, easy grades and wide lanes.**
4. **It must be well planned, with good use of land, minimum destruction of property and neighborhood.**
5. **It must be designed to take advantage of natural terrain and scenic attractiveness.**

On February 13th 30,000,000 people who read the Sunday newspapers subscribing to PARADE Magazine opened their copies and learned a section of California State Highway 88 had been chosen as the best designed scenic route built in the United States in 1965.

In the five years of the competition, this is the first time a winner west of the Mississippi has been chosen, although the Twain Harte section of California Route 108 was one of the five highways receiving honorable mention for 1964. Both 88 and 108 are in Highway District 10, with headquarters at Stockton.

The prize-winning portion of route 88—officially (Foster Meadows Road to east of Silver Lake"— was designed by a team headed by Louis G. Kroeck, senior highway engineer. Although the design work, like all California highway design work, was an accumulation of the efforts of many people, great credit must be given Kroeck for the painstaking work he did in fitting the highway into the terrain.

A native of Stockton, and son of a professor at the University of the Pacific, Kroeck learned to love the central Sierra while still a boy, and he still spends much of his spare time there indulging in his hobbies of hiking, photography, and painting. He and his wife Alice have walked over much of the old emigrant trail which Highway 88 generally follows, and as recently as 1964 they came upon an old rotted wagon wheel at the side of the trail.

Judges for the PARADE contest were John Gibbons of the Automotive Safety Foundation; Jack Wood of the American Planning and Civic Association; Charles N. Brady of the American Automobile Association; Wilbur O. Garmshausen of the Ohio Department of Highways, representing the American Society of Landscape Architects; and Jack Ritter of ENGINEERING NEWS-RECORD.

Route 88 is one of the state's most historic routes, crossing the Sierra at Carson Pass and it now continues into Nevada with the same route number, to end at US 395 just north of Minden. The pass was named by Frémont in 1844 for mountain man Kit Carson. Frémont and his party crossed here through deep snow in the dead of winter, but Frémont's usual luck held, and they encountered no bad storms.

At one point Carson climbed a high peak to reconnoiter, and discovered a large body of water to the north. This is the first recorded mention of Lake Tahoe by any white explorers, although at the time Frémont put it down on his map as Mountain Lake. (Later he named it Lake Bonpland, but in the 1850's Californians called it Lake Bigler after an early Governor. Eventually it got back its Indian name of Tahoe.)

At the summit of the pass, Carson blazed a tree, and then, within the blaze, carved "Kit Carson, 1844." For many years this red fir stood at the side of the trail, but eventually it died. The stump bearing the blaze can be seen at Sutter's Fort in Sacramento. A monument, State Marker 315, has been placed on the spot where the tree once stood.

In 1848, the Mormon Battalion, released by Kearny after playing its part in the conquest of California, returned to Salt Lake City via this route. Near Tragedy Springs three of the battalion's scouts, according to one story, were ambushed and killed by Indians, to give this point its name.

During the years of the Gold Rush many immigrant wagons came over the Sierra at Carson Pass, until better and lower passes were found farther north. "The Maiden's Grave," a few miles west of Tragedy Springs, marks the burial place of one of these immigrants, Rachel Melton of Iowa, who died there October 4, 1850. Nothing else is known about her.

The romantic years of stagecoach travel are marked by place names along the route which once designated hostelries for travelers. Names such as Kirkwoods, Picketts, Woodfords, and Hams dot the road's map from valley to valley.

The section which won the prize for 1965 is a part of a long-range modernization program which has been in effect on the route for several years, and much of it has been converted to modern highway. The paving of the winding, dangerous older section has been removed, the ground beneath deeply scarified, and planted with native vegetation. Two small sections—the Red Lake Grade just east of the pass and a portion from Woodfords to the Nevada state line—still remain to be modernized. This work will be done in the near future, to make 88 one of the state's finest scenic mountain highways.

Beauty and safer driving go hand in hand in new design

At Panther Meadow road passes through groves of relatively rare sugar pines, with yellow pine and fir mixed among them.

For those who pull off and sit by the side of modern scenic Highway 88, the ghosts of Fremont and Kit Carson will swing past with their mile-eating woodman's walk. Sit there a little longer and the sober-miened Mormon Battalion, homeward bound, will slog by. Next will come creaking covered wagons headed downgrade to the fertile valley below, and a little later great loaded freight wagons struggling upgrade, the mules straining in the harness and the skinner's whip cracking. Finally, a cloud of dust rises as a Concord stagecoach whips around one of the sharp curves of the old road, the yells of the driver hanging in the still mountain air.

Then comes a station wagon, loaded with parents, kids, and camping gear, and you are back in the 20th century.

awards presentation

AT DENVER A.R.B.A. CONVENTION

Mr. Womack receives PARADE award from Mr. Kiester while Senator Jennings Randolph of West Virginia, chairman of the Subcommittee on Public Roads, and Federal Highway Commissioner Rex M. Whitton look on.

In Denver on February 21 Mr. Edwin Kiester, Jr., managing editor of PARADE Magazine, made the official awards for the 1965 scenic highway contest before some 1,200 assembled members of the American Road Builders Association convention.

Mr. J. C. Womack, California State Highway Engineer, was present to receive a bronze plaque in the name of the California Division of Highways, and Mr. Louis G. Kroeck, senior highway engineer, to receive a scroll as chief designer. The Amador County Chamber of Commerce, which nominated the highway for the contest and prepared the presentation which won the award, was given a $500 bond. Mr. David Mason, Jr., president of the chamber, accepted the award for his organization.

Prior to presentation of the awards, Mr. Kiester addressed the body on the subject of scenic highways. Since the words of this sincere young editor seem to embody virtually all there is of importance to be said on the subject of highway aesthetics, the speech is reproduced here.

"The PARADE scenic highway contest has been in operation five years. This means that we slightly predate the current widespread interest in scenic highways on the government level. It does not, however, place us ahead of the American people in our interest in beautiful highways.

One of the first things we discovered in sponsoring the scenic highway contest is that people feel very deeply and very strongly about what they see through their windshields. In the first year of the contest we were startled to receive more than 400 letters of nomination, including some that enclosed poems, odes to beautiful highways, reminiscences of trips gone by, old photographs and even paintings. Since then we have had repeated evidence of this enormous interest on the part of the driving public.

Last Sunday, February 13th, as you probably know, PARADE announced the winning highway for 1966 in the pages of the magazine. Already we have received a blizzard of letters commenting on the selection.

What this says to us is that Americans—our readers—find in highways something more than mere transportation. Highways to them must not only be swift and secure but must bring them some kind of fulfillment, some nourishment of the soul, somehow bring them closer to this nation's wonderful landscape. I think the members of A.R.B.A. and of the entire highway industry are to be commended for recognizing, as they have, that this deep need exists, and for designing and building highways that are enlightening and uplifting.

So that brings me to the PARADE scenic highway for 1966. It is, as many of you already know, the Carson Pass Highway, State Route 88, in Amador County, California.

It fulfills all the spiritual needs I was discussing a moment ago. It is safe: its curves are sweeping, its lanes wide, grades gentle. It is swift: it replaces an old and tortuous winding road dating back a century. It is breathtaking: most of it is a mile high, and it threads along the forested Sierra ridgetops in such a way that you can truly appreciate the wonder of nature. And it is historic: this is the route the explorer Kit Carson followed into California, and driving it now, the motorist can get a compelling feel of pioneer history.

The engineers of the California Division of Highways were guided by the idea that they should not spoil this magnificent country, but enhance it, and they have done so. The route was planned to take advantage of the finest views. Working closely with the U.S. Forest Service, the engineers carefully installed 12 scenic overlooks and parking areas where motorists could pull off and drink in the

view. They followed a policy of selective thinning of trees and immediate planting of shrubs and seedlings. One of the features that especially impressed the judges was that they immediately obliterated the old, abandoned road so that this evidence of man's presence would quickly return to nature.

To the judges, this highway—indeed, all 25 highways included in the final judging—was a work of art. People don't think of highways that way, and they don't think of highway engineers as an artistic group, and yet these men are contributing to aesthetics just as much as those who build buildings, paint paintings or write music. One of the reasons PARADE established the contest originally was to recognize these artists and encourage others to follow them. Consequently it gives me great pleasure to make the first of these awards today to the artist responsible for the creative work that is the PARADE scenic highway—Mr. Louis G. Kroeck of the California Division of Highways.

I'm very happy to present Mr. Kroeck with the scroll given each year to the design engineer responsible for the winning highway, and to commend him and his men for the fine work done on Route 88.

As I said before, PARADE has been interested from the first in recognizing people and their feelings about highways. We have done this by offering a $500 bond to the person who nominates the winning highway and writes the best letter in support of his nomination. This year the winner is not an individual but an organization, the Amador County Chamber of Commerce, which is rightly proud of the work of art that runs through its area.

I also want to note that there are several other awards that will not be made today. These are for the five special-mention, or runnerup, highways, and these scrolls will be presented later. Meanwhile, I will just tell you that they go to the State of Massachusetts, for Interstate Route 495, Boxborough to Southborough; the Virginia Department of Highways, for Interstate Route 95, Fredericksburg to Woodbridge; the Pennsylvania Department of Highways, for Route 22-322, north of Amity Hall; Georgia Department of Highways, for Interstate Route 85, between Route 98 and 51; and the Vermont Department of Highways, for Interstate Route 89 in the Bolton-Richmond area of Vermont.

Finally, I have here a large bronze plaque that says flatly that California has built the most beautiful new highway in the nation.

It gives me great pleasure to present this to a gentleman I have known for several years, and who has long been interested in the subject of scenic highways, an official of your organization and the guilding spirit behind this year's winner—Mr. Jasper Womack of the California Division of Highways.

I thank you."

Proud local officials pose before Division of Highways exhibit in Denver. Left to right: Sidney Smith, manager of the Amador County Chamber of Commerce; Myron Questo, chairman of the Amador County Board of Supervisors; Louis Kroeck, design engineer, California Division of Highways, Stockton; Hubert Bruns, chairman of the Alpine County Board of Supervisors; and David Mason, Jr., president of the Amador County Chamber of Commerce.

Louis Kroeck, J. C. Womack, and Edwin Kiester pose for press photos in Denver with PARADE award plaque.

PARADE'S SCENIC HIGHWAY AWARD

1965

Presented To

CALIFORNIA DIVISION OF HIGHWAYS

FOR

CARSON PASS HIGHWAY

FOSTER MEADOWS ROAD TO SILVER LAKE

(AMADOR COUNTY) CALIFORNIA

A HIGHWAY CONCEIVED WITH IMAGINATION

AND CONSTRUCTED WITH DEVOTION

TO THE BEST PRINCIPLES OF

DESIGN, PLANNING AND UTILITY

interstate 5 freeway

DISTRICT SIX

By GEORGE FLUTER

A major highway on the west side of the San Joaquin Valley has been the subject of discussion for at least 40 years. Now, with the aid of the federal interstate program, it is taking shape.

Most of the cities on the west side of the San Joaquin Valley developed and were incorporated during the first quarter of this century and as they grew the need for a good highway became acute.

However, because of the many uncontrolled rivers emptying into the valley, much of the area was often swampy or, in wet years, completely under water, making a good connection across the valley to US 99 difficult.

A "Westside Highway Association" was formed, and in 1925 Assemblyman Charles A. Foster of Fowler introduced a bill in the Assembly for funds to survey a route between Mendota and Ventura. The Governor vetoed the bill.

Later, at the request of the boards of supervisors of Kings and Fresno Counties, the Highway Commission requested State Highway Engineer R. M. Morton to study a route for a west side highway. In March 1926 the Highway Commission adopted the State Highway Engineer's report. It is of interest to review his recommendations of 40 years ago, as quoted in the "Fresno Republican" (forerunner of the "Fresno Bee"), March 5, 1926:

"It should be one-half mile distant from parallel railroad lines, to permit local industrial development and expansion. It should avoid railroad crossings and those necessary should be separated from the highway grade. Grade separations for intersecting highways and streets should be considered.

"Its right-of-way should have sufficient width for two high-speed one-way traffic lanes, each 30 feet wide and separated by an unpaved strip. Reservation of 20 feet should be allowed for the planting of trees, and parking on roadsides. Outside of this width there should be roadways for slow-moving, short-distance traffic, and for heavy trucks. Two hundred feet of right-of-way will be required and should now be provided."

Morton's recommendations were not followed. Subsequent highway development was along conventional standards, becoming State Sign Route 33 as we know it today.

It was not until 1939 that the Arroyo Seco Parkway, the first freeway in California, was finally constructed. It is noteworthy how striking a similarity this road bore to Mr. Morton's description for this recommended Westside Freeway of 13 years before.

The first post-World War II study of the route was made when the 1950 Legislature directed the Division of Highways to investigate the pros and cons of building a toll road between Los Angeles and San Francisco, financed by toll revenue bonds. The division's report to the Legislature concluded that such a toll road was not financially feasible at that time, primarily, because it would face competition of free parallel freeway routes (Highway 99, etc.).

However the data accumulated during this toll road study proved helpful six years later when the Legislature again instructed the division to reinvestigate the construction of a high-speed highway on the west side of the San Joaquin Valley between Woodland and the Grapevine Grade. This report concluded that such a highway was feasible and would cost approximately $261,000,000. The 1957 Legislature added the route to the state highway system.

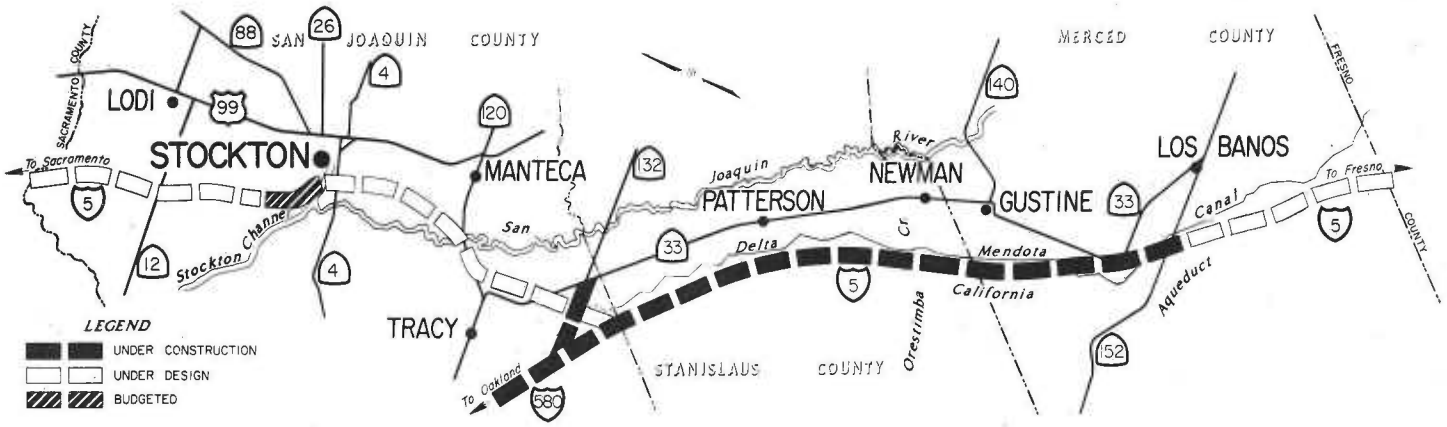
Immediately, the division started detailed route studies on several alternates for consideration by the California Highway Commission. (See "Westside Freeway," September–October 1960 issue, "California Highways and Public Works.")

The first construction contract in District 6 was awarded in April 1965. Approximately 21 miles long, it extends from Manning Avenue to the Merced county line.

Work is now going on in all counties on the Westside Highway.

One of the problems encountered in construction has been soil subsidence described in an accompanying article in this issue.

Among other construction highlights: On the southern 16 miles of Route 5 in Kings County, which lies across farming and grazing land and through the Kettleman Hills, independent roadways will be used to enhance the aesthetic quality of the freeway. The interchange with Route 41 will lie within this hilly terrain. Its design includes contour grading to



As indicated by the dotted line on the above map Interstate 5 is being constructed on entirely new alignment along the west side of the San Joaquin Valley.

blend excavation slopes with natural ground lines.

An interchange at Utica Avenue will be near the site of a future aquatic park.

A safety roadside rest will be built approximately 3½ miles north of the Kern county line.

Along the 66 miles of Route 5 in Fresno County, which also crosses farming and grazing lands, grades are mild on approximately 60 miles of the project, requiring only low cuts and fills no more than three or four feet high. On the remaining six miles, grading will be heavier requiring cuts and fills up to 40 feet.

Independent roadways and separated grades will be used on much of the alignment as a scenic feature.

Two safety roadside rests will be built in Fresno County, one 5½ miles south of the Derrick Avenue crossing and the other two miles south of Shields Avenue.

The amount of farming land affected by the freeway presented special problems to the design and right-of-way departments who had to complete adjustments to irrigation facilities in time for the work to be included in the construction contracts.

The problem was further compounded by the imminent development of the California Water Plan which will bring many new acres under irrigation.

The rehabilitation of irrigation systems was given priority over other right-of-way activities because of the critical importance of maintaining irrigation schedules to avoid crop losses.

This bleak scene along Utica Avenue in Kings County will be the location of an Interstate 5 interchange and an aquatic park.

This construction site along Interstate 5 in Fresno County will be the location of an interchange with Panoche Road.

interstate 5 freeway

DISTRICT TEN

By George B. Avery and
R. Kenneth Wells

The new Westside Freeway follows the western edge of the San Joaquin Valley high up on the alluvial fans that have formed at every creek mouth. Over eons of time, these have joined together to form a fluted edging to the barren hills. The engineers have used various means to blend the design of the new highway into this setting so that it will become a part of the fluting pattern by locating it at the natural dividing line between arable and grazing land. Little farm land will have to be taken and severence has been held to a minimum.

The new highway also parallels the California Aqueduct and has been designed to complement it. Vista points are planned to provide the traveler with outstanding views of the central valley, the foothills, the aqueduct, and the Delta-Mendota Canal.

Throughout the life of this project the engineers have continually weighed engineering costs against appearance to build a highway which is economically as well as aesthetically acceptable. Roadway alignments and grades were combined to achieve a pleasing effect. A lot of attention was given to the interchange areas so that they would blend with the surrounding countryside.

There are several areas where large valleys lie to the west of the freeway. At these locations interchanges and underpasses will permit free circulation of local traffic as well as easy access to the freeway.

The construction of this modern freeway through new territory involved 800 parcels of land. In order to acquire this land in the most economical manner and cause least disruption to existing operations, the Division of Highways entered into a cooperative agreement with the Department of Water Resources to obtain the necessary rights-of-way for both the freeway and the California Aqueduct in one transaction with each property owner. As an indication of how little displacement occurred to the residents, only two homes were acquired in Merced County because of the freeway. None were acquired in Stanislaus County. Irrigation pipelines have been installed to preserve existing irrigation and drainage patterns.

Where the new highway and canal cross the pipelines connecting oil fields near Bakersfield and refineries in the San Francisco Bay area, agreements have been entered into to preserve or relocate the lines. In some areas, local irrigation districts have revised their facilities.

The interstate highway law commits us to a 1972 construction completion date. One result is that where formerly projects 5 miles in length were considered large, it has been necessary in this district (10) to advertise projects as long as 15 miles. (District 6 has a single contract underway on Interstate 5 in Kern County that is 24 miles long.)

These large contracts allow the contractors to work at maximum efficiency. Equipment manufacturers have produced machines to meet the demand. Paving trains have been organized that can lay a mile of concrete 24 feet wide on a single day.

Several projects involved moving nearly four million cubic yards of earth. Contractors employed two running shifts on excavation operations and moved as much as 40,000 cubic yards of earth in one day.

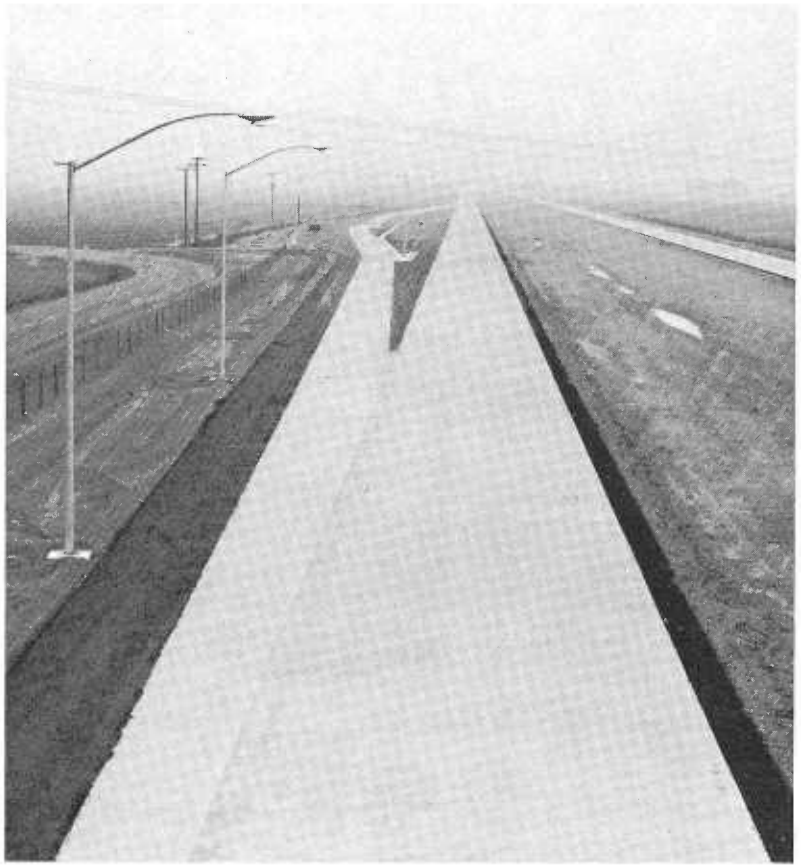
As these projects went to construction, the demand for base and surfacing aggregates jumped from thousands to hundreds of thousands of tons. Plants that worked intermittently in years past found themselves working around the clock. At least a dozen plants are now in full production making aggregates not only for base and surfacing on the freeway but also concrete aggregates to line the tremendous California Aqueduct.

The traveler on this new freeway will have a panoramic view of the full sweep of the San Joaquin Valley.

The Department of Parks and Recreation is vitally interested in the development of the freeway. Their future plans have the freeway traveler in mind. Five wayside campground sites are currently being studied along the aqueduct and the Interstate 5 Freeway. Typical of these is Orestimba Creek in Stanislaus County. Fifty-four acres are being acquired west of Stuhr Road at a large grove of mature cottonwood and sycamore trees next to Orestimba Creek. One hundred camping units will be constructed here for tent and trailer campers. The entire area will be landscaped and irrigated to handle year-round vacation traffic.

A 60-mile section of Interstate Routes 5 and 580 are under construction or budgeted between US 50 west of Tracy and Route 152 west of Los Banos. These projects should be completed and open to traffic by the summer of 1967, providing an entirely new artery for traffic between the bay area and Los Angeles and intermediate points in the San Joaquin Valley.

The eighth and last contract is for the three-mile section from Sybil Avenue in San Leandro to 173rd Avenue near the Castro Valley Interchange and follows the general route of Foothill Boulevard (the extension of MacArthur Boulevard). The project, which will be completed soon, will cost $5,174,000.



A nearly completed section of Interstate 5 Freeway northwest of Los Banos in Merced County. The area and connecting lanes left of the northbound roadway are for a truck weighing station. The view is southward.

The new Interstate 5 Freeway follows the natural dividing line between arable and grazing land along the west side of the San Joaquin Valley.

interstate 5 freeway

SUBSIDENCE AND THE WESTSIDE FREEWAY

By William F. Kleiman

Much of the Westside Freeway (Interstate 5) cuts across the alluvial fans and mud flows extending into the San Joaquin Valley from the east side of the Coast Range. These fans contain soils that tend to settle when saturated with water for a long time.

Soil subsidence studies on this and other areas have been carried on by engineers, geologists and technicians of the California Division of Highways, California Department of Water Resources, the United States Bureau of Reclamation, and others.

These studies show that the areas of shallow .subsidence contain fine grain loose-packed soils but that there appear to be concentrations of these soils rather than a uniform distribution throughout the entire mass. Rainfall in the areas is low, three or four inches a year, most of it coming from infrequent storms during the winter months. Quick drying of the mud flows followed by an extensive drying period produces a porous soil mass cemented together by clay particles. Such soil is stable under normal conditions, but when saturated, it crumbles and settles.

This phenomenon has long been a thorn in the sides of canal builders and pipeline companies operating in the west side of the San Joaquin Valley because settlement of the ground during irrigation has caused vertical distortion of canals, pipelines and farm roads.

Preliminary studies on the design of the Westside Freeway required a great deal of laboratory and field testing and offered special problems. For one thing, the natural ground water through this area is more than 200 feet below the ground surface. One of the conditions necessary for estimating settlement is that the specimen be tested in a **natural** saturated condition. Results of the conventional consolidation test performed in the laboratory were not considered applicable for predicting settlement in the field.

Thus, a modification to the standard consolidation test was made. Water was added to the test specimen and a constant vertical pressure maintained after the specimen had been consolidated at field moisture content under some predetermined pressure. From this an estimate of subsidence due to saturation could be made.

Several field subsidence test plots were operated for several months. These test plots were situated at the same locations from which samples were obtained for the laboratory tests. Subsidence occurred as water saturated the ground and elevations were determined at time intervals on the surface and at 20 feet and 40 feet beneath the surface. Correlation between estimated settlement from consolidation test and observed settlement of the subsidence plots was good to fair for four locations and very poor for two locations. On the basis of consolidation tests, field reconnaissance, and other data, areas were placed into two broad categories (1) those that would subside a negligible amount, say less than one-half foot, and (2) those that would subside several feet. The findings also showed that no one soil characteristic correlated very well with known subsidence so that it would be necessary to consider all possible factors including personal judgment based on field observations.

Conclusions of these investigations were:

1. In the areas where major subsidence can be expected: (a) secure approximately 150 feet of additional width outside the normal right-of-way on both sides; (b) provide drainage to prevent ponding of water from irrigation or surface runoff within approximately 125 feet of the freeway embankment; (c) provide cross culverts at all natural drainage channels and additional cross culverts along the line at intervals not greater than 300 feet.

2. Specify compaction of original ground under all embankments in all areas of major or minor potential subsidence.

Water Resources is even more concerned with subsidence than is Highways, especially deep subsidence which occurs over large areas to depths of 300 feet or more. Deep subsidence seldom causes settling that seriously affects highways. However, maintenance of a profile grade is vital for aqueducts and canals and deep subsidence can alter gradients so that flow is greatly reduced. Highways can often avoid subsidence areas by being relocated, but studies of alternate alignments by Water Resources indicated that it was not practical to bypass the subsidence areas with the aqueduct.

Construction of the aqueduct required a different approach to the subsidence problem than highway construction. The Division of Highways tends more to **preventive** treatment. Water Resources must use **corrective** treatment as water in a canal constructed without treatment would result in excessive maintenance and operation costs and disruption of water deliveries to the southern part of the San Joaquin Valley and southern California.

Special studies were conducted at

49 locations over approximately 200 miles of the aqueduct alignment. Subsidence ranged from less than 1 foot to more than 20 feet. The largest subsidence occurred south of Buena Vista Lake in Kern County and at the Mendota test site in Fresno County.

At the Mendota site a prototype canal was constructed. The first phase consisted of maintaining water in simple ponds measuring 200 feet by 400 feet. At the first pond, nearly 16 feet of subsidence was observed after maintaining a constant depth of water of one foot in it for 16 months. After compaction of the native soils by saturation, a prototype canal was constructed through three of the test ponds. The canal was 1,400 feet long and the ponds or plots are separated by cut sections of native, uncompacted soil. One-half of the canal was concrete lined and the other half was lined with a heavy compacted earth lining.

After the canal had been inundated for 90 days, the concrete lining and embankments in the uncompacted areas were badly cracked. After 130 days of operation, the earth-lined section showed signs of distress and collapsed shortly afterward.

The concrete-lined and earth-lined sections in the precompacted areas were in excellent condition after the test canal had been in operation for almost a year.

The California Division of Highways and the Department of Water Resources have projects currently under construction through areas of shallow subsidence on the west side of the San Joaquin Valley.

The preventive method used by the Division of Highways consists of extensive drainage facilities to prevent ponding of water near any embankments. The first contracts include grading only of the freeway embankments. Paving will be done after the embankments have been in place for at least one year. The completion of the freeway is scheduled for 1972.

In the case of the State Water Plan aqueduct it is believed that precompaction by ponding and saturation will enable construction of an aqueduct which will be relatively free of settlement. Water is being maintained in the ponds for an average of six months, and a drying period of one year will be required prior to construction of the aqueduct. Present plans call for completion of the precompaction work in 1967.

An aerial photo of a prototype test canal built by the Department of Water Resources some 15 miles south of Mendota. Note concrete-lined and earth-lined portions.

Failure of the earth-lined section in the noncompacted portion of the prototype test canal after 130 days of operation.

Failure of concrete lining and embankment in noncompacted portion after inundation of the prototype test canal for 90 days.

interstate 5 freeway

COMPACTION CONTROL with NUCLEAR GAGES

By William G. Weber, Jr.

The Numec backscatter gage (on ground left of truck) reflects gamma rays back from the soil.

The first use of a nuclear soil gage on a construction project for compaction control in California was in 1964 on a project in District 1 (Eureka). As a result of this study the present program using soil gages on 10 construction projects was initiated. Two of these projects are on Interstate 5 (Westside Freeway).

Two types of nuclear density gages are being used: backscatter and transmission. The backscatter type reflects gamma rays back from the soil which are counted by a detector. This type is being used on a District 6 project. The transmission type counts the gamma rays penetrating a soil mass. The gage requires either a nuclear source or detector placed in the soil mass. This type of gage is being used on a District 10 project. So far, test results indicate that the transmission-type gage is to be preferred.

The material on the project in District 6 consists almost entirely of roadway excavation and borrow from alluvial fans which has outwashed from the adjacent slopes on the east side of the Coast Range. In the process of erosion the soil has only been transported short distances so that the degree of abrasion has been relatively minor. Hence, although the material is predominantly fine grain, many of the soil particles consist of small pieces of parent material such as shale and sandstone in a badly weathered condition. The materials tested with the nuclear gage on this project are roadway excavation, borrow and structure backfill. No structural section material was included. The gage used is a Numec.

The roadway excavation for the District 10 project is predominantly sedimentary, consisting of fat clays, shales, poorly cemented sandstone, clean fine sands, sand and gravel, conglomerates and other materials. The layers vary in thickness from a fraction of an inch to several feet, and great variation may exist even in small cuts. Thus, a scraper of fill material might consist of any one of the above materials or any sort of combination of materials. This complicates testing because the test at one spot may not be representative of conditions in nearby areas. A Troxler (transmission type) gage is being used on this project.

Calibration of the gages and preparation of the soil surface for nuclear testing has presented some problems, especially with the backscatter type. Both types of gages require the soil to have a plane surface that is in full contact with the bottom of the gage. This means a lot of time being spent in test site preparation. Methods are being developed which will reduce this preparation factor.

Health and safety factors have presented no problems so far. The gages use only a very small amount of radioactive material and film badges and dosimeters are worn by the operators to record the radiation that they receive.

In spite of the problems mentioned above in the use of the nuclear gages, valid density readings have still been obtained. However, experience shows there is need for improvement to make the gages easier to use to get even more accurate readings.

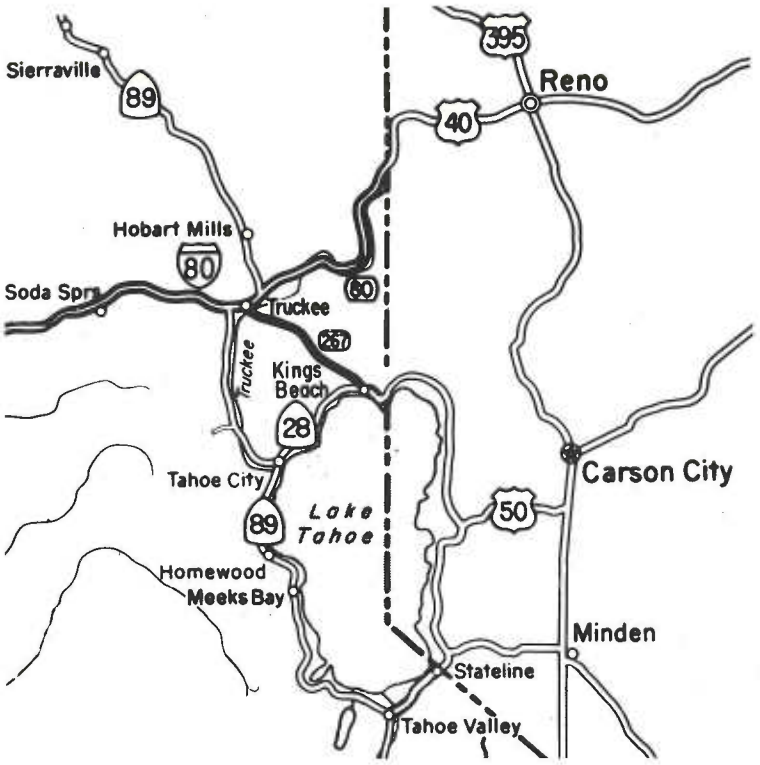
The Troxler transmission gage being set in place here counts gamma rays penetrating a soil mass.

The new feature in the nuclear test method is in the use of the area concept; that is, several tests performed in a given area. Normally there should be at least six tests taken in any specified area. The average compaction reading from the tests must be higher than compaction value required in the job specifications (the higher the reading on the gage, the more compacted the soil). Also, two-thirds of the individual tests must give results above the compaction value required in the job specifications.

This method of testing recognizes that variations in relative compaction are normal in earthwork. Variations such as layer thickness, coverage with rolling equipment, moisture content and variation in material will cause slight variations in the compacted densities. The area concept is an attempt to allow for these variables.

The use of the nuclear testing on the Westside Freeway is increasing the effectiveness of earthwork compaction control. The difficulties encountered so far in nuclear testing do not appear insurmountable. There is little doubt that use of nuclear testing will increase as time goes on.

Truckee - Brockway Shortcut



One of the newest additions to the 14,200-mile state highway system is a 13-mile stretch in the Lake Tahoe region.

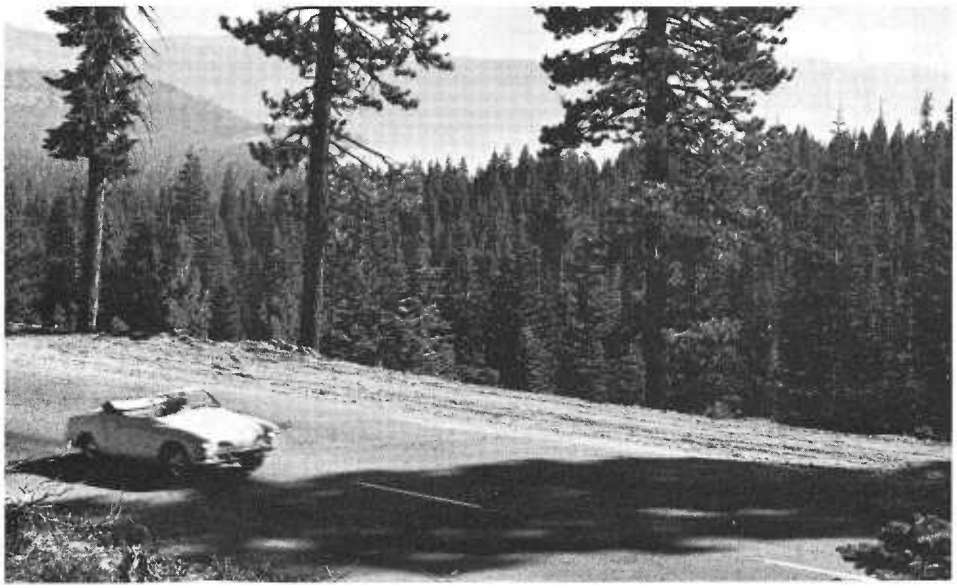
The Brockway Shortcut has long been known to nearby residents as the most direct route from Interstate 80 at Truckee to Kings Beach, Crystal Bay and North Shore. It is some eight miles shorter than its alternate—a combination of State Routes 89 and 28 which passes by the Squaw Valley entrance and meanders through the resort area which borders Lake Tahoe's northern shore.

This route has provided a popular access to Lake Tahoe in recent years for local residents and others familiar with the region. Now, it has been improved to state highway standards with county, federal and state matching funds.

The new signing as a state route (see photo on right) now assists other motorists seeking the shortcut.

Although Interstate 80 must receive first priority in snow removal operations in the severest winter conditions, additional equipment assigned to the Truckee area is making it possible to keep the route open in most storms.

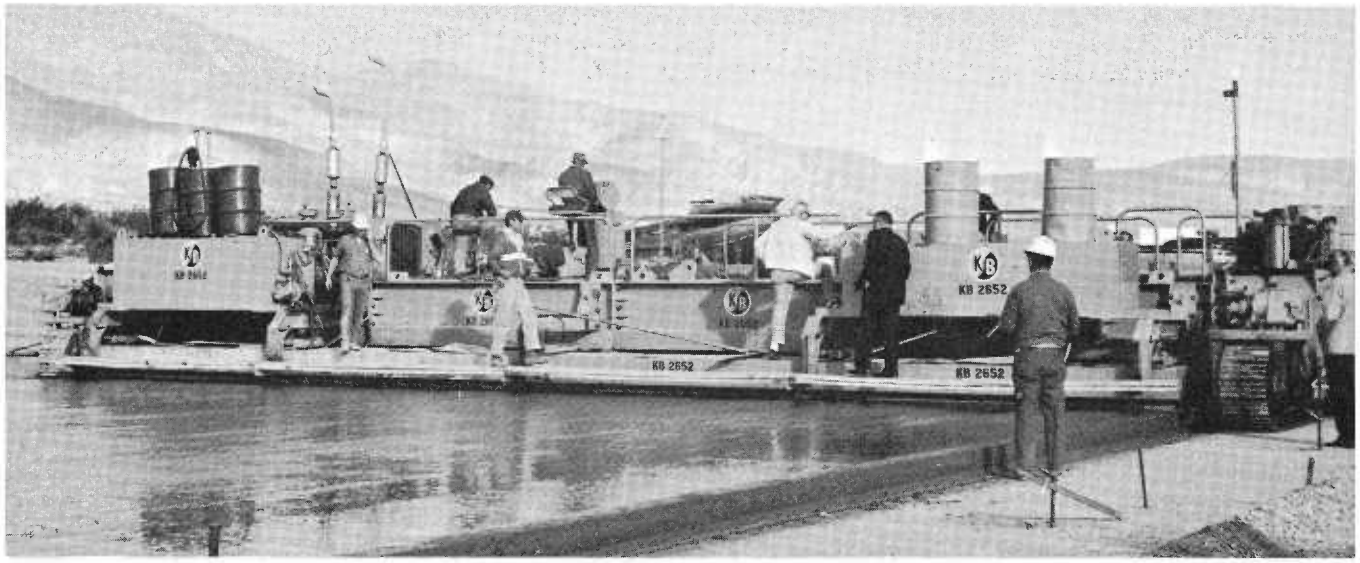
Route 267 was authorized by State Senate Bill 1081 (introduced by Senator Paul Lunardi during the Legislature's 1965 General Session) and adopted by the California Highway Commission on September 22.



Signs on Interstate 80 near Truckee, above, indicate place to turn off main route to use new state cutoff. Left, Route 267 is modern, well paved, with easy grades. Road continues to left to drop down to shore of Lake Tahoe, scenic view of which is seen in distance.

"instant freeways"

SAN BERNARDINO FIRM DEVELOPS FIRST FOUR-LANE PAVER



Jeff Kasler (in white jacket), president of Kasler Corporation, shows C. V. Kane (in black business suit), California Division of Highways' district engineer for San Bernardino and western Riverside Counties, the highway construction firm's modified slipform cover.

BY PAUL BROWN

Two extensively modified pieces of paving equipment are making freeway construction history in Riverside County.

For the first time anywhere, a contractor has equipment which successfully paves a four-lane-wide ribbon of smooth concrete pavement.

Motorists probably aren't going to get too excited over this feat which has impressed engineers and highway construction people. But drivers do recognize and appreciate a smooth-riding highway. And this newly modified machinery is producing a ribbon of extra-smooth pavement.

The equipment—a slipform paver and a pipe float which represent a $255,000 investment and four months of intensive modification work—went into operation early this year on a freeway construction project on Interstate 10 about eight miles northwesterly of Palm Springs.

Slipform pavers capable of producing three-lane-wide continuous concrete pavement have been in operation for the past several years.

But the Kasler Corporation, of San Bernardino, is the first firm to achieve success with a 48-foot-wide pavement venture.

Jeff Kasler, the firm's president, modestly reports that credit for the successful operation goes to his master mechanic, San Bernardino resident Curly Toles. Kasler also expressed his delight over the extra-smooth pavement produced by the machinery.

Another man impressed by the historic event is C. V. Kane, California Division of Highways' District 8 engineer.

"It's a milestone in concrete paving operations," Kane emphasized.

"Kasler's slipform paver and plant setup," Kane pointed out, "are capable of running about 550 cubic yards of concrete an hour!"

The district engineer noted that when he started working for the Division of Highways as a draftsman in 1928 a concrete paving operation would run 200 to 300 cubic yards of concrete in an eight-hour shift. Conventional three-lane-wide pavers today spread about 250 to 300 cubic yards an hour.

Modern high-speed traffic demands high standards of pavement smoothness. And Kasler's 48-foot slipform paver and pipe float are meeting this high standard, Kane reported.

Engineers, using a specially designed gauge, measure pavement smoothness and rate it under a standard called a profile index. The Division of Highways will accept pavement with a profilograph reading of 7 inches per mile or under.

If the index goes over 7, the contractor must grind down the pavement to achieve the desired smoothness of surface. The profile index on the first four-lane-wide pavement produced by Kasler's equipment is 1.2!

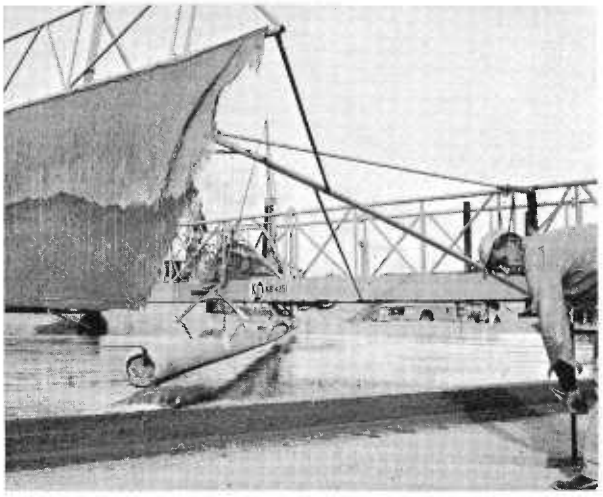
Kasler reported that the modification work involved changing a manufacturer's slipform paver—a slope paving machine purchased in 1964 and used to pave flood control channels—into its present form as a 48-foot-wide highway paver. The modification work included designing a new electronic control panel to operate the machine. He said the original paver was $200,000 and the modification job cost $40,000.

Also reconstructed was a 24-foot power-driven pipe float (which follows the paver and smooths down the freshly laid pavement). This piece of equipment originally cost $8,000. Kasler said modifications on the float cost $7,000.

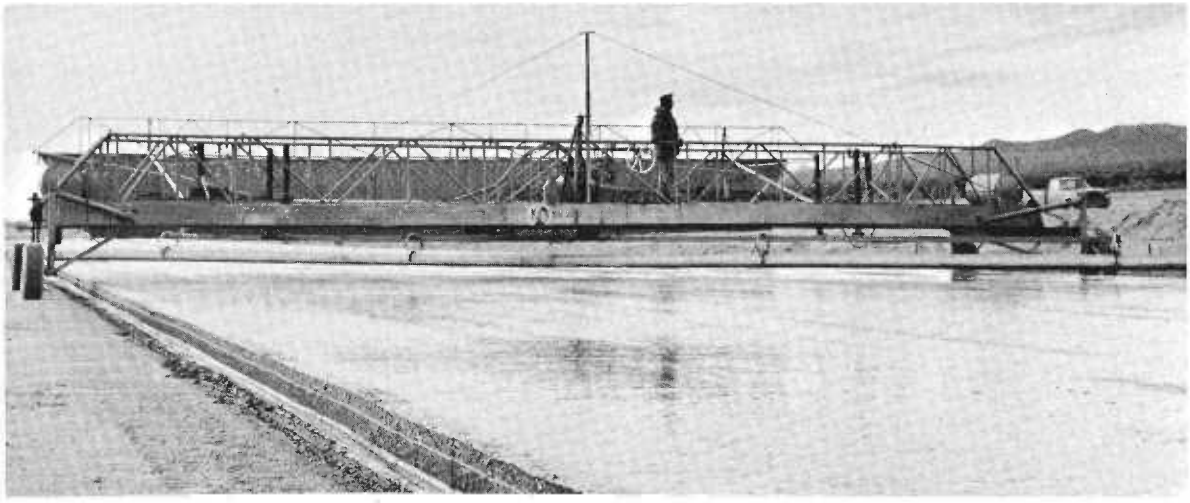
These two successfully modified pieces of equipment are being used on a construction project to upgrade an approximate five-mile section of four-lane expressway to an eight-lane freeway.

The $4.5 million job, scheduled for completion about next August, is located on Interstate 10 between Cabazon and the Route 10/111 junction. This project is a joint construction venture of Kasler Corporation, Gordon H. Ball Enterprises and the E. L. Yeager Construction Company.

and smoooth!



Workman removing guide wiring helps illustrate the size of this pipe float, which was modified to do a 48-foot-wide strip.



This freshly laid ribbon of concrete pavement on freeway construction project, Interstate 10, about eight miles northwesterly of Palm Springs, is first successful paving of four lanes at one time.

THE UKIAH FREEWAY

By L. B. Dwyer

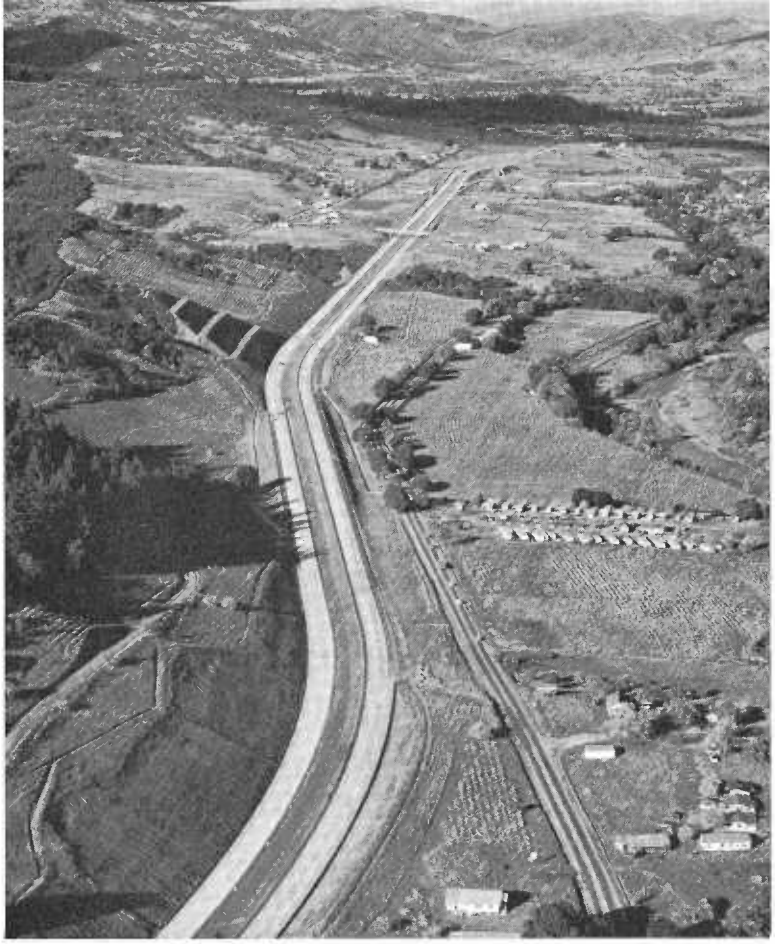
A 5½-mile freeway section around Ukiah which was opened on November 8, 1965, completes freeway construction on the Redwood Highway (US 101) from six miles north of Hopland to north of Calpella, a distance of 14½ miles.

The City of Ukiah is approximately a 2½-hour drive north of San Francisco. It is the Mendocino county seat and its largest city (population: 10,000). The surrounding area is noted for its pear and walnut orchards, vineyards and large cattle ranches. Several wood product manufacturers are also located in and around Ukiah. The city is a natural stopover for meals and lodging for business and vacationer traffic using US 101.

The new freeway is located generally to the east of Ukiah and is relieving the city of heavy trucks and bumper-to-bumper traffic, allowing local customers easier parking and more leisurely shopping. Through traffic saves 15 minutes by using the freeway and missing the downtown congestion

The freeway was constructed to blend in with the surrounding area by contour grading and seeding of slopes. A functional and tree-planting project planned for this spring will further enhance its appearance.

The first of five contracts which constructed this 14½-mile stretch of freeway was started in 1961 and completed in November 1962. It included 13 bridges and partial grading from Ford Road to 0.8 mile south of Forsythe



(Left) Looking north over new freeway section toward Calpella and Redwood Valley
(Below) Ukiah in distance, in foreground simple "trumpet type" interchange which joins State Route 20 to Redwood Highway.

Creek. The contractor was Guy F. Atkinson. N. A. Gust and John Brown, Jr., were resident engineers. Job cost was around $1,600,000.

A second contract for 5½ miles from Ford Road to ½ mile south of Forsythe Creek was started in April 1962 and completed in January 1964. Contractor was Frederickson Brothers; E. J. Reed, Jr., was resident engineer. Project cost was $2,400,000.

Work started on the third contract in June 1963 and was completed in July 1964. It included construction of the southern four miles of the freeway and included three bridges. Hooker Co. and Fredrickson & Watson Construction Co. were the contractors; resident engineer was Albert J. Braga. Project cost was $2,200,000.

The fourth contract between one-half mile north of Robinson Creek and North State Street included 11 bridges. It was completed in the fall of 1964. Contractor was Gordon H. Ball; Fred Graebe and Wynn Norsworthy were resident engineers; and P. A. Main, W. B. Sperry and L. L. Younie, District 1 representatives on the $2,000,000 project.

The last contract between Robinson Creek and North State Street, some 5½ miles, was started in the fall of 1964, completed in December 1965 and cost $2,750,000. It connected the two previously constructed freeway sections. Contractor was Gordon H. Ball; L. B. Dwyer, the resident engineer.

Bylines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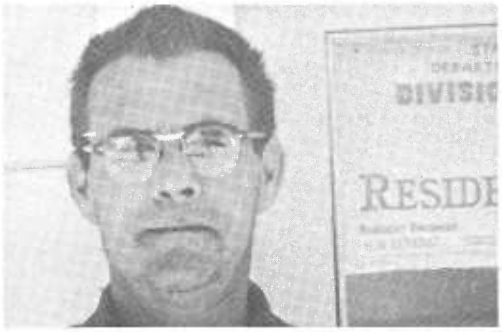
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William G. Weber, Jr. (1), who wrote "Compaction Control With Nuclear Gages," is a native San Franciscan and a graduate of the University of California at Berkeley. He joined the Division of Highways in 1949. Now a senior materials and research engineer, his specialities include soft foundations and use of nuclear gages to measure soil compaction.

"Interstate 5 Freeway—District Ten," by George B. Avery (7) and R. Kenneth Wells (2).

Mr. Avery is assistant design engineer for the Division of Highways in the Stockton district office. A native of Stockton, he is a graduate of the University of California at Berkeley and came to work for the division in 1953. He is past president of the Central Valley Branch of the American Society of Civil Engineers.

Mr. Wells, also stationed in Stockton, is report engineer for the district. He was born in Santa Cruz and joined the division after his graduation from the University of California in 1931.

Author of "MacArthur Freeway" is Dale C. Ryman, (3) now assistant district engineer of the Division of Highways San Francisco office. A native of South Dakota and graduate of South Dakota State College, Mr. Ryman joined the division in 1946. A highlight of his prestate career included a two-year stint as relocation engineer on the $300,000,000 Panama Canal Third Lock project.

William F. Kleiman (4), author of "Subsidence and the Westside Freeway," was born in Kansas City, Missouri, and moved to California in 1935. He graduated from the University of California at Berkeley in 1940 and joined the Division of Highways in 1947. He is a soils engineering associate with the Materials and Research Laboratory. His specialty is stability of embankments.

Paul Brown (5), author of "Instant Freeways," was born in Chicago, and came to California in 1944. He is a graduate of the University of California at Los Angeles. Before coming to work as assistant information officer with the Division of Highways San Bernardino office in 1964, he worked as a reporter and photographer for newspapers in southern California.

"Dean Creek to Miranda," by H. W. Benedict (6). Mr. Benedict was born in Colorado Springs, Colorado, and moved to California at an early age. He attended Oregon State College and joined the California Division of Highways in 1941. Now a highway engineering associate, he has served as resident engineer on many large highway construction projects in northern California.

"Interstate 5 Freeway—District Six," by George Fluter (8). Mr. Fluter is a senior highway engineer in design with the Fresno office of the Division of Highways. He was born in Centralia, Washington, and moved to California when still young. He is a graduate of the University of Redlands and joined the Division in 1947. He was in charge of design for the Bakersfield Bypass and Grapevine Grade sections of Interstate 5.

"The Ukiah Freeway," by L. B. Dwyer (9). A native of Tupper Lake, New York, Mr. Dwyer attended Rensselaer Polytechnic Institute in Troy and the University of California at Berkeley. He joined the California Division of Highways in 1948. He is a highway engineering associate and has been resident engineer on highway projects in central and northern California.

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