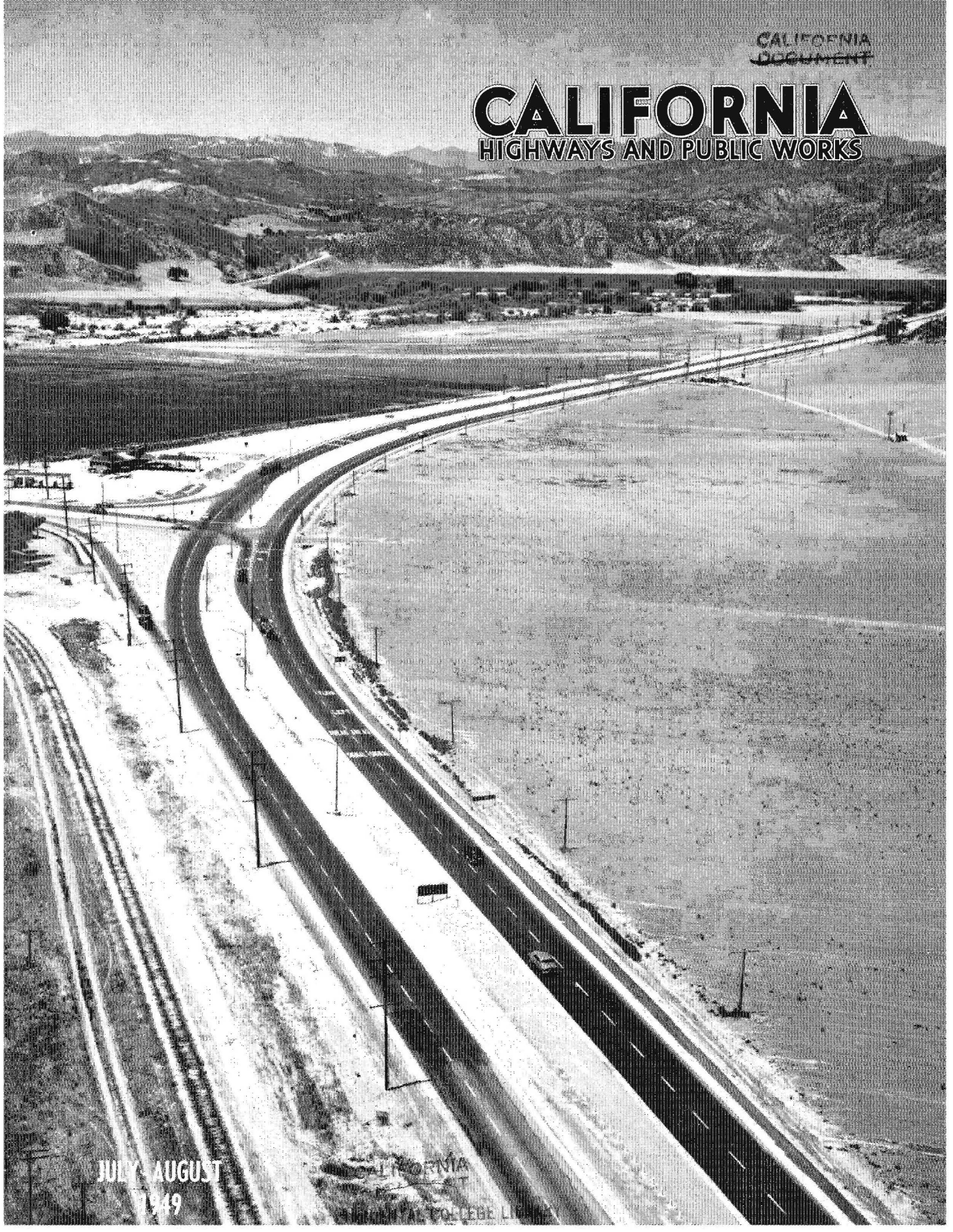


CALIFORNIA
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CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



JULY-AUGUST
1949

CALIFORNIA

PHOTOGRAPH BY G. B. ...

California Highways and Public Works

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

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Published in the interest of highway development in California. Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

Address Communications to

CALIFORNIA HIGHWAYS AND PUBLIC WORKS
P. O. Box 1499
Sacramento, California

Vol. 28

July-August

Nos. 7, 8



Public Works Building
Twelfth and N Streets
Sacramento

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Cost Index

Highway Construction Prices Show Decrease
in California During First Half of 1949

By RICHARD H. WILSON, Assistant State Highway Engineer, HENRY C. McCARTY, Office Engineer, and RICHARD R. NORTON, Assistant Office Engineer

OF PRIMARY INTEREST at this time is the fact that the California highway construction cost index has dropped from a high of 216.8 (1940=100) for the first half of 1948 to 195.7 for the second quarter of 1949, a reduction of 9.7 percent from the peak.

The decrease appears to be due chiefly to the following factors:

(1) Labor productivity has increased, due to the fact that production is catching up with demand in many industries and there is more competition for jobs. In 1948 labor productivity was estimated at 75 percent. This figure is now estimated to be 90 percent, compared to 1940.

(2) Material prices are decreasing for the first time since 1940.

(3) Many of the elements of uncertainty are being eliminated. Materials are becoming definitely available at guaranteed prices and the labor supply is more stable. Contractors are able to reduce contingency items in their bids formerly necessary to cover uncertainties in securing materials and labor.

Contract Prices Drop

The greatest decreases in average contract prices from the first half of 1948 to the second quarter of 1949 are:

Roadway excavation dropped 23 percent, from \$0.56 to \$0.43 per cubic yard.

Class "B" Portland cement concrete pavement dropped 12 percent from \$13.37 to \$11.74 per cubic yard.

Bar reinforcing steel dropped 12 percent from \$0.094 to \$0.083 per pound.

Structural steel dropped 24 percent from \$0.145 to \$0.110 per pound.

Since contractors are bidding 9.7 percent less on highway construction than they were a year ago, an analysis was made of contractors' costs for the first quarter of 1949 to determine the factors which made this reduction possible.

Significant Trend

An analysis of a number of projects completed in the first half of 1949

NOTICE!

CALIFORNIA HIGHWAYS AND PUBLIC WORKS is having returned to it by the post office too many copies of the magazine addressed to persons who have moved without notifying us of a change of address.

Accompanying the September-October issue will be a postcard requesting all recipients of the magazine to indicate whether they desire to continue receiving *California Highways and Public Works*. It will be necessary to take off our mailing list for the future the names of all recipients who do not fill out and return their postcard to this office.

Editor

An article in the January-February issue of *California Highways and Public Works* entitled "High Costs Seriously Retard State Highway Building Program" attracted more nation-wide attention than any article that has ever appeared in this magazine. In response to many requests, the authors have brought the construction cost information up to date.

The original article was reprinted in many construction and engineering publications of national scope, including *American Highways*, *Engineering News-Record*, *Roads and Streets*, *The Constructor* (Associated General Contractors), *Public Works Magazine*, *Pacific Road Builder and Engineering Review*, *Southwest Builder and Contractor*, *Daily Pacific Builder*, and *Western Construction News*.—EDITOR.

shows a very significant trend in the proportions of the contractors' costs which are going to labor and to materials as compared to similar projects a year ago. The proportion of contractors' costs which go to labor has decreased from 45 percent (assuming 10 percent pay roll taxes and 10 percent profit) to 33 percent due chiefly to the increased labor productivity factor and the proportion going into materials has increased in the same period from 27 percent to 37 percent.

The factor of labor productivity is not subject to exact measurement. It is presently estimated at 90 percent, compared to the 75 percent factor used a year ago.

The price index of 186 (1940=100) has been used for the cost of materials for the first quarter of 1949. Although this is based on the latest available information for all materials, it is known that prices of several construction materials are now lower than they were in the first quarter of 1949.

An index of 197 (1940=100) is used for the cost of equipment ownership. This was taken from Marshall and Stevens Index which appeared in the March 17, 1949, issue of "Engineering News Record," and represents the figure for December, 1948.

Contractors' Cost Index

Using the above factors the Contractors' Cost Index for the first quarter of 1949 is as follows:

Item	Percent of item in total construction cost	Present cost of item compared to 1940 = 100	Present number cost of item compared to index total construction cost (1940 = 100)
Labor	33	216	71.28
Materials	37	186	68.82
Equipment	25	197	49.25
Overhead	5	200	10.00

First Quarter 1949 Contractors' Cost Index 199.35

This is in very close agreement with the California Highway Cost Index of 200.4 for the same period.

The following tabulation shows a comparison between the California Highway Cost Index and the Bureau of Public Roads Composite Mile Index and the "Engineering News-Record" Construction Cost Index for the last one and one-half years. All indexes are shown with a common base year of 1940=100.

	California highway cost index	BPR composite mile index	"Engineering News-Record" construction cost index
1948			
1st quarter		210.2	183.0
2d quarter		217.7	185.2
1st half	216.8	214.0	184.1
3d quarter		224.9	195.7
4th quarter		230.9	197.9
2d half	216.4	227.9	196.8
1949			
1st quarter	200.4	225.4	197.7
2d quarter	195.7		195.5

Composite Mile Index

It will be noted that the Bureau of Public Roads Composite Mile Index is higher than the California Index. The Bureau Index is originally based on 1925-29 costs; we have applied a factor to bring the index number to a 1940 base. It would be expected to be higher than the California Index, as it is accumulated on a nation-wide basis, and we have seen reports from various states showing very little or no decrease at all in construction costs.

Prior to the first of July it was pretty generally believed that the peak in highway construction costs had been passed. However, with recent wage increases (operating engineers, 6½ cents; carpenters, 5 cents; truck drivers, 5 cents; laborers, 2½ cents), with the unsettled conditions and pending strikes in the steel industry and the railroads, and with the Federal Government's continued policy of operating with an unbalanced budget, it is our opinion that costs will inevitably be held up and possibly increased, and that present inflationary trends will be continued until there is more definite stabilization of the national economy.

Possible Explanation

The rate of decrease in California highway construction costs was less for the second quarter of 1949 (2.4 percent) than it was for the first quarter of 1949 (7.4 percent). The con-

A REAL COST ANALYSIS

LAST MONTH in *Roads and Streets* California engineers presented one of the most thorough analyses of highway construction costs available since the war. A careful study of this article leads us to make several observations.

Firstly, cost indices used by the various state highway departments and other agencies will bear double checking. The index used should be based on actual highway construction costs rather than on general construction costs.

Secondly, few of us have really wakened to the impact of inflated prices on ultimate highway development programs. We are painfully conscious on letting day that this or that immediate project goes for a high sum. But what of our 10- and 15-year programs? Inflated prices, together with the standards of design needed to meet modern traffic demands, have resulted in such high cost estimates for future highway work that a lot of people are scared. A 5 percent to 10 percent "leveling off" of prices isn't going to alter the situation fundamentally.

Since the article in question was written (late in 1948), the boom in this country has reached its peak, and the future is anybody's guess. But few signs point to any substantial lowering of costs of construction because wages, which are an element in the cost of every job as well as of equipment and materials that go into every job, are not likely to come down very far. Contractors may temporarily cut with their prices to get jobs, but if they cut their profits too low, nobody would gain in the long run.

Thirdly, we need to sell our citizens on a new way of looking at road costs. As a nation we haven't yet wakened up to the fact that highway transportation costs will represent an increasingly large part of the total national economy. We've hardly begun to pay the war damage to our roads, let alone really modernize. All in all road costs will remain high for years to come, but they will seem cheapest if faced squarely and recognized as a part of the cost of our way of life. Perhaps we should quit talking about dollar cost of construction, and think and talk in terms of service rendered; of the direct and indirect penalties of delayed road betterments; of the benefits that make well planned facilities self-liquidating. When we do talk costs, we might better use vehicle-per-day cost or some other sensible yardstick, as Commissioner MacDonald suggests, since construction cost after all is merely a ledger item in our bookkeeping.—From "Roads and Streets"

struction cost index published by "Engineering News-Record" has increased in the months of June and July.

We wonder if the recent decreases in construction costs, as based on contractors' bids, was not almost wholly due to "squeezing the water out," that is, decreased prices due to elimination of uncertainties in availability of materials and labor and an observed increase in labor productivity, with very little decrease in basic costs. At least, it is our belief that no definite or accurate predictions can be made at this time as to future cost trends.

Highway costs are sensitive to general economic conditions, and the competitive contract system enables the State to secure the full benefit of lower

State Influx Totals Off 10 Percent From 1948's All-time High

APPROXIMATELY 10 percent less out-of-state autos arrived in California during the first six months of this year than in the similar period of 1948.

First half totals showed 413,553 cars, carrying 1,094,338 passengers, entering the State as compared with last year's record figures of 448,325 cars and 1,183,175 passengers.

Auto Club of Southern California touring officials say that, despite this year's leveling off trend, nearly twice as many out-of-state autos arrived in California during this first half period than in the similar months of the record prewar year of 1941.

Indications that California may experience another record summer travel season was noted in the influx totals for June which showed 106,211 autos and 298,210 passengers arriving in California this year as compared with 1948's all-time high of 106,800 cars and 299,795 passengers.

FIND SAFE PLACE

When forced by tire trouble or other emergency to stop on a busy highway, always pull well off the road, giving ample clearance for passing cars.

prices due to changes in the general economic condition. The average number of bidders per project has increased to 6.8 during the first half of 1949, compared to 5.1 for the last half of 1948. The average number of bids on structure projects increased from 5.5 for the last half of 1948 to 8.6 for the first half of 1949.

While the decrease in highway construction costs has been definite and has created a great deal of interest, it has not been very large in terms of percentages, and, as brought out in the first article which appeared in this magazine, it still appears that under present conditions it will require approximately 20 years to correct the critical deficiencies in the California State Highway System.

The Design of Seal Coats and Surface Treatments

By F. N. HVEEM, Staff Materials and Research Engineer
W. R. LOVERING, District Materials Engineer
G. B. SHERMAN, Associate Highway Engineer

IT HAS BEEN apparent for a number of years that the methods commonly employed for estimating the quantity of asphalt and screenings and to control the placing of seal coats are not adequate to insure that satisfactory results will be consistently obtained.

Up to the present time, the accomplishment of a successful seal coat has depended upon skill and experience on the part of the engineer, the availability of suitable equipment and materials and above all upon good weather. However, there has never been an over supply of engineers experienced in this particular class of work and as a result of the rapid expansion in the California Highway Program, it is increasingly difficult to find experienced men for all of the numerous cases where seal coat construction is involved. The problem has been recognized for several years and the Materials and Research Department has been engaged in collecting information, making observations on current practice and as opportunity has permitted, has studied the problem involved in the designing and placing of seal coats on road surfaces.

Pertinent Discussion

In a recent paper entitled "The Use and Abuse of Seal Coats," Mr. C. V. Kiefer, (1), Member of the Engineering and Development Committee, Pacific Coast Division of The Asphalt Institute, presented a pertinent and timely discussion on the subject of seal coats. Mr. Kiefer has set forth in very readable form most of the factors which have an influence upon the success or failure of seal coats.

The purpose of this article is to describe the problem, to point out some of the factors involved and to outline

the first steps of a definite engineering approach. While complete field data are lacking to support all of the conclusions and inferences drawn, nevertheless, it is believed that a start can be made and as more information becomes available, procedures can be adjusted or modified as found to be necessary. In any event, the field engineer or maintenance superintendent should be furnished with an orderly and logical procedure in order that the essential details of seal coat construction can be handled with greater assurance than is possible at the present time.

Some of Factors

Before attempting to present a design method, it will be desirable to discuss some of the factors affecting the quality and over-all performance of seal coats. As in the case of all bituminous road surfaces, seal coats are made up of two ingredients; namely a bituminous binder and stone chips or screenings. While the ingredients are relatively commonplace and simple, nevertheless, there are many variations in properties of both asphalt and stone and it is proposed to discuss some of these variations.

Before we can decide what is important and what is relatively unimportant, it is necessary to recognize the purpose for which a seal coat is being placed. The term "seal coat" implies that the original intent of this type of construction was to *seal* the road surface; that is, to prevent surface water from penetrating the pavement or base. However, all highway engineers will recognize that a surface treatment of asphalt and screenings may be applied to a road to accomplish *one or more* of several distinct purposes.

Distinct Purposes

These may be enumerated as follows:

1. To seal the road surface against the entrance of moisture or air.
2. To develop a non-skid texture where the existing road surface is dangerously smooth and slippery.
3. To apply a fresh coat of asphalt which will enliven an existing dry or weathered surface and thus improve wear resistance.
4. To reinforce and build up an inadequate pavement section.
5. To provide a demarcation for traffic guidance between shoulder sections and traffic lanes.
6. To improve luminosity or visibility at night.

The above list indicates the approximate order of importance or frequency of purpose and it is evident that there are commonly four or even six different reasons for placing such a so-called "seal coat" and therefore, the choice of asphalt binder, the number of layers and size of screenings can only be selected intelligently if the engineer has a clear conception of the purpose in each particular case.

California Method

A seal coat may consist of one or more successive layers of bituminous binder and screenings but in the majority of cases, at least in California, a seal coat consists of one application of asphalt on the existing surface and a single application of screenings. The Standard Specifications for the California Division of Highways list under "Seal Coats": Class "A-Medium," Class "A-Fine," Class "B-Single," Class "C-Coarse," Class "C-Medium" and Class "C-Fine," all of which involve a single application of liquid asphalt covered with one layer of screenings. There are

of course the two layer seals such as Class "B-Double" and Class "C-Double."

An analysis chart, *Fig. 1*, has been prepared in order to classify the factors that are involved when selecting the type and quantity of screenings. The breakdown shown in *Fig. 1* was made in order to indicate the factors which bear upon the quality of screenings, those which should be taken into account when deciding upon the size and also the variables that will influence the quantity required, particularly on a tonnage basis. These three primary items of quality, size and quantity were selected because it is evident that each ought to be considered by the engineer in preparing an adequate set of specifications and must also be recognized by the engineer in charge of construction who wishes to secure a satisfactory job.

Items on Figure 1

Taking up the items on *Fig. 1* in order, first consideration must be given to the question: What do we mean when we stipulate that the screenings must be of good quality? Common experience indicates that many types of stone that are durable, properly graded and clean and with the proper surface characteristics, will be satisfactory for the manufacture of screenings, and it does not seem to be important whether the screenings are in the form of crushed rock, screened gravel or crushed gravel. Good results have been obtained using any of these three types of aggregates. However, it is evident that all types of stone are not necessarily used in equal amounts and also the appearance of the seal coat surface texture will vary somewhat depending upon the type of aggregate.

It is important that the screenings have the ability to retain a film of asphalt in the presence of water. In other words, the asphalt must wet the stone and not strip off when subjected to rain or ground water. Mineral aggregates from which asphalt can be stripped by the action of water are commonly called "hydrophilic," meaning that the aggregate has an "affinity" for water. Stone particles that hold asphalt tenaciously even when subjected to water action are called "hydrophobic," meaning that they avoid water. The question

Analysis Chart Indicating the Relationship or Influence of All Factors That May Affect the Choice and Performance of Screenings

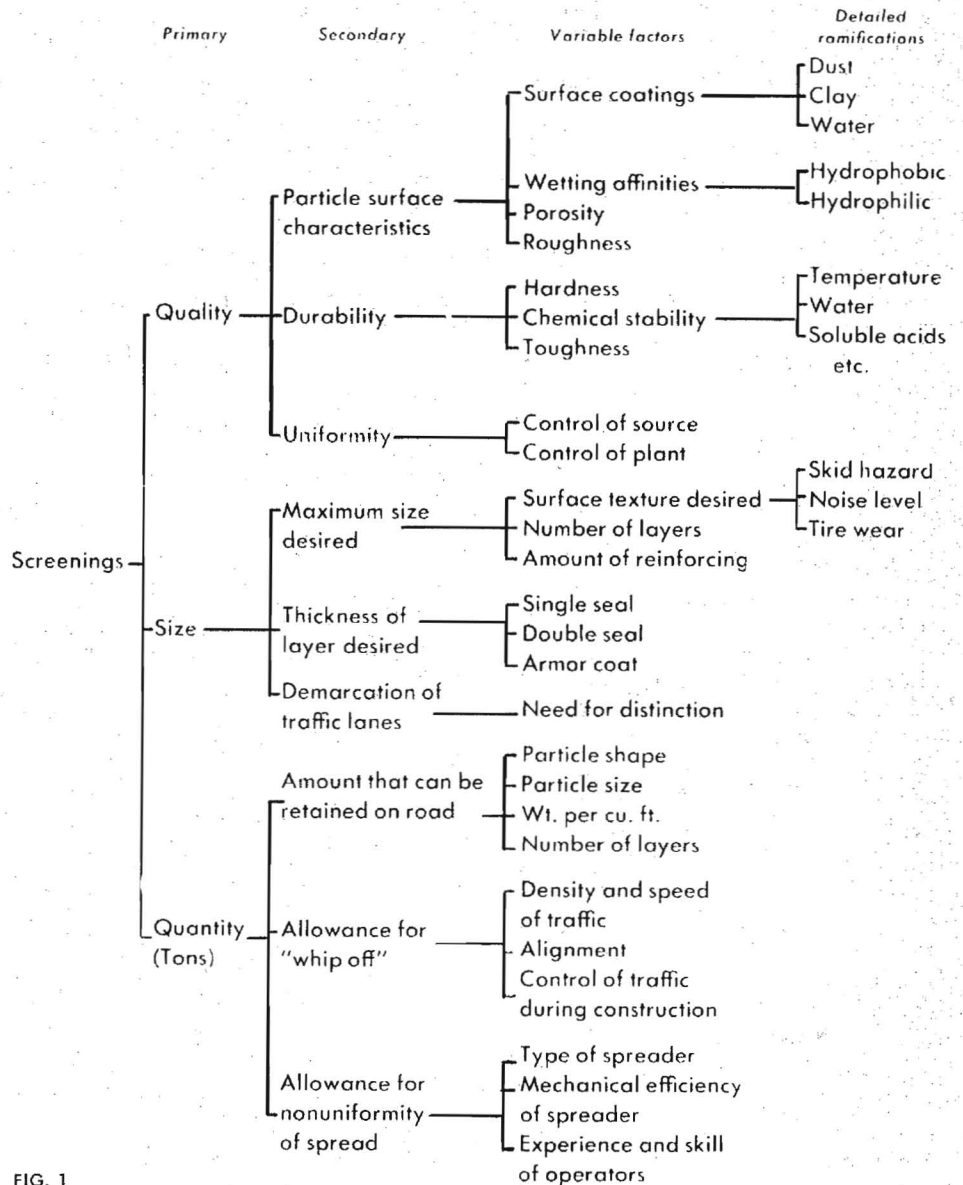


FIG. 1

of adhesion affinities is ordinarily indicated by film stripping tests performed in the laboratory. Certain commercial additives or anti-stripping agents are being sold or proposed for use with the intent of improving the adhesion and thus permit the use of aggregates that otherwise would strip and be unsuitable. So far, these additives have not proved to be universally successful. A number of proprietary compounds are available, but in California practice a selection is made only after laboratory tests have indicated that a certain additive will improve the particular aggregate in question.

Porosity of Stone Particles

The porosity of the stone particles will have an effect upon the amount of oil or asphalt that will be taken up and the surface roughness may also have an influence. However, the question of surface coatings is probably the most serious and the surface films of dust, clay or moisture on the screenings have been responsible for a great many failures in seal coat construction. Like many other factors, these matters are relative, and damp aggregate may cause no trouble when the work is completed and properly cured or conditioned during warm weather. However, the same

amount of moisture in the stone may result in failure when the work is carried on during cold weather or when the humidity is high. The weather condition during the construction period undoubtedly represents the most important single factor contributing to the success or failure of this type of construction.

The question of durability is primarily a problem for laboratory determination and need not be discussed in detail.

Size of Screenings

Uniformity is achieved by the control of plant operations and by efficient operation of the screening facilities.

The second principal factor shown in *Fig. 1* relates to the selection of the size of screenings. In selecting the size, the planning engineer must consider such questions as smoothness of the surface desired, whether or not consideration is given to the irritating noise or rumble in cars and the question of tire wear as well as that of providing an enduring or permanently non-skid surface. In order to make an intelligent selection of screening size, the engineer must give consideration to the primary reasons for placing the particular seal coat, referring to the six distinct purposes listed above in the introduction. It is evident that the selection of stone size will depend to a large degree on the reasons for placing the "seal coat."

At the present time, the choice of screenings for a single course construction on the state highway system generally involves consideration of only two sizes; namely, the *Medium* screenings having a nominal maximum size of $\frac{3}{8}$ " and the *Medium Fine* in which 90 to 100 percent will pass a $\frac{5}{16}$ " screen. Finer screenings have proved troublesome to spread and it is difficult to prevent "padding," or a wavy surface. Coarse screenings of $\frac{1}{2}$ " maximum have been found to develop a noisy uncomfortable surface texture and they are undoubtedly responsible for increased tire wear.

Quality of Screenings

The third primary factor is the question of quantity. In the past, inaccuracy in estimating the quantities have not usually been responsible for

failures. The principal errors have resulted in providing an excessive amount of screenings, which means waste and needless expense. Work in the laboratory of the Division of Highways has followed the lines originally laid down by Hanson in New Zealand, (2), who established the fact that regardless of the amount of screenings placed over a given application of oil, the final layer that adheres would be only one stone in thickness. A series of investigations carried out in California have tended to verify the findings of Hanson. It has been found, for example, that a maximum of 18 pounds of screenings per square yard represented an excellent coverage on the road using $\frac{3}{8}$ " x No. 6 screenings. Experiments conducted in the laboratory indicated that for this size of screenings, 18 pounds per square yard represented a layer one stone thick.

Hanson's Conclusions

Hanson also concluded that for conditions in New Zealand it was necessary to make an allowance of about 10 percent extra material because methods of spreading were not 100 percent perfect and there is a certain amount of loss or "whip off" that occurs when the new surface is subjected to traffic. Under average conditions prevailing during construction in California, it is probable that an estimate of 20 percent allowance is justifiable. The proper allowance for "whip off" should be based upon the type of spreading equipment and perhaps upon the speed and volume of traffic.

Studies conducted by one of the authors, W. R. Lovering (formerly of headquarters laboratory and now Materials Engineer in District I stationed at Eureka) established a relationship between the effective maximum size of screenings and the volume of the same screenings which would produce a layer one stone thick. Hanson established a correlation between the average least diameter of the stone and the quantity of screenings required for coverage. This average least diameter was determined by caliper measurement which is hardly feasible with the screening sizes commonly used in California and an attempt was made to determine a more practical correlation.

"Effective Maximum Size"

A relationship was established between the "effective maximum size" and the loose volume of the same screenings which would produce a layer one stone thick as long as closely sized screenings containing no appreciable overrun in the fine sizes were used. The effective maximum size is determined as the theoretical sieve size in inches which would allow 90 percent of the screenings to pass through the openings. Better correlation was obtained between the "spread modulus" and the loose volume of the same screenings required to produce a layer one stone thick. The spread modulus may be defined as the weighted average of the mean size of the largest 20 percent, the middle 60 percent, and the smallest 20 percent of the screenings as determined from a plot of the grading curve. Screenings from different sources gave somewhat different values, however, indicating that all variables had not been considered. Probably the most important of the variables not evaluated are the character of the surfaces of the rock and the shape of the rock particles.

Quantity of Screenings

It is felt however, that the use of the *effective maximum* size will give sufficiently accurate results considering present limitations of construction methods and equipment, provided the other factors are kept in mind. On the basis of the foregoing, a chart, *Fig. 2*, has been prepared as an aid in estimating the quantity of any size screenings required. This chart provides an adjustment for the size of screenings with an allowance for either 10 or 20 percent "whip off." A correction factor for the variations in weight per cubic foot and a final conversion to the number of tons required per station for different widths of spread is provided. It is also possible to compute the number of lineal feet which would be covered by one ton of screenings for the various widths of spread. The instructions on the chart indicate the steps to be taken.

In order to use the chart, two determinations must be made or two items of information must be on hand. First, a sieve analysis of the screenings must be obtained and plotted on a standard semi-log grading chart. From this

CHART FOR ESTIMATING THE QUANTITY OF SCREENINGS TO BE APPLIED FOR SEAL COAT CONSTRUCTION.

Information Required

Maximum effective size of screenings and weight per cu.ft.

Proceed in clockwise direction.

First quadrant determines volume of screenings.

Curve A-Net amount which will adhere to road surface.

Curve B-Net amount plus 10%.

Curve C-Net amount plus 20%.

Second quadrant converts volume to pounds per sq. yd.

Third quadrant indicates total quantity required per station.

TONS OF SCREENINGS PER STATION

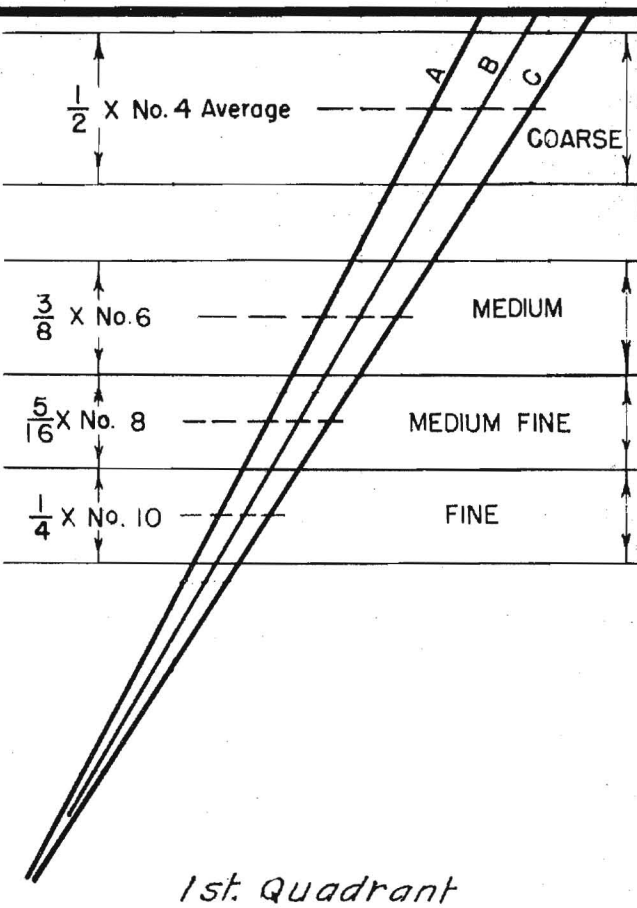
EFFECTIVE MAXIMUM SIZE - INCHES

1st. Quadrant
CU. FT. OF SCREENINGS PER SQ. YD.

0.10 0.20 0.30 0.40

$\frac{1}{2}$ X No. 4 Average
 $\frac{3}{8}$ X No. 6
 $\frac{5}{16}$ X No. 8
 $\frac{1}{4}$ X No. 10

COARSE
MEDIUM
MEDIUM FINE
FINE



1.5 1.0 0.5

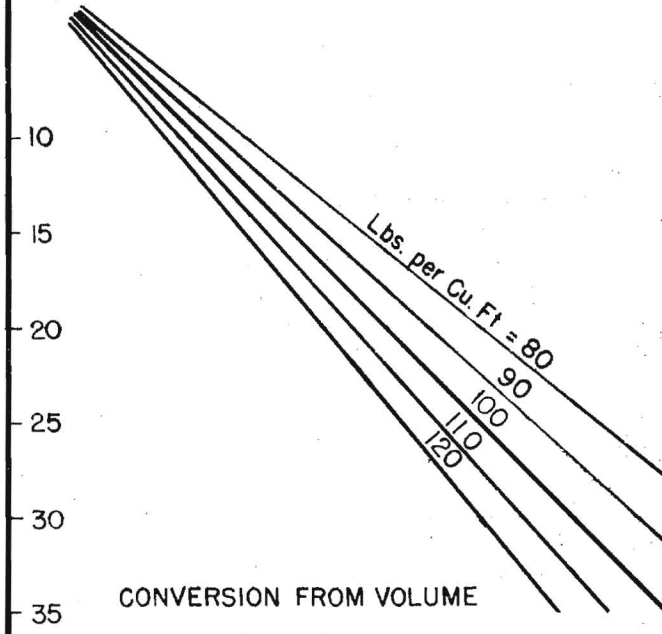
SREAD IN LBS. PER SQ. YD.

CONVERSION FROM VOLUME TO WEIGHT

2nd. Quadrant

0.10 0.15 0.20 0.25 0.30

Lbs. per Cu. Ft. = 80
90
100
110
120



12' Width of Spread

3RD Quadrant

60 70 80 100 150 200 400
LINEAL FEET PER TON OF SCREENINGS

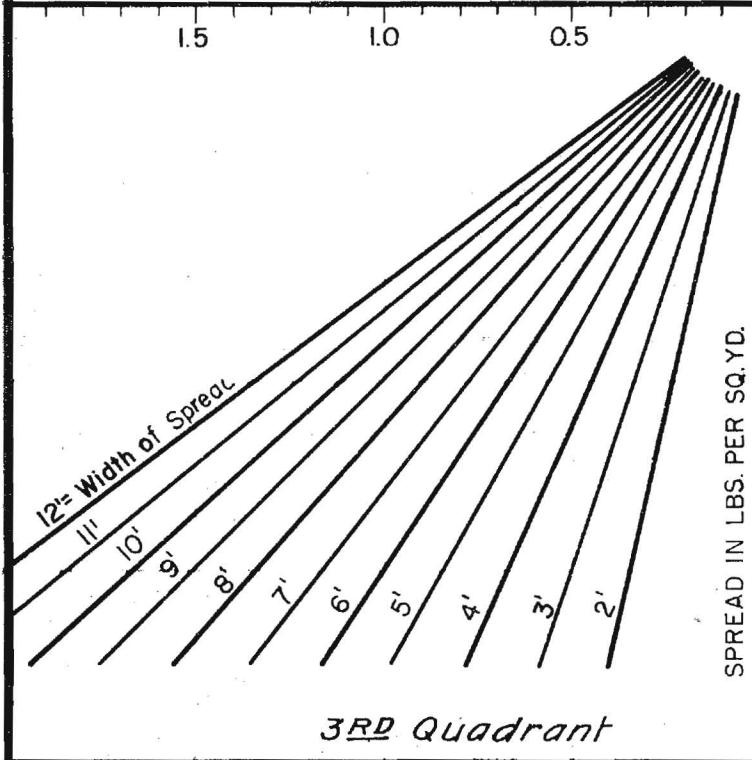
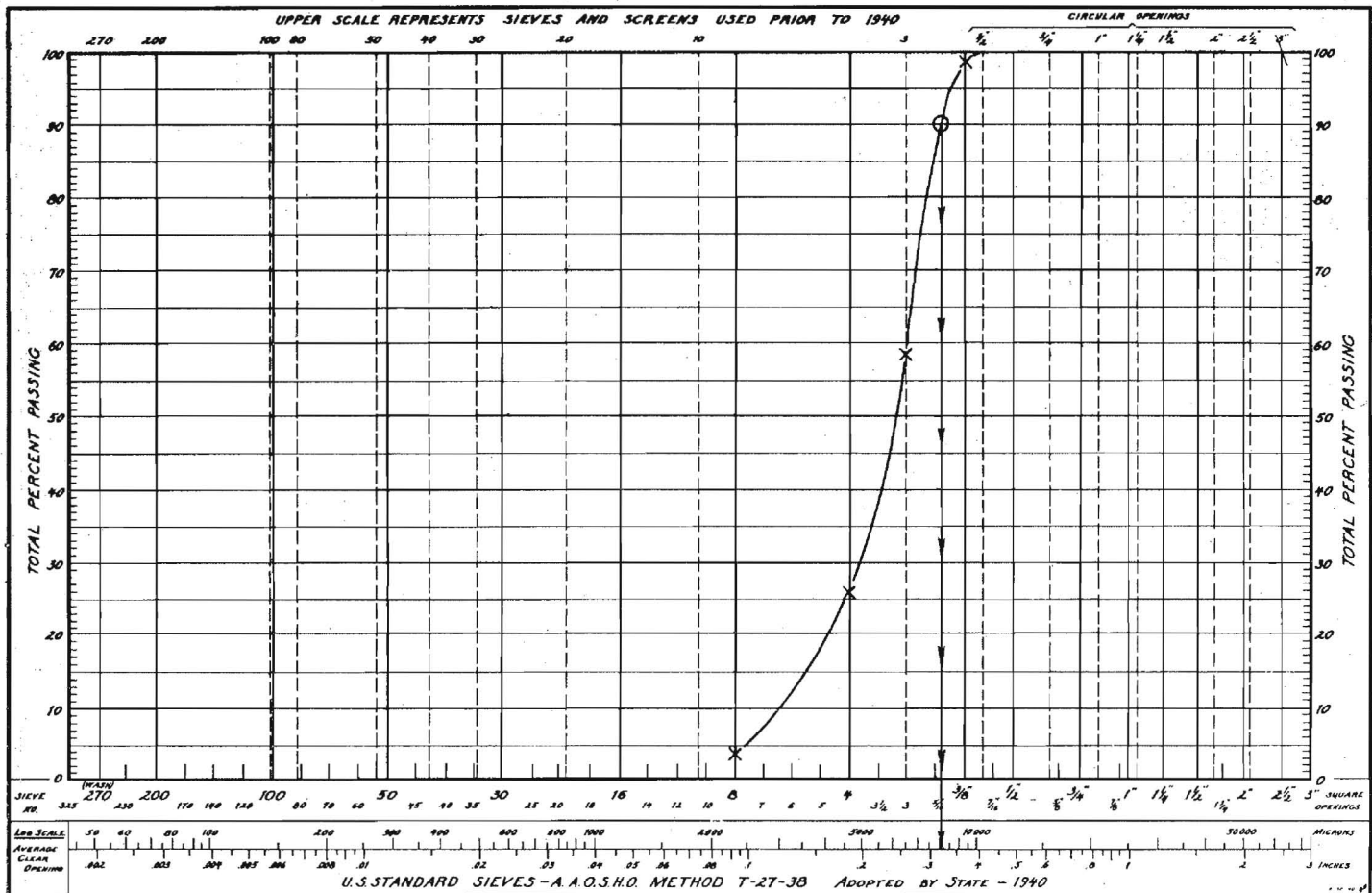


Fig. 2

SEMI-LOG CHART FOR GRADING CURVES

Fig. 3



curve, the effective maximum size in inches is determined by noting the size in inches on the bottom scale that corresponds to the point where the plotted graph crosses the line representing 90 percent passing. Fig. 3.

The grading chart, Fig. 3, gives an illustration showing a typical curve for a sample of medium screenings of nominal size $\frac{3}{8}$ " x No. 6. In this case the curve crosses the 90 percent line at a point equivalent to a hypothetical screen having 0.32" openings. This represents the effective maximum size of the screenings. Chart, Fig. 2, lists the standard specification screenings indicating the range of effective maximum size. The second item of information required is the loose weight per cubic foot of the particular screenings in question. Having the effective maximum size and the weight per cubic foot, the number of pounds of screenings required to cover one square yard can be determined from the chart.

SELECTION AND APPLICATION OF BITUMINOUS BINDER

Any bituminous material, whether asphalt or tar, that is suitable for sticking rock particles to the road surface must have certain properties. For seal coat construction, a bitumen should have good adhesion to the existing road surface and to the screenings. It should develop sufficient cohesive strength to hold the screenings in place and should develop this strength rapidly in order to prevent loss of screenings under traffic. The bituminous binder should be able to resist deterioration under conditions of outdoor exposure and not become hard or brittle for a substantial period of time. In addition, the bitumen should have the proper fluidity or consistency to permit ready and accurate application. As the conditions vary between projects, it is evident that no one grade of liquid asphalt will satisfy all of the requirements for every project considering the wide variety of condi-

tions of the existing road surface, type of screenings, equipment available and climatic conditions which may be encountered in California.

Complex Problem

While the selection of the proper grade and type of asphalt can be a complex problem, it is often further complicated by the individual likes and dislikes of engineers. Few engineers have a philosophical attitude towards a poor job and it is only natural that if a certain project turns out badly, the engineer understandably takes a dim view of everything connected with the unlovely result, and it often happens that the particular type or grade of asphalt involved is blamed for the trouble and condemned for all future use.

In order for a bituminous binder to hold screenings on the road surface, it must adhere to the screenings and develop at least a minimum degree of cohesive strength. In the case of liquid asphalts, this cohesion is developed by

evaporation and to some extent by oxidation. The rate of evaporation is controlled by the temperature of the liquid, the amount and type of volatile constituents, temperature of the air, humidity, air movement and by the amount of exposed surface.

Temperature Factor

In the case of seal coats, the temperature of the asphalt is determined by the temperature of the pavement to which the binder is applied. The pavement temperature will, of course, depend somewhat upon the recent air temperature and will be definitely influenced by the ability to absorb heat directly as a result of radiation from the sun. Thus, it is generally true that liquid asphalt applied in the summer months when the days are long and temperatures are high will reach the desired consistency in a reasonable period of time. During the fall months, with shorter days and lower temperatures this interval can become greatly extended depending upon weather conditions. However, it is also true that hot weather may cause loss of screenings because the asphalt is too soft. For example, ROMC Cutbacks have been observed to give good results in late summer or early fall but were not satisfactory in hot weather as the asphalt was too fluid because of the high temperature and still did not set up rapidly enough to hold the screenings.

Weather Condition Factor

A chart, Fig. 4, has been prepared to show the factors that bear upon the selection of the grade and type of bituminous binder and includes the variables which should influence an estimate of the quantity required. The chart indicates that the prevailing weather condition is one factor having an influence upon the choice of asphalt. For example, it could be expected that a rapid curing cutback, RC-5, will set up or gain in consistency at a faster rate than RORC-5.

While this latter product contains a volatile solvent, the base asphalt contains a larger percentage of oily constituents. Thus, it might appear that the RC-5 would be preferable in cold weather work. However, the question of brittleness intervenes as a base stock of an RC-5 is 85-100 penetration as-

phalt and ordinarily could be expected to reach the brittle point due to weathering in a shorter period of time. The best solution, of course, is to avoid placing seal coats or any other bituminous construction under adverse weather conditions. It has been suggested that a substitute treatment might be employed in the form of a light application of open-graded plant mix placed upon a heavy tack-coat in lieu of the orthodox seal coat when weather conditions are liable to be unfavorable.

Traffic Density Factor

Aside from durability reasons, the density of traffic to be carried is a factor. With increase in traffic and average vehicle speed, the problem of closing a road to traffic becomes more difficult. While it is essential that traffic be kept off the road until the asphalt reaches a consistency which will hold the stone chips in place, the setting time required will vary depending upon the type and grade of asphalt as well as the prevailing weather. This indicates the importance of using a rapid setting binder when construction must be carried on in the late fall.

The lower portion of the chart, Fig. 4, lists factors which have an influence upon the quantities of bituminous binder. These factors are the character of the screenings, the condition of the existing road surface, also the degree and kind of compaction to which the screenings will be subjected.

Under the heading "Character of Screenings" is included such things as particle gradation, particle shape, particle roughness and porosity. The gradation or sieve analysis of the screenings is an index to the amount of voids which must ultimately be filled with asphalt. The particle shape, that is, whether the stone chips are relatively cubical or flat will also have an influence on the void space. Particle roughness and porosity will take up additional oil compared to normal screenings. Hanson pointed out that the amount of asphalt should range from 0.5 to 0.7 of the voids in the aggregate as placed and compacted on the road.

Particle Shape Factor

While sieve analyses are easily made and the surface capacity of the stone due to roughness and porosity can be

evaluated by noting the amount of light lubricating oil that will be retained by the screenings when drained under standard conditions (4), the factor of particle shape or cubicity is less easy to evaluate. Hanson (2), recognized the effect of cubicity in the screenings and proposed that the least dimension of individual rocks of a representative sample should be measured. Hanson averaged the least dimension of a number of particles and estimated the amount of oil from this average value. However, Hanson was dealing largely with coarse stone ranging from 1/2-inch to 3/4-inch in size and as stated above his method of measuring individual particles by means of calipers does not seem practicable for the smaller sized screenings now used in California.

A method having better possibilities was developed by Egberto F. Tagle (3) of Argentina. This procedure involved the use of slotted screens which provide a particle size analysis based upon least dimension rather than upon maximum size of the rock particle. By comparing this type of grading analysis to the grading produced by standard screens, Tagle derived a factor which he designated the "cubicity factor" and the quantity of oil recommended in Argentine practice was based upon this factor. They also consider that "cubical" shaped particles are most satisfactory.

Oil

In the design chart, Fig. 5, the quantity of oil to be applied is based upon the *maximum effective size* of the screenings derived from a standard sieve analysis rather than upon the cubicity or average least dimension. This method has been selected because it is at the present moment more applicable than are the procedures proposed by either Tagle or Hanson.

Correction for Porosity

The particle roughness and porosity can be determined by methods described in connection with the Centrifuge Kerosene Equivalent Test for establishing the surface factor K_c (4). The design chart, Fig. 5, carries an allowance for porosity of the stone in the third quadrant of the chart. (The factor K_c may be determined by measuring the amount of No. 10 lubricating oil retained by the screenings after they

have been soaked in the oil and then drained under controlled temperature conditions.)

In considering a correction for porosity using the factor K_c , it must be pointed out that this correction represents the amount of oil that will ultimately be absorbed by the screenings and the rate of absorption will depend upon the consistency of the bituminous binder which, in turn, is a function of temperature. As the temperature of an asphalt film in any sort of road mix or penetration treatment is controlled entirely by the temperature of the road surface or the aggregate, it is evident that absorption may take place very slowly when the road surface is cold and as a result the asphalt applied to compensate for absorbent aggregates may appear to be excessive and bleeding may develop before the excess is absorbed. However, at some future time when the pavement temperature rises, the oil may be absorbed and if a sufficient quantity is not applied in the first instance the absorption may leave an insufficient amount to hold the screenings in place. Therefore, it appears that screenings composed of highly porous stone will be particularly unsuited for cold weather work. It is not the intent to suggest that the ultimate amount of asphalt be applied during cold weather for a seal using porous aggregate. The inevitable result would be that sand would be applied to take up the apparent excess and the surface would dry out sooner or later. It is probable that the best solution is to avoid porous aggregates when possible.

Chart, Fig. 5, includes a correction for the porosity of the old road surface and it should again be emphasized that weather conditions and the presence of moisture may have a definite influence on the rate at which the oil is absorbed.

Summary of Factors

To summarize, it is recognized that the quantity of screenings required to cover the road surface will vary depending upon the size of the screenings and hence, the dimensions of the stone. Thus, a greater weight in volume of screenings will be required to develop a coverage of $\frac{1}{2}$ -inch screenings than will be required if $\frac{1}{4}$ -inch size is used. As the screenings vary in weight per cubic foot, a correction must be made

Analysis Chart Indicating the Relationship or Influence of All Factors That May Affect the Choice and Performance of Bituminous Binder

(Assuming That the Bituminous Binder Is of Suitable Quality)

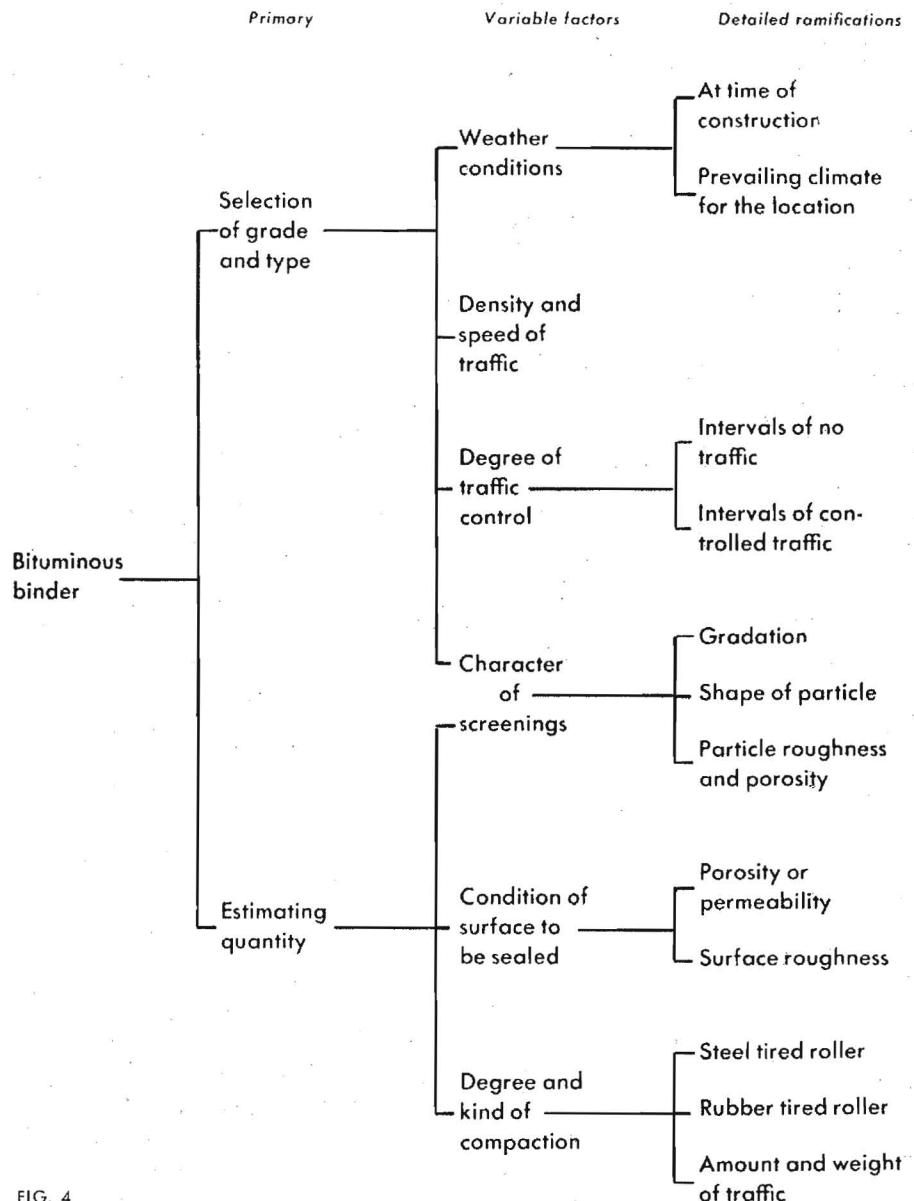


FIG. 4

in the number of pounds per square yard or the number of tons per station to compensate for variations in the volume-weight relationship. The amount of asphalt required is a function of the voids existing in the layer of screenings applied to the road. The total application of asphalt is also influenced by the amount necessary to prime the existing road surface which means that the existing surface must be evaluated in order to determine how much of the application will be taken up as a prime. Finally, there will be

some variability when the screenings are definitely porous. The correct evaluation of these variables will permit an accurate estimate of the rate of application and the total quantity of asphalt required.

Selection of Asphalts

A casual survey of California practice indicates that the selection of asphalts for seal coat purposes revolves around the SC-6 grade. SC-6 or asphalts of 200-300 penetration have proved to be very satisfactory. However, in many

CHART FOR ESTIMATING THE QUANTITY OF ASPHALT REQUIRED FOR A SEAL COAT.

Information Required

Effective maximum size of screenings; porosity of screenings; condition of existing road surface.

Proceed in clockwise direction.

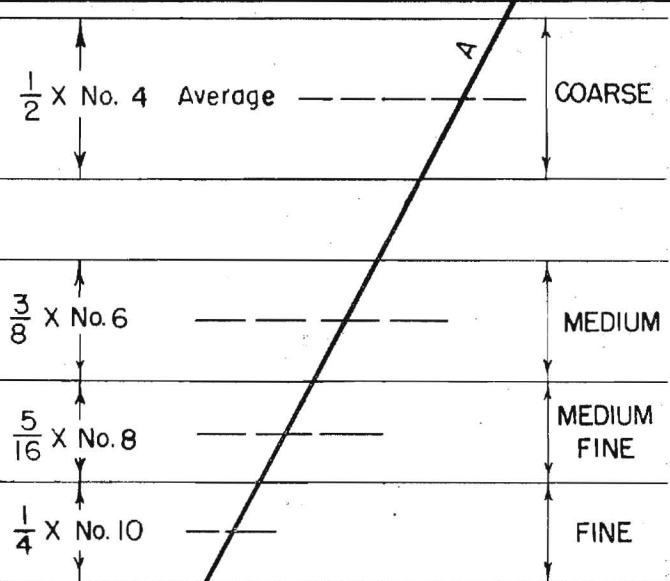
First quadrant gives volume of screenings which must be held by asphalt. Second quadrant adds amount of asphalt needed to prime existing road surface.

Third quadrant provides allowance for porosity of screenings.

No correction for grade or type of asphalt.

TOTAL APPLICATION OF BITUMEN IN GAL. PER SQ. YD.

EFFECTIVE MAXIMUM SIZE - INCHES



1st. Quadrant

CUBIC FEET OF SCREENINGS PER SQ. YD.

0.30 0.25 0.20 0.15 0.10 0.05

CORRECTION FOR POROSITY OF SCREENINGS

$k_c = 1.4$
1.2
1.0
0.8

GALLONS PER SQ. YD. OF BITUMEN

0.05
0.10
0.15
0.20
0.25
0.30
0.35

3rd Quadrant

Old Dense Rich Surface

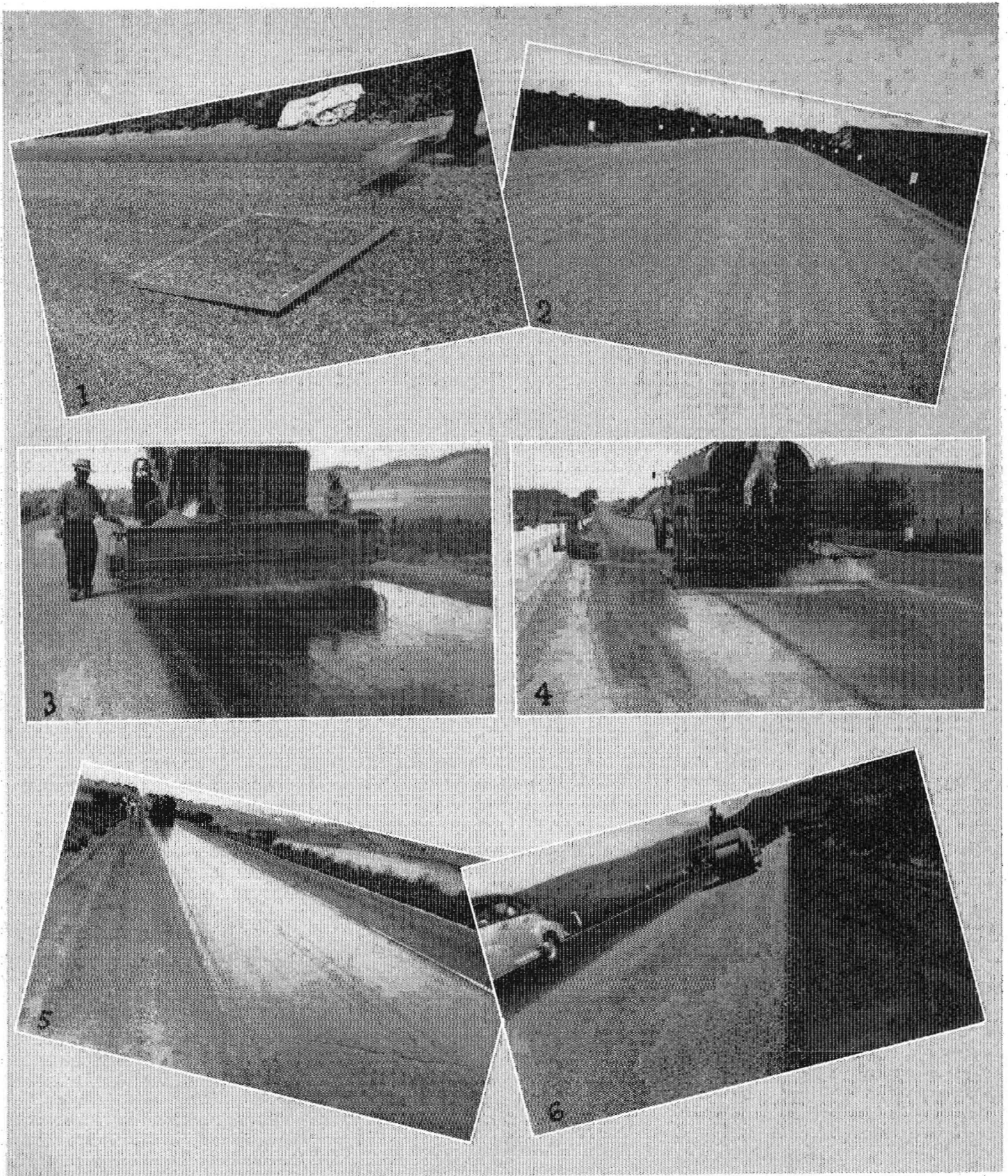
Normal Surface

Old Dry Porous Surface
Gravel Road

ESTIMATED ASPHALT SPREAD WITH ALLOWANCE FOR CONDITION OF UNDERLYING ROAD SURFACE

2nd. Quadrant

Fig. 5



1—A tray representing one square yard placed on pavement to determine uniformity of distribution of screening spreader. 2—A newly completed seal coat. 3—Screenings being applied to the surface with a mechanical spreader. 4—Distributor truck starting spread of asphalt. 5—Freshly applied asphalt immediately following passage of distributor. 6—Screenings being rolled with a tandem roller

cases the asphalt distributor could not be controlled in order to apply the amount desired. The quantity of SC-6 could not be cut down to the desired rate without causing skipping or streaking of the sprays. For this reason, the base asphalt has often been diluted with solvents and many projects have been constructed with MC-3, 4 or 5, or with ROMC-3, 4 or 5, all of which represent blends of soft asphalt and a kerosene type of cutter stock.

In order to avoid loss of screenings due to the slow setting of kerosene cutbacks, RC types have been preferred in many quarters. However, the standard grades of rapid curing cutbacks are manufactured from base stock of 85-100 penetration asphalt and in order to have the advantage of a softer base asphalt, a special grade of cutback is listed in the California Standard Specifications and designated as RORC-5 consisting of 200-300 penetration asphalt cutback with a small amount of naphtha solvent.

Emulsified Asphalt

Another method for reducing the viscosity and thus permitting light applications to be made with a high degree of uniformity is the use of emulsified asphalt. A great deal of satisfactory seal coat construction has been accomplished by the use of emulsions. From evidence now available, it does not appear that it is necessary to make any distinction in the quantities of asphalt used whether soft paving grades, cutback or emulsion.

Ordinary emulsions of the penetration or mixing type have a viscosity ranging from 20 to 100 seconds. Emulsions of this type have a tendency to run off the road on steep grades, especially on superelevated curves. In order to avoid this difficulty, special emulsions have been developed giving a viscosity range from 200 to 400 seconds or even greater. These emulsions have noticeably less tendency to run off the road. However, the high viscosity of emulsions can be achieved in different ways and in certain cases an increase in viscosity has been accompanied by a slower setting which resulted in the loss of screenings.

It is hoped that the foregoing outline will help to clarify the problem and that the charts and method of calcula-

tion will serve to remove some of the uncertainties involved in current practice.

The procedure proposed is not considered to be complete or final and may be subject to correction or modification when more data are available.

It is desired to acknowledge the helpful comments and suggestions of Mr. T. H. Dennis, Maintenance Engineer; Mr. Nelson Bangert and Mr. Clarence Woodin of Headquarters Maintenance Department, Mr. G. A. Tilton, Jr., Assistant Construction Engineer; Mr. C. E. Bovey, Assistant District Engineer at Stockton, and Mr. C. V. Kiefer, member of the E & D Committee, Pacific Coast Division of the Asphalt Institute.

References

- (1) C. V. Kiefer, *Second Nevada Asphalt Forum held at Carson City, Nevada, November 18, 1948. Published in The Crushed Stone Journal, June, 1949*
- (2) F. M. Hanson, M.M., *Bituminous Surface Treatment of Rural Highways, Proceedings of the New Zealand Society of Civil Engineers, 1935.*
- (3) Egberto F. Tagle, *Buenos Aires, Argentina, Personal Communication.*
- (4) F. N. Hveem, *The Centrifuge Kerosene Equivalent as Used in Establishing the Oil Content for Dense Graded Bituminous Mixtures, Proceedings of the A. A. P. T., 1942. Reproduced in California Highways and Public Works, 1942.*

REQUEST GRANTED

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*California Highway Department
Sacramento, California*

GENTLEMEN: Could we be put on the mailing list for your publication "California Highways and Public Works." We have been told that it is a very interesting and beautiful magazine. As we could make good use of it in our library we shall be most grateful to receive it.

Yours truly,

BERTHA ASHBY, Librarian

First Results Under Responsibility Law

APPROXIMATELY one out of every 15 motor vehicles registered in California was involved in a serious accident during the past 12 months.

Moreover, these accidents involved more than one person in every 37 living in the State during that period, an analysis of first-year results under California's Financial Responsibility Law shows.

During the period from July 1, 1948 through June 30, 1949, some 268,860 reports on motor accidents involving death or injury and property damage in excess of \$100 were received by the State Department of Motor Vehicles.

Fortunately, more than 75 percent of these accidents were covered by bodily injury and property damage liability insurance and did not require that persons involved post cash or other security pending settlement of their cases, the analysis showed.

Some 23,401 others were not so covered and were forced to relinquish their operator's licenses, pending deposit of adequate security.

Those persons not covered by insurance deposited in excess of \$700,000 in cash or other security during the 12-month period, the club revealed.

WASHO MEETING IN DENVER

Western States were well represented at the recent meeting of the joint cooperative committee of the American Association of State Highway Officials and Associated General Contractors of America, Inc., in Denver.

All member states of the WASHO but one had at least one key official or engineer at the meeting. State men present included: W. J. Dinneen, Wyoming Highway Commissioner; J. R. Bromley, superintendent of the same department; W. C. Williams, Assistant State Highway Engineer in Oregon; W. W. Stiffler, also Assistant State Highway Engineer, with the Oregon Department; H. G. Smith, Oregon Construction Engineer; J. D. Meacham, Nevada Construction Engineer; James Reid, Idaho Director of Highways; Richard H. Wilson, Assistant State Highway Engineer in California.

Here's Proof

Outer Highway Increases Both
Business and Property Values

By HARRY N. COOK, Associate Right of Way Agent

YOU, THE MOTORIST, are cruising swiftly along that beautiful strip of highway on route 101 headed south some six miles out of the seaside city of Ventura, or north from Hollywood or Santa Monica. A road sign informs you that just ahead is a junction. You approach the intersection, slow down perhaps, and read the signs. An arrow points to Los Angeles via Hollywood. Another arrow indicates the alternate route, the coast road through Santa Monica.

Striking Changes

At this important junction of highway 101 with that of alternate 101, you have come upon a modern highway business center. Two years ago you drove along this road and the service station, cafe and one motel didn't appeal to you any more perhaps than the numerous other roadside businesses you passed in your day's travel. Today however, all that is changed for here has been constructed a freeway and outer drive which permits you to pull out of the main traffic lanes and enter the outer drive where you may safely park, or better still, turn into the parking area of the establishment of your choice. The few business ventures located here through all the years of

the old highway, have, since development of this modern freeway and outer drive expanded into the beautiful and picturesque 45-unit Wagon Wheel Motel and Restaurant, a garage, nursery, golf-driving range, the 18-unit Junction Motel (remodeled), Alternate Inn Cafe (relocated) and three light industrial businesses.

Famous Branding Irons

Suppose after entering the outer highway you turn into the spacious parking area of the "Wagon Wheel". Here you will find a motel and restaurant which are becoming well known to California motorists. The restaurant and Branding Iron Room Bar seats 140 people. Branding irons were "rounded up" from famous Ventura County ranchos and are all on display.

The "Branding Iron" idea was born when during excavation for the motel, branding irons were unearthed, relics of the Old West. Permanently branded into the buildings and furnishings of this colorful restaurant are such famous California brands as: Camarillo Ranch, R. W. Strathearne Ranch, R. W. Poindexter, Hobson Bros. Ranch, Rancho Casitas, Dominic McGrath Estate, Joel McCrea Ranch,

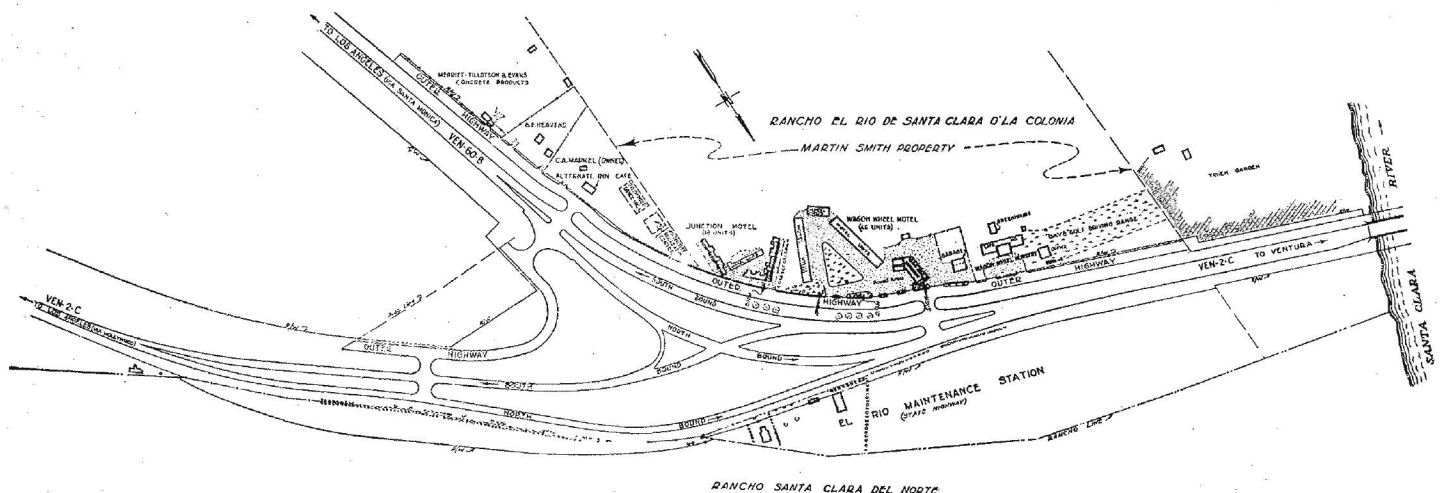
Golden Top, Newhall Land and Cattle, Joe Terry Ranch and many others.

If you are curious and have the time you may view these "irons" and other collections and displays that will bring back the days when cow men roamed the ranchos.

Restful Night

After satisfying your appetite at the Wagon Wheel Restaurant here, or at the Alternate Inn Cafe nearby on the outer drive, you probably will want to visit Gay's golf-driving range, or browse through the Wagon Wheel Nursery and take along some native plant or shrub as a reminder of your discovery of this ultra-modern highway, designed for your safety.

By now perhaps the sun has gone down in the Pacific three or four miles to the west. You are tired and tomorrow lies ahead with another day of driving. The Wagon Wheel Motel set well back from the highway amid colorful flowers and spacious lawns, or the Junction Motel with kitchens, beckon. And so to bed. But not immediately to sleep. Where is the rumble and noise of the busy highway? The screech of horns, the jar of heavy trucks? The many unpleasant reminders so prevalent on most transconti-



mental or trans-state arteries of motor travel?

And then you remember the outer highway. The drive off the main thoroughfare into which you steered your car when approaching this haven of peace and rest. You think it an excellent idea.

If you spend the night at the "Wagon Wheel," your hosts will be that well-known Western motel man Fred Humphreys, and his son, Paul Humphreys, who will tell you that on another visit to their motel you may enjoy a refreshing plunge in the swimming pool which they are planning to add at an early date.

Freeway Started in 1948

In the morning you will want to know more about this modern highway. The El Rio construction is one of the many freeway projects started and finished within the last four years as part of a road construction program of vast extent. Work on the freeway and outer drive at this junction started in March, 1948, and was completed in September, 1948. Construction work was done under contract by Smith-Edmondson Company of Glendale, under the direction of Resident Engineer L. W. Sixt, Assistant Highway Engineer. The construction included full traffic actuated signals and highway lighting.

At the present time Highways 101 and 101 Alternate are freeways at this junction and for a short distance in each direction. Other construction now in progress or planned for an early date will extend this freeway into the cities of Oxnard and Ventura.

Right of way acquisition for this project affected thirteen separate property parcels plus twenty-one leasehold interests.

Outer Highway Clause

The thirteen properties were all partial acquisitions and the deeds on these included a Relinquishment of Access Rights clause, whereby owners gave up all abutter's rights, including access rights appurtenant to their remaining properties in and to said freeway; provided however, that such remaining properties would abut upon and have access to an outer highway to be connected to freeway at such points as would be established by public author-

Mr. Davis—Read the Article by Mr. Harry N. Cook

FARM MANAGEMENT ASSOCIATES, INC.

Kansas City, Mo.

Mr. Frank C. Balfour
Chief Right of Way Agent
Division of Highways

Dear Mr. Balfour:

I have just had the privilege of studying your recent article "Effect of Freeway Development on Adjacent Land Values in California." You are to be congratulated on making a very careful and very thorough presentation.

I was indeed pleased to have an opportunity to study the typical sales that have taken place along limited freeways. Incidentally, however, one is forced to inquire after studying the sales whether the appraisers for the State Highway Department were unusually conservative on their estimates of fair market value before the taking or whether there has been an unusual appreciation in land value along the limited freeways. I would suggest that about the only way this can be measured is by comparing the percentage increase in value for the period when the land represented by sales along the freeways was taken with the percentage increase in value for the same period for similar land not located on the freeway.

Being a Missourian, it is quite difficult to me to comprehend the affect the pressure of increased population has had on land in California for the past several years. Fortunately, however, I was privileged to serve as dean of the American Institute of Real Estate Appraisers Farm Appraisal Course given at the University of California at Davis, California, last summer. This gave me a very excellent opportunity to study in a small way the effect of the pressure of the population upon land values. It is therefore possible to see that the pressure of the population may be represented in your presentation. However, the point is this—"Would the land along the limited freeways increase more or less in the same period than the land not along the limited freeway?" This would be the final guide. Any additional information that you are able to send along this way would be appreciated because we would like to know as much about the problem as possible.

Yours very truly,

(Signed) W. D. DAVIS, President

ity. Relinquishment of access rights was not considered or claimed as a damage where the parcels abutted upon the outer highway with full access to the outer highway.

Six units of the Junction Motel were within the new right of way area and were moved from their original location on the highway to their present site by the owner, the State paying the estimated cost of moving.

Structures Moved

The "Wagon Wheel" improvements completed about the time the freeway construction started were not materially affected by the right of way acquisition, since they had been located well back in anticipation of the right of way needs. The Alternate Inn Cafe, shown on the accompanying sketch, was moved from its former location in the gore at the intersection of Routes 101 and 101 Alternate, to the present site by the owner.

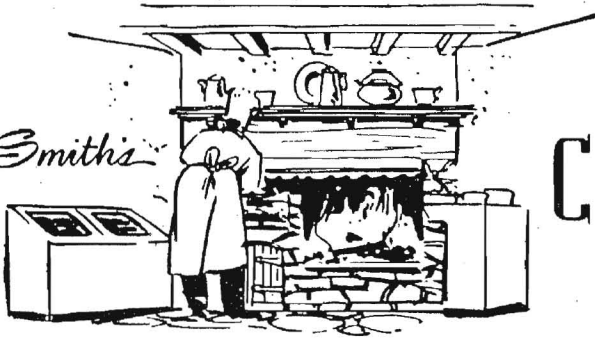
The Junction Motel is the only property in this area that has sold or has been offered for sale since the State acquired access rights. This motel is on a ground lease; the buildings belong to the lessee and he has the right to remove them at the expiration of the lease. The sale on this property was in February, 1949, at a price of \$42,000.

Property Value Enhanced

In October, 1946, without any knowledge of the freeway and outer highway plans Mr. Martin Hansen bought this property for \$35,000. In the Spring of 1948 and after learning of the freeway and outer highway plans, Mr. Hansen spent approximately \$7,000 on additions and then sold the motel for \$42,000. The importance of this sale data is that this property sold for the same dollars (adjusted for improvements added) after relinquishment of access rights and when the ground lease had an unexpired term of eight years as against ten and one-half years and on a much lower market for motel properties. It thus appears that the freeway and outer highway enhanced the value of this property.

Martin Smith, owner of fifteen hundred feet fronting this outer highway, states that "an eastern life insurance company recently appraised this property and found that the freeway and outer highway did

Martin Smith's



COLONIAL HOUSE

CHARCOAL BROILED STEAKS COMPLETE CATERING DEPT.
COPPER ROOM FOR COCKTAILS BANQUET ROOMS

711 NO. OXNARD BLVD. ON COAST HIGHWAY 101 • PHONE 847 OR 6-2254 • OXNARD CALIF.

May 1, 1949

The Mr. G. T. McCoy, State Highway Engineer
COLONIAL HOUSE Sacramento, California

is Recommended Dear Sir:

By As owner of the Wagon Wheel Motel and Restaurant and 1500 ft. of
DUNCAN HINES business frontage, improved with a golf driving range, a nursery,
DOORWAY TO a garage and another motel, on the new outer highway at the
GOOD LIVING, junction of U.S. Routes 101 & 101-A, between Oxnard and Ventura,
I wish to take this occasion to express my reactions to this new
type of highway.

GOURMETS I have an investment in excess of \$285,000 in this location; all
of which was made with full knowledge of your plans for a freeway
and outer highway; \$60,000 has been spent on the Wagon Wheel Res-
taurant after completion of the highway work.

Choice Eastern

Corn-Fed Beef

Used Exclusively

At the time Mr. Fred Humphreys, lessee-operator of the Wagon Wheel
Motel, and I were planning the construction of the "Wagon Wheel,"
we were well aware of the fact that attracting highway trade to an
outer highway location with limited openings to the freeway, would
create a problem; however, we felt that the safety and convenience
afforded the traveler, in being able to enter our property from
the slow moving traffic of an outer highway instead of from the
fast lanes of traffic, would outweigh any slight inconvenience
caused by limited openings to the outer highway. Reaction of our
customers and the volume of business being enjoyed at this outer
highway location has completely affirmed our judgment.

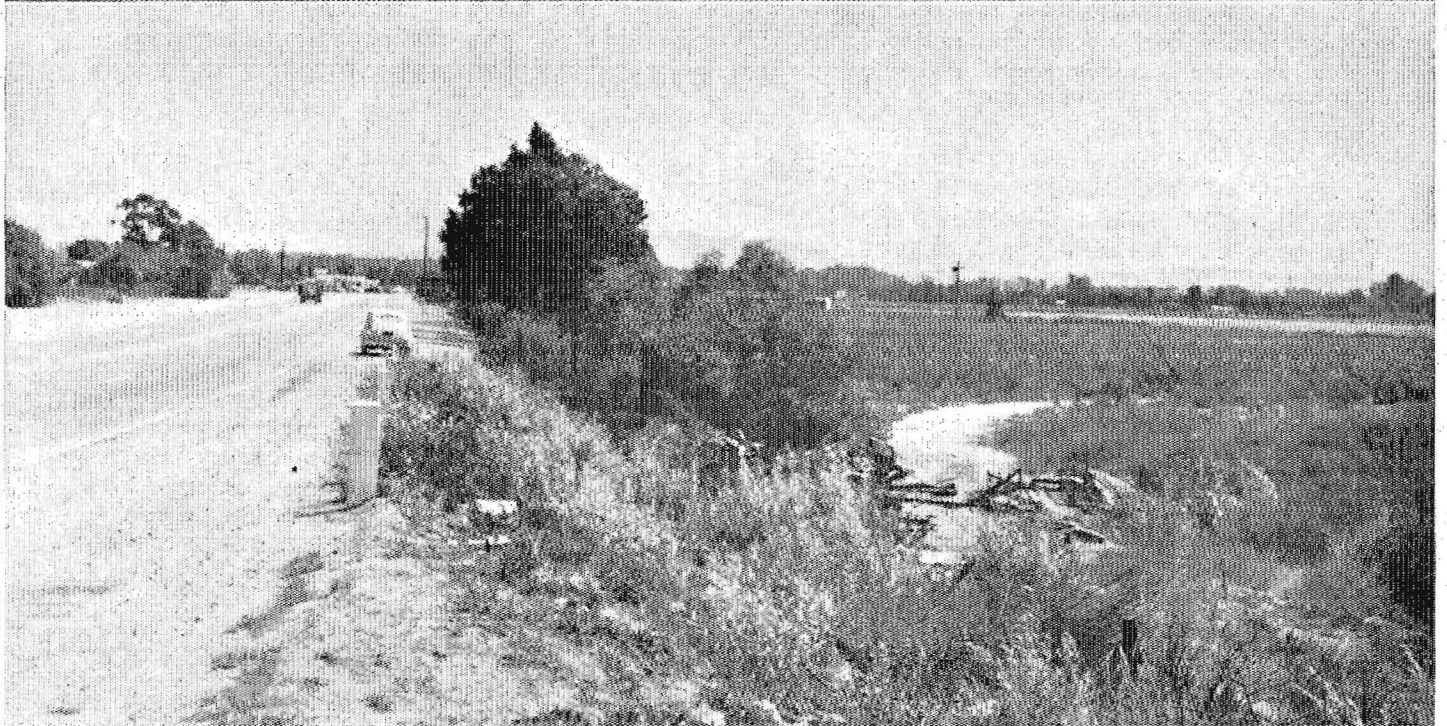
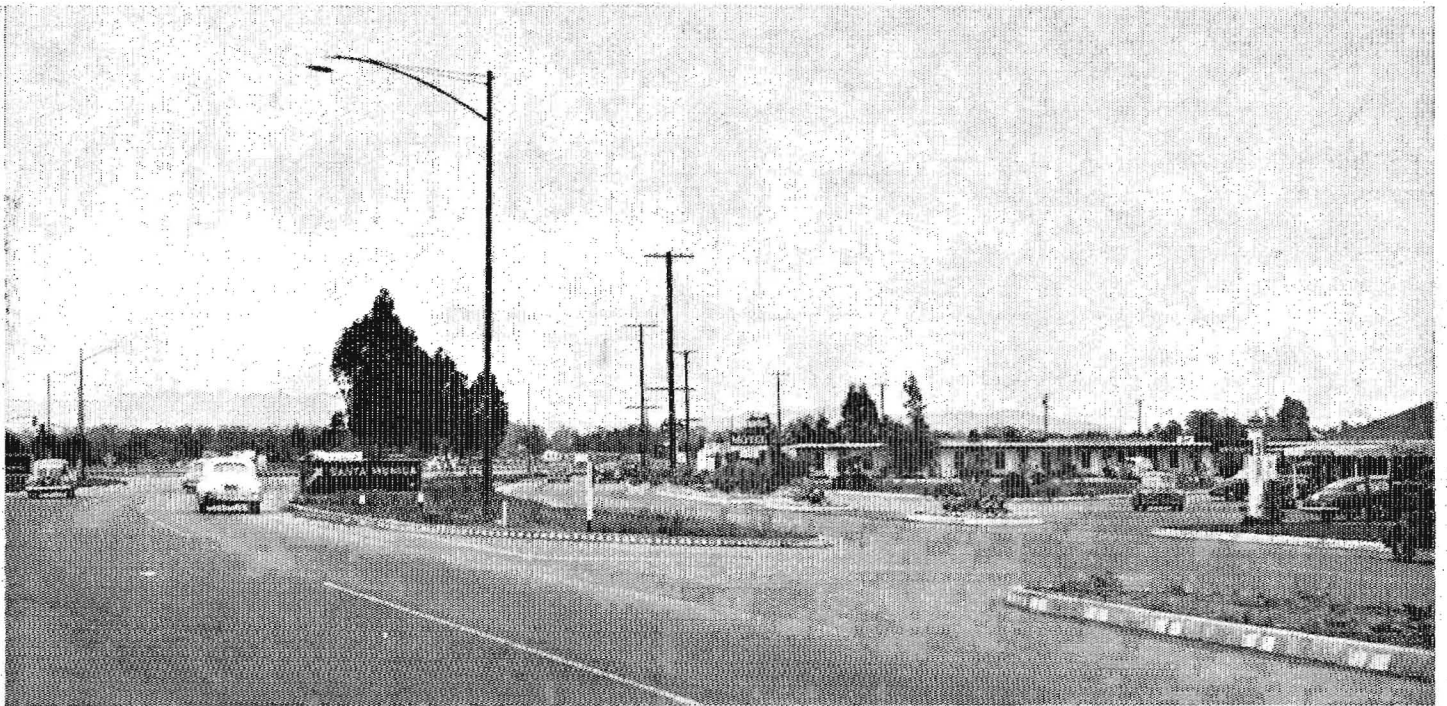
These businesses are new and therefore we have no historical
operating data for comparison with current business. We do know
though, that our original projected estimates are being equaled
and bettered.

Yours very truly,

Martin Smith

MS:vc

*Five charming and distinctly different rooms to serve you—The Grill Room, The Green Room—
overlooking the Patio, The Copper Room—for cocktails, The Saratoga Room—featuring the Scotch
Case Bar and twenty-three foot open hearth fireplace, available for private parties up to 200. The
Patio—for Sunday afternoon dining and warm summer evenings.*



Upper—This photo was taken in May, 1949, and shows southbound freeway lane, outer highway, Wagon Wheel Restaurant and Motel, and parking area. Lower—Photo taken in October, 1946, shows typical appearance of highway frontage at that time. Golf driving range, nursery, garage, Wagon Wheel Motel and Restaurant improvements front on the new outer highway, which is now parallel to and to the right of the highway shown in this photograph

not adversely affect the value of my property."

Another letter from Mr. Smith takes an optimistic view of the future in relation to this outer highway business property. Reproduced herewith in full, the letter speaks for itself.

Supplementing the opinion and judgment of Mr. Smith, the proprietor of the Wagon Wheel Motel, Fred Humphreys, commented enthusiastically on the outlook in a letter to Mr. S. V. Cortelyou, Assistant State Highway Engineer. He ended with: "We are doing a very satisfactory business

and with increasing frequency hang out the 'sorry no vacancy' sign * * * We have put a great deal of time and money in landscaping * * * In another year the entire property will be a riot of colorful flowers and shrubbery." We believe that any entrepreneur catering to highway trade, can



with enterprise and ingenuity accomplish the success Mr. Humphreys is enjoying.

So it appears, if the experience and opinions of the owners and leaseholders of the properties abutting the El Rio intersection outer drive are to be taken as a criterion, the off-the-highway idea for business is here to stay. Results tabulated and closely observed by the Division of Highways bear out the carefully considered and practically executed theory as applied to this particular project—that motorists do pull into these outer highway zones—that consequently owners of these businesses are profiting by what might once have been termed a hazardous and revolutionary experiment.

Adequately Signed

An intersection such as that of the El Rio must be adequately sign posted. Access channels to the outer drive should be clearly indicated for both day and night drivers. Dead ends of the strip of outer highway should be shown and the entrance and exit channels prominently marked. The California motorist is already learning to look ahead and anticipate these safe stopping places.

Quoting Mr. George E. Merrit, of Merrit, Tillison and Evans, lightweight concrete products manufac-



Upper—Photo taken in May, 1949. At right center is a boulevard stop for cars entering the freeway from the outer highway. Lower—Photo taken in October, 1946. Motel units shown in center of picture were moved back to make room for outer highway construction

turers, located on this outer highway: "It is quite evident to me that our customers are very enthusiastic about this outer drive design, primarily due to the increased safety of parking and getting out of and into their cars on the outer highway instead of on the shoulder of the heavily-traveled highway."

There seems little doubt about the tremendous benefits affecting the highway traveler in this tried and proven device of the outer drive. Vehicle operators quickly adjust their habits to this system of gaining

approach to roadside businesses fronting on the outer strip of pavement.

The merchant in turn will do some adjusting of his preconceived conclusions, and in his efforts he will work out a solution that will prove highly profitable to himself and entirely satisfactory to nomadic minded customers.

The outer drive plan is not entirely new. For more than 20 years there have been "safety zones" with entrance and exit channels to and from properties and businesses located off the

... Continued on page 51

Ridge Route

Progress Report on Widening to
Four-lane Limited Access Freeway

By SPENCER V. CORTELYOU, Assistant State Highway Engineer

BY THE END of this year the reconstruction of the Ridge Route providing a four-lane divided limited access freeway will be better than 50 percent completed. We apply the name "Ridge Route" to the portion of State Highway Route 4 (U. S. 99) from the north city limits of Los Angeles northerly to the Kern County line, a distance of 44 miles.

From here U. S. 99 continues 14 miles via the "grapevine" to the floor of the San Joaquin Valley south of Bakersfield, thence north to the Oregon line and beyond.

Of this total of 44 miles, 23 miles will be completely reconstructed and modernized to a four-lane divided highway by the end of this year, leaving 21 miles remaining for future construction.

Plans are proceeding rapidly for the reconstruction and widening of the remaining sections of the Ridge Route, and it is expected that we will have a completed four-lane divided roadway, developed for the most part on a limited access freeway basis, for the entire 44 miles of the Ridge Route within the next few years.

The name "Ridge Route" is a carry-over from the designation given the original Route 4 construction between Gorman and Castaic that was first opened to traffic in 1915. This old road actually did follow along the top of the ridges of the mountains for a very considerable portion of its length. The subsequent relocation of this state highway route to the west of the original location that was opened to traffic October 29, 1933, as a three-lane highway, while no longer following the ridges, has quite naturally been called the "Ridge Route."

The Ridge Route is a part of State Highway Route 4 that provides the only direct highway connection between the Los Angeles metropolitan district and the San Joaquin-Sacramento valleys, and it carries a large volume of heavy truck traffic, being one of the most important truck highways in the western half of the country. Route 4 used in conjunction with



Completed section of Ridge Route looking southerly from the Santa Clara River crossing, showing channelized intersection with State Highway Route 79 to Saugus

east and west laterals north of Bakersfield puts the Ridge Route on what many motorists consider as the easiest and quickest route between Los Angeles and San Francisco. Unquestionably, State Highway Route 4 is one of the most important highway arterials in the State.

The portion of Route 4 in District VII begins at Route 2 (U. S. 101) in downtown Los Angeles and runs northwesterly to the Kern County line near Lebec. From Route 2 northerly to the north city limits of Los Angeles, the highway traverses the relatively level terrain of the Los Ange-

les River basin and of the San Fernando Valley. Entering the foothills at this point, it crosses the southeasterly fringe of the Santa Susanna Mountains and enters the Santa Clara River basin. Just northerly of Castaic the highway enters the mountainous region at the junction of the Coast Range with the Transverse Range which is sometimes referred to as the Piru Divide.

The highway is located in this rugged mountainous terrain for about 17 miles and then passes through Peace Valley to an intersection with State Highway Route 59 near Gorman. From this point to the Kern County line the highway is located in the Tejon

Pass of the Tehachapi Mountains. The total length of Route 4 in Los Angeles County is 75 miles, of which approximately 31 miles is within incorporated cities and the northerly 44 miles, called the Ridge Route, is in rural area.

As constructed and opened to traffic in 1933, the Ridge Route provided 30 feet of pavement and was used for three lanes of traffic. Very soon after opening, due to the high percentage of heavy truck traffic (20 percent), it became evident that these three traffic lanes were of insufficient capacity to handle the daily traffic flow that developed, which far exceeded the accepted maximum of 5,000 vehicles per day for this type of highway. The relatively high accident rate that developed on the Ridge Route clearly indicated the safety deficiency of this important highway arterial.

Studies for improvement of the Ridge Route were started in 1940 but construction improvement could not be carried out because the war intervened. On November 18, 1943, the State Highway Commission approved portions of the Ridge Route as a post-war construction project and design studies were started for general widening to provide a four-lane divided high-

way with the ingress and egress rights of abutting property owners limited.

The design problem confronting the Division of Highways was not so much the improvement of grade and alignment, although many substantial revisions are being made of this character, but was one of increasing the pavement width to modern standards and providing a central division strip to separate northbound from southbound traffic.

The pavement widening has been accomplished in some cases by utilizing the existing 30-foot width of pavement for two lanes for traffic moving in one direction and providing an additional 24-foot width of new pavement so that two traffic lanes will be available for vehicles moving in the other direction. Where the existing pavement cannot be so utilized, then two 24-foot widths of new pavement are being provided.

This separation of opposing traffic is especially important on the Ridge Route where the lighter, fast traffic is continually passing the slower moving trucks on long grades. Through the mountainous portions of the Ridge Route where grading costs are very great, the width of the central division strip was established as six feet and this

area contains raised bars outlined by double stripes. Where the grading costs do not so limit design, the central division strip has been made 42 feet wide. In the latter case, a drainage ditch is placed along the center of the division strip and paved shoulders five feet in width are placed adjacent to the main traveled lanes of the pavement. Along the outside edges of all the pavement, paved shoulders eight and nine feet in width are provided so that ample space is available for the parking of vehicles off the pavement.

Due to the lack of stability in the geological formations at certain locations, precautions have had to be taken to prevent high embankments from lateral movement by the construction of heavy buttress fills. Cut slopes are being built on a slope of one and one-half horizontal to one vertical, and at many critical locations benches are excavated at higher levels in order to relieve the overburden weight and prevent future slides from occurring. Several important channel changes have had to be built in order to control flow of drainage water. Existing drainage structures are being extended and additional drainage provided where necessary. As a protection against the ab-

Portion of Ridge Route near northerly end, showing grading operations in progress. Existing 30-foot pavement now used for two-way traffic will become one-way roadway for southbound traffic after the new roadway for northbound traffic is completed



sorption of moisture from the original ground by the newly placed fill material due to capillary attraction, a pervious material blanket of river-bed sand and gravel is being laid as a base

As the designs for the reconstruction of the Ridge Route progressed, it became evident that considerable quantity of selected porous material would be needed in order to provide adequate drainage for the lower portions of roadway embankments. Suitable material could not be found along the highway right of way. Therefore, prospecting investigations were carried out by the District Material staff and an area was located in Castaic Creek a short distance east of Castaic School where an adequate supply of pervious material was available.

Borrow agreements were negotiated with property owners by the District Right of Way Department on the basis of obtaining a maximum quantity of 90,000 cubic yards. This borrow privilege extends for a period of three years from the date of the agreement. It is anticipated that sufficient quantity of material is available to take care of all of our needs on the Ridge Route for this type of imported borrow.

Due to the fact that so much of the native soil on the Ridge Route is unsuitable for subgrade material and that the haul of pavement aggregate from commercial plants would be a minimum of 25 miles, extensive prospecting was

done by the District Materials staff for suitable sources for subgrade material and for pavement aggregate. A body of rock was located in the Palomas Creek area about one-fourth mile westerly of the state highway. Forty acres were purchased at this location at a price of \$1,000 with rights of access through the owner's property. Adjoining the 40 acres, an additional 10 acres was leased for a period of five years at a cost of \$300. A high quality breccia material was thus made available for use in subgrade and pavement at low cost.

To date 326,000 tons have been hauled from this site at a cost of \$0.004 per ton for acquisition. The hauling expense to get equivalent material from commercial plants based on Public Utilities Commission freight rates would have been \$1.15 per ton. These figures indicate the large saving in costs to date resulting from operating this state-owned quarry.

In order to keep the hauling costs at a minimum, the District Materials staff has prospected for considerable distances on both sides of the state highway to determine where the most suitable sources of material for use in subgrade and pavement could be found. Quarry rights have been obtained to a 160-acre area at Frenchman's Flat along Piru Creek. This site was located in the Los Padres National Forest and quarrying rights from the Forest Service were obtained under a special use permit free of cost.

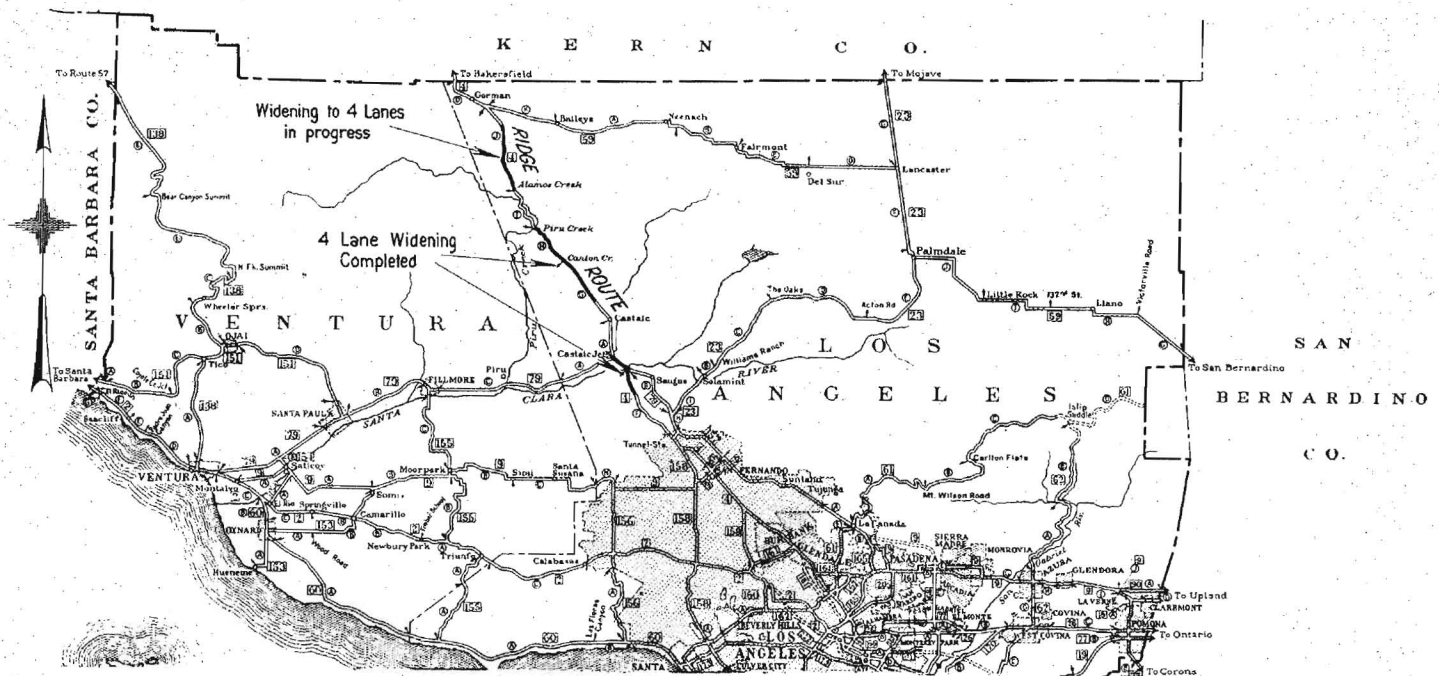
Farther north on Piru Creek near the junction with Los Alamos Creek, a borrow privilege was negotiated from G. E. Kinsey which makes available a large deposit of gravel and sand.

Another source for road material is the state-owned 43-acre parcel containing high quality granitic material near Gorman Creek Bridge. This area of land has a 1,000-foot frontage on the west side of the highway and extends back 1,875 feet, and cost the State \$750. From this quarry site 5,000,000 cubic yards of high quality material is available. This source will be utilized for the Peter Kiewit Sons' Company contract which is now in progress.

The lining up of these local sources of satisfactory material for road construction in close proximity to the state highway has already resulted in savings to the State of hundreds of thousands of dollars in construction cost.

Reconstruction contracts on the Ridge Route, completed or to be completed by the end of this current year, total \$5,500,000.

The first reconstruction contract was awarded on March 10, 1947, to the Clyde Wood Construction Company of Los Angeles for 2.6 miles between Palomas Creek and Violin Saddle, and this work, totaling \$795,000, was completed June 9, 1948. This contract was partially financed with federal aid interstate highway funds in the amount of \$438,000.



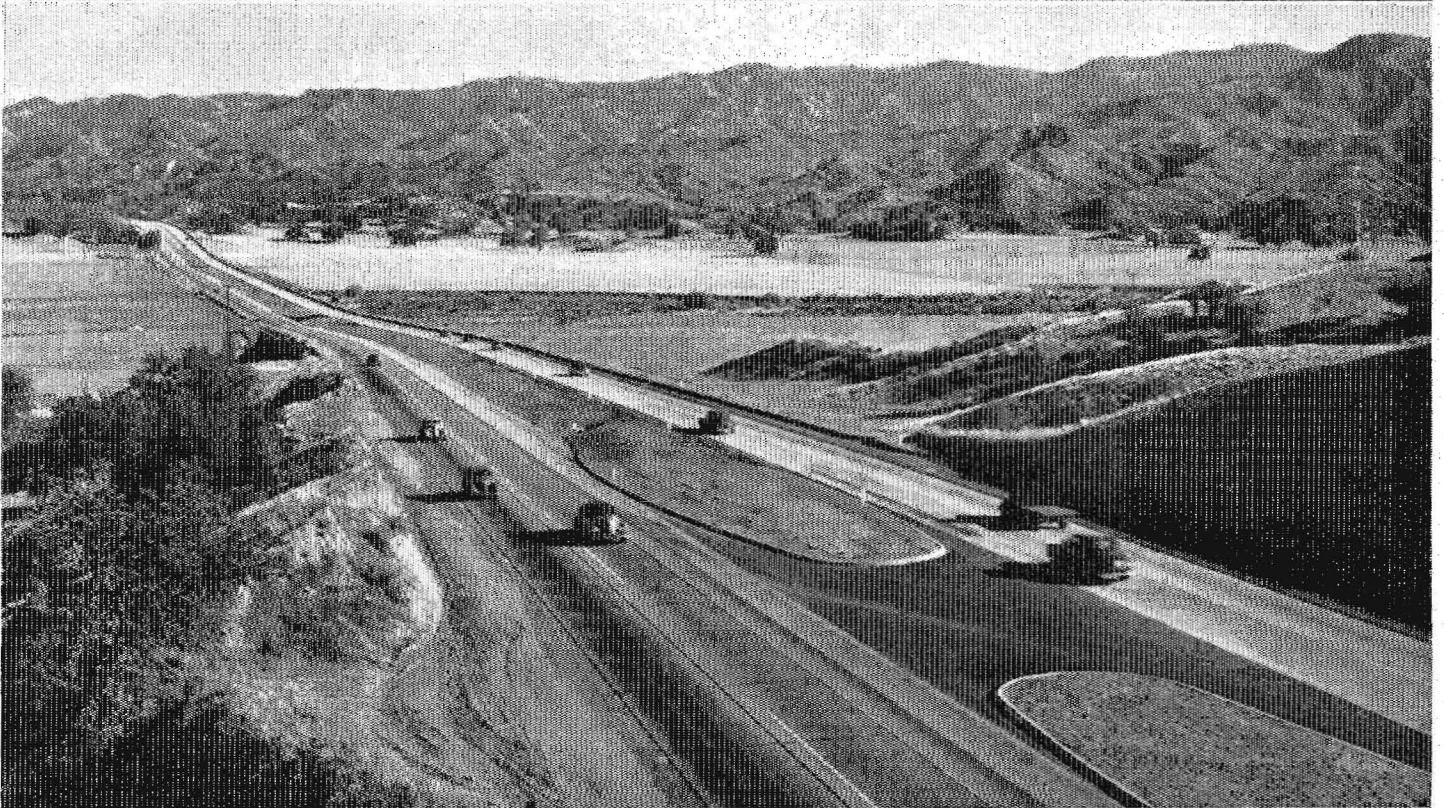
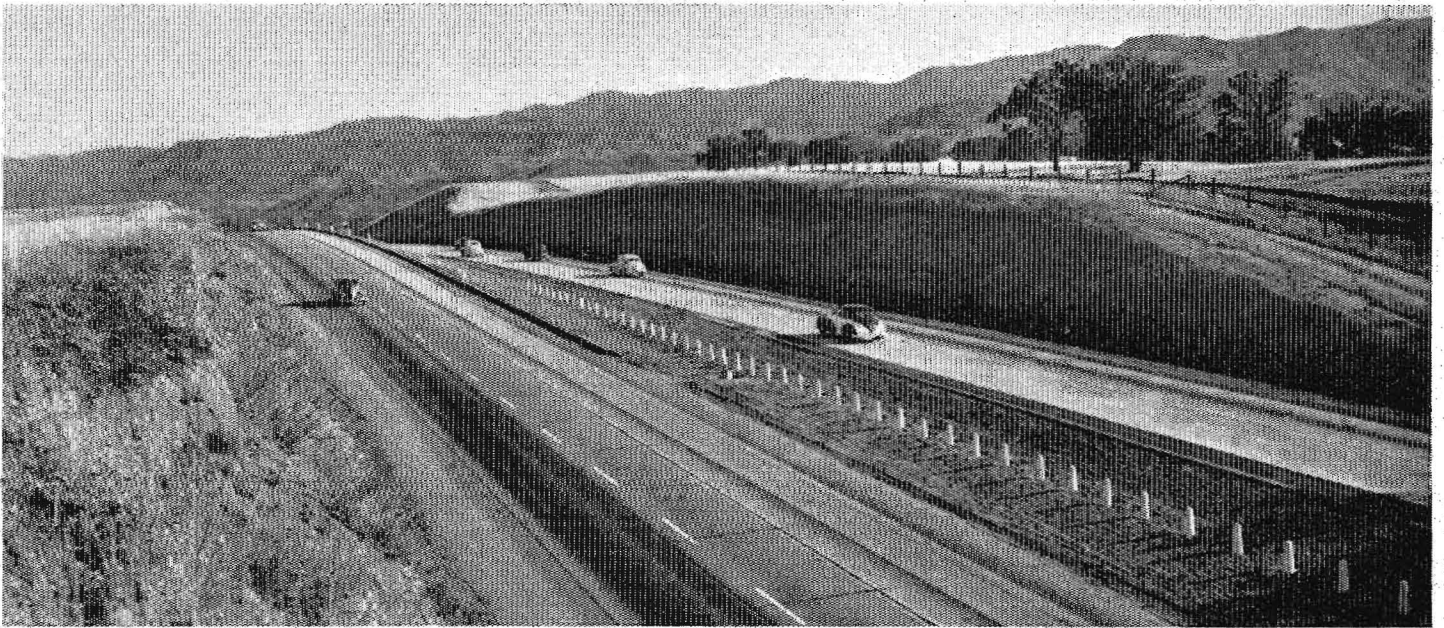


Upper—Completed section of Ridge Route north of Castaic. Lower—Completed section of Ridge Route between Santa Clara River and Pico Canyon, looking southerly, showing protection provided traffic where newly constructed pavement is lower in grade elevation than the existing pavement

The second contract was awarded May 29, 1947, to Winston Brothers of Los Angeles for 3.8 miles between

Whitaker Summit and Piru Creek. Construction totaling \$1,420,000 was completed October 8, 1948.

The third contract to be carried out also was awarded to Winston Brothers on February 6, 1948, for the 4.4 miles



Upper—Completed construction on the Ridge Route near Pico Canyon, showing treatment to prevent haphazard crossings of central division strip between new pavement on right and old pavement on left. Lower—Completed construction on Ridge Route at Pico Canyon showing treatment of connection between new pavement on right and old pavement on left of central dividing strip

of reconstruction from Violin Saddle to Whitaker Summit. This was completed February 24, 1949, at a cost of \$1,392,000.

The fourth unit of reconstruction for the 2.6 miles between Santa Clara River and Castaic Creek was awarded on June 10, 1948, to the Griffith Com-

pany and completed May 13, 1949. The cost of this work was \$489,000.

The fifth reconstruction contract was awarded on June 24, 1948, to N. M. Ball Sons for 3.3 miles of reconstruction from Pico Canyon Road to Saugus Road. This contract was completed April 8, 1949, at a cost of \$450,600.

The sixth contract for reconstruction on the Ridge Route from Los Alamos Creek to a point 2.3 miles southerly of Route 59, upon which work is now in progress, was awarded to Peter Kiewit Sons' Company on April 14, 1949. This 6.7 miles of recon-

... Continued on page 62

Prison Labor

Story of Highway Road Camps
in the State of California

By G. A. TILTON, JR., Supervising Highway Engineer

This is the third article in a series appearing in *California Highways and Public Works*, recording the history and continuous operation of State Highway Prison Road Camps in California since the first camp was established in 1915. The first article covering history and legislation, and the second covering organization, were published in the April-May and June-July issues, respectively.

This article is intended to outline the basic principles involved in the location of camp sites and design of camp layouts.

NO OTHER feature of prison road camp administration is more important and vital to successful operation of the camps than the selection of the camp site and design of the camp layout.

The camp is the headquarters for construction personnel and the center of prisoner activities. It is the home of the prisoner for many months, where he eats, sleeps, and spends all his recreational time outside of working hours.

The camp must not only meet the welfare needs of the prisoner and custodial requirements of the Department of Corrections, but it must, at the same time, satisfy the economic construction requirements of the Division of Highways.

Camp Layouts Highly Specialized

Modern camp plans, as presently developed in California, are the result of many years of experience in coordinating the specialized dual needs of the custodial agency and the production agency.

The need for thorough study and consideration of all factors pertaining to the selection of a camp site, and attention to detail design of the layout, cannot be overemphasized.

Selection of Camp Site

Given a specific length of highway project to build, the first step preliminary to actual highway construction involves an intensive field study and search for the best available camp site. In rugged terrain, the selection of a site, and design of its layout to best fit the topography, more often than not, presents a difficult problem. In such cases, the ideal site is rarely available that

Early Experience

Increased labor production resulting from good housing facilities was recognized early in the prison road camp program as indicated in the following excerpt from a report by Division Engineer F. G. Somner to the California Highway Commission December 31, 1918.

"The men are housed in tents and frame buildings. The camps are well lighted and heated. The sanitation conforms to the regulations of the Commission of Immigration and Housing, which covers everything conducive to cleanliness, health and comfort, including bathing facilities.

"Each man is provided with a steel spring cot, a cotton mattress and plenty of blankets and warm clothing.* The prisoner is given all the good wholesome food he can eat and plenty of tobacco. He is better cared for than he would be in any free labor camp. Criticism has been made that we treated them too well but we know, by experience, that it pays to treat them well."

* This was prior to the pay system established in 1923.

meets all of the desirable features of a road camp layout.

The physical and custodial considerations to be weighed in the selection of a camp site include:

(a) Location Near Center of Gravity of Work

Insofar as it is economically feasible, a camp site should be located as near as possible to the construction center of gravity, or heaviest part of the pro-

posed highway work. For many projects, the best available location for the camp site may be sufficiently off-center to require revision of the original limits of the proposed work.

(b) Area of Land

A comparatively level and well-drained area of not less than six acres is necessary for the development of a well-balanced camp layout. This amount of land will provide sufficient room to properly segregate inmate quarters from free quarters, to space separate individual buildings far enough apart to minimize the fire hazard, as well as parking area for construction equipment, and room for recreational activities.

(c) Water Supply

An uncontaminated water supply of not less than 10,000 gallons per day should be available for domestic use in the camp, and not less than 20,000 gallons storage provided for fire protection purposes.

(d) Isolation

For security reasons, other considerations being equal, a camp site should be located a reasonable distance from highways, railroads, and local habitations.

(e) Communication and Power Facilities

Establishment of quick communication between the camp and outside is essential for custodial reasons. Consideration should be given to the proximity of telephone lines and commercial power supply when considering the various factors pertinent to the selection of a camp site.

Although telephone service is desirable, it is not essential if a two-way radio station can be substituted for it. Likewise, a diesel power plant can be satisfactorily substituted for commercial power if necessary.

Design of the Camp Layout

The second important step in establishing a camp involves design of the camp layout to fit the terrain, which may be either on flat land or on sloping ground in mountainous areas. In either case, the same basic principle of arranging buildings in three general groups applies:

Group (1) Central Group

Buildings used jointly by free personnel and prisoners, such as the administration building, mess hall and kitchen, guards' offices and quarters, are best located in the central area of the camp

layout where they are readily accessible to all concerned.

Group (2) Buildings Occupied by Prisoners

Buildings occupied and used exclusively by prisoners are arranged, insofar as possible, on one side of the camp site, and in such a manner that their entrances are easily observed from the guards' quarters. This group of buildings includes prisoner cabins, bathhouse, hospital, shoe shop, barber shop and recreational hall.

Group (3) Building Occupied by Free Men

The third group of buildings, comprising free men's quarters, superintendent's quarters, shop buildings, store houses, garage, etc., all of which are off-limit to prisoners outside of working hours, should be located on the side of the camp opposite the buildings occupied by prisoners.

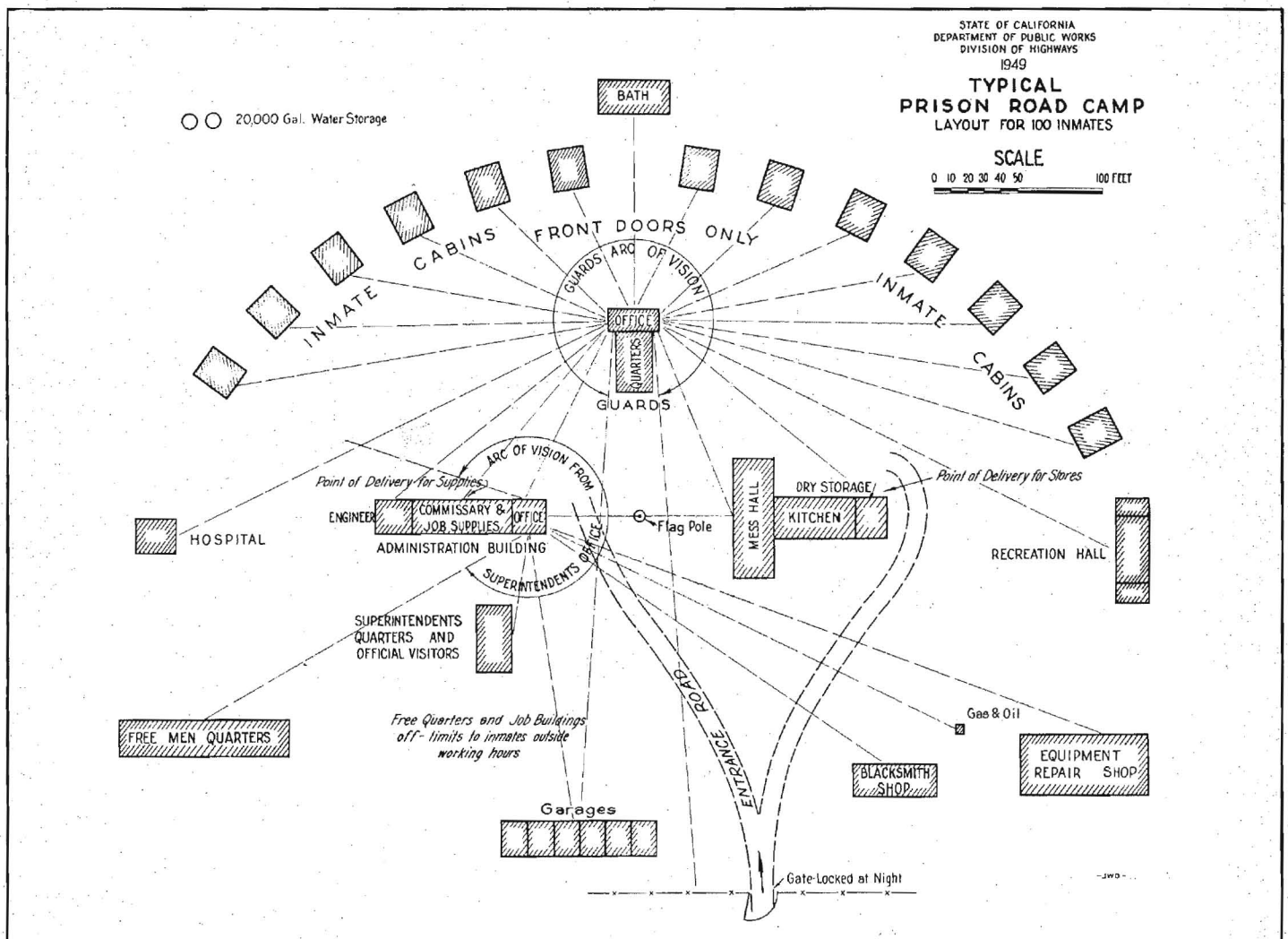
Administration Building

The administration building, housing the superintendent's office, engineer's office, camp commissary and job supplies, is the key building of the camp layout. It is the nucleus around which the various other camp buildings are grouped, and necessarily must be near the center of the camp layout. The entrance road to the camp should be planned so that all outside parties having business in the camp must first stop at the office of the camp superintendent or the custodial supervisor.

Guards' Office and Quarters

Custodial offices and quarters should be located, preferably on an elevated spot, where as many of the camp buildings as possible can be observed, and still be readily accessible to camp inmates. It is of particular importance that the entrances to all prisoner-used

Layout of modern ideal prison road camp for 100 inmates



buildings, including cabins, hospital, bathhouse, recreational hall, camp commissary, food stores, as well as the entrance road, be visible from the guards' office. (See plan of typical prison road camp layout.)

Kitchen and Mess Hall

The kitchen and mess hall unit must be located in the middle of the camp where it is accessible to the inmates on

one side and free employees on the other side. The thoroughness with which this unit is laid out will have a definite effect on the quality and economy of food service; and the detail of its design, including arrangement of equipment, should be given the benefit of the best technical advice available.

The standard basic design of the kitchen and mess hall plan developed for the prison road camps in California

is adaptable to practically any field conditions encountered.* It can be arranged in a "T," "L," or straight line, to best fit the topography of the location.

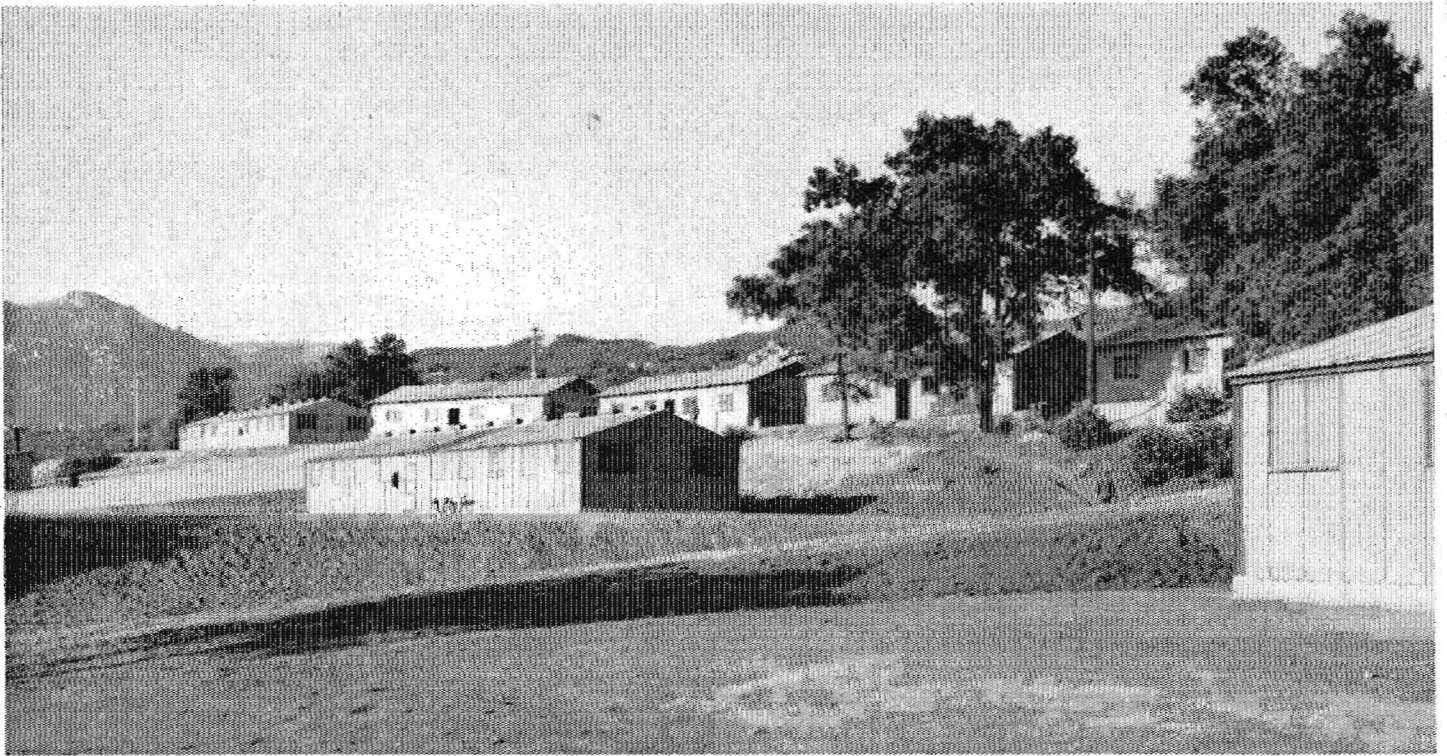
The kitchen and mess hall layout includes:

(a) Dry storage for staple food stores.

* Kitchen and mess hall design will be included in a subsequent article.

Upper—This photo shows the modern kitchen in operation in Camp 39 on U. S. 395 in Modoc County. Lower—Mess hall for same camp. Tables for free men in background and for inmates in foreground





Upper—Barracks housing 24 men each at Camp 40 in San Diego County. Lower—Interior of one of the 24-man barracks at Camp 40

(b) Refrigeration for perishable food supplies.

(c) Kitchen and appurtenances.

(d) Mess hall for inmates and free personnel.

Component parts are planned so as to streamline food-preparation routes from the receiving and storage points to the service counter and mess hall, with a minimum of effort and retracing of steps.

Prisoners are served cafeteria style and free employees are served family style. Both are served exactly the same food.

Inmate-occupied Buildings

Inmate buildings are located on the side of the camp opposite the entrance road. Aligning them in a semicircular arrangement has proved highly satisfactory and gives a pleasing appearance to the camp site.

The camp hospital is isolated from other buildings and must not be closer than 200 feet from the mess hall and 75 feet from sleeping quarters to comply with state health and housing regulations.

The bathhouse is located in the middle of the inmate group of buildings

and is equipped with clothes washing facilities.

A recreational building is constructed in each camp where prisoners may play indoor games and sports, and moving pictures may be shown at regular periods. The barber shop, tailor shop, shoe shop and camp library can conveniently be located in both ends of the recreational building.

Inmate Bunkhouses

The evolution of housing for inmates during the last 34 years has passed through many stages, from early-day tents without floors to the present-day comfortable 20-foot by 24-foot standard quarters housing eight men. Each of the inmates in an eight-man cabin is assigned a steel spring bed cot, mattress and bedding, and a locker where he can keep his personal possessions.

Recent inmate cabin designs include modern toilet facilities and have all entrance doors facing the guards' quarters—no other doors are permitted.

Eight-man cabins have been found to be economical and have met custodial requirements satisfactorily; but due to increased building and heating costs, consideration is now being given

to use of larger barracks quarters housing 24 men. Several of these 24-man buildings have recently been constructed on an experimental basis.

Job Buildings and Free Quarters

Job buildings and quarters for camp employees are grouped on the side of the camp layout opposite to the inmate quarters.

This group of buildings includes:

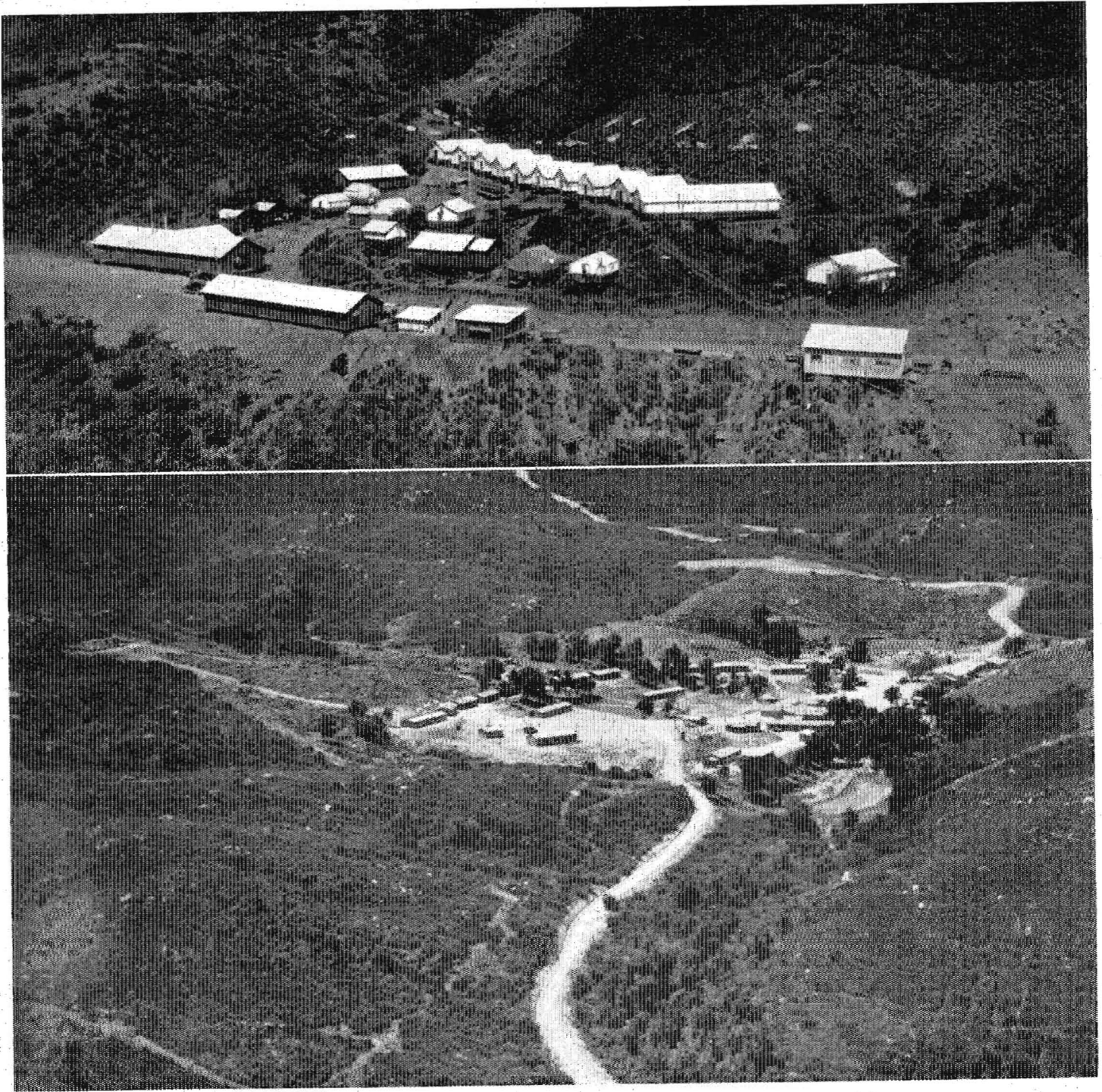
- (a) Free men's quarters.
- (b) Superintendent's and official visitors' quarters.
- (c) Equipment shop.
- (d) Blacksmith shop.
- (e) Gas and oil house.
- (f) Warehouse.
- (g) Garage.

Family Quarters

Most prison road camps are located in isolated mountainous areas where living quarters for families are rarely available, and it has proved highly advantageous to the work to establish family quarters for employees close to the camp. A limited number of four-room houses are constructed that are assigned to key camp personnel, for

Camp 26 built in 1932 at Anderson Canyon overlooking the Pacific Ocean on State Route 1 in Monterey County





Upper—Tent camp of 21 years ago established at Salmon Creek on State Route 1 in San Luis Obispo County. Lower—This is a view of a modern prison road camp on U. S. 80 in San Diego County

which sufficient rental is charged to amortize the cost over a definite period.

Miscellaneous

Explosives storage, including a powder house and cap house, although not a part of the camp layout, is a part of the camp setup and is located in a protected area in such a manner as to com-

ply with all governmental explosive regulations.

Modern sanitary sewage disposal facilities are designed and constructed for each camp in compliance with state health regulations and county ordinances.

Good housing is essential to good camp morale, whether it be for inmates

or free personnel. This is particularly true in locations subject to severe weather conditions, and is in keeping with the modern trend toward adequate housing for construction forces.

The size of the camp, character of buildings, and inmate quota, will depend to a large extent upon the magni-

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Traffic Signals

Used in Connection With
Bridge Redecking Jobs

By W. H. JACOBSEN, Assistant Bridge Engineer

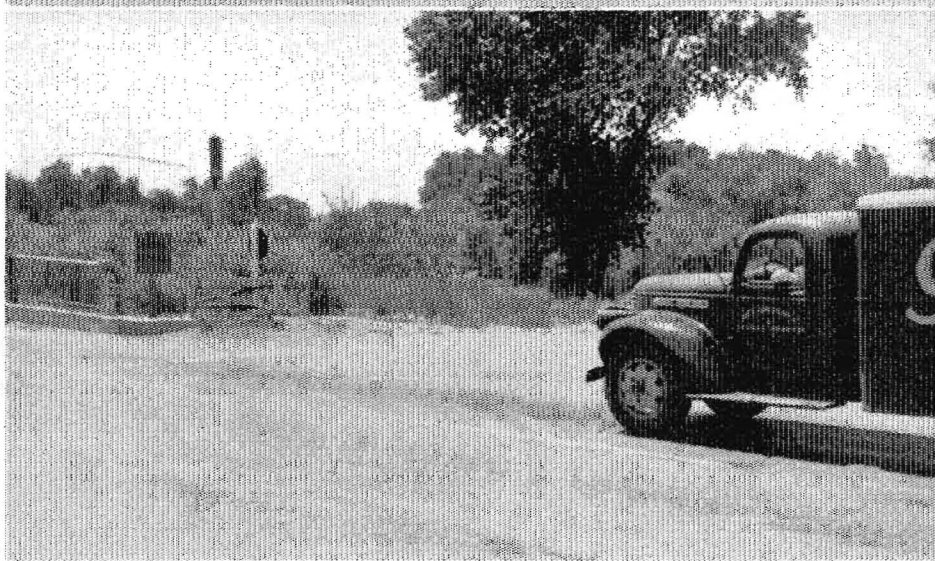
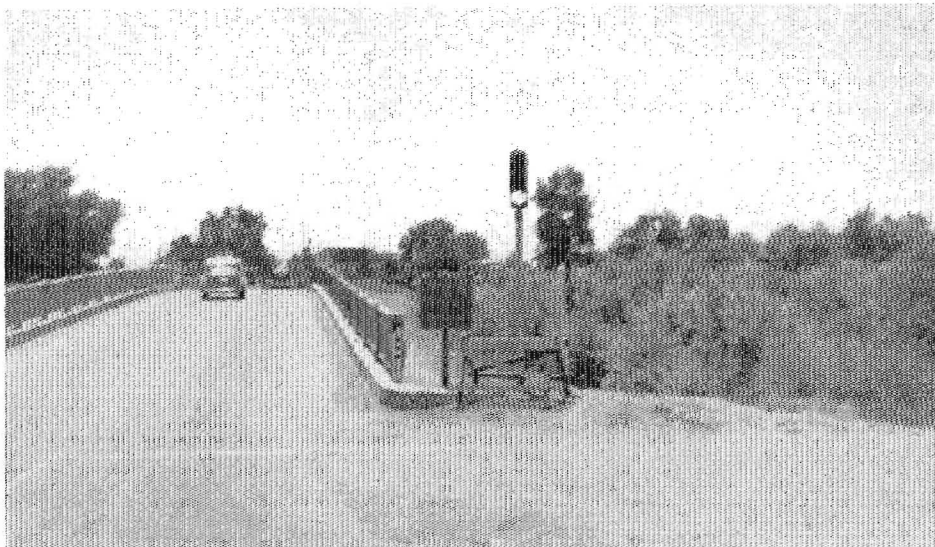
AS AN INNOVATION in the handling of one-way traffic while the Old and Middle River Bridges across the San Joaquin west of Stockton and the Knights Landing Bridge across the Sacramento River were being redecked, traffic signals were utilized with outstanding success.

It has been standard practice of the Division of Highways to use flagmen for the control of traffic. Flagmen however represent a very costly method of solving the traffic problem. On these two jobs in San Joaquin County on Route 15, detours were not available and a re-routing of the traffic would have been so circuitous that the use of flagmen and the maintenance of traffic through the work would be essential.

Cost studies made at the beginning of the work showed that the cost of controlling the traffic by use of flagmen on a 24-hour basis would very nearly equal the cost of the contract items. By installing the traffic signals and using a manual control, a saving of approximately 45 percent of the total flagging cost was realized. This does not include the salvage value of the equipment which is about 80 percent.

The signals were set up to stop the traffic well away from the work on either end of the bridge and the operator was placed in a position so that he could see traffic from both directions. In this manner he was able to control the movement of traffic with the minimum amount of lost time. The traffic was handled much more smoothly and with less delay than would have been possible under the conventional systems using the flagmen on each end of the control section. This was especially true at night during the cold winter months when difficulty would have been had keeping flagmen on the job.

The actual cost of controlling traffic with the signals was \$15,800. The cost



These photos show traffic signals used in one-way traffic control on Knights Landing Bridge

of using flagmen alone for this period would have been \$23,600. Therefore, during the time in which traffic control was in operation the saving to the State was \$7,800.

The work was done under contract by the Lew Jones Construction Company of San Jose. The contract was administered by the Bridge Department under F. W. Panhorst, Assistant State Highway Engineer, and the author was Resident Engineer.

PASSING ON GRADES

Vacation drivers are reminded by the California State Automobile Association that on mountain roads too narrow for safe passing, the Vehicle Code requires the driver of the descending car to back up the hill to a point where it is possible for the ascending car to pass safely.

New Route

Eleven Structures on U. S. 99
and U. S. 50 Stockton Project

By CHAS. E. WAITE, District Engineer

IN JUNE, 1949, Lord and Bishop and M. J. B. Construction Company of Sacramento and Stockton, respectively, completed their contract for grading and structures on the rerouting of a portion of State Highway 4 (U. S. 99) from south of Stockton to north of Stockton and the extension of State Highway Route 5 (U. S. 50), easterly, from "D" Street in Stockton to a connection with the rerouted U. S. 99.

The rerouted U. S. 99, about 5¼ miles in length, begins at the Mariposa Road, 1½ miles south of Stockton and extends in a northerly direction over new rights of way to the Calaveras River, 1¾ miles north of Stockton, where it joins the four-lane divided limited access freeway between Calaveras River and Lodi, completed in October, 1947. The extension of U. S. 50, all within the City of Stockton, is approximately one mile in length, located between "D" Street and the new rerouted U. S. 99.

Limited Access Freeway

All right of way was acquired including access rights, and the project was constructed as a limited access freeway.

This contract, the first stage of the construction of a four-lane divided highway on U. S. 99, when completed will consist of two Portland cement concrete pavements, each 23 feet wide and eight inches thick, with a dividing strip 36 feet wide, and a four-lane divided highway on U. S. 50 between Wilson Way and "D" Street, and a two-lane highway from "D" Street to the connection with the rerouted U. S. 99.

The recently completed contract provided for the grading, bridges, railroad, and roadway separation structures. The several bridges and structures are located as shown on the map and described as follows:

East Stockton Underpass

This structure is a structural steel deck girder bridge consisting of two spans each 67 feet 1 inch long supported on reinforced concrete abutments and a center bent on spread footings and will carry the mainline track of the Atchison, Topeka and Santa Fe Railway across the rerouted U. S. 99.

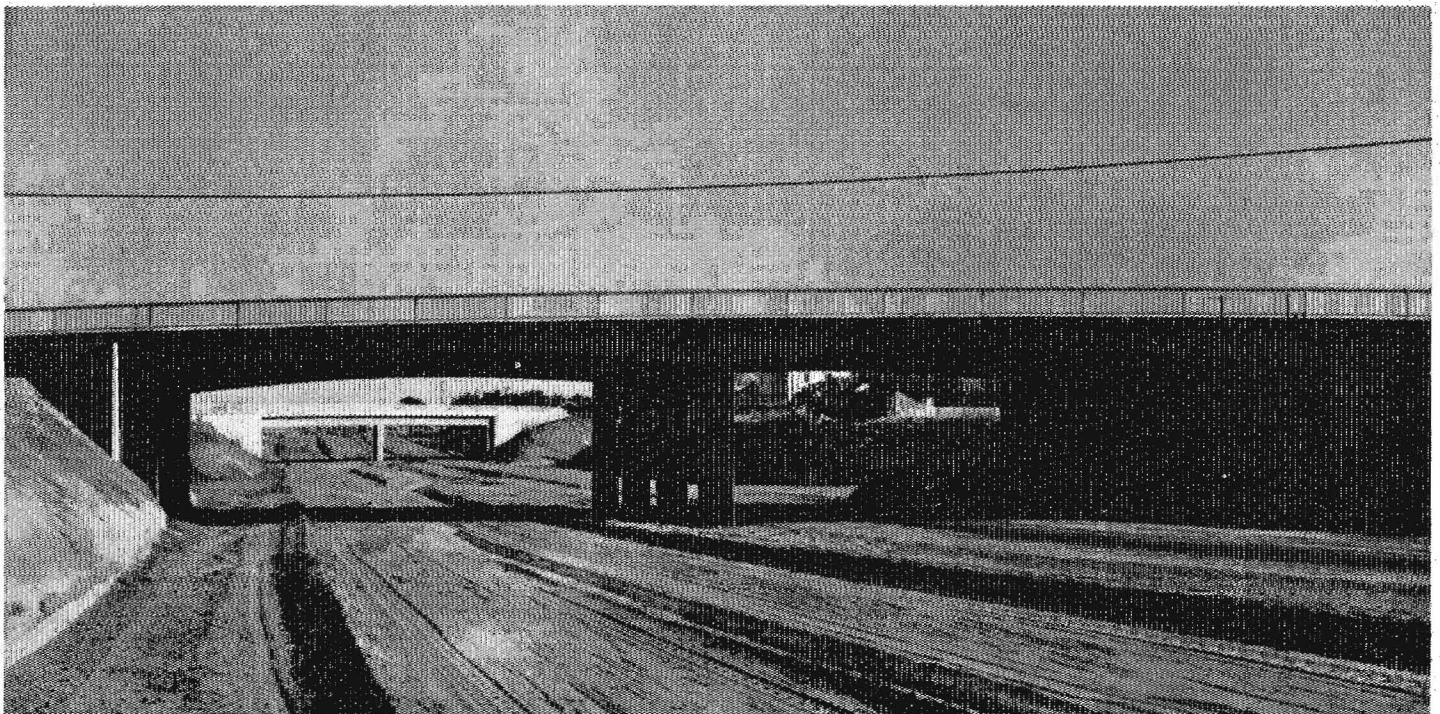
Bridge Across Norman Slough

There were a pair of similar reinforced concrete slab bridges constructed across Mormon Slough, each consisting of two spans 28 feet long and two spans 22 feet long on concrete pile bents.

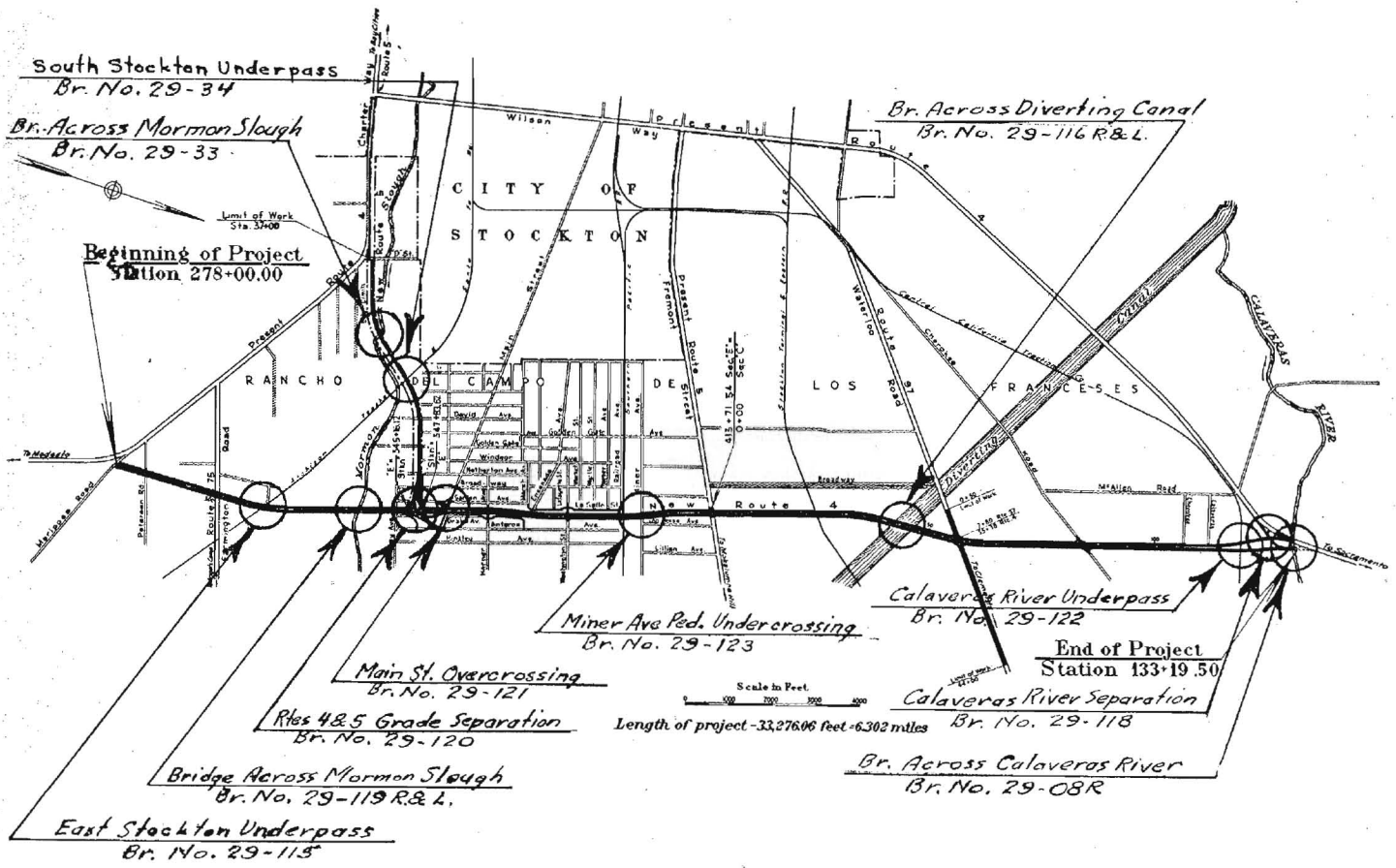
Routes U. S. 99 and U. S. 50 Grade Separation Structure

At the junction of U. S. 99 and U. S. 50 a reinforced concrete girder bridge was constructed consisting of one span 58 feet 6 inches long and two canti-

Main Street Overhead in foreground. Separation of U. S. 99 and U. S. 50 routes in background



In San Joaquin County, between Mariposa Road and Calaveras River, and between D Street and Route 4



lever spans each 4 feet 6 inches long on reinforced concrete abutments and a center bent on spread footings.

This structure will carry the east-bound roadway of Charter Way extension (U. S. 50) across U. S. 99 and will provide a roadway 27 feet wide and two safety curbs each 1 foot 9 inches wide.

Main Street Overcrossing

A reinforced concrete box girder bridge 125 feet 5 3/4 inches long, consisting of two spans on concrete abutments and a center bent on spread footings was constructed to carry Main Street traffic across the rerouted U. S. 99. This structure provides two roadways each 22 feet wide with a 6-foot separation and two sidewalks each 4 feet 3 inches wide.

Miner Avenue Pedestrian Undercrossing

To provide a safe crossing for a large number of pedestrians and school children at Miner Avenue a reinforced concrete box 7 feet wide by 7 feet high by 104 feet long together with ramps was constructed under the rerouted U. S. 99.

Bridge Across Diverting Canal

A pair of similar steel beam bridges consisting of six spans each 40 feet long and two spans each 34 feet 6 inches long on concrete pile bents were constructed across the Diverting Canal on the rerouted U. S. 99 and each provide a clear roadway 27 feet wide between 1-foot 9-inch wide safety curbs.

Calaveras River Underpass

A structural steel through girder bridge consisting of two spans each 53 feet 5 inches long was constructed over the rerouted U. S. 99 to provide an overcrossing for the Central California Traction Company mainline tracks. Considerable railroad work was included in the contract in connection with the restoration of the mainline restoration.

Calaveras River Separation

To provide a safe blending of traffic where the rerouted U. S. 99 rejoins the existing U. S. 99 a steel beam bridge consisting of one span 75 feet long, one span 48 feet 2 inches long, and one span 47 feet 6 inches long on reinforced

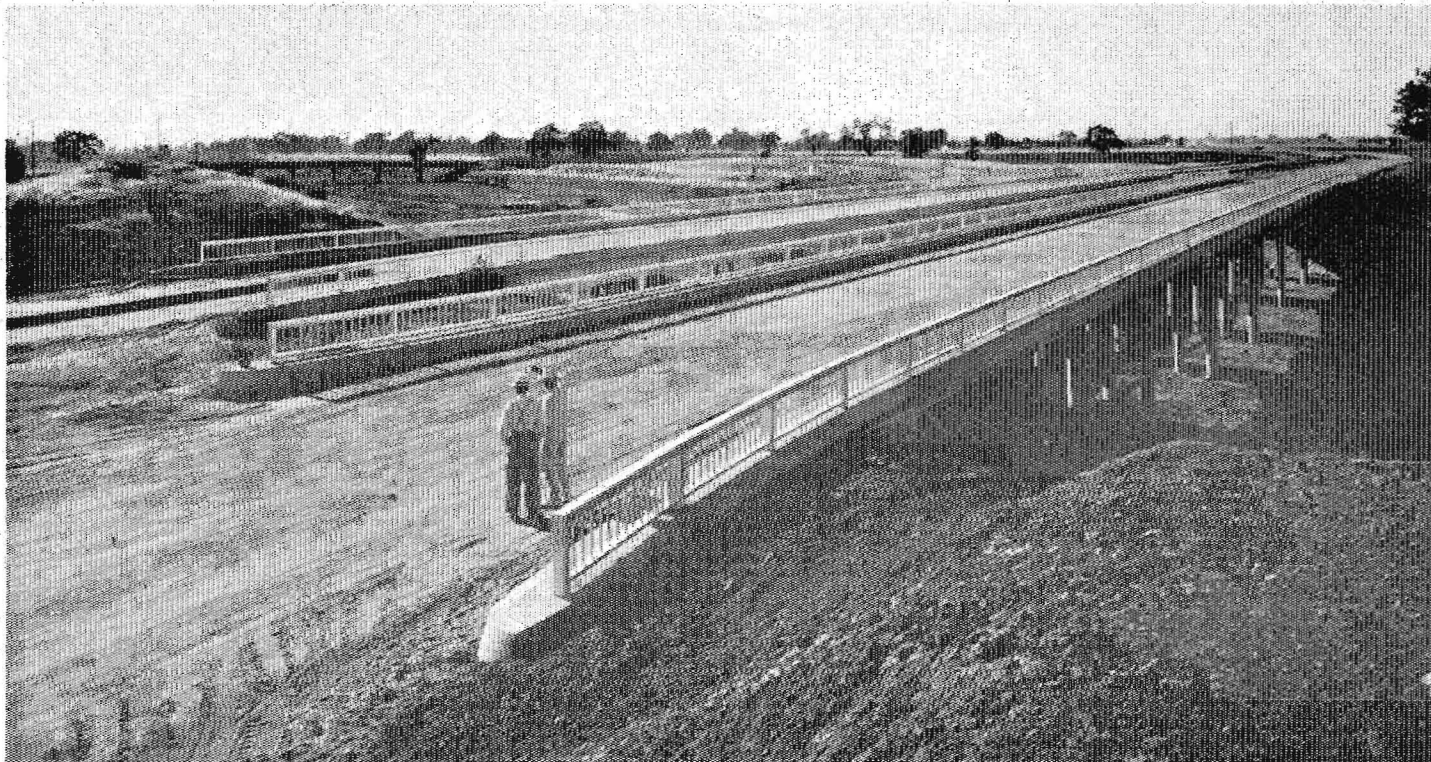
concrete abutments on concrete piles and reinforced concrete bents on spread footings was constructed over the southbound roadway of the rerouted U. S. 99 to carry the northbound roadway of the Stockton to Lodi Highway. This structure provides a 26-foot roadway between 1-foot 9-inch wide safety curbs.

Bridge Across Calaveras River

A steel beam bridge consisting of one span 54 feet long and two spans each 40 feet long on concrete pile bents was constructed across the Calaveras River to carry the northbound roadway of the rerouted U. S. 99. This structure provides a 40-foot roadway between 1-foot 9-inch wide safety curbs. Included in the contract was a revision of the existing bridge providing for a 4-foot wide sidewalk on the left and a revision of the location of the timber railing.

Bridge Across Mormon Slough

A reinforced concrete slab bridge consisting of three spans each 24 feet long, two spans each 19 feet long, and



Looking north across diverting canal bridges. Lockeford Road Bridge on left

two cantilever spans each 4 feet long on concrete pile bents was constructed across Mormon Slough and provides a 27-foot roadway between 1-foot 9-inch wide safety curbs on Charter Way Extension (U. S. 50).

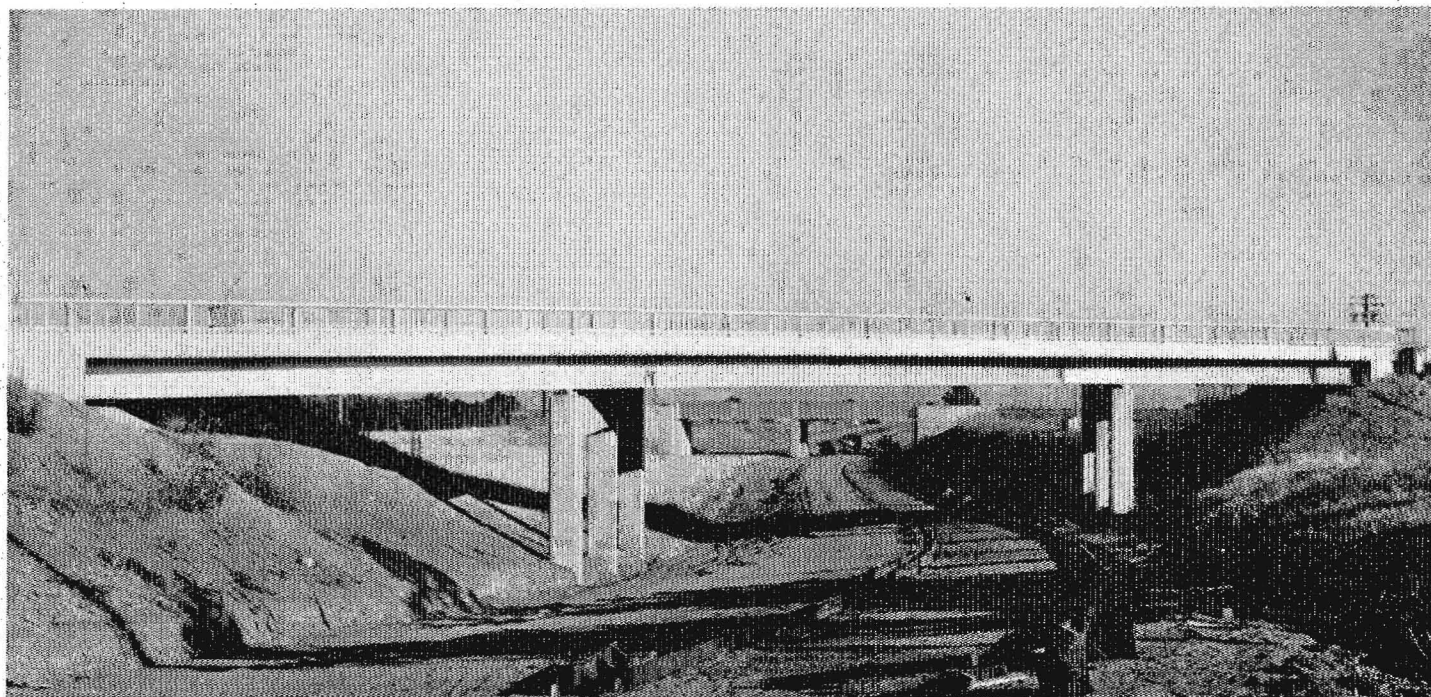
South Stockton Underpass

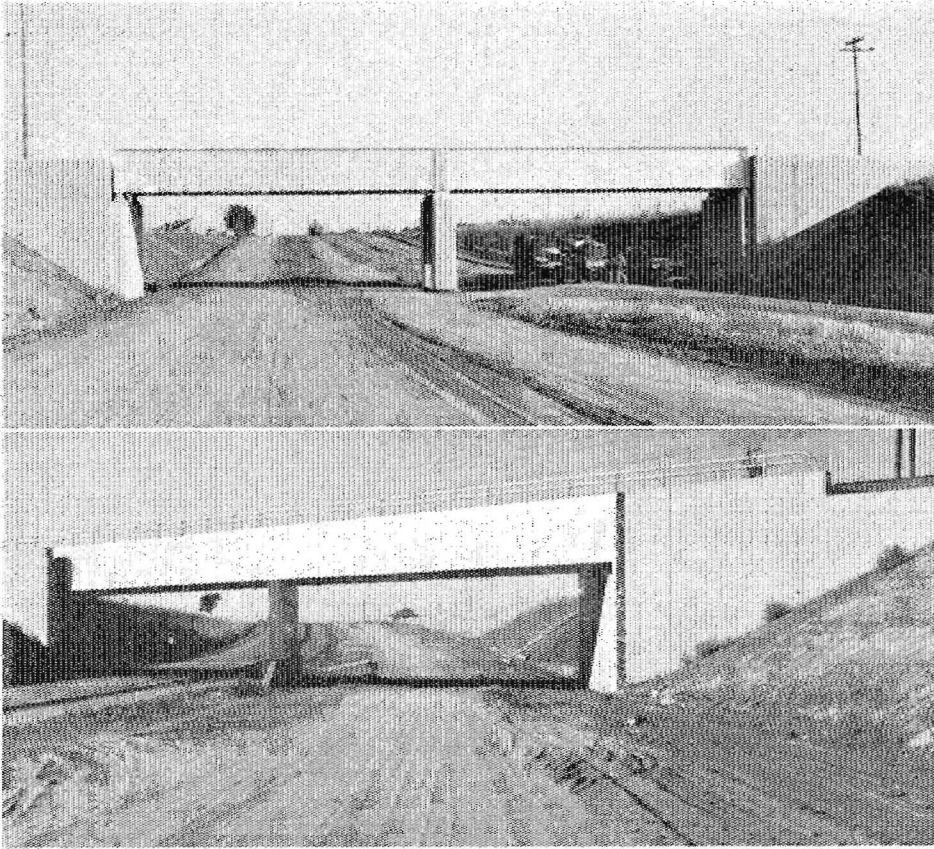
To provide an overcrossing for the main line of the Atchison, Topeka and Santa Fe Railway over Charter Way Extension (U. S. 50), a structural steel stringer span 43 feet long on reinforced

concrete abutments on treated timber piles was constructed.

The completed contract for grading and structures cost \$1,514,400 and the paving contract recently awarded to the United Concrete Pipe Corporation will cost an

Looking south from separation of Wilson Way. Central California Traction Company railroad underpass in background





Upper—Highway 99 underpass of Central California Traction Railroad. Lower—Highway 99 underpass of Atchison, Topeka and Santa Fe Railroad

estimated \$1,137,700, making the total construction cost for the completed project \$2,652,100. The paving contract is scheduled for completion in June, 1950.

When this project is opened to traffic, the serious traffic conditions now existing on Wilson Way will be alleviated to a large degree. According to recent traffic studies, there will be nearly 5,000 vehicles use the new through route daily. This through traffic is at present required to travel on Wilson Way, which also carries an average daily count of 17,000 vehicles composed of local traffic, and vehicles originating and terminating in Stockton and vicinity.

San Joaquin County, the City of Stockton, and the business concerns along Wilson Way have cooperated in every way possible to bring this project to a successful conclusion. It is realized that the removal of through traffic from Wilson Way will not only benefit those people not destined for Stockton but also local business and residents.

The rerouting of U. S. 99 effects a saving in distance of 1.57 miles over

the existing route for through traffic and due to the elimination of a congested area along Wilson Way, a considerable saving in vehicle operation time will be effected.

The major items of work involved in the completed contract were 348,000 cubic yards of roadway excavation, 20,800 cubic yards of structure excavation, 18,130,000 station yards of overhaul, 8,020 cubic yards Class "A" Portland cement concrete (structures), 1,521,000 pounds furnishing and erecting structural steel, 1,244,000 pounds furnishing and placing bar reinforcing steel, 11,540 lineal feet of culvert pipes, 1,000 lineal feet removing railroad track, 1,450 lineal feet constructing railroad tracks, 2,980 lineal feet raising railroad tracks, and the necessary pumping and electrical equipment for draining and lighting the various separation structures.

A. N. Lund and W. F. Fleharty, Resident Engineers, and Wayne Deady, Bridge Department representative, handled the engineering on this project under the supervision of M. C. Fosgate, District Construction Engineer.

In Memoriam

ELDRED G. GARRIGAN

Eldred G. Garrigan, Assistant Highway Engineer, passed away in Sacramento July 16, 1949, after an illness lasting several months.

Gary, as he was known to everyone, was born on September 14, 1875, in Pittsburgh, Pennsylvania. He was educated in the Los Angeles city schools and Hemet Union High School.

He left a Southern California stock ranch to enter the Navy during World War I. After the war he worked for a time in a San Pedro shipyard and then went down into Mexico on land development work.

Gary started his engineering career in 1920, working on land surveys in the vicinity of Lodi. He was then employed by the Division of Water Resources and the State Reclamation Board, and in 1924 went to work for the Southern Pacific Railroad on location near Cisco. On October 26, 1925, he accepted a position in Headquarters Office in Sacramento, where he worked up to the time of his illness.

Among his survivors are two daughters, Maryann Garrigan and Mrs. Evelyn Louise Brainerd, and a granddaughter, Susan Louise Brainerd, all of Sacramento; his sisters, Mrs. Mercedes E. Matson of Sacramento and Mrs. Jennie Kelso of San Jose, and his brother, James D. Garrigan of Santa Barbara, and "Uncle Jean" and "Uncle Jim" McGann, widely known to Gary's friends.

Gary was widely known and loved throughout the Division of Highways; he was famous for his geniality, his readiness to help others, and especially for his wit, keen sense of humor, and sharp and concise expressions. Headquarters Office will not be the same without Gary.

COURTESY PAYS

Automobile drivers should remember that courtesy begets courtesy, and on the highway mutual driving courtesies beget safety, says the California State Automobile Association.

State Fair

Visitors Will Motor Over Many
New State Highways This Year

CALIFORNIANS returning by bus or automobile this year to the State Fair in Sacramento, September 1st-11th will find 232 miles of new state highways over which to drive to the Capital City's great attraction.

Some of these new highways, all completed since the end of the 1948 State Fair, are of freeway design, others are four-lane divided roadways and many more have been improved to provide easier traveling and to care for increasing motor vehicle traffic.

Included in the improvements are grade crossing structures and new highway bridges.

State Fair officials estimate that approximately 250,000 visitors will motor to the Big Show this year. Some 100,000 are expected to drive from the San Francisco Bay area over U. S. 40 which, with the exception of four short sections totaling 10 miles, will be four-lane divided between Sacramento and the San Francisco-Oakland Bay Bridge.

The most recent projects, the four-lane divided Fairfield bypass and extension easterly, will be open to State Fair traffic.

Many Exhibits

Visitors to the 1949 California State Fair will find an exposition with hundreds of attractions and countless exhibits which will mirror the State's romantic past, portray its manifold accomplishments of the present and stress its possibilities of the future.

Some 40 of California's 58 counties will present their exhibits in the imposing Agriculture Building which also will house the displays of France, England, Norway, Switzerland and the Island of Malta.

The county exhibits will be shown against a backdrop of tumbling waterfalls, bubbling brooks and picturesque dioramas. Most of the exhibits will be animated, pointing up pioneer and gold rush days. The fair this year is celebrating the centennial of the western trek

Projects Completed on U. S. 101 From Oregon Line to San Francisco			
Since 1948 State Fair			
Limits	Length miles	Type	
<i>Humboldt County</i>			
Stone Lagoon to one mile south of Orick	5.3	Surfacing	
Two miles south and 0.5 mile north of Humboldt-Del Norte County Line	2.5	Surfacing	
South city limits of Eureka to Eureka Slough Bridge	2.6	Surfacing	
7.6 miles to 10.4 miles north of Orick	2.8	Surface	
<i>Mendocino County</i>			
2.8 miles south and 1.0 mile north of Rattlesnake Summit	3.8	Grade and surfacing	
At Rock Creek	0.6	Bridge and approaches	
Red Mountain Creek to Piercy	4.6	Grade and surface	
1.5 miles south to 3.5 miles north of Forsythe Creek	5.2	Grade and surface	
<i>Sonoma County</i>			
Between Healdsburg and Santa Rosa	1.7	Resurface	
Two miles north to 0.7 miles south of Santa Rosa	4.3	Grade, surface, structures	
<i>Marin County</i>			
1.6 miles north of Novato to Ignacio	2.3	Surfacing	

a century ago of the Argonauts who came to California in quest of gold and who remained to lay the foundation for the State's agricultural and industrial structure. The diversity of this agriculture is reflected in the display of nearly 900 farm products for which the fair is offering premiums.

In nearby Machinery Hall and Machinery Park there will be one of the greatest displays of farm implements and industrial machinery ever assembled in the West.

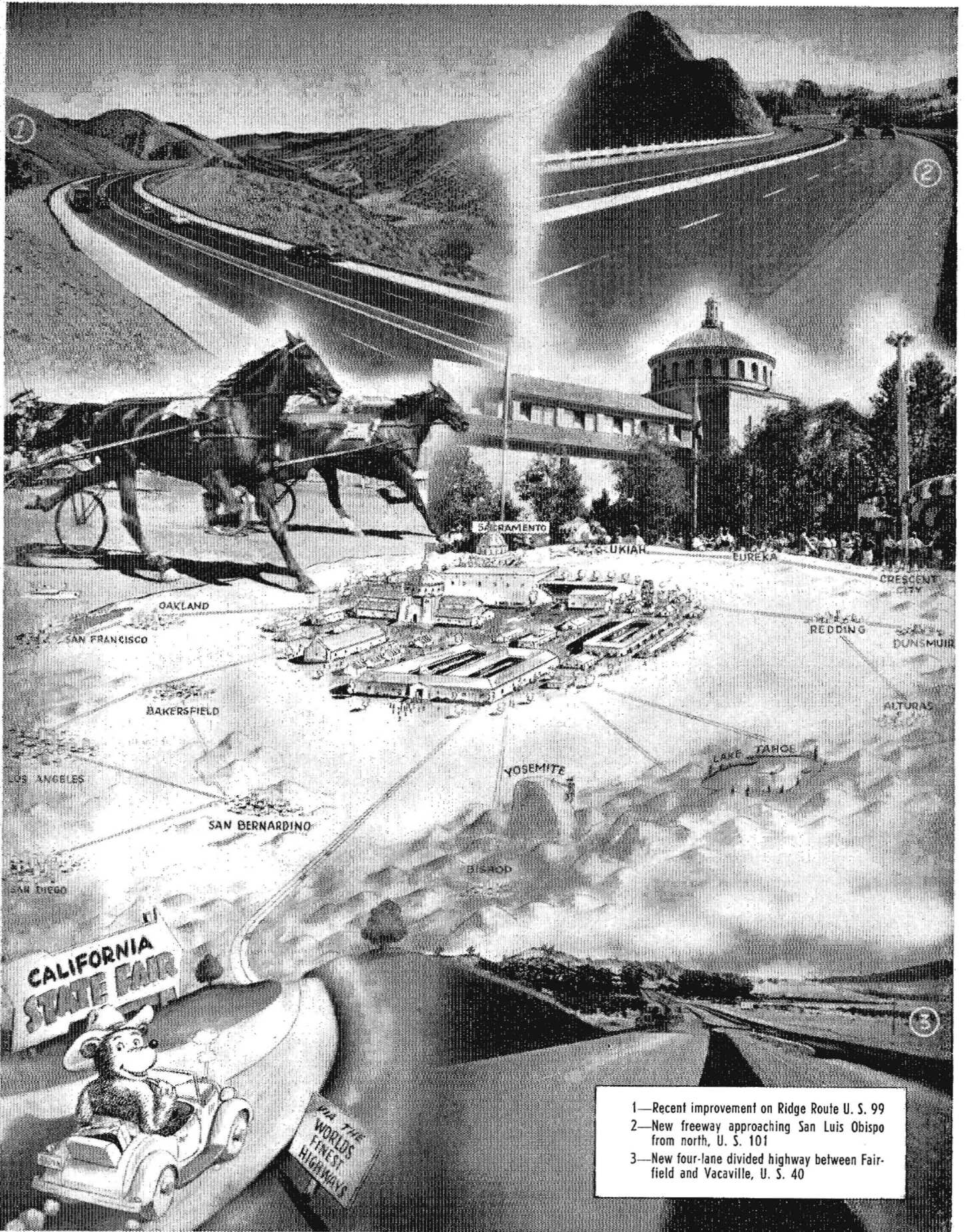
Livestock Show

The fair's livestock show will be greater than ever this year. The fair

is offering a total of \$103,000 in cash premiums, in addition to prized ribbons, to entries in the open and junior divisions. In the latter division, Future Farmers of America will compete during the first five days of the fair, while members of 4-H clubs will vie for honors the final five days.

The West's outstanding horse show will be staged each evening in the Outdoor Arena under the direction of Ed and Tevis Paine. This fashionable event, staged with pomp and circumstance, attracts the best show horses, riders and drivers in the Nation.

During the day, the thoroughbreds and standardbreds will hold the equine



1—Recent improvement on Ridge Route U. S. 99
 2—New freeway approaching San Luis Obispo from north, U. S. 101
 3—New four-lane divided highway between Fairfield and Vacaville, U. S. 40

spotlight in a racing program offering \$121,000 in purses and climaxed by the \$10,000 added Governor's Handicap to be run on September 8th. Seven running and three harness races will be held each weekday during the fair, and five harness races, without betting, will be run off on each of the two Sundays during the Ninetieth Fair.

Fireworks Display

Night activities on the fair grounds will be ushered in by a magnificent display of fireworks. The display will be followed by the night shows, staged in front of the grandstand, and starring such celebrities as Ted Lewis, Frances Langford and Stanley Noonan. The famous Broadbent Chorus will also be back to step through its precision numbers. A male chorus will also be featured.

Hundreds of California's foremost artists will exhibit their works at the fair's art show, to be presented in the new outdoor showplace just across from Governor's Hall. Prizes totaling \$15,000 have made competition the keenest in the history of the fair.

Another stellar feature will be the fashion show, to be staged each evening at the Open Air Theater. Twenty beautiful models will show off the creations of the California apparel industry in these nightly parades of style.

The fair's flower show will again be a paramount attraction. The show will be staged in the Hall of Flowers with its three crystal waterfalls tumbling into streams which course through the building. Spectators may view the mass of blooms from elevated bridges spanning the streams. The fair is offering \$35,000 in premiums to participants in this magnificent showing of California blooms.

Plenty of Entertainment

The Gayway, the fun zone, will be operated this year by Craft Shows and will feature new and thrilling rides, scores of sideshows and innumerable concessions. The same organization will also operate a miniature Gayway, called Kiddie Land, for the children. This attraction will be located just inside the main gate.

Jojo and Bette Ann, the famous clown team, will be back again this year to provide free entertainment for the youngsters. They will stage their

Projects Completed on U. S. 99 Between Oregon Line and Mexican Border

Since 1948 State Fair

<i>Limits</i>	<i>Length miles</i>	<i>Type</i>
<i>Siskiyou County</i>		
Gazelle to 5.5 miles northerly.....	5.5	Surfacing
<i>Sbasta County</i>		
Between Cottonwood and Anderson	5.0	Grade, surface, structures
<i>Yolo County</i>		
Putah Creek to Zamora	6.0	Grade and surface
<i>Butte County</i>		
Nelson to Butte Creek.....	14.0	Grade and surface
<i>Merced and Stanislaus Counties</i>		
Merced River to Hatch Crossing ...	10.9	Surfacing
<i>Fresno County</i>		
Fresno City Limits to San Benito Avenue	1.2	Grade, surface, structures
Belmont Circle to Clinton Avenue..	1.8	Grade and surface
One-half mile north of Kingsburg to Selma	5.2	Grade and pave
<i>Kern County</i>		
Minkler Underpass to Snow Road..	1.4	Surfacing
Grapevine to Switzer's	19.0	Grade and surface
Bakersfield to Snow Road	3.0	Grade, surface, structures
<i>Los Angeles County</i>		
Pico Canyon Road to Route 79.....	3.3	Grade and surface
Violin Saddle to Whitaker Summit	4.4	Grade and surface
9 miles north of Castaic to Frenchman's Flat	3.8	Grade and surface
South of Santa Clara River to Castaic Creek	2.6	Grade and surface
<i>San Bernardino County</i>		
Between E Street and State Street in Redlands	7.2	Grade, surface, structures
Benson Avenue to San Antonio Avenue	1.2	Surfacing
<i>Riverside County</i>		
East City Limits of Banning to Route 187	10.5	Surfacing
<i>Imperial County</i>		
Trifolium Canal to Sandy Beach Road	15.1	Surfacing, structure
Between Calexico and Brawley.....	3.2	Surfacing, structures

popular show each afternoon in the Open Air Theater.

The Open Air Theater will also be the scene of many special events, such as band music, the gold panning cham-

pionship and the Biggest and Best contest.

The Hobby Show and Foods Building will house many attractions, including the Centennial Cookery, fea-

turing pioneer recipes; the interesting display of a wide range of hobbies, a model of the Mt. Lick Observatory and two model trains.

The Industrial Building will contain the latest developments in television and radio and a host of household appliances, while the Regional Building will house the treasures of the Redwood Empire, Alta California, and other areas.

Photographs entered in the North American International Salon of Photography will be displayed in the Woman's Building. Here, too, will be found the home-preserved products and exhibits of needlework.

PROJECTS COMPLETED ON U. S. 40 BETWEEN NEVADA LINE AND SAN FRANCISCO Since 1948 State Fair			
Limits	Length, miles	Type	
Nevada County			
Kingvale to Fox Farm, Donner Summit to 1 mile E. and at Flycasters, 4.5 miles E. of Truckee	3.7	Grade and surface	
Solano County			
Vallejo Wye to 0.5 mile E. of Rt. 208	4.3	Grade and pave	
3.5 miles E. of Fairfield and 0.4 mile E. of Alamo Creek	5.6	Grade, pave, structures	
Between Ledgewood Creek and 3.5 miles E. of Fairfield	4.7	Grade, pave, structures	
Contra Costa County			
Pinole Overhead to E. of Rodeo	1.5	Grade, pave, structures	

All of the countless attractions, with few exceptions, may be enjoyed this year for the reduced price of 50 cents. Children under 12 years of age will be admitted free to the fair. Reservations to the races, the night shows and the horse show—the only shows that require an additional outlay—may be made through Western Union offices in Reno and Carson City and key cities in Northern California. Reservations also may be made through the customary fair facilities. General admission to these three events is 60 cents.

and Public Works

Projects Completed on U. S. 101, U. S. 101 By-pass and U. S. 101 Alternate Between Mexican Border and San Francisco

Since 1948 State Fair

Limits	Length Miles	Type
San Mateo County		
Peninsular Avenue to Poplar Avenue on Bayshore Freeway	0.4	Grade and surfacing
Colma Creek to north city limits of South San Francisco on Bayshore Freeway	4.9	Grade, pave and structures
Santa Clara County		
San Antonio Avenue to Saratoga Road	1.5	Grade and surface
Gish Road to Route 5	0.5	Surfacing
Ford Road to Morgan Hill	6.1	Surfacing
Monterey County		
San Ardo to King City	3.6	Surfacing
San Luis Obispo County		
Miles Station to Marsh Street	6.6	Grade and surface
Pismo Beach to Miles Station	4.9	Grade and surface
Santa Barbara County		
Santa Ynez River to Jonata Park	3.6	Grade and surface
Salsipuedes Overhead Crossing of S. P. R. R.		Overcrossing
Ventura County		
Seacliff to Mussel Shoals	1.2	Grade and surface
Los Angeles County		
Vineland Avenue to Barham Boulevard	1.8	Grade, surface, structure
Through Malibu Junction	3.2	Grade and surface
Calabasas to 1.5 miles westerly	2.2	Grade and surface
Malibu Creek to Las Flores Creek	2.9	Grade and surface
Soto Street to Eastman Avenue	2.0	Grade and pave
Colorado Street Tunnel to Lincoln Boulevard	0.6	Surfacing
Orange County		
1.3 miles south of Los Patos Avenue and Route 43	5.5	Resurfacing
Between Route 43 and Irvine Avenue	0.6	Surface

INTERNATIONAL HOUSE

BERKELEY 4, CALIFORNIA
May 18, 1949

CALIFORNIA HIGHWAYS AND
PUBLIC WORKS
P.O. Box 1499
Sacramento, California

GENTLEMEN: My father has been receiving your excellent magazine at

his permanent home. However, for at least two years he will be in Afghanistan working with the Morrison-Knudsen, Inc. I am sure he would like to receive it there, and if you would be so kind as to send it to him there, he and I would appreciate it. The old and new addresses are given below. Thank you.

Yours very sincerely,

JOHN M. DANSKIN, JR.

Bridge Builders Organize Course In Orientation

Recognizing the need for new employees, and for many of the older ones as well, to become familiar with the organizations and functions of the various sections of the Division of Highways, Bridge Department, the engineers in that department have organized a series of weekly talks and discussions. These are held in the Board Room of the Public Works Building every Wednesday from 12.30 to 1 p.m. With nearly 100 employees in the Sacramento Office of the Bridge Department alone, assignments are necessarily specialized, and many do not have the opportunity to learn what is going on in departments or sections other than their own.

Customarily, in a large business organization, problems of indoctrination and in-service training are handled by formal lecture courses and printed hand-outs prepared by the management's personnel experts. However, these Bridge Department meetings are informal in nature. Programs have been chosen and arranged by a committee of the members of the organization and are designed to present the subject matter in as brief and interesting a manner as possible. Although attendance is entirely voluntary and on the individual's own time, meetings have been regularly attended by a large majority of the members.

Series of Talks

The suggestion for such a series of talks was made at a meeting of the Planning Section of the Bridge Department and met with a favorable response. Those present chose a committee composed of seven of the younger members who proceeded at once to arrange details and select speakers.

The meetings started with talks by Cass Rose of the Highway Design Office on the operation of the Burns-Collier Act. Jasper Womack, Engineer of Advance Planning and Frank Reynolds, Assistant Budget Engineer, spoke on the inception and planning of high-

FREEMAN H. CUSHMAN RETIRES

THE DIVISION OF HIGHWAYS has lost a most valued employee through the retirement of Freeman H. Cushman, Senior Highway Engineer. He retired July 31, after 27 years of state service.

Mr. Cushman started his career filing saws for a Tacoma sawmill in 1897. After completing his formal education at Stanford University, he worked for various engineering concerns on the Pacific Coast on drafting, topographic, construction and maintenance work, involving railways, hydroelectric, tunnels, and dams.

Between 1910 and 1920 he was Assistant Engineer for the City of Tacoma, in which post he created an enviable reputation in handling earthwork by leveling off numerous hills. He took a leave of absence in 1917 when he was commissioned as a captain in the Army Engineers Corps, serving until the end of World War I.

From 1920 to 1922, Mr. Cushman was field engineer for the Portland Cement Concrete Association in Spokane, Washington.

In 1922 he entered state service on the staff of the Division of Highways at Headquarters Office where he has remained until his retirement as Senior Highway Engineer. In this position, Mr. Cushman handled a multitude of details, which, through his long expe-

rience, made him an excellent leader. He was one of the originators of the present Stores Department of the Division, organized in 1947, and with which he has been associated since its inception. The vast knowledge he has accumulated on engineering materials and supplies will be a loss to that organization.



FREEMAN H. CUSHMAN

rience, made him an excellent leader. He was one of the originators of the present Stores Department of the Division, organized in 1947, and with which he has been associated since its inception. The vast knowledge he has accumulated on engineering materials and supplies will be a loss to that organization.

Upon his retirement, Mr. Cushman will take a much needed rest and plans to take up golf seriously.

way projects. Subsequent talks have been given by members of the Bridge Department as follows:

Wilbur Robison, Preliminary Surveys; C. H. Harned, Special Foundation Investigations; Claude Darby, Preliminary Layouts and Designs; R. Robinson Rowe, Hydraulic Investigations; Ralph Hutchinson, Design Procedure (general); Jason Plowe, Design Procedure (freeways); M. A. Koontz, Specifications; Merle Godwin, Bridge Maintenance Procedure.

The general idea of the talks has been to follow, in logical sequence, the steps through which a bridge project must progress from the time it is first

recommended until it it opened to traffic, and to outline how the work is handled.

The committee in charge of this orientation course expects to continue the talks for several months and to arrange special trips and inspections to places of technical interest such as a steel fabricating shop.

The caliber of the prepared talks and the interest shown in them by the members of the Bridge Department indicate that the procedure followed in this case is worthy of careful consideration by those interested in personnel training.

Strategy

Morongo Indians Figure How to Get New Uniforms for Ball Team

By RAY E. O'BIER, District Right of Way Agent

DISTRICT VIII recently concluded successful negotiations with the Morongo Indian Tribe and allottees involving the acquisition of land and access rights on a controlled basis across lands held in ownership by the tribe and individual allottees. This is the first case in which the department has acquired access rights through Indian lands.

An interesting highlight in the transaction with the Indians involved the relocation of approximately three miles of barbed wire fence. At the time the present four-lane divided highway was constructed, the Indian tribe demanded that its land be fenced, the fence to be placed upon its property. During the meetings with the tribe for the current acquisition, the question of relocating the fence was immediately brought up by one of the women members of the tribe. She spoke of the men having to go long distances in order to obtain work and thought it would be a fine thing to have their men working closer to the reservation for a change. She requested that the tribe be paid for relocating the fence rather than to have the work performed by the state contractor or other agencies. Before the tribe would consent to the right of way transaction, the state representative had to agree to the relocation of the fence as requested by the tribe.

All for Baseball Team

The Indians did not want the pay for the relocation work to be included in the right of way transaction as then the money therefor would have been deposited with the Federal Government, which would not suit their purposes. An agreement providing for relocation of the fence was executed by the Tribal Committee. It provided that the tribe would do all work and furnish all tools and equipment necessary to complete the work for an agreed price.

It was voted by the tribe that any profits accruing from the relocation work would be used for the purchase of new baseball



LULU MARTIN, Official Scorekeeper for Morongo Braves

suits so that their team would compare favorably when playing the richer Indians from the Palm Springs Reservation. The baseball team was so anxious that there would be a profit that its members volunteered to build one mile of fence for nothing. The tribe would not consent to this, believing that a fair portion of the money should be paid out in wages.

To make sure that all the money allowed by the State for the relocation work would not be paid out in wages, every man on the baseball team got a job on the fence and allowed no loafing by the workers. Needless to say, the baseball uniforms were purchased.

Morongo Reservation

The Morongo Indian Reservation lies north and easterly of the city of Banning in Riverside County and comprises approximately 30,762 acres, most of which is used as desert grazing land and small irrigated farms. The reservation consists of even-numbered government-owned sections and has a highway frontage of approximately three miles, one-half mile of which consists of private allotments, that is, separate allotments of land owned by

individual Indians. There are 302 members of the tribe and over 200 members live on the reservation and have their own homes.

The reservation was established by executive order dated May 15, 1876. Some reservations in other states are known as nations, such as the Cherokee Nation. State laws, in general, do not apply to the reservation, neither does the law of condemnation; however, it is our understanding that lands which have been allotted to individual Indians can be condemned.

The original right of way acquisition from this same Indian tribe was made in 1940. However, the width obtained at that time was insufficient for freeway standards, but was all the right of way that could be obtained from the tribe at that time. The current acquisition was for a strip of land, 50 feet wide, across tribal land and 20 feet wide across private allotments, making a minimum right of way width of 170 feet, and access rights.

A definite procedure for acquiring Indian lands is prescribed by the Department of Interior and since it was also proposed to acquire access rights, the transaction was thoroughly discussed with H. W. Gilmore, Assistant to the State Director, California Indian Agency, whose office is located in Riverside, California. The first step was to contact the spokesman for the tribe and arrange for a meeting between representatives of the State and the Tribal Committee. Approximately four such meetings were held where the State made its offer for the value of the land and access rights.

Tribal Committee Meets

The Tribal Committee tentatively gave its approval, but, due to the fact that the transaction involved the taking of 15.13 acres of tribal land together with the access rights along the entire frontage and, also, since access rights was a term with which none of them

... Continued on page 60

Freeway Fiesta

Multi-million Dollar Highway
In Oakland Open to Traffic

TRAFFIC is moving in an increasing flow over the second unit of the Eastshore Freeway in Oakland from Fifth and Oak Streets to 23d Avenue, following dedication ceremonies which were held on July 22d.

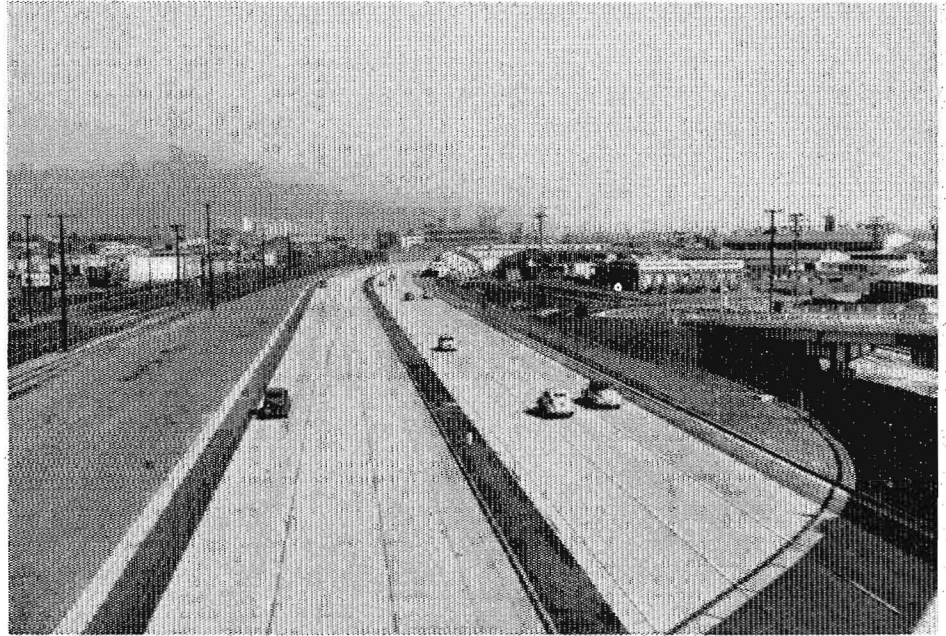
Representatives of the federal, state, county and city governments participated in a "Freeway Fiesta" celebrating the completion of the second section of the freeway, which to date has cost approximately \$17,000,000, of which \$2,900,000 was federal aid money.

At the present time there are current contracts in progress for completion of the project as far south as 98th Avenue. The next unit, extending the freeway to 12th Street and 42d Avenue, near High Street, should be put in operation in July of 1950. The extension of the freeway as far as 98th Avenue, which would give service to San Leandro, is expected to be completed and opened to traffic sometime between July of 1950 and the end of that year.

The California Highway Commission expects to progressively add to the Eastshore Freeway in future budgets to the end that there will be a completed freeway to at least a connection with Hesperian Boulevard near San Lorenzo sometime in 1952.

Dedication ceremonies were held in the shadow of the 23d Avenue Overpass which culminated when C. H. Purcell, Director of Public Works and Chairman of the Highway Commission, removed the last barrier to traffic by cutting a chain with an acetylene torch.

Purcell headed a list of speakers including Thomas A. Caldecott, Chairman of the Alameda County Advisory Committee and Vice Chairman of the Alameda County Board of Supervisors, Mayor Clifford E. Rishell of Oakland, State Senator Arthur H. Breed, City Councilman Frank Osborne of Alameda, Robert Klein, Assistant City Manager of San Jose, State Highway Engineer George T. McCoy, Highway Commissioner Harrison R. Baker of



Completed section of Eastshore Freeway opened to traffic on July 22d



Director of Public Works C. H. Purcell cuts barrier on Eastshore Freeway. LEFT TO RIGHT—Highway Commissioner Walter Sandelin, Ukiah; Clifford E. Rishell, Mayor of Oakland; Highway Commissioner James A. Guthrie; Harry Bartell, Chairman, Board of Supervisors of Alameda County; Highway Commissioner Harrison Baker, Pasadena; Thomas E. Caldecott, Supervisor, Alameda County; Highway Commissioner Chas. T. Leigh, San Diego; William H. Park, President Oakland Chamber of Commerce; Mr. Purcell; Joseph Kirby, Oakland Junior Chamber of Commerce; Elwyn Dunstan, President, Oakland Junior Chamber of Commerce; Captain J. B. Harney, Oakland Naval Air Station; Harold Saunders, Emeryville Industries Association; Charles Grant, Air Reduction Sales Company



Vehicles of antique vintage take part in "Parade of Transportation"

Pasadena, Mayor Fred Watson of San Jose, Mayor W. J. Branscheid of Alameda, and Colonel Jno. H. Skeggs, Assistant State Highway Engineer, who supervised the freeway project.

A spectacular feature of the celebration was a "Parade of Transportation" through downtown Oakland to the dedication site at 23d Avenue, in which horse drawn vehicles, cars of ancient

vintage, and newest model automobiles took part.

The ceremonies were arranged by the Oakland Junior Chamber of Commerce, which served 1,500 spectators at a noon-day barbecue, for which tables had been set on the freeway. Joe Kirby, Jr., was general chairman and master of ceremonies, assisted by W. H. Park, President of the Oakland Chamber of Commerce.

Crowd gathers on Eastshore Freeway near the 23d Avenue Overpass to partake of a barbecued steak luncheon



and Public Works

State Highway Window Display In Bakersfield

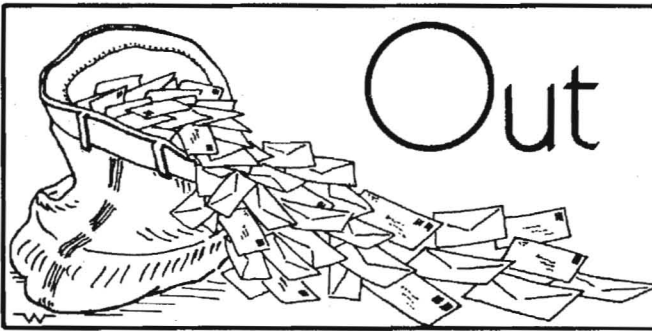
By JOHN R. WEST
Associate Right of Way Agent

THE KERN COUNTY Chamber of Commerce maintains a show window which is just to the right of the main entrance to the Hotel El Tejon on 17th Street in Bakersfield.

The writer was complimenting Gay Hoffman, General Manager of the Kern County Chamber of Commerce, on one of the exhibits which had been placed in the window, and it was suggested that a highway educational display might be interesting. Mr. Hoffman thought it a good idea and asked if such an exhibit could be arranged.

We searched through the District VI files and obtained aerial and other photographs, also data concerning highway development in and near Bakersfield. The photo in the lower center of the exhibit, U. S. 99, showed a view of the old "Grapevine," before being improved as a modern highway. The three lower pictures at the right, showed portions of the famous Grapevine, the two lower before improvement, and the upper of the three, after improvement. The lower and the upper of the three were taken practically from the same location. Other photos were aerial views of the highway work completed during the past two years on U. S. 99 through and north of Bakersfield.

Graphic representations at left and right showed the accident rate, U. S. 99, one north of Bakersfield, and one south of Bakersfield, before improvement as a four-lane divided highway as compared to after such improvement. A decided drop in accident rate per thousand car traffic was shown, after improvement as a four- and six-lane divided highway. A tabulation in the center showed that about five and a half million dollars was spent by the State during the past two years in Kern County.



Out of the Mail Bag

INTEREST IN PRISON LABOR

PENNSYLVANIA ECONOMY LEAGUE, INC.
611 Blackstone Building
HARRISBURG, PA.

CALIFORNIA HIGHWAYS AND
PUBLIC WORKS
P. O. Box 1499
Sacramento, California

GENTLEMEN: Would it be possible for the Pennsylvania Economy League to be placed on your mailing list for the publication *California Highways and Public Works*?

We are particularly interested in the current series of articles on "Prison Labor Road Camps in California." Because of our interest in highway problems in Pennsylvania, many additional articles in the periodical will no doubt also be helpful to us.

We shall very much appreciate any consideration you can give this request.

Sincerely yours,

B. ELIZABETH ULRICH
Librarian

NOW ON MAILING LIST

CALIFORNIA PACKING CORPORATION
Los Angeles Office

LOS ANGELES

*California Highways and
Public Works*
Sacramento, Calif.

DEAR SIR: May I be put on the list to receive your publication, "California Highways and Public Works."

I am much impressed with the publication and consider the information as put out by it very valuable.

Yours very truly,

W. W. BERRIS

OHIO ON LIST

STATE OF OHIO
DEPARTMENT OF HIGHWAYS

CHILLICOTHE, OHIO
CALIFORNIA HIGHWAYS AND
PUBLIC WORKS
P. O. Box No. 1499
Sacramento, California

GENTLEMEN: We wish to take this opportunity to thank you for publications which you sent us—*California Highways and Public Works*—for periods from January to August, 1948.

As suggested in our letter, we would like to be placed on your mailing list in order to receive these booklets regularly. Since California leads in super highways of America, we are interested in keeping abreast of progress, and find many articles in these periodicals of great value in the planning of Ohio highways.

Very truly yours,

JOSEPH N. DOYLE
Assistant to Chief Engineer
W. P. MARTIN
Division Plan Engineer

LIKES MAGAZINE

VACAVILLE, CALIF.

*California Highways and
Public Works*
Sacramento, Calif.

GENTLEMEN: I am very glad to be on your mailing list. I value your magazine very highly, also the fine pictures in it. I keep your magazines on file with my National Geographic Magazine. I always read it very carefully and am very glad to keep posted about the State highway work.

Very sincerely,

NEWT M. TATE

A COMPLIMENT

MICHIGAN
STATE HIGHWAY DEPARTMENT
Lansing 13
Charles M. Ziegler
State Highway Commissioner

KENNETH C. ADAMS, Editor
*California Highways and
Public Works*
Sacramento, California

DEAR MR. ADAMS: Our department is considering changing the format of our departmental house organ. Your magazine has always stood out as the best in our display rack.

It would be appreciated if you would tell us how much it costs to publish this fine magazine. We would also be interested to know if the funds for publishing are budgeted in your Division of Public Relations. If not, will you kindly advise how the money is budgeted.

Yours very truly,

ELMER J. HANNA
Public Relations Division

WE HOPE SO

PENNSYLVANIA ECONOMY LEAGUE, INC.
State Division

HARRISBURG, PA.
June 10, 1949

EDITOR
*California Highways and
Public Works*
Sacramento, California

DEAR SIR: Thank you very much for placing our name on your mailing list for *California Highways and Public Works*.

I am sure the publication will be very helpful to us.

Sincerely yours,

B. ELIZABETH ULRICH
Librarian

California Highways

FROM PARIS

VIA
28, Rue de la Grange Bateliere
Paris, France

PARIS, LE

MR. CHARLES H. PURCELL, *Director*
California Highways and
Public Works
Sacramento, California, U. S. A.

DEAR SIR: On the occasion of a visit to the head office at the Ministry of Public Works, Transports and Tourism, we had recently the opportunity to look through different numbers of your very interesting magazine.

We are publishing ourselves a review pertaining to roads and aeronautic infrastructure problems. Referring to this title, we should very much appreciate an exchange with your publication.

May we also request your authorization to publish in "Via" extracts of your publication, mentioning the origin. It is naturally understood that we shall grant you the same authorization regarding the articles inserted in "Via," if you were interested in such.

We are sending you under separate cover the two latest issues of "Via," Nr 5 and Nr 6.

Awaiting the pleasure of a favorable reply, we remain, dear sir,

Very truly yours,

L. FLANDROIS
Director-Chief Redactor

FROM BRITISH COLUMBIA

BURRARD IRON WORKS, LIMITED
231-235 Alexander Street

VANCOUVER, B. C.

The Union Diesel Engine Co.
Oakland, Calif.

GENTLEMEN: We have just received a copy of California Highways and Public Works, for which we thank you. We wish we had some of your good roads in British Columbia and some of your road engineers.

Reading this journal makes one want to visit California.

BURRARD IRON WORKS, LTD.
K. D. BROWN, President

FROM NORWAY

DIPL. ING. OTTO KAHRS
STATENS BILSAKKYNDLIGE

OSLO, 16th May 1949

THE EDITOR
California Highways and
Public Works
P.O. Box 1499
Sacramento, California

DEAR MR. ADAMS: I just received the January-February number for 1949 and beg to express my best thanks for this most interesting and valuable magazine, which I trust I may receive regularly.

I have arranged that "Meddelelser fra Vegdirektøren (Information from Director of Roads), a Norwegian equivalent to *California Highways and Public Works*, will be sent regularly to you, but of course I am quite aware that the knowledge of English is more widely available in Norway than knowledge of Norwegian most probably may be in California.

Furthermore, our magazine is quite inferior to yours, both in size, makeup and interest.

Will you permit me to express my admiration of the many interesting articles in the first number, parts of which may be used here.

Yours faithfully,

OTTO KAHRS

OF COURSE

1971 Hopkins Street
BERKELEY 7, CALIFORNIA
June 22, 1949

California Highways and Public
Works

P. O. Box 1499
Sacramento, California

GENTLEMEN: My name is on your mailing list to receive copies of your publications as they are issued, and I just received the May-June, 1949 issue, which I think is so interesting I would like to have another copy to send to a relative in Arabia, who knows the State of California well.

If I am entitled to another copy I shall appreciate it very much if you will forward it to me.

Thanking you for this courtesy.

Yours very truly,

MRS. GERTRUDE G. CAPRON

FROM AN ENTHUSIAST

WOODLAND, CALIF.

July 12, 1949

California Highways and
Public Works
P. O. Box 1499
Sacramento, California

GENTLEMEN: I own and operate the Harry Carrow Service Station at Browns Corner just outside of Woodland, Calif. In the business of selling gasoline, oils, etc., I find it would be of great assistance to be able to explain intelligently to my customers the use and need of the gasoline tax.

The California Highways and Public Works Magazine has just been called to my attention as a publication to acquaint the public with the work and progress of extending and keeping in repair our already famous highways.

I should very much like to be put on your mailing list for California Highways and Public Works Magazine, that I might be of better service to my customers in clearing up questions on some of the highway expense problems.

Sincerely yours,

HARRY CARROW
716 Third Street
Woodland, California

TO ENGLAND

DIVISION OF HIGHWAYS
SACRAMENTO, CALIFORNIA

DEAR SIR: Your magazine *California Highways and Public Works* has been coming to our house for over a year. I am a woman but I thrill when I read about and see pictures of the wonderful highway construction projects and the obstacles overcome in their making. I am so proud of our State and its highways, that I write to ask you if you would send your magazine to England. I know an engineer over there. I would like to let him see and know what our highway commissioners are doing.

Wishing you continued success in your work of making our State a motorist's paradise and thanking you,

I am sincerely,

MRS. WILLIAM P. BENSON
3245 Herman Avenue
San Diego, California

Fairfield By-Pass

New Project on U. S. 40
Is Nearing Completion

By C. J. TEMBY, Assistant District Engineer

THE OPENING to traffic on July 2, 1949, of two lanes of the unit of state highway in Solano County, between Ledge-wood Creek and 3.5 miles northeast of Fairfield, known as the Fairfield By-pass, represents further progress in providing additional traffic facilities on U. S. Highway 40 between the San Francisco Bay area and Sacramento. The entire four-lane divided highway is expected to be completed September 1, 1949.

This particular unit of State Highway Route 7 is constructed on new location. The proposal for relocating U. S. Highway 40 to by-pass the City of Fairfield was presented to the city council in regular session on March 18, 1947, and it approved the relocation.

The California Highway Commission declared it a freeway on December 10, 1947. The right of way was acquired with 160 feet minimum width with access rights obtained to provide for a limited access freeway.

Saving in Distance

The new route, 4.7 miles in length, replaces 6 miles of old state highway, thus making a saving to state highway users of 1.3 miles. In addition to the decreased traveled distance, the new route by-passes the City of Fairfield, thus eliminating the necessity for highway traffic to travel over the city streets of Fairfield and an 800-foot radius curve with a 90-degree central angle immediately east of Fairfield, resulting in an average saving of operation time of about 3½ minutes per vehicle. This will result in an estimated average annual saving of vehicle operation time in excess of 200,000 vehicle hours.

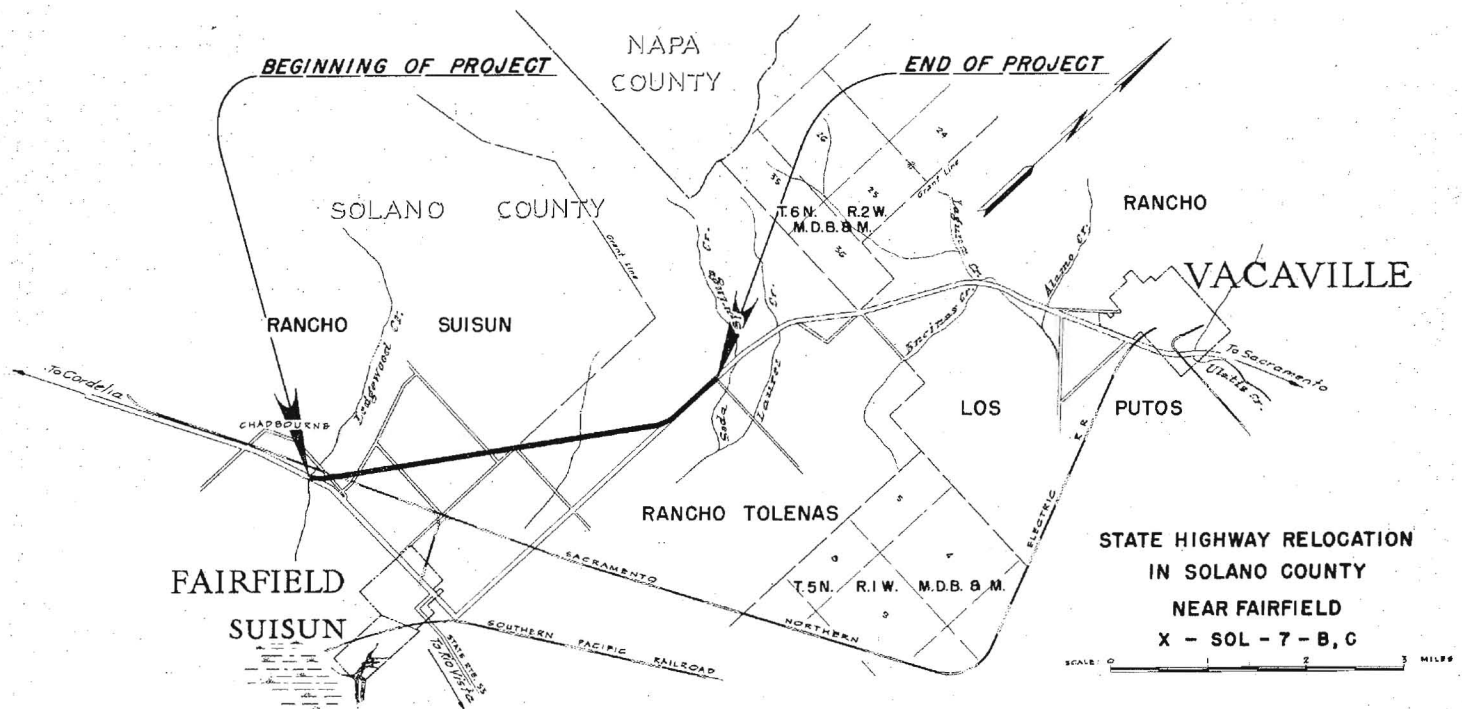
Fairfield, the county seat of Solano County, and its companion city, Suisun, is located in Suisun Valley, rich in agriculture and dairy products, has had a constantly increasing population over the last several years. During the Second World War, the Fairfield-Suisun Air Field, located about five miles

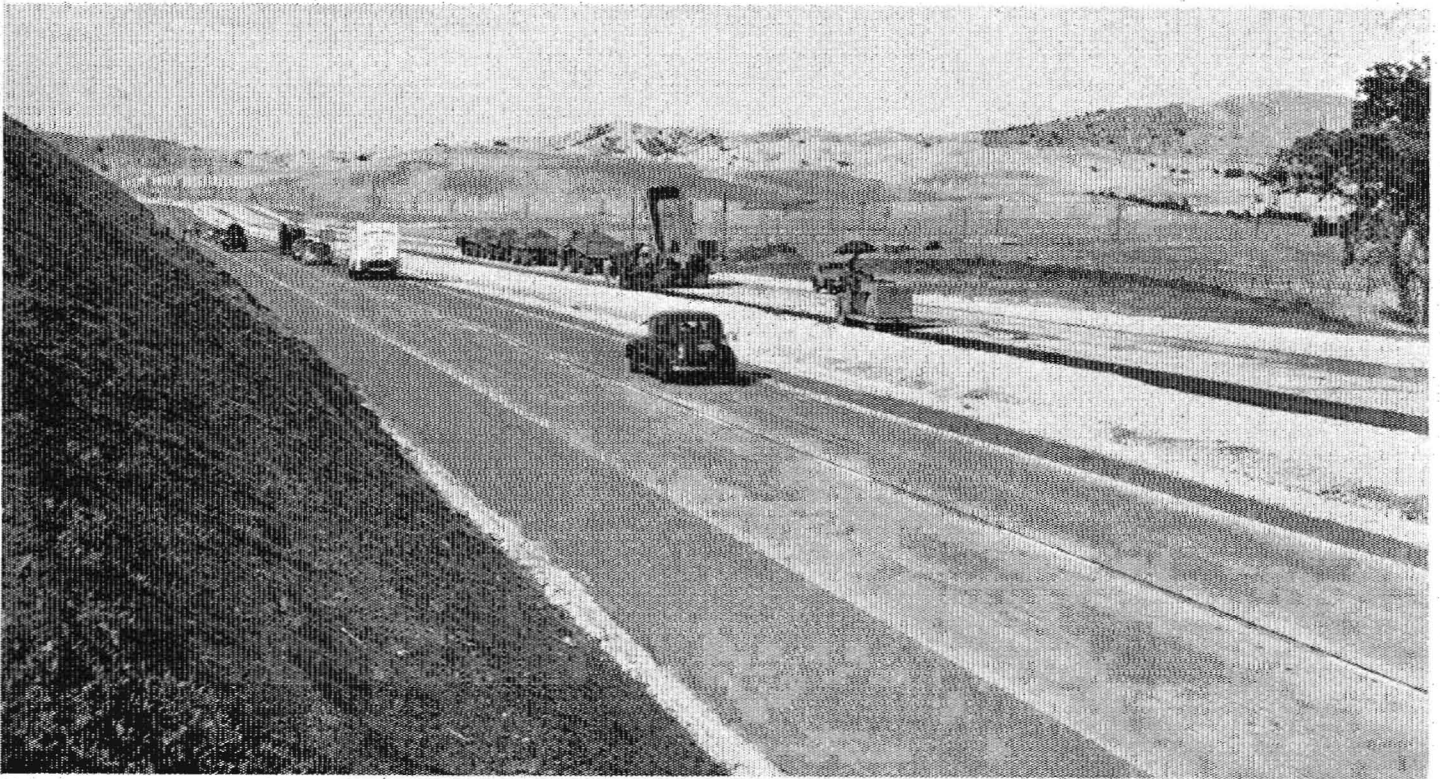
east of Fairfield, was constructed and is still in operation. The service men's families and workers at the air field have contributed greatly to the population increase since 1940. This increased population created housing problems resulting in many new homes and housing facilities and similarly many additional vehicles in the community.

City Street Congested

Practically the entire business zone of Fairfield is located on the city street on which the existing state highway is routed, consisting of stores, restaurants, cafes, service stations, garages, banks, business offices, the county court house, high school, library, and other miscellaneous buildings. The volume of highway and local traffic on this street has been steadily increasing for the past several years to the extent of congestion of highway and street

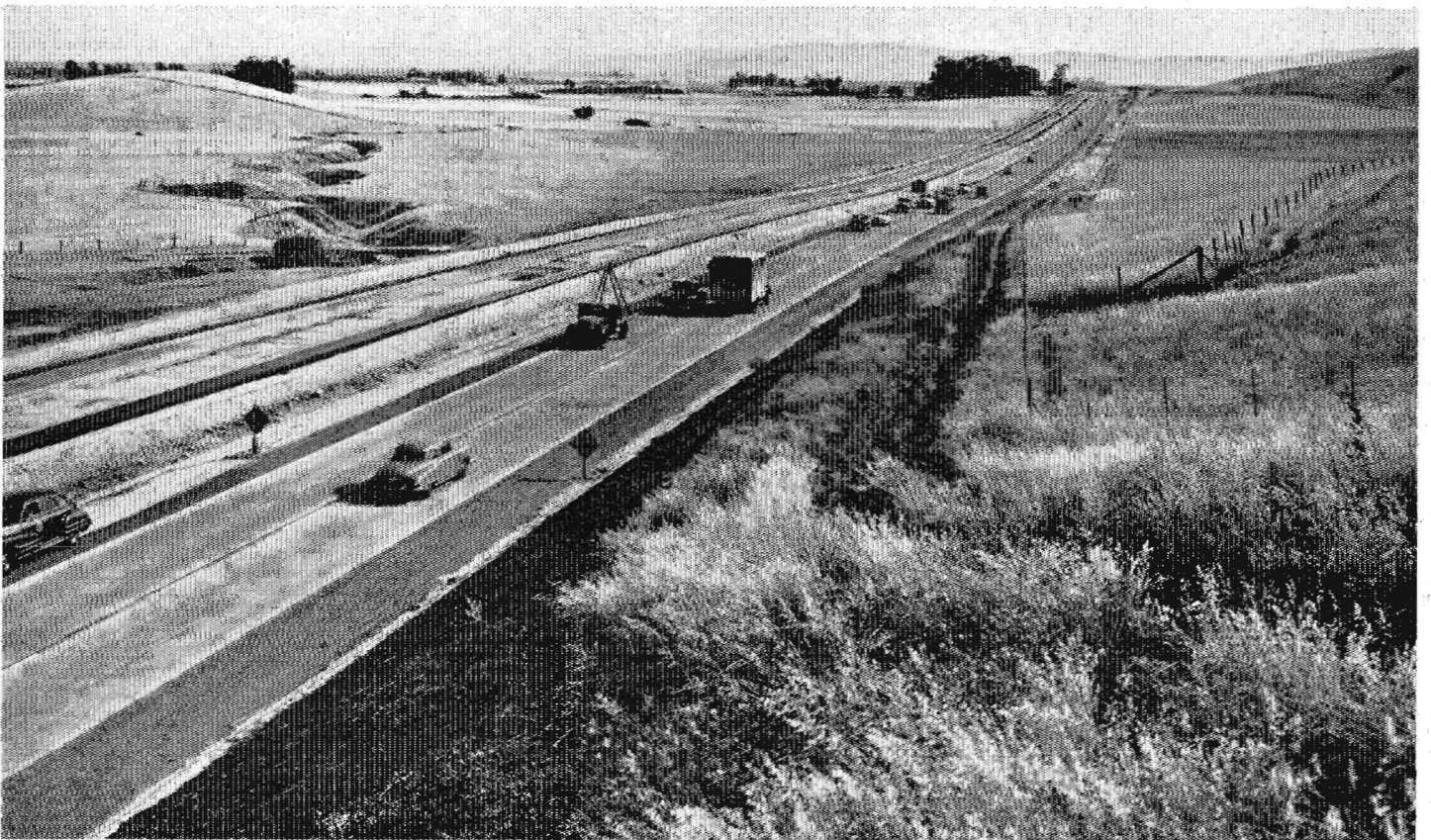
... Continued on page 64





Fairfield By-pass under construction near the east end of project. Traffic is using southbound lane as a two-lane highway

About middle of new highway under construction looking west. Traffic is using southbound lanes as a two-lane highway



Highway Bids and Awards for May, June, July, 1949

May, 1949—Continued

PLACER COUNTY—Between one mile east of Auburn, and one mile west of Applegate, about 6.1 miles, four-lane divided highway to be graded and two reinforced concrete overhead structures over the tracks of the Southern Pacific Co. to be constructed. District III, Route 37, Section A. N. M. Ball Sons, Berkeley, \$1,186,699; Bressi & Bevanda Constructors, Inc., North Hollywood, \$1,131,556; Fredrickson & Watson Construction Co., Oakland, \$1,206,691; Granite Construction Co., Watsonville, \$1,341,656; Vinnell Company, Inc., Alhambra, \$1,345,546; Winston Bros. Co. & Yount Constructors, Inc., Azusa, \$1,389,186; A. Teichert & Son, Inc., Sacramento, \$1,436,412; Fredrickson Bros., Emeryville, \$1,437,970; Bent Construction Co., Los Angeles, \$1,460,283. Contract awarded to United Concrete Pipe Corp., Ralph A. Bell; & Westbrook & Pope, Sacramento, \$1,107,646.

RIVERSIDE COUNTY—In the City of Palm Springs, between 3.5 miles and 0.4 mile south of north city limits, about 2.5 miles in length, to be surfaced with plant-mixed surfacing on existing pavement and shoulders. District VIII, Route 187, Section PSp. Basich Bros. Construction Co. and Basich Bros., San Gabriel, \$22,415; R. A. Erwin, Colton, \$27,650; John J. Swigart Co., Torrance, \$29,826. Contract awarded to R. P. Shea Co., Indio, \$21,455.

RIVERSIDE COUNTY—Between 3.2 and 4.3 miles west of Corona, two reinforced concrete and structural steel overheads over the tracks of the A. T. & S. F. Railway Co., a reinforced concrete and structural steel bridge across the Santa Ana River, a reinforced concrete bridge across Oakwing Creek, and a reinforced concrete and structural steel highway separation structure over Route 43 to be constructed. District VIII, Route 77, Section E. W. J. Disteli, Los Angeles, \$479,504; Charles MacClosky Co., San Francisco, \$492,208; Byerts & Sons & E. C. Perham, Los Angeles, \$497,837; Bates & Rogers Construction Corp., San Francisco, \$504,560; Judson Pacific-Murphy Corp., Emeryville, \$516,600; Winston Bros. Co. & Yount Constructors, Inc., Azusa, \$521,767; Bent Construction Co., Los Angeles, \$539,796; Sharp & Fellows Contracting Co., Los Angeles, \$555,037; Norman I. Fadel, North Hollywood, \$557,207; Cox Bros. Construction Co., Stanton, \$613,298. Contract awarded to R. M. Price Co. & O. B. Pierson, Altadena, \$477,427.

RIVERSIDE AND SAN BERNARDINO COUNTIES—Between Russell Street in Riverside and 0.3 mile north of San Bernardino County line, about 2.6 miles to be graded and surfaced with plant-mixed surfacing on cement treated base. District VIII, Route 43, Sections Riv., C.F. Geo. Herz & Co., San Bernardino, \$439,980; Basich Bros. Construction Co. & Basich Bros., San Gabriel, \$445,869; Fredrickson & Kasler, Sacramento, \$480,588; Griffith Co., Los Angeles, \$490,516; Cox Bros. Construction Co., Stanton, \$526,794; Matich Bros. & E. L. Yeager, Riverside, \$579,945. Contract awarded to J. A. Payton, Riverside, \$428,728.40.

SAN BERNARDINO COUNTY—Between R Street and Walnut Street in Needles, about 0.4 mile, to be graded, surfaced with imported borrow and bituminous surface treatment applied. District VIII, Route 58, Section N. Ned. Herz Paving Co., San Bernardino, \$13,895; R. A. Erwin, Colton, \$13,612; Covina Construction Co., Covina, \$12,374; K & H Co., Colton, \$14,817. Contract awarded to Ken Lowe, San Bernardino, \$8,989.

SAN DIEGO COUNTY—Between San Marcos Creek and Carlsbad and between Oceanside and Las Flores, a net length of about 4.3 miles, to be surfaced with plant-mixed surfacing. District XI, Route 2, Sections B, C. John J. Swigart Co., Torrance, \$68,870; Griffith Co., Los Angeles, \$68,968; Cox Bros. Construction Co., Stanton, \$80,125; R. E. Hazard Contracting Co., San Diego, \$83,478. Contract awarded to R. P. Shea Co., Indio, \$54,770.

SAN DIEGO COUNTY—Between 0.1 mile and 0.9 mile east of Santa Ysabel and between 6.4 miles and 5.9 miles west of Ramona, about 1.3 miles, to be graded, surfaced with selected material and bitumi-

nous surface treatment and seal coat applied. District XI, Routes 78, 198, Sections C, H. E. C. Young & Co., Bakersfield, \$69,943; Eimer Bros. Inc., Escondido, \$76,837; Bonadiman-McCain, Inc., Los Angeles, \$94,042; Morris Van Meter, Bonita, \$113,167. Contract awarded to Clifford C. Bond & Co., Arcadia, \$68,184.70.

SAN FRANCISCO COUNTY—Between Augusta Street and 25th Street, about 1.3 miles, to be graded and paved with portland cement concrete on cement-treated subgrade and plant-mixed surfacing on cement-treated base; a grade separation structure, two undercrossings, a pedestrian undercrossing and an off-ramp overcrossing to be constructed; and highway lighting and traffic signals to be furnished and installed. District IV, Route 68, Section SF. Clindon Construction Co. of California and Eaton & Smith, San Francisco, \$2,937,704; Bates & Rogers Construction Corp. and Parish Bros., San Francisco, \$3,021,448; Stolte, Inc., United Concrete Pipe Corp., and Ralph A. Bell, Oakland, \$3,231,949; Fredrickson & Watson Construction Co., M & K Corp., Piombo Construction Co. and Hass & Rothschild, Oakland, \$3,280,287; MacDonald, Young & Nelson, Inc., and Morrison-Knudsen Co. Inc., San Francisco, \$3,358,074. Contract awarded to Guy F. Atkinson Co. and Chas. L. Harney, Inc., South San Francisco, \$2,819,378.90.

SAN LUIS OBISPO COUNTY—Portions of Polonio Pass Road and Cottonwood Pass Road, between Cholame and Kern County line, a net distance of about four miles, imported borrow to be placed over portions of existing roadbed and surfaced with plant-mixed surfacing on imported borrow cement stabilized. District V, Routes 33, 125, Sections C, D. Madonna Construction Co., San Luis Obispo, \$143,331; Granite Construction Co., Watsonville, \$148,950. Contract awarded to Valley Paving & Construction Co., Inc., Pismo Beach, \$125,396.25.

SISKIYOU COUNTY—At Clear Creek, about nine miles south of Happy Camp, a reinforced concrete girder bridge and approaches thereto to be constructed. District II, Route 46, Section A. Fred J. Maurer & Son, Eureka, \$131,070; Chittenden & Chittenden, Auburn, \$144,276; Grant L. Miner, Palo Alto, \$145,885; Ransome Company, Emeryville, \$164,986. Contract awarded to G. M. Carr & Bati Rocca, Santa Rosa, \$129,779.25.

SOLANO AND YOLO COUNTIES—Between 0.7 mile east of Ulatis Creek and 0.5 mile west of Yolo Causeway, crossovers to be widened and concrete curbs and barrier posts to be constructed. District X, Routes 7, 6, Sections DIA, EA. J. Henry Harris, Berkeley, \$73,793; A. Teichert & Son, Inc., Sacramento, \$33,021; W. G. LeFever, Sacramento, \$83,793. Contract awarded to Harms Bros., Sacramento, \$69,040.50.

SONOMA COUNTY—At various locations between Cloverdale and Healdsburg, a net distance of about 4.8 miles, to be graded and surfaced with plant-mixed surfacing. District IV, Route 1, Section A. E. A. Forde, San Anselmo, \$165,889; Harms Bros. and C. M. Syar, Sacramento, \$193,108; J. Henry Harris, Berkeley, \$203,001. Contract awarded to A. G. Raisch Co., San Francisco, \$152,429.50.

VENTURA COUNTY—Between junction Route 2 at Camarillo and junction Route 9 near Somis, about 4.1 miles in length, plant-mixed surfacing to be placed over existing pavement and shoulders to be constructed of imported base material and bituminous surface treatment applied thereto. District VII, Route 153, Section B. Conrad & Crowder, Inc., Ojai, \$77,485; Jesse S. Smith, Glendale, \$78,755; C. J. B. Construction Co., Oxnard, \$84,287; Griffith Co., Los Angeles, \$85,101; Baker & Pollock, Ventura, \$86,010; Dimmitt & Taylor, Monrovia, \$93,273. Contract awarded to Frank T. Hickey, Inc., Los Angeles, \$77,028.

YOLO COUNTY—At Saltroyer and Salt Creeks, about four miles west of Capay, two reinforced concrete box culverts to be constructed and about 0.7 mile of roadway to be graded and bituminous surface treatment applied thereto. District III, Route 50, Section C. W. C. LeFever, Sacramento, \$46,711; Jensen & Pitts, San Rafael, \$49,428; A. G. Raisch

Co., San Francisco, \$49,429; Chittenden & Chittenden, Auburn, \$50,782; McGillivray Construction Co., Sacramento, \$53,406; C. C. Steele, Sacramento, \$53,978; Rice Bros., Inc., Marysville, \$56,788; J. Henry Harris, Berkeley, \$64,979. Contract awarded to O'Connor Bros., Red Bluff, \$45,285.90.

June, 1949

ALAMEDA COUNTY—Between Greenville and 1.5 miles west of Livermore, about 5.8 miles to be graded and surfaced with Portland cement concrete pavement on cement treated subgrade and with plant-mixed surfacing on existing pavement and on various types of bases; miscellaneous drainage structures and a water supply system to be constructed or installed; and highway lighting facilities to be furnished and installed. District IV, Route 5, Sections E, F, B. United Concrete Pipe Corp., Baldwin Park, \$890,340; Fredrickson & Watson Construction Co., Oakland, \$914,627; Fredrickson Bros., Emeryville, \$965,809; A. G. Raisch Co., San Francisco, \$966,771; Guy F. Atkinson Co., South San Francisco, \$984,015; M. J. B. Construction Co., Stockton, \$992,390; Parish Bros., Benicia, \$1,053,807; Granite Construction Co., Watsonville, \$1,082,380; Stolte Inc. & The Duncanson-Harrelson Co., Oakland, \$1,122,300. Contract awarded to Harms Bros. & N. M. Ball Sons, Berkeley, \$888,291.95.

BUTTE COUNTY—At Oroville Maintenance Site, a truck shelter, gas and oil house, storehouse, loading ramp, sewage disposal facilities, and fence to be constructed. District III, Route 21, Section A. R. Taylor Willis, Santa Rosa, \$15,609; James H. McFarland, San Francisco, \$19,589. Contract awarded to Robert Taylor, Oroville, \$12,684.34.

CONTRA COSTA COUNTY—At the intersection of San Pablo Avenue and Tennyson Avenue in the City of Pinole, furnish and install traffic signal and lighting system. District IV, Route 14, Pin. Tri-Cities Electrical Service, Inc., Los Angeles, \$9,361; Abnett Electric Corp., Emeryville, \$9,403; Severin Electric Co., San Francisco, \$9,769; Underground Electric Construction Co., Oakland, \$9,835; Spott Electrical Co., Oakland, \$9,876; Ed Pierce Electric Co., Vallejo, \$11,600. Contract awarded to L. H. Leonard Electric Construction Co., San Rafael, \$8,899.

DEL NORTE COUNTY—Across Mill Creek, in Mill Creek Redwoods State Park, a reinforced concrete slab bridge to be constructed. District I, Mill Creek Redwoods State Park. J. Henry Harris, Berkeley, \$46,634; Fred J. Maurer & Son, Eureka, \$48,024; Baldwin, Straub Corp., San Rafael, \$48,686. Contract awarded to Mercer, Fraser Company, Inc., Eureka, \$43,237.

DEL NORTE COUNTY—In Mill Creek State Park, seven timber bridges to be replaced with corrugated metal pipe culverts and about 0.4 mile of roadway to be graded and surfaced with imported base material. District I, Mill Creek State Park. Tom Hull, Eureka, \$37,910; Wayne Janetzky & Geo. Stout, Merced, \$42,950; Fred J. Maurer & Son, Eureka, \$43,720; J. Henry Harris, Berkeley, \$47,521; C. M. Syar, Vallejo, \$55,541. Contract awarded to Mercer, Fraser Co., Inc., Eureka, \$32,852.80.

INYO COUNTY—At Bishop, about 0.4 mile to be resurfaced with road-mixed surfacing and drainage to be corrected. District IX, Route 23, Sections D, Bis, E. Browne & Krull, Hayward, \$52,469; Oilfields Trucking Co., Inc., & Phoenix Construction Co., Inc., Bakersfield, \$58,269; Edward Green, Los Angeles, \$64,661. Contract awarded to Bishop Engineering and Construction Co., Bishop, \$43,103.39.

KERN COUNTY—Between Grapevine Station and Switzer's, about 19.1 miles of plant-mixed surfacing borders to be constructed. District VI, Route 4, Sections B, C. Dicco, Inc., Bakersfield, \$42,332; Miles & Bailey, Madera, \$55,750. Contract awarded to Griffith Co., Los Angeles, \$38,412.50.

KERN COUNTY—Between Mojave and 0.8 mile north, about 0.8 mile to be graded and surfaced with road-mixed surfacing on imported base material. District IX, Route 23, Section B. Covina Construction Co., Covina, \$34,512; E. C. Young & Co., Bakersfield, \$37,117; Robert R. Hare, Glendale, \$40,987;

Arthur A. Johnson, Laguna Beach, \$41,283; Anderson Company, Visalia, \$41,795; Oilfields Trucking Co. & Phoenix Construction Co., Bakersfield, \$49,846; G & H Paving Co., Los Angeles, \$53,958. Contract awarded to Davis & Swartz, Bakersfield, \$33,985.

KERN COUNTY—Between Mojave and San Bernardino County line, about 11.5 miles, applying Class "B-Single" seal coat. District IX, Route 58, Sections A, B. Ken H. Jones, Sepulveda, \$13,554; A. A. Veit Co., Tujunga, \$16,808; Oilfields Trucking Co., Inc., & Phoenix Construction Co., Inc., Bakersfield, \$16,870; Guerin Co., Glendale, \$17,276. Contract awarded to G & H Paving Co., Los Angeles, \$13,471.20.

LOS ANGELES COUNTY—On Hollywood Parkway in the City of Los Angeles between Glendale Boulevard and Grand Avenue, about 1.2 miles to be graded and surfaced with Portland cement concrete pavement on cement treated subgrade. District VII, Route 2. J. E. Haddock, Ltd., Pasadena, \$938,784; Griffith Co., Los Angeles, \$968,001; Winston Bros. Co. & Yount Constructors, Inc., Azusa, \$975,013; McDonald & Kruse & Fred D. Chadwick & Co., Glendale, \$1,036,964. Contract awarded to N. M. Ball Sons, Berkeley, \$938,108.27.

LOS ANGELES COUNTY—On Hollywood Parkway in the City of Los Angeles between Virgil Avenue and Glendale Boulevard, about 1.6 miles to be graded and surfaced with Portland cement concrete pavement on cement treated subgrade. District VII, Route 2. Griffith Co., Los Angeles, \$1,301,794; Winston Bros. Co. & Yount Constructors, Inc., Azusa, \$1,323,349; United Concrete Pipe Corp. & Ralph A. Bell & Jesse S. Smith, Baldwin Park, \$1,325,470; J. E. Haddock, Ltd., Pasadena, \$1,338,717; Peter Kiewit Sons Co., Arcadia, \$1,393,767. Contract awarded to N. M. Ball Sons, Berkeley, \$1,287,397.37.

LOS ANGELES COUNTY—Between San Fernando Blvd. and Burbank Blvd. in the City of Burbank, a distance of about 0.8 mile to be graded and paved with asphalt concrete on cement treated base. District VII, Route 4. Oswald Bros. Co., Los Angeles, \$196,125; S. A. Cummings, Compton, \$218,597. Contract awarded to Griffith Co., Los Angeles, \$183,475.

LOS ANGELES COUNTY—At the intersection of Foothill Boulevard and Indian Hill Boulevard, in the City of Claremont, furnish and install traffic signal and lighting system. District VII, Route 9. C. D. Draucker, Inc., Los Angeles, \$9,870; Tri-Cities Electrical Service, Inc., Los Angeles, \$10,018. Contract awarded to Paul R. Gardner, Ontario, \$9,775.80.

LOS ANGELES COUNTY—Between south city limits of Lynwood and Patata Street, a distance of about 1.7 miles, to be resurfaced with plant-mixed surfacing. District VII, Route 167, Lyn, SGT. Griffith Co., Los Angeles, \$45,946; Vido Kovacevich Co., South Gate, \$46,248; Oswald Bros. Co., Los Angeles, \$47,569; Vernon Paving Co., Inc., Los Angeles, \$47,642; Cox Bros. Construction Co., Stanton, \$47,729. Contract awarded to C. O. Sparks, Inc. & Mundo Engineering Co., Los Angeles, \$45,110.

LOS ANGELES COUNTY—On Rosemead Boulevard from Beverly Boulevard to Garvey Avenue, furnish and install full traffic actuated signal systems and highway lighting at three intersections and highway lighting at two intersections. District VII, Route 168, Sections B, C. Tri-Cities Electrical Service, Inc., Los Angeles \$42,762; Westates Electrical Construction Co., Los Angeles, \$44,408; Paul R. Gardner, Ontario, \$45,219. Contract awarded to C. D. Draucker, Inc., Los Angeles, \$42,452.

MENDOCINO COUNTY—Across Salmon Creek about 0.6 mile south of Albion, a structural steel truss bridge on reinforced concrete towers, bents and abutments to be constructed. District I, Route 56, Section D. Bates & Rogers Construction Corp., San Francisco, \$352,182; Granite Construction Co., Watsonville, \$376,148; Lew Jones Construction Co., San Jose, \$376,164; Dan Caputo, San Jose, \$378,614; Guy F. Atkinson Co., South San Francisco, \$381,661; Erickson, Phillips & Weisberg, Oakland, \$383,506; Metzger Co., San Pablo, \$385,473; Fred J. Maurer & Son, Eureka, \$386,488; Charles MacClosky Co., San Francisco, \$396,825; J. H. Pomeroy & Co., Inc., San Francisco, \$398,417; Fredrickson Bros., Emeryville, \$428,532. Contract awarded to Judson Pacific Murphy Corp., Emeryville, \$324,958.80.

MERCED COUNTY—Between Cox Ferry Bridge and Snelling, about 6.3 miles, borders to be excavated, backfilled with untreated rock base and surfaced with plant-mixed surfacing. District X, Route 123, Section B. George Stout, Merced, \$41,915; Elmer J. Warner, Stockton, \$45,800. Contract awarded to River Rock, Inc., Merced, \$38,060.

NEVADA COUNTY—At Squirrel Creek about 5 miles west of Grass Valley about 0.1 mile, furnishing and installing a field assembled plate culvert, grading and surfacing approaches thereto. District III, Route 15, Section A. W. C. Lefever & D. Gerald Bing, Sacramento, \$32,425; O'Conner Bros., Red Bluff, \$32,591; Rice Bros., Inc., Marysville, \$32,974; Tyson & Watters Co., Sacramento, \$34,510; Huntington Bros., San Anselmo, \$35,930; M. J. Ruddy & Son, Modesto, \$37,424; J. Henry Harris, Berkeley, \$38,971; Arthur B. Siri, Inc., Santa Rosa, \$41,333. Contract awarded to Miles & Bailey, Madera, \$29,947.

NEVADA COUNTY—In Truckee, between intersection of Commercial Row with Bridge Street and ½ mile east, about 0.5 mile to be graded and surfaced with plant-mixed surfacing on gravel base. District III, Route 38, Section A. Harms Bros., Sacramento, \$82,791. Contract awarded to J. Henry Harris, Berkeley, \$64,879.80.

RIVERSIDE COUNTY—Between Mira Loma and 2.5 miles west of Riverside, three intersections to be graded and surfaced with plant-mixed surfacing. District VIII, Route 19, Section A. R. A. Erwin, Colton, \$43,099; Geo. Herz & Co., San Bernardino, \$46,736. Contract awarded to Covina Construction Co., Covina, \$40,939.75.

RIVERSIDE COUNTY—Between 3.3 miles north of Imperial County line and 4.0 miles north of Blythe, three reinforced concrete slab bridges and a reinforced concrete pipe siphon to be constructed and four existing bridges to be removed. District XI, Route 146, Sections A, B, C. E. S. & N. S. Johnson, Fullerton, \$54,786; Thomas Construction Co., San Fernando, \$55,637; E. L. Thorsten, Santa Monica, \$60,144; R. P. Shea Co., Indio, \$65,866. Contract awarded to E. G. Perham, Los Angeles, \$46,479.

SAN BENITO COUNTY—Between Tres Pinos and 0.25 mile north, about 0.3 mile to be graded, imported subbase and base materials to be placed, surfaced with plant-mixed surfacing and a seal coat to be applied thereto. District V, Route 119, Section E. Paul E. Woolf, Fresno, \$34,716; H. Sykes, Patterson, \$35,185; George Stout & Wayne Janetzy, Merced, \$35,403; Leo F. Piazzi, San Jose, \$35,719. Contract awarded to Granite Construction Co., Watsonville, \$28,958.

SAN BERNARDINO COUNTY—At Yermo and Amboy Maintenance Stations, cottages to be constructed. District VIII, Routes 31, 58. Sections H, J. Contract awarded to the Mahoney-Morrison Co., Sunland, \$24,578.35.

SAN BERNARDINO COUNTY—Near Cajon, between 0.9 mile east and 3.8 miles east of junction with Route 31, about 2.9 miles, to apply bituminous surface treatment to existing roadbed. District VIII, Route 59, Section C. K & H Company, Colton, \$9,970; Garrett Construction Co., Claremont, \$11,530; R. A. Erwin, Colton, \$14,260; Ken Lowe, San Bernardino, \$12,770. Contract awarded to Herz Paving Co., San Bernardino, \$9,767.

SAN BERNARDINO COUNTY—Between Erwin Lake and 1 mile east of Route 43, about 3 miles, imported borrow to be placed and bituminous surface treatment applied thereto. District VIII, Route 190, Section G. K & H Company, Colton, \$19,526; Dana Company, Inc., Fawnskin, \$21,746; Frank Day, Big Bear Lake, \$24,046. Contract awarded to George Herz & Co., San Bernardino, \$19,468.50.

SAN DIEGO COUNTY—On Cannon Street in the City of San Diego between Rosecrans Street and one-half mile west, about 0.5 mile, to be resurfaced with plant-mixed surfacing and a reinforced concrete pipe storm drain and appurtenances to be constructed. District XI, Route 12. Walter H. Barber, La Mesa, \$82,828; R. E. Hazard Contracting Co., San Diego, \$93,816. Contract awarded to Pace Construction Co., San Diego, \$74,288.18.

SAN DIEGO COUNTY—At intersection of state highway with Fifth and Grand Avenues in the City of Escondido, furnish and install full traffic actuated signal systems and intersection lighting. District XI, Route 77. Westates Electrical Construction Co., Los Angeles, \$20,140; Paul R. Gardner, Ontario, \$21,271; Ets-Hokin & Galvan, San Diego, \$22,261;

Ed Seymour, Long Beach, \$22,850. Contract awarded to Clinton Electric Corp., Los Angeles, \$18,367.

SAN DIEGO COUNTY—In the City of Escondido, between 15th Avenue and Grant Avenue, about 17 miles to be landscaped. District XI, Route 77, Section B, Esd. Stephen L. Vistica, San Mateo, \$19,951. Contract awarded to Jannoch Nurseries, Altadena, \$17,867.50.

SAN DIEGO COUNTY—At San Luis Rey Maintenance Station site, junction of Routes 77 and 195, maintenance station to be constructed. District XI, Routes 77, 195, Sections G, B. Culberson-Kettle Co., Oceanside, \$33,950. Contract awarded to O. O. & R. E. Maurer, San Diego, \$24,611.07.

SAN JOAQUIN COUNTY—On Borden Highway, between Old River and Middle River about 4.3 miles in length, untreated rock base to be placed over existing surfacing and plant-mixed surfacing placed on the central portion, imported borrow shoulders to be constructed and metal plate guard railing to be placed. District X, Route 75, Section A. M. J. B. Construction Co., Stockton, \$106,807; Browne & Krull, Hayward, \$115,479; A. Teichert & Son, Inc., Sacramento, \$117,658; Granite Construction Co., Watsonville, \$119,087; J. Henry Harris, Berkeley, \$123,451; E. A. Forde, San Anselmo, \$124,588; Clements & Co., Hayward, \$126,305; C. M. Syar, Vallejo, \$130,987. Contract awarded to M. J. Ruddy & Son, Modesto, \$101,884.

SAN LUIS OBISPO COUNTY—Over Brizzolari Creek on Pepper Lane on the campus of California Polytechnic College. District V. Henry C. Dalessi, San Luis Obispo, \$6,458; Maino Construction Co., San Luis Obispo, \$6,785; Madonna Construction Co., San Luis Obispo, \$7,500; Valley Paving and Construction Co., Pismo Beach, \$7,747. Contract awarded to Threewit & Webb, Buttonwillow, \$5,576.

SAN MATEO COUNTY—At Cypress Creek, about 0.6 mile north of Santa Cruz-San Mateo County line, about 0.3 mile to be graded and surfaced with road-mixed surfacing. District IV, Route 56, Section A. Paul E. Woolf, Fresno, \$32,551. Contract awarded to Granite Construction Co., Watsonville, \$29,883.40.

SAN MATEO COUNTY—At Half Moon Bay Maintenance Station, two miles south of Half Moon Bay, a chain link fence to be constructed. District IV, Route 56, Section C. American Steel & Wire Co., Cyclone Fence Div., Oakland, \$1,676; Anchor Post Products, Inc., of California, San Francisco, \$1,687; California Wire Cloth Corp., Oakland, \$2,071. Contract awarded to San Jose Steel Co., Inc., San Jose, \$1,622.08.

SANTA BARBARA COUNTY—Between Orcutt Wye and Santa Maria, about 2 miles to be graded and surfaced with plant-mixed surfacing. District V, Route 2. Ted F. Baum, Fresno, \$240,754; Baker & Pollock, Ventura, \$241,106; Rand Construction Co., Bakersfield, \$242,839; Valley Paving and Construction Co., Inc., Pismo Beach, \$243,142; Frederickson & Kastle, Sacramento, \$267,085; Cox Bros. Construction Co., Stanton, \$272,241. Contract awarded to Madonna Construction Co., San Luis Obispo, \$230,778.50.

SAN BERNARDINO AND RIVERSIDE COUNTIES—Between South E Street and State Street in Redlands; between east city limits of Banning and Route 187, and between San Diego County line and one mile north of Temecula, a net distance of about 23.4 miles, seal coat to be applied. District VIII, Routes 26, 77, Sections E, A, Rld, C, A. K & H Co., Colton, \$28,625; George Herz & Co., San Bernardino, \$29,886; Ned H. Mulleneaux, Oceanside, \$29,911; I. L. McClanahan, Arlington, \$29,924; Match Bros., Colton, \$32,996; R. A. Erwin, Colton, \$33,519. Contract awarded to G & H Paving Co., Los Angeles, \$27,159.30.

SANTA BARBARA COUNTY—Between Railroad Avenue and west city limits of Santa Maria, about 0.5 mile to be graded and surfaced with plant-mixed surfacing on stabilized imported base material. District V, Route 148. Valley Paving and Construction Co., Inc., Pismo Beach, \$54,090; Rand Construction Co., Inc., Bakersfield, \$55,841; Ted F. Baum, Fresno, \$57,145; Nichols & Berry, Santa Barbara, \$60,065. Contract awarded to Madonna Construction Co., San Luis Obispo, \$53,817.

SANTA CLARA COUNTY—At the intersection of Clay Street with Lafayette Street and Grant Street with Franklin Street, in the City of Santa Clara, furnishing and installing traffic signal and highway lighting systems. District IV, Route 2.

Manning and Whitaker, Inc., San Francisco, \$15,046; Underground Electric Construction Co., Oakland, \$15,075; L. H. Leonardi Electric Construction Co., San Rafael, \$15,137; Tri-Cities Electric Service, Inc., Los Angeles, \$15,491; Abbett Electric Corp., San Francisco, \$15,593; Malm & Welter, San Jose, \$17,056. Contract awarded to Severin Electric Co., San Francisco, \$14,443.

SANTA CRUZ COUNTY—On lower Soquel Road, 250 feet south of State Highway Route 56, three prefabricated metal buildings to be erected; grading and surfacing to be done; fencing to be constructed; gasoline and diesel oil pumps and tanks to be installed, drainage, sewage and electrical facilities to be installed. District IV. George C. Renz Construction Co., Inc., Gilroy, \$31,399; W. J. Nicholson Co., Santa Clara, \$32,446; Granite Construction Co., Watsonville, \$35,558. Contract awarded to Guerin & Morgan, Los Gatos, \$27,891.

SHASTA COUNTY—At various locations, near Redding and at Fall River Mills, portions, about 22.7 miles in length, Class "A-Fine" seal coat to be applied. District II, Routes 3, 20, 1074, 1076, Sections A, Rdg. C, A, B, I. J. Ely Co., San Anselmo, \$31,592; Fredrickson & Watson Construction Co., Oakland, \$32,961; Jensen & Pitts, San Rafael, \$35,314; W. C. Railing, Redwood City, \$37,087; J. Henry Harris, Berkeley, \$43,552. Contract awarded to Morgan Construction Co., Redding, \$30,750.70.

SHASTA COUNTY—About 6 miles west of Burney, about one mile to be graded and surfaced with road-mixed surfacing. District II, Route 28, Section C. M. W. Brown, Redding, \$40,857; W. C. Railing, Redwood City, \$43,718; J. Henry Harris, Berkeley, \$46,497. Contract awarded to W. B. Jones, Palo Cedro, \$33,361.40.

SHASTA AND SISKIYOU COUNTIES—Between Crespo's and Spring Hill, portions, about 35.1 miles in net length, crusher run base (cement treated) to be placed on portions of existing roadbed, plant-mixed surfacing to be placed on new crusher run base and on existing surfacing, and a Class "D" seal coat to be applied. District II, Route 3, Sections C, D, A, Dmr. M.Sha. Granite Construction Co., Watsonville, \$433,040; Rice Bros., Inc., Marysville, \$439,733; Fredrickson & Watson Construction Co., Oakland, \$480,558; A. Teichert & Son, Inc., Sacramento, \$528,927; Peter Kiewit Son's Co., Arcadia, \$566,340; Winston Bros. Co. & Yount Constructors, Inc., Azusa, \$574,470. Contract awarded to McGillivray Construction Co., Sacramento, \$424,445.

SOLANO COUNTY—Constructing chain link fence at the Fairfield Maintenance Station, about ¾ mile west of Fairfield. District X, Route 7, Section B. Anchor Post Products, Inc., of California, San Francisco, \$3,800; The California Wire Cloth Corp., Oakland, \$3,813. Contract awarded to San Jose Steel Co., Inc., San Jose, \$3,455.03.

SOLANO COUNTY—Near Vallejo, furnish and install full traffic actuated signal systems and highway lighting at three intersections and semitrafic actuated signals and highway lighting at two intersections. District X, Route 7, Sections F, G. Severin Electric Co., San Francisco, \$50,953; Underground Electric Construction Co., Oakland, \$51,049; L. H. Leonardi Electric Construction Co., San Rafael, \$51,126; Ed Pierce Electric Co., Vallejo, \$52,950; Manning and Whitaker, Inc., San Francisco, \$53,014; Abbett Electric Corp., San Francisco, \$54,870; Del Monte Electric Co., Oakland, \$55,948; Stanley Pierce Electric Co., Vallejo, \$61,423; Scott-Buttner Electric Co., Inc., Oakland, \$62,985. Contract awarded to Tri-Cities Electrical Service, Inc., Los Angeles, \$47,078.

SONOMA COUNTY—At Fort Ross Maintenance Station, a foreman's cottage and garage to be constructed. District IV, Route 56, Section D. Contract awarded to Walter N. Makaroff, Guerneville, \$12,614.

TULARE COUNTY—Between 1 mile south of Tipton and Tulare Airport, about 7.8 miles to be paved with portland cement concrete pavement on cement treated subgrade and plant-mixed surfacing on crusher run base. District VI, Route 4, Section B. Griffith Company, Los Angeles, \$634,149; Guy F. Atkinson Co., South San Francisco, \$662,950; A. G. Raisch Co., San Francisco, \$674,747; Cox Bros. Construction Co., Stanton, \$686,923; M. J. B. Construction Co., Stockton, \$727,149; Fredrickson Bros., Emeryville, \$731,681; Fredrickson & Watson Construction Co., Oakland, \$744,344; Peter Kiewit Sons' Co., Arcadia, \$799,532. Contract awarded to N. M. Ball Sons, Berkeley, \$633,228.90.

TULARE COUNTY—Across St. John's River about 4 miles northeast of Visalia, a reinforced concrete girder bridge to be constructed and about 1.2 miles of roadway to be graded and surfaced with plant-mixed and untreated rock surfacing. District VI, Route 133, Section A. Rex B. Sawyer, Visalia, \$154,609; Charles MacClosky Co., San Francisco, \$156,789; H. Earl Parker, Inc. & Thomas Construction Co., San Fernando, \$160,589; N. M. Ball Sons, Berkeley, \$163,898; Northup Construction Co., Long Beach, \$164,682; Guy F. Atkinson Co., South San Francisco, \$167,536; Browne & Krull, Hayward, \$179,958. Contract awarded to Anderson Company, Visalia, \$148,363.

VENTURA COUNTY—Between Montalvo and Ventura, about 1.8 miles to be surfaced with plant-mixed surfacing. District VII, Route 2, Section C. Jesse S. Smith, Glendale, \$59,605; C. J. B. Construction Co., Oxnard, \$63,235; Griffith Co., Los Angeles, \$63,910; Nichols & Berry, Santa Barbara, \$64,410; Dimmitt & Taylor, Monrovia, \$66,770. Contract awarded to Baker and Pollock, Ventura, \$59,121.50.

VENTURA COUNTY—Between Route 2 near El Rio and Oxnard, about 2.1 miles to be graded and paved with portland cement concrete and asphalt concrete on cement treated subgrade and base. District VII, Route 60, Sections B, Oxn. Baker and Pollock, Ventura, \$276,736; Cox Bros. Construction Co., Stanton, \$290,160; United Concrete Pipe Corp. & Jesse S. Smith, Baldwin Park, \$297,707; Silva & Hill Construction Co., Los Angeles, \$307,173. Contract awarded to Griffith Co., Los Angeles, \$249,050.

VENTURA COUNTY—At the intersection of Oxnard Boulevard with Saviers Road and with Gonzales Road, furnish and install full traffic actuated signal system and intersection lighting. District VII, Route 60, Section B. C. D. Draucker, Inc., Los Angeles, \$12,374. Contract awarded to Tri-Cities Electrical Service, Inc., Los Angeles, \$11,611.

VENTURA COUNTY—Between Wells Road and Ellsworth Barranca, about 1.4 miles, existing roadbed to be widened and surfaced with plant-mixed surfacing. District VII, Route 79, Section A. Nichols & Berry, Santa Barbara, \$35,033; Frank T. Hickey, Inc., Los Angeles, \$35,862; Jesse S. Smith, Glendale, \$36,315; Dimmitt & Taylor, Monrovia, \$37,504; Griffith Co., Los Angeles, \$37,515. Contract awarded to C. J. B. Construction Co., Oxnard, \$34,226.56.

VENTURA COUNTY—Between mile 2.5 and mile 6.4 north of Ventura City limits, about 4 miles in length, shoulders to be graded and surfaced with plant-mixed surfacing on untreated rock base; and plant-mixed surfacing to be placed on existing surfacing. District VII, Route 138, Section A. Conrad & Crowder, Inc., Ojai, \$94,494; Jesse S. Smith, Glendale, \$99,155; C. J. B. Construction Co., Oxnard, \$99,974; Dimmitt & Taylor, Monrovia, \$100,997; Griffith Co., Los Angeles, \$103,335; Covina Construction Co., Covina, \$104,952; Ventura Pipe Line Construction Co., Ventura, \$108,865. Contract awarded to Frank T. Hickey, Inc., Los Angeles, \$90,894.

YUBA COUNTY—At Marysville, on "D" Street, nine piers of the existing bridge across the Yuba River to be repaired. District III, Route 3, Section B, Mvl. Dragline Rentals Co., Long Beach, \$107,927; Grant L. Miner, Palo Alto, \$108,898; Erickson, Phillips and Weisberg, Oakland, \$111,372; Ben C. Gerwick, Inc., San Francisco, \$118,393; Dan Caputo, San Jose, \$122,479. Contract awarded to Underground Construction Co., Oakland, \$97,515.20.

F.A.S. County Projects

BUTTE COUNTY—Between Cherokee Canal and Pennington Road, about 3.7 miles to be graded and bituminous surface treatment applied and two reinforced concrete girder bridges widened. District III, Route 758. W. H. Darrough, Yuba City, \$108,647; Close Building Supply, Hayward, \$109,887; Rice Brothers, Inc., Marysville, \$109,941; Tyson & Waters Co., Sacramento, \$114,969; Arthur B. Siri, Inc., Santa Rosa, \$119,645; Granite Construction Co., Watsonville, \$123,384; W. C. Lefever & D. Gerald Bing, Sacramento, \$135,730; J. Henry Harris, Berkeley, \$137,591; O'Connor Bros., Red Bluff, \$145,506. Contract awarded to W. H. O'Hair Company, Colusa, \$103,597.75.

BUTTE COUNTY—Between Oroville Wyandotte Road and Oroville-Quincy Highway at Ward Boule-

vard, about 2.3 miles to be graded and culverts to be installed. District III, Route 759. Close Building Supply, Hayward, \$48,751; Arthur B. Siri, Inc., Santa Rosa, \$49,439; Tyson & Waters Co., Sacramento, \$49,779; M. W. Brown, Redding, \$50,176; Huntington Bros., San Anselmo, \$54,856; W. H. Darrough, Yuba City, \$55,047; Baker Bros., Contractors, Chico, \$59,093; W. C. Lefever & D. Gerald Bing, Sacramento, \$63,699; Granite Construction Co., Watsonville, \$64,397; W. H. O'Hair Co., Colusa, \$73,529; O'Connor Bros., Red Bluff, \$74,716; Miles & Bailey, Madera, \$77,960; M. Malfitano & Son, Inc., Pittsburg, \$79,396. Contract awarded to Richter Bros., Oroville, \$47,919.75.

EL DORADO COUNTY—Between Lotus-Rescue Road and State Route 65 about 3.9 miles to be graded and surfaced with imported material and penetration treatment and a seal coat applied. District III, Route 1097. M. W. Brown, Redding, \$60,111; Arthur B. Siri, Inc., Santa Rosa, \$64,832; W. C. Lefever & D. Gerald Bing, Sacramento, \$73,124; J. Henry Harris, Berkeley, \$76,008; Harms Bros., Sacramento, \$77,616; W. C. Railing, Redwood City, \$91,525. Contract awarded to Tyson & Waters Co., Sacramento, \$54,700.80.

LOS ANGELES COUNTY—Across San Gabriel River on Valley Boulevard, near El Monte, a new deck plate girder bridge to be constructed and existing plate girder bridge to be reconstructed and approximately 0.5 mile of approaches to be graded and paved with asphaltic concrete pavement and pre-mix pavement on aggregate base and existing pavement. District VII, Route 852. Winston Bros. Co. & Yount Constructors, Inc., Azusa, \$626,196; Byerts & Sons & E. G. Perham, Los Angeles, \$634,272; Erickson, Phillips & Weisberg, Oakland, \$670,431; Chas. J. Rounds & Lars Oberl, Los Angeles, \$674,745; United Concrete Pipe Corp. & Ralph A. Bell, Baldwin Park, \$715,614; Guy F. Atkinson Co., Long Beach, \$739,377; Spencer Webb Co., Los Angeles, \$785,103; Charles MacClosky Co., San Francisco, \$788,536; J. E. Haddock, Ltd., Pasadena, \$816,768; Carlo Bongiovanni, Los Angeles, \$860,444. Contract awarded to W. J. Disteli, Los Angeles, \$602,859.15.

STANISLAUS COUNTY—At San Joaquin River, about 4.5 miles northeast of Crows Landing, about 0.6 mile to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 915. Elmer J. Warner, Stockton, \$33,949; Frank B. Marks & Sons, Tracy, \$39,718; Browne & Krull, Hayward, \$45,184; M. J. Ruddy & Son, Modesto, \$45,477. Contract awarded to Karl C. Harmeling, Stockton, \$33,638.50.

July, 1949

ALAMEDA COUNTY—Over the tracks of the Key System Transit Lines, the Atchison, Topeka & Santa Fe Railway Co., and Oakland Terminal Railway, and over State Route 5, in the City of Oakland, exposed metal surfaces of the existing steel bridge to be cleaned and painted. District IV, Route 5. Martin Fried, San Francisco, \$41,046. Contract awarded to D. E. Burgess Co., San Francisco, \$21,620.

ALAMEDA COUNTY—In the City of Albany, at Cerrito Creek, a reinforced concrete culvert to be constructed and a detour to be graded and surfaced and later obliterated. District IV, Route 69. Lee J. Immel, San Pablo, \$37,531; J. Henry Harris, Berkeley, \$40,995. Contract awarded to J. R. Armstrong, El Cerrito, \$37,237.50.

CONTRA COSTA AND SOLANO COUNTIES—Carquinez Strait Bridge at Crockett, electrical service and feeder equipment to be installed and existing electrical service to be removed. District X, Route 7, Sections A,F. Scott-Buttner Electric Co., Inc., Oakland, \$9,984; Monzo Electric Co., Oakland, \$10,444; George F. Brayer, San Francisco, \$10,879; Abbett Electric Corp., Emeryville, \$12,527; Ed Pierce Electric Co., Vallejo, \$12,820. Contract awarded to Crabbe Electric, Pittsburg, \$8,358.

CONTRA COSTA AND SACRAMENTO COUNTIES—Across San Joaquin River, at Antioch, portions of the existing steel bridge to be cleaned and painted. District X, Route 11, Sections A,C. Bill Reid Painting Service, Sacramento, \$29,927. Contract awarded to Pacific Bridge Painting Co., San Francisco, \$23,310.

FRESNO COUNTY—In the City of Fresno, between San Benito Street and the northerly end of Belmont Avenue Circle, about 2.6 miles in length,

the existing pavement to be surfaced with open graded plant-mixed surfacing. District VI, Route 4. Ted F. Baun, Fresno, \$34,715; Gene Richards, Fresno, \$35,830; Oilfields Trucking Co. & Phoenix Construction Co., Inc., Bakersfield, \$36,320. Contract awarded to Westbrook & Pope, Sacramento, \$34,620.

GLENN COUNTY—Across the Sacramento River at Butte City, a fender to be repaired on the existing bridge. District III, Route 45, Section B. J. F. Lauritzen, Pittsburg, \$14,055; B. S. McElderry, Berkeley, \$14,060; James H. McFarland, San Francisco, \$14,411. Contract awarded to Lord & Bishop, Sacramento, \$12,980.

INYO COUNTY—Near Keeler, between Soda Plant and 8 miles south, a net distance of 7.1 miles to be graded, imported base material to be placed and surfaced with road-mixed surfacing. District IX, Route 127, Section D. Basich Bros. Construction Co. & Basich Bros., San Gabriel, \$85,012; Oilfields Trucking Co. & Phoenix Construction Co., Inc., Bakersfield, \$87,740; Browne & Krull, Hayward, \$91,155; W. C. Lefever & D. Gerald Bing, Sacramento, \$97,639; Vinnell Co., Inc., Alhambra, \$104,522; Tyson & Watters Co., Sacramento, \$106,127; Arthur A. Johnson, Laguna Beach, \$111,412; Kirst & Sons, Altadena, \$112,205; Dicco, Inc., & Dix Syl Construction Co., Inc., Bakersfield, \$112,654; Roland T. Reynolds, Anaheim, \$115,067; Close Building Supply, Hayward, \$128,765. Contract awarded to R. A. Erwin, Colton, \$80,989.50.

KERN COUNTY—Between 1 mile northwest of Mojave and Freeman; and between 8.7 miles northwest of Mojave and 6.5 miles west of Boron, about 19 miles, applying class "C-Fine" seal coat. District IX, Routes 23, 58. Ned H. Mulleneaux, Oceanside, \$21,910; G & H Paving Co., Los Angeles, \$22,631; Oilfields Trucking Co. & Phoenix Construction Co., Inc., Bakersfield, \$22,750; Guerin Company, Los Angeles, \$24,780; A. A. Veit Co., Tujunga, \$25,690. Contract awarded to Davis & Swartz, Bakersfield, \$18,690.

KERN COUNTY—In the City of Bakersfield, at the intersection of Baker and Sumner Streets, furnishing and installing electric traffic signal system. District VI, Routes 57, 58. Oilfield Electric Co., Inc., Bakersfield, \$10,056. Contract awarded to L. H. Leonard Construction Co., San Rafael, \$9,656.

LAKE COUNTY—Between 5.4 miles and 6.0 miles north of Middletown, about 0.6 mile to be graded and surfaced with road-mixed surfacing. District I, Route 89, Section B. J. L. Conner, Jr., Eureka, \$52,437; Close Building Supply, Hayward, \$56,117; Chittenden & Chittenden, Auburn, \$56,981; Harold Smith, St. Helena, \$57,921; Carden & Cox, Sacramento, \$60,011; O'Connor Bros., Red Bluff, \$61,080; Tyson & Watters Co., Sacramento, \$63,996; Fred J. Maurer & Son, Eureka, \$67,191; Miles & Bailey, Madera, \$67,310; J. Henry Harris, Berkeley, \$71,363. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, \$51,767.

MENDOCINO COUNTY—Across Gualala River, Glennau Gulch, Garcia River, and Albion River, at various locations between 16 miles south of Point Arena and 18 miles south of Ft. Bragg, four existing steel bridges to be cleaned and painted. District I, Route 56, Sections A, B, D. Fred T. Judd Co., Berkeley, \$18,160. Contract awarded to D. E. Burgess Co., San Francisco, \$13,520.

MARIN COUNTY—Between Ignacio and Richardson Bay Bridge, a net length of about 4.3 miles in six separate locations, shoulders and existing pavement to be surfaced with plant-mixed surfacing and an outer highway to be constructed. District IV, Route 1, Section A, SRF, C. Mad, C. Brown-Ely Co. Contractors & E. A. Forde, Corte Madera, \$235,392; Purish Bros., Benicia, \$239,044; Lee J. Immel, San Pablo, \$241,806; Fredrickson Bros., Emeryville, \$256,950. Contract awarded to A. G. Raisch Co., San Francisco, \$217,988.45.

NAPA COUNTY—Across Napa Creek, at west city limits of Napa, a reinforced concrete slab bridge and about 0.04 mile of approaches to be constructed. District IV, Route 49, Section D. E. H. Peterson & Son, Richmond, \$40,612; Huettig & Schromm & A. T. Bennett Construction Co., Palo Alto, \$40,639; Lew Jones Construction Co., San Jose, \$43,445; B. S. McElderry, Berkeley, \$46,140; Erickson Phillips & Weisberg, Oakland, \$47,339; Metzger Company, San Pablo, \$48,375; C. B. Tuttle Co., Long Beach, \$51,140; Slinsen Construction Co., Napa, \$55,160. Contract awarded to Dan Caputo, San Jose, \$39,101.

NEVADA COUNTY—Over the tracks of the Southern Pacific Company and Truckee River about one mile north of Polaris, the existing bridge to be repaired. District III, Route 38, Section A. Johnson Western Gunite Company, Oakland, \$9,569; Cement Gun Construction Co., Sausalito, \$10,300; Emsco of San Francisco, San Francisco, \$10,781; Contract awarded to Ted Schwartz, Smartview, \$6,910.

PLACER COUNTY—At Sheridan, about 0.3 mile to be graded and surfaced with plant-mixed surfacing on crusher run base. District III, Route 3, Section B. Hubert Sykes, Patterson, \$26,184; J. R. Reeves, Sacramento, \$27,344; Paul E. Woof, Fresno, \$29,097; Browne & Krull, Hayward, \$29,225; A. Teichert & Son, Inc., Sacramento, \$29,893; O'Connor Bros., Red Bluff, \$30,157. Contract awarded to Rice Brothers, Inc., Marysville, \$24,978.

PLACER & YUBA COUNTIES—Between 0.5 mile north of Lincoln and 1.5 miles south of Marysville, about 20.2 miles, existing drainage facilities to be extended. District III, Route 3, Sections B, A, B. Rice Brothers, Inc., Marysville, \$48,698; Transocean Engineering Corp., Oakland, \$49,356; Chittenden & Chittenden, Auburn, \$57,061. Contract awarded to O'Connor Bros., Red Bluff, \$45,344.

PLUMAS COUNTY—At two locations between Rock Creek and Belden, about 3.4 miles, portions to be graded and plant-mixed surfacing to be placed throughout. District II, Route 21, Section A. Piombo Construction Co., San Francisco, \$153,123; A. Teichert & Son, Inc., Sacramento, \$190,089. Contract awarded to Granite Construction Co., Watsonville, \$135,656.

PLUMAS COUNTY—Between Route 83 and east end of Chester Causeway, about 4.4 miles, portions to be graded and plant-mixed surfacing to be placed on the new grade and on existing surfacing. District II, Route 29, Section A. Granite Construction Co., Watsonville, \$153,839; Harms Bros., Sacramento, \$156,494; A. Teichert & Son, Inc., Sacramento, \$172,938; Tyson & Watters Co., Sacramento, \$174,777. Contract awarded to Clements & Co., Hayward, \$145,773.50.

RIVERSIDE AND SAN BERNARDINO COUNTIES—Between a point on Route 43 about 3.6 miles west of Corona and Pine Avenue at the south end of Euclid Avenue about 7.5 miles south of Ontario, portions about 6.5 miles in net length to be graded and surfaced with plant-mixed surfacing on selected material base and a bridge to be constructed across Chino Creek. District VIII, Routes 77, 192, Sections EA, A. Vinnell Co., Inc., Alhambra, \$615,918; Basich Bros. Construction Co. & Basich Bros., San Gabriel, \$646,243; Griffith Co., Los Angeles, \$661,144; Winston Bros. Co. & Yount Constructors, Inc., Azusa, \$667,920; N. M. Ball Sons, Berkeley, \$676,373; Matich Bros. & L. A. & R. S. Crow, El Monte, \$696,355; Claude Fisher Co. Ltd., Los Angeles, \$705,873; Cox Bros. Construction Co., Stanton, \$707,272; United Concrete Pipe Corp. & Jesse S. Smith, Baldwin Park, \$718,943; Peter Kiewit Sons Co., Arcadia, \$719,322; Dimmit & Taylor & K. B. Nicholas, Monrovia, \$743,180; R. P. Shea Construction Co., Indio, \$746,366; Silva & Hill Construction Co., Los Angeles, \$787,054; Sharp & Fellows Contracting Co., Los Angeles, \$969,868. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$598,859.

SAN DIEGO COUNTY—Across Viejas Creek, about three miles east of Alpine, a reinforced concrete girder bridge to be constructed. District XI, Route 12, Section D. Clifford C. Bong & Co., Arcadia, \$56,424; Thomas Construction Co., San Fernando, \$58,773; Johnson Western Gunite Co., Coronado, \$59,370; E. S. & N. S. Johnson, Fullerton, \$63,682; Nielsen Construction Co., San Diego, \$66,668; John Strona, Pomona, \$72,189; Walter H. Barber & H. R. Breeden, La Mesa, \$75,404; Northrup Construction Co., Long Beach, \$75,675. Contract awarded to E. G. Perham, Los Angeles, \$51,875.

SAN JOAQUIN COUNTY—Between Calaveras River and Lodi, constructing crossovers of plant-mixed surfacing on untreated rock base, at various locations. District X, Route 4, Section C. A. Teichert & Son, Inc., Sacramento, \$38,057; W. C. Lefever & D. Gerald Bing, Sacramento, \$41,888; J. Henry Harris, Berkeley, \$49,124. Contract awarded to Claude C. Wood Co., Lodi, \$31,655.50.

SAN JOAQUIN COUNTY—Between Lockeford Street and 0.1 mile north of Lodi city limits and between Cherokee Lane and 0.3 mile east, about 0.6

mile, existing pavement to be widened with plant-mixed surfacing on Portland cement concrete base and untreated rock base and resurfaced with plant-mixed surfacing. District X, Routes 4, 24, Section Lodi, C. Lodi. A. Teichert & Son, Inc., Sacramento, \$54,633. Contract awarded to Claude C. Wood Co., Lodi, \$48,525.50.

SAN LUIS OBISPO AND MONTEREY COUNTIES—Across Leffingswell Creek, San Simeon Creek, Wild Cattle Creek, and Vicente Creek, at various locations, between 36 and 85 miles north of San Luis Obispo, four existing steel bridges to be cleaned and painted. District V, Route 56, Sections B, C. Fred T. Judd Co., Berkeley, \$9,355; Williams & Kelly, Los Angeles, \$9,779; R. W. Reade & Company, Berkeley, \$9,977; Acme Painting Service, Sacramento, \$34,831. Contract awarded to D. E. Burgess Co., San Francisco, \$8,340.

SANTA BARBARA COUNTY—Bridge across Santa Rosa Creek, timber wingwalls to be constructed. District V, Route 149, Section C. E. L. Thorsten, Santa Monica, \$7,937; Thomas Construction Co., Inc., San Fernando, \$9,207. Contract awarded to Klein-Smid Construction Co., Bakersfield, \$7,240.

SANTA CLARA COUNTY—Across Carnadero Creek, about 1.8 miles south of Gilroy, a reinforced concrete slab bridge to be constructed. District IV, Route 2, Section C. Carl N. Swenson Co., Inc., San Jose, \$93,546; Granite Construction Co., Watsonville, \$100,772; Lew Jones Construction Co., San Jose, \$103,147; Metzger Co., San Pablo, \$107,925; Huettig & Schromm & A. T. Bennett Construction Co., Palo Alto, \$108,467; Wm. Radtke & Son, Gilroy, \$109,228; Geo. C. Renz Construction Co., Inc., Gilroy, \$117,731; Charles MacClosky Co., San Francisco, \$117,845; Erickson Phillips & Weisberg, Oakland, \$123,798; C. B. Tuttle Co., Long Beach, \$138,007. Contract awarded to Dan Caputo, San Jose, \$88,676.50.

SANTA CRUZ COUNTY—At San Lorenzo River, 1.5 miles south of Waterman's Switchback, about 0.1 mile to be graded, bituminous surface treatment to be applied and a field assembled plate culvert to be installed. District IV, Route 116, Section B. Dan Caputo & Ed Keeble, San Jose, \$29,696; Paul E. Woof, Fresno, \$32,128. Contract awarded to Granite Construction Co., Watsonville, \$26,464.

SHASTA COUNTY—In the town of Burney, across Burney Creek and West Branch Burney Creek, reinforced concrete bridges to be constructed and across East Branch Burney Creek, a reinforced concrete culvert to be constructed and approaches to be graded. District II, Route 28, Section D. Lew Jones Construction Co., San Jose, \$109,774; Harold Smith, St. Helena, \$112,933; Chittenden & Chittenden, Auburn, \$123,243; J. P. Brennan, Redding, \$142,848; O'Connor Bros., Red Bluff, \$146,021; Charles MacClosky Co., San Francisco, \$147,282. Contract awarded to Metzger Co., San Pablo, \$97,410.

SIERRA COUNTY—Across Fiddle Creek about 5 miles east of Yuba County line, the existing bridge to be repaired. District III, Route 25, Section A. James H. McFarland, San Francisco, \$5,056; C. C. Gilder-sleeve, Nevada City, \$5,588; L. V. Cantrell, Berkeley, \$5,784; O'Connor Brothers, Red Bluff, \$6,305; Shaul Construction Co., Hayward, \$6,985; B. S. McElderry, Berkeley, \$8,890. Contract awarded to William S. Shedd, Yuba City, \$4,884.

TULARE COUNTY—Across Deer Creek and at Deer Creek Ditch, about 5.6 miles south of Porterville, a reinforced concrete slab bridge and a reinforced concrete box culvert to be constructed, existing roadbed to be widened, untreated rock base to be placed and plant-mixed surfacing to be placed over untreated rock base and existing pavement. District VI, Route 129, Section B. E. G. Perham, Los Angeles, \$63,663; E. S. & N. S. Johnson, Fullerton, \$64,865; Trewhitt, Shields & Fisher, Fresno, \$65,939; Dan Caputo, San Jose, \$66,581; Charles MacClosky Co., San Francisco, \$71,430; Norman I. Fadel, North Hollywood, \$78,707. Contract awarded to Thomas Construction Co., San Fernando, \$61,583.50.

YOLO COUNTY—Between Putah Creek and Colusa County line, four reinforced concrete bridges to be widened and 29 box and pipe culverts to be extended. District III, Route 7, Sections AB, C. Charles MacClosky Co., San Francisco, \$153,762; Lew Jones Construction Co., San Jose, \$158,815; Dan Caputo,

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IMPROVEMENTS ON U. S. 40 NEAR AUBURN



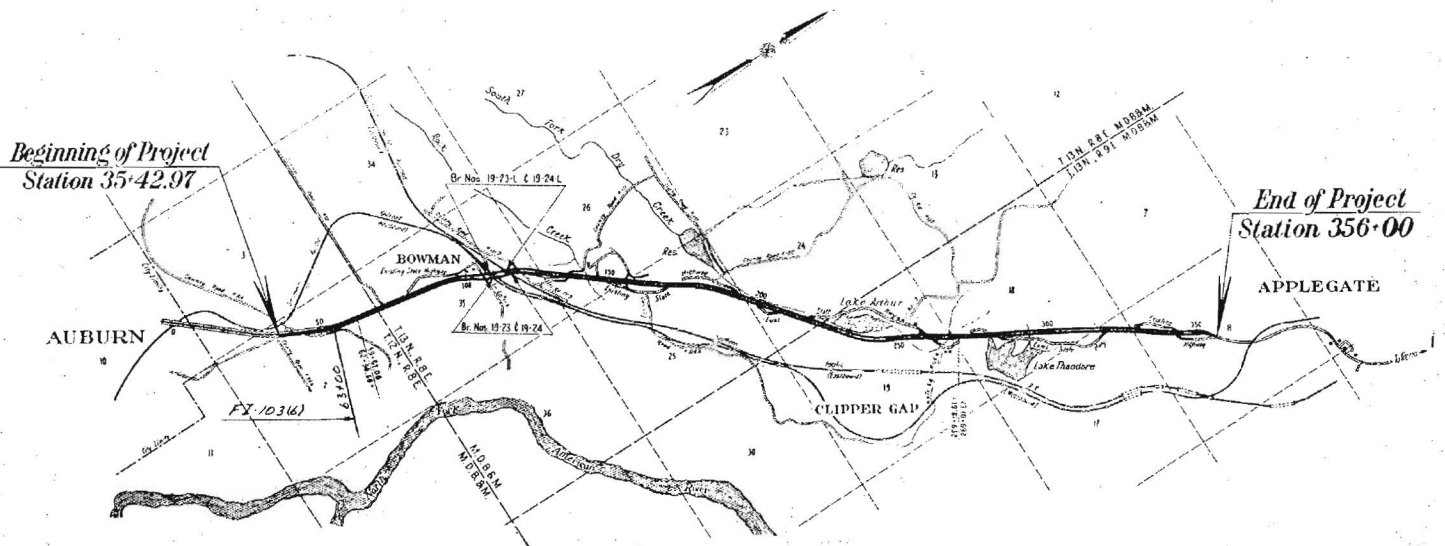
Beginning of construction of new four-lane divided highway on U. S. 40 between Applegate and Auburn in Placer County. Existing highway on left, grading for new location on right, looking west from Applegate

ONE of the most important interstate highways in California is U. S. Route 40. Entering the State a few miles west of Reno, the route crosses the Sierra Nevada Mountains at Donner Summit and descending the western slope of the mountains, the Sacramento Valley is reached near Roseville in Placer County.

This section of U. S. 40 is subject to heavy traffic throughout the year, a large portion of which consists of freight trucks and busses. When coupled with the large volume of passenger cars used for winter sports and summer vacationists, it is easily understood why congestion at many locations is a frequent occurrence. Much

relief was afforded this situation with the construction of the Auburn Freeway which was opened to traffic in November, 1947.

On April 27, 1949, bids were received for developing another section of U. S. 40 to divided four-lane standards. The project now under construction joins the freeway one mile east



of Auburn and extends easterly to one mile west of Applegate. The present contract provides for grading the roadways and constructing drainage structures and two overhead crossings of the Southern Pacific Railroad at Bowman.

The highway has been designed to contain only 14 curves having a total curvature of 180 degrees. Choice of the location of this realignment has made possible the use of light grades, and the maximum of 6 percent has been reached on only two sections, each of which is less than 2,000 feet in length.

When considered from elevations at the beginning and end of the project, it is to be noted that the average rise is about one foot in each 60 feet of distance traveled. While this reconstruction project is only about one-third mile shorter, considerable driving time will be saved by eliminating the many restrictions imposed through the almost continuous curving alignment along the present road.

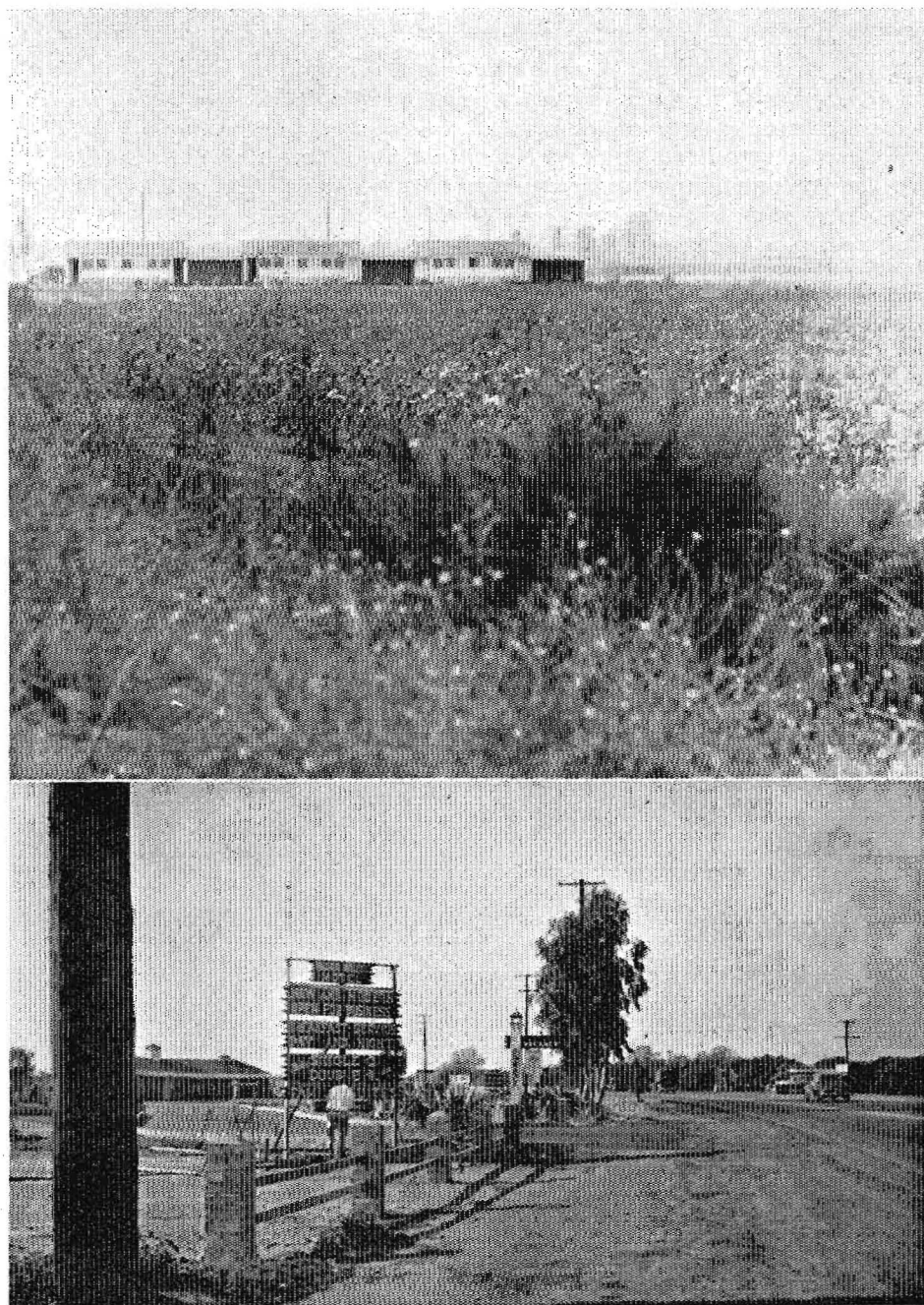
The present road exists on almost the same alignment and grade as it did when it came into the State Highway System. The original contract for construction by the State in 1922 was concerned to great extent with surfacing, while the grading work was generally confined to roadbed widening and drainage improvement. In the passing years, surfacing has been widened, shoulders improved and the two existing railroad overcrossings at Bowman were constructed.

Within the limits of the present project, there exists on the road now traveled 56 curves containing 1,506 degrees of curvature equal to slightly over four complete circles and there are grades of as high as 7 percent.

The paving project to follow, when the present grading contract is completed early in 1950, will provide for pavements 24 feet in width and shoulders eight feet and five feet wide in each roadbed with a division strip 36 feet wide. The contract now under construction will involve expenditure of approximately \$1,470,000. United Concrete Pipe Corporation, Ralph A. Bell and Westbrook and Pope are the contractors.

Outer Highway Increases Both Business and Property Values

Continued from page 17 . . .



Upper—Photo taken in October, 1946. Junction Motel in background, site of Wagon Wheel improvements in center foreground. New outer highway is now constructed across the right foreground of this area. Lower—Photo taken in September, 1947, just prior to the construction of the freeway and outer highway

main highway, most of which have been voluntary.

In conclusion: This case study has added further confirmation to what those of us who have studied and guided highway development believe to be necessary to meet the increasing needs of motorists, while af-

fording the greatest protection to you, the property owner. It is just a matter of time until this type of highway planning will be accepted as a normal evolution of road building as multiple lane highways are now recognized and accepted as a minimum necessity.

Bridge Styles

*Modern Trends in Design
Influenced by Many Factors*

STATE HIGHWAY ROUTE 4, (U. S. 99) which is the main highway between Sacramento and Los Angeles, was originally built as a two-lane highway. By stage construction this important route is being transformed into a four-lane divided highway. The most critical portions are being widened to four lanes as fast as funds will permit.

In the design of the structures for these new parallel lanes the Bridge Engineer is frequently able to follow the same design as was previously used. However, at many locations the design of the existing structure is not found to be entirely satisfactory for modern design, construction techniques and changing prices. He, therefore, may be confronted with the problem as to whether it is wise to duplicate the old in appearance for the sake of uniformity or to abandon the old and build a more economical structure of modern design and construction techniques but strikingly different in appearance.

Oil Junction Overhead

This was the situation when plans were prepared for the new structure paralleling the old overcrossing over the main line tracks of the Southern

Pacific Company at Oil Junction about five miles north of Bakersfield.

The existing grade separation structure at this point was built in 1933. The width between curbs was 34 feet and was designed to accommodate three 10-foot approach paving lanes. The bridge crossed the tracks and existing highway on a 55-degree skew and required a series of 60-foot continuous steel girder spans. It is interesting to note that it was one of the first continuous steel girder jobs to be used on the State Highway System. Previously only simple spans had been used, while today the continuous type is the one most frequently used.

Question of Design

In preparing the new structure adjacent to the old it was, therefore, a question whether to follow the old outline and general appearance or to abandon the old lines and to construct a structure strikingly different in appearance.

In an effort to determine what would be the most satisfactory type of structure to build under the changing conditions following the war, studies were made that revealed many interesting points which influenced the choice for

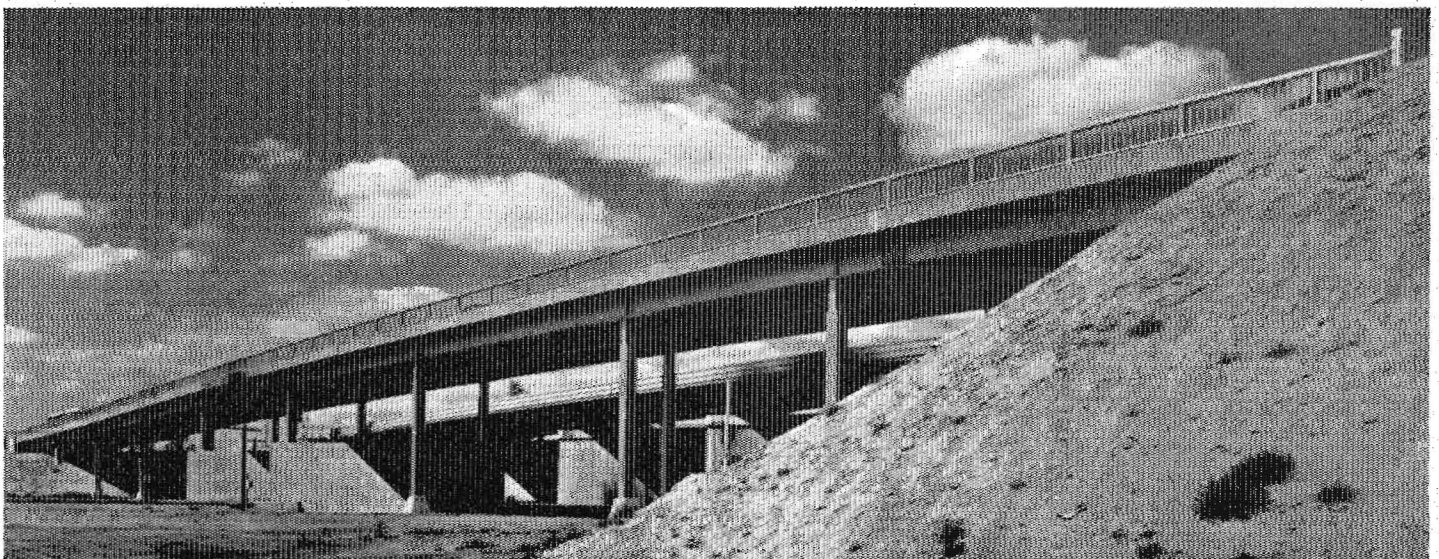
the new structure. Geographic location, field conditions and numerous other factors influenced the choice for the new structure and the materials for its component parts.

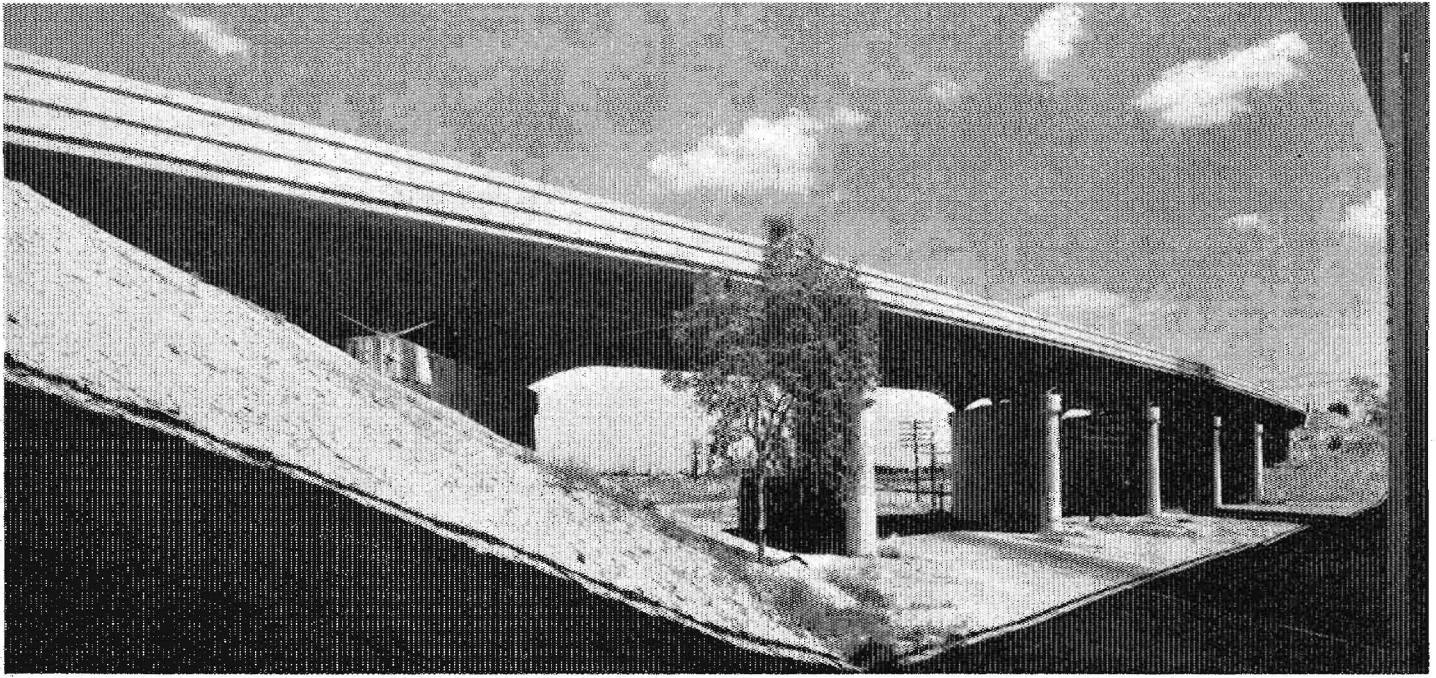
Economic Conditions Influence Cost

For instance the price of concrete in structures had changed in the 15-year period since 1933 from \$13.70 per cubic yard to \$50 per cubic yard, and, in spite of the fact that the new design decreased the amount of concrete required over the old design by 830 cubic yards, the total cost of concrete alone in the new structure was approximately equal to the total cost of the entire structure as built in 1933.

Examination of the reasons for this increase in concrete revealed that while the price of materials for the concrete had advanced only a few dollars per yard, the cost of the finished concrete in place had raised \$35 to \$40 per cubic yard. The price increase had therefore, been in unskilled labor, carpenters and form work. It was, therefore, concluded that simplification of details and reduction of concrete form work would greatly tend to reduce the cost of the new structure.

This new structure has light steel rail, uniform depth beams, and light but strong steel columns for supports





Old structure built in 1933 has solid concrete rail, curved bottom chord girders and heavy concrete piers built to skew of railroad track

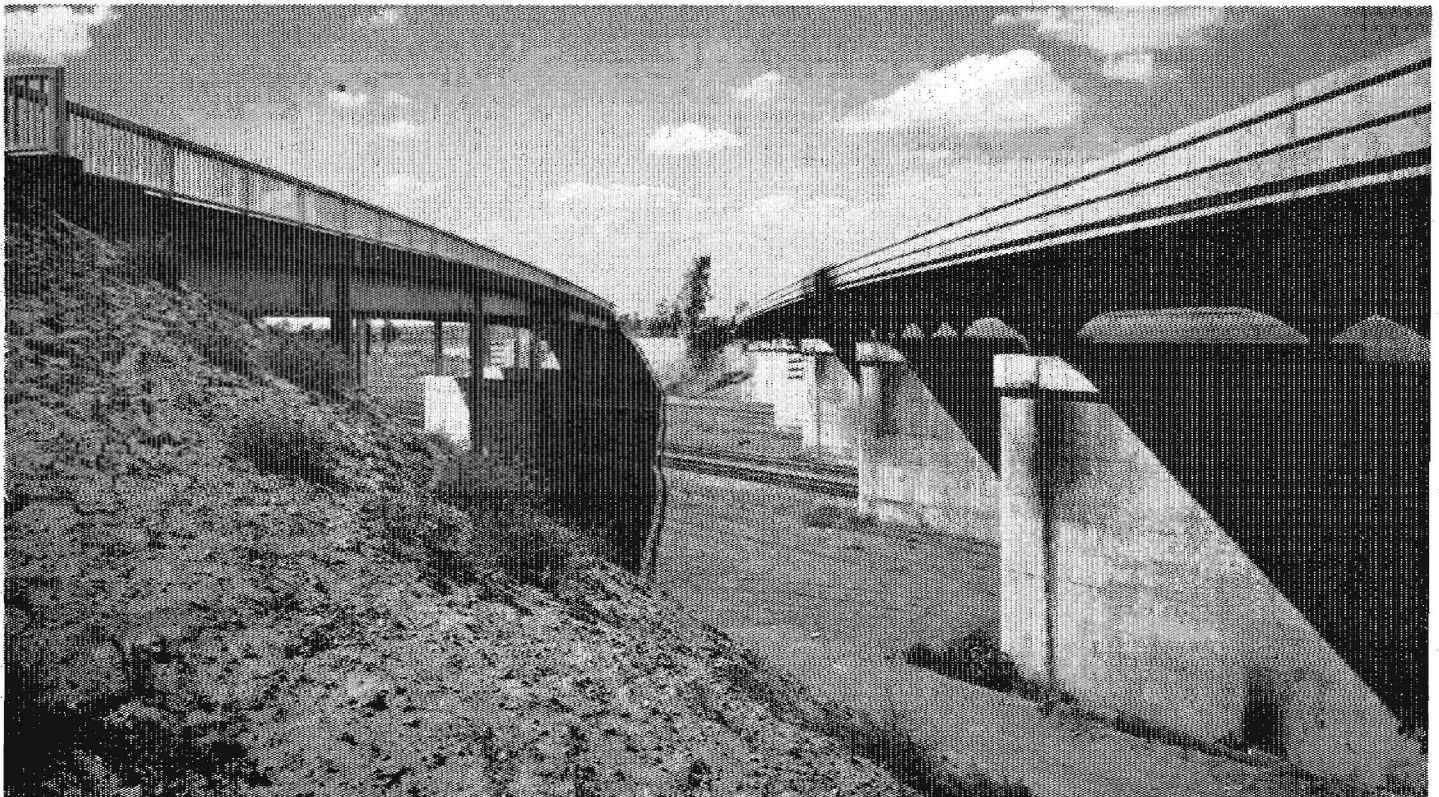
The same was true of structural steel. The price for this item had jumped from 5.2 cents per pound to 14.5 cents per pound. Here again, the price of the raw material had increased

only a small amount in comparison to the increase in cost for the fabricated structural steel. The old structure was built of curved bottom chord, built-up steel beams. This required the mini-

mum amount of materials but the maximum amount of fabrication and labor. A design, therefore, that could use the material as it came directly from the

... Continued on page 55

This photo shows the striking difference between the old structure on the right and the new structure on the left



Desert Bridges

Their Reconstruction Presents Various Problems to Engineers

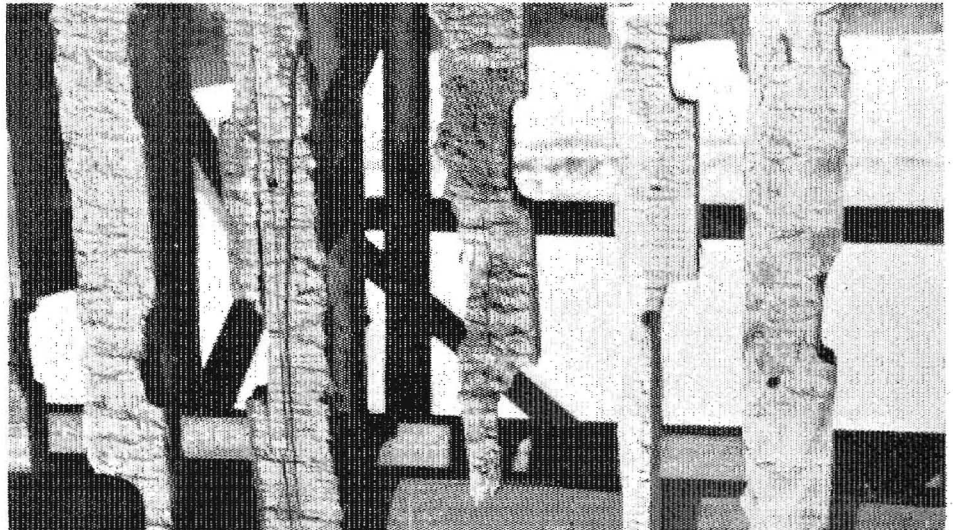
By F. M. MORRILL, Associate Bridge Engineer

IN SOME of the more arid sections of California, the State has a large number of timber bridges which are reaching the end of their economical service life. Although located in sparsely inhabited areas, they are for the most part on roads that carry a large volume of traffic, including heavy interstate freight trucks and busses. Thus their reconstruction is a matter of real urgency and the great number of structures involved makes the problem one of major proportions.

Considerable study has been given to details and methods of reconstructing these bridges in an effort to work out some smooth operating system which would lend itself to duplication on the many structures to be rebuilt.

Problems of Detours

One of the major items of trouble and expense is the handling of traffic during the reconstruction. Owing to the remoteness of the location and the general straight alignment of the road, normal traffic speeds are high and it has been found most expedient to build detours, rather than to attempt to handle the traffic on a restricted roadway. In many cases, however, the con-



Salvaged pieces of laminated flooring. Note the wear where the laminations rested on the stringers and the excessive wear on the faces of the pieces owing to rocks working down between laminations

struction of a detour has been a considerable percentage of the total cost of the work.

The use of precast units both from the standpoint of economy and to facilitate the time of traffic disruption has been studied. To date, however, nothing along this line seems to adequately solve this problem. If something satisfactory could be developed

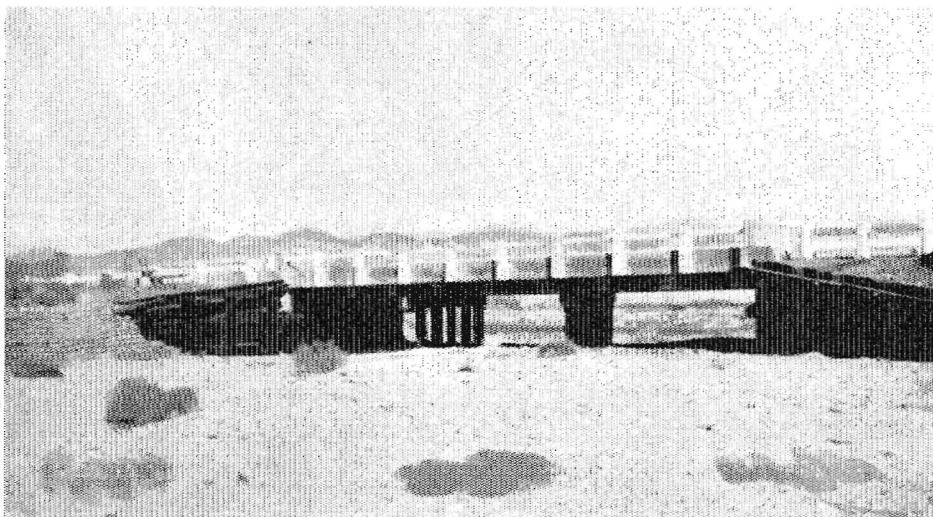
it would eliminate the need of a detour and greatly decrease the length of time during which flagmen would be required.

Reconstruction Method

The typical desert bridge being reconstructed consists of 19-foot spans on timber pile bents. The deck system is timber stringers with laminated timber floor and asphalt surfacing of varying thicknesses. Under the method of reconstruction which has been adopted, the surfacing is first removed and the deck exposed, defective stringers and caps are replaced and laminated floors are tightened and respiked. The bituminous surfacing is replaced with a concrete slab and the old timber rail is replaced with steel rail or a new timber rail so constructed as to increase the roadway width to 26 feet between curbs.

Where obtainable the concrete was furnished transit mixed. At locations where this was not feasible or economical the aggregates were hauled to the job and concrete mixed at the site. In locations remote from a water supply, curing by means of an impervious

Typical desert structure after placing concrete deck and new railing



membrane was permitted. Where water was available, water curing was used.

Two Alternatives

Owing to the fact that at many locations the highway grade had been built up by successive applications of asphalt surfacing, one of the problems to be faced was whether it was more economical to place additional thickness of slab or jack up the deck system of the bridge.

It was the practice where the raise in grade was only about an inch that this addition would be made up by an increase in concrete slab thickness. If the increase was between 1 inch and 3 inches, the additional thickness would be made up by a plant-mixed surfacing on top of the concrete deck slab. For differences in grade over 3 inches it was desirable to jack up the deck structure of the bridge. The manner of placing the concrete deck was varied somewhat. In some cases, concrete was placed on the old laminated deck and in other cases where the laminated deck was beyond structural usefulness the concrete deck was set directly on the stringers with a plywood or sheet metal subform.

Temperature Extremes

Inasmuch as these desert areas are subjected to extremes of temperature, there were difficulties with concrete placed during the summer months because of the heat and the rapid drying of the thin slabs. In the winter, pre-



Removing surfacing from desert bridge preparatory to redecking

cautions had to be taken to keep the slabs from freezing. In all cases 80 feet to 90 feet of metal plate guard rail was installed to the right of approaching traffic at the end of each bridge. In many cases, where detours were constructed the detours were left in place so that the Maintenance Department at a future date could salvage the material for repairs to the highway.

Faced with the problem of reconditioning large numbers of badly deteriorated bridges, the department feels that in the methods of reconstruction which have so far been adopted and are outlined here, they are following an economical and practical solution to a difficult and expensive problem.

Bridge Styles

Continued from page 53 . . .

rolling mills with but a small amount of fabrication would be effective in reducing the cost of the structure.

For these reasons, it was decided to build a structure as simple in lines and details as possible. Concrete was reduced to a minimum, with form work free from intricate details, costly curves and bevels, and superfluous "gingerbread." The structural steel framing was laid out so that all details would be square, eliminating costly skew connections. Girders were made constant depth rather than the curved bottom chord, and of such a size that they could be rolled at the mills and eliminate the fabricating costs of building them up from angles and plates.

The new structure is a series of continuous spans approximately 60 feet long with all joints and connections at right angles for simplification, rather than skewed as in the old. Also the beams are uniformly 36 inches deep as made at the rolling mills and required only the minimum amount of fabrication. Simple steel column supports have been used rather than the massive concrete piers as well as a light steel railing which was easily fabricated and erected rather than the heavy solid concrete rail.

The results of these ideas to fit the changing conditions produced a more economical structure and resulted in one strikingly different in appearance as an inspection of the accompanying pictures will reveal.

Typical desert alignment and typical desert bridge



The following paper was prepared for the right of way agents in District VII to apprise them of the long-term real estate trends and to keep them informed of current trends in the Los Angeles area. It was largely compiled from articles appearing in *The Appraisal Journal*, American Institute of Real Estate Appraisers of the National Association of Real Estate Boards.—Editor.

Real Estate Trends

*A Paper of Interest to
Right of Way Agents*

By H. W. LEONARD, Metropolitan District Right of Way Agent

THE TENDENCY during this century has been toward a reduction in the number of farms, an increase in the average size of farm, a decline in the proportion of the population on farms, and a definite movement westward of the volume of production. Between 1920 and 1940, while there was an increase of approximately 26 million in total population, there was an actual decline of approximately one million in farm population. From the point of view of the appraiser the number of families indicates a measure of the prospective demand for home properties.

The number of marriages in the United States is now very high. This results in part from deferment of marriage during the war and the depression of the 30's and to the high incomes now prevailing. The present high rate of family formation has caused a corresponding demand for real estate and housing. This high number of marriages is a direct result, 20 to 24 years later, of the high number of births in the early 20's. The declining birth rate from a peak in 1921 to a low in 1933 will reflect in a lessening number of new families being formed 20 to 24 years later.

Birth Rate Increase

Not only are children arriving in very large numbers, but an associate fact is that most of them are surviving and living longer. The proportion of children at birth who may be expected to survive at least until age 18 has been steadily rising for a long time. There will be for a long time an unusually large number of children in the American population and this would seem to mean a long time trend of large demand for suburban property with all the

stimulus to real estate and building and relocation of businesses and services.

The major parts of all American cities preponderantly built 20 to 50 years ago are very ill-designed for children by modern standards, and automobile transportation has made outlying areas more accessible. For 20 years or more there has been an outward movement of population in all cities.

Urban decentralization is apparent. Most cities are losing population at their centers, gaining slightly on their outer edges and in their incorporated suburbs, and experiencing their most rapid growth in the open unincorporated fringe which has been made accessible by the automobile and the bus. From 1930 to 1940 in 66 metropolitan areas the central cities gained 3 percent, the incorporated suburbs 9 percent, and the unincorporated suburbs 27.7 percent.

Property Value Data

In 1907 value data was compiled on 50 American cities. Very few downtown 100 percent locations have held their business, and no residential district in any major American city maintained supremacy for as long as 35 years. Unless a new use takes over a district, the useful life of its buildings (usually 25 to 40 years) determines the good life of the district. The land value fails as the structures upon the land fail. The value shifts to more favored areas and structures.

Even in stable cities real estate values are forced down by reduced family purchasing power which lowers the amount that can be paid for rent and also reduces the purchases in retail stores. Reproduction costs of buildings are lowered by a decline in material

prices, by some reduction in building wages, and by a greater efficiency of labor, and this reduces the values of existing structures. The increase in vacancies and a lowering in rents, due to doubling up or a decline in family incomes, increases the foreclosures on heavily mortgaged properties and the sale of properties acquired by banks and financial institutions depletes prices still more.

Housing Trends

Consumer demand for housing can probably be sustained through 1949 and perhaps through 1950 at a 5 percent to 15 percent lower building cost level. The demand probably cannot be sustained beyond 1950. At present, home building costs are very high in relation to consumer income. For example, since the mid-20's costs of home building, as measured by fairly reliable indices, have outstripped the increase in the income of the average nonfarm family by from 25 percent to 40 percent after it has paid its taxes. The period of housing desperation is drawing to a close. At the end of the war 1.2 million families lacked anything they could call their own home. They were doubled up and living with in-laws. Probably less than half of them would normally come in to the housing market.

Since the end of the war about three million new families, needing housing, have been created. The figures suggest a total of somewhere near 3.5 million families needing new housing since the war. Over the same period more than three million new homes have been created, so it appears that we have come within a few hundred thousand homes of catching up with the most basic de-

mand for housing created by homeless families. At present new homes are being built at the rate of about one million a year. New families are being produced at about only half that rate. Consequently it appears that we shall run through the balance of the desperate housing shortage fairly soon.

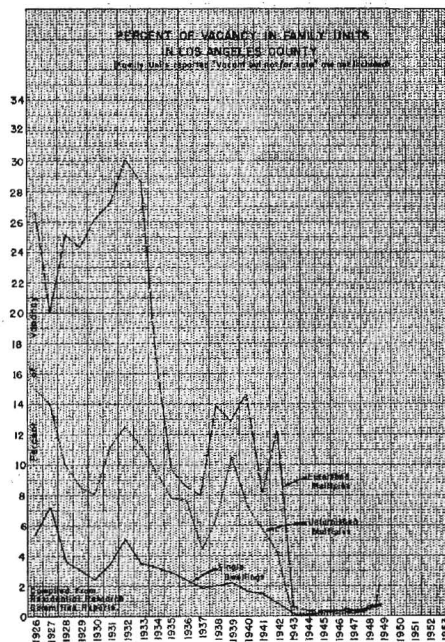
Replacement Market

To sustain the present rate of construction over an extended period it is obvious that a replacement market for houses must be developed. To do that it seems equally obvious it will be necessary to get the cost of housing much more in line with consumer income of which there has been a shift in distribution. In 1941 approximately 85 percent of families received incomes under \$3,000 per year, while in 1946 approximately only 57 percent received incomes under \$3,000 per year. In 1941 approximately 4 percent of families received incomes over \$5,000, while in 1946 approximately 15 percent received incomes over \$5,000 per year. The depreciation of the dollar is not taken into account in this picture but, even with adjustment for this factor, there would still be an upshoot.

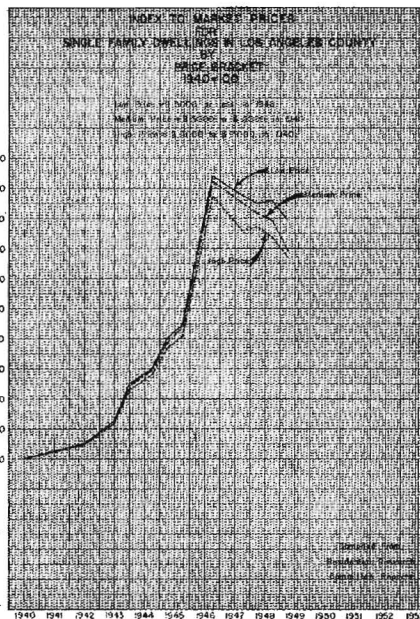
With some kind of a roof over their heads, consumers of housing will be in a position to shop around instead of scrambling desperately for a place in which to live. Consumers at present have very large accumulations of savings. These savings simplify the problems of financing new homes. However, it should be noted that most of the savings are in the hands of the well-to-do who are already the best-housed. So the savings won't do a great deal to help those in the low-income groups who need housing most.

A Prediction

With this large accumulation of savings and the promise of our Federal Government's action to make it easier on those who are short on savings to get a home, it can be expected that the present million a year tempo of housing construction will be sustained through 1949 and possibly through 1950. Thereafter housing costs must get into line with consumer income if there is not to be a substantial bust in the housing business. The share of con-



sumer income going to pay rent has dropped. It is now one-third less than it was before the war. Lower income groups spend a much larger share of their income on rent than higher income groups. The middle income group, which includes perhaps 50 percent of all consumer rent, spends between 10 percent to 20 percent income on rent. However, even this fraction is about one-third lower than it was before the war. Hence an increase in rent payments of that dimension would not get these payments out of line historically, but while the consumer has been paying less rent he has been pay-



ing more for other items, so that his net savings have not been going up. Hence an increase in rent would have to be offset by a decrease in expenditures for other things or a decrease in savings or both.

Higher Cost Housing

In 1949 housing will begin to take a larger part of the consumer dollar, possibly because of lower prices for food and some other items and somewhat higher rents. According to Dow Service, the average retail building material price index for common brick, Portland cement, and construction lumber in 1948 was at 260.2 against 100 for 1941. Most authorities seem to agree that reductions will eventually assume proportions not greater than about 10 or 12 percent.

In the last few years we have been going through a phase in the building and real estate cycle which might be broken down into three periods.

The first period might be called the period of shortage—one in which the building industry was struggling to meet a demand for housing, and other types of construction, beyond its capacity to produce with existing facilities. This was a period in which the marginal builders, the marginal building material producers, and the marginal building mechanics thrived. Prices in that period were not closely related to long-term values. Many of the buyers came into the market under duress, forced to buy because they could not find satisfactory quarters to rent. Many purchased with savings accumulated from inflated war wages or profits. Veterans supplied with funds through government guarantees constituted a sizable part of that market. The typical purchaser was younger and less cautious than the pre-war buyer. The money for the down payment had been acquired with less effort and hence was spent with less discrimination. According to the Department of Commerce, 925,000 dwelling units were constructed in 1948.

Second Period

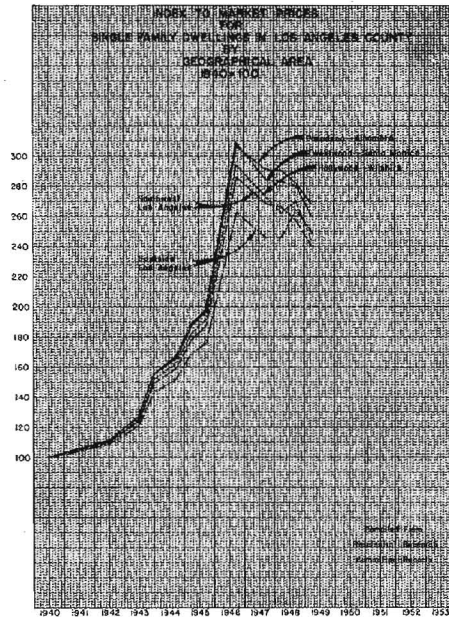
The second period was when the most urgent demand for housing had been met and the serious shortages relieved. The market is now entering a

period of slow adjustment. Supply and demand now appears to be in fair balance. The volume of new construction has declined and so have construction costs. Technological progress and improvements in construction methods will come quickly as builders are again forced to compete in a contracting market. Buyers will become more discriminating, and the older and less favorably situated properties will be difficult to market. Real estate prices and rents have softened, and the cash buyer is beginning to be able to extract real concessions. The rate of new family formation will fall with the decrease in the birth rate of 20 to 24 years ago. Vacancies will increase as builders, reluctant to adjust their operations to diminishing demand, continue to erect houses and apartments beyond the market's capacity to absorb them.

Third Period

The third period is called the period of adjustment—one during which the excesses and the price inflation of the early post-war years will be squeezed out of the market. Employment and income of the people will decrease. New private construction will diminish and the market for real estate will become sluggish—prices and rents will decline and foreclosures may be expected to rise. Recent current prices were not evidences of value but mere measures of the premium that necessities or imprudent buyers were forced to pay for immediate occupancy. This year will show lower unit costs and a smaller volume of construction.

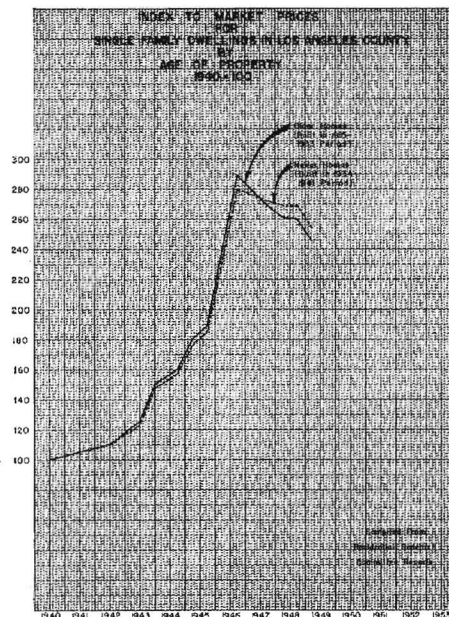
The prediction of the United States Department of Commerce is for 875,000 dwelling units for 1949 as compared with 925,000 in 1948. One of the most marked changes in the building industry is the elimination of the premium paid for immediate use. The possibility of higher costs made buyers rush to purchase. The prospect of lowered costs causes them to delay buying, thinking they may gain, rather than lose, by waiting. Prices will stabilize at a level lower than that which existed in 1948. Labor wage will remain high but will be more efficient. Building costs have already dropped approximately 5 percent since the 1948 high.



Recession Forces

The forces operating toward recession are:

1. The decline in the prices of farm products reduces buying incomes by a significant amount. The limitations on farmers' incomes will have a disturbing influence on the market for consumers' goods and farm machinery.
2. Inability of many persons, particularly those in the salary class, to buy at present prices. Sales of luxury goods are already down, as are night clubs, shows, and even movies. Several farmers and heavy household appliance concerns report that their customers are unable to buy



at present prices. This suggests that a sizable portion of the population is at present unable to live on current incomes.

3. In periods of uncertainty or contraction higher wages cause employers to devise economy measures to protect the cash status of their business. This means that higher wages will produce offsetting decreases in expenditures that will, under such circumstances, tend to increase unemployment. The decreases in expenditures on the part of business may, in fact, more than offset any increase in pay rolls.

Labor Productivity

4. An increase in labor productivity will have an offsetting effect on price rises. Output per manufacturer may be increased as the flow of materials is evened out, so that plants can produce smoothly and continuously instead of intermittently. Further labor productivity tends to rise within an increase in unemployment. If this results in a greater usability of goods or more lower prices it will have an anti-inflationary effect.

5. There is some evidence that the accumulated demand for consumer goods is being satisfied. It is possible now to obtain many of the household appliances that were in scarce supply less than six months ago. We may not have reached the buyers' market stage yet, but we are no longer in a distinctly sellers' market.

6. The low rate of saving which stimulated the demand for consumer goods during the past two years cannot be expected to continue indefinitely. A change in the rate of saving caused by a fear on the part of the people of a possible recession might easily cause individual savings to rise to such an extent as to weaken the demand for consumer goods.

7. The expectation of lower building costs could produce a postponement of presently planned construction.

8. The American Bankers Association is presently engaged in a campaign to induce bankers to tighten up on loan policies as a means of offsetting the inflationary forces.

9. Inventories of materials and merchandise increased more than 20 percent in dollar value during the year 1947. This increase was due in the main to price increases rather than physical volume. The danger of extensive unloading of inventories in case of a drop in sales is much greater today with inventories in excess of

40 billion than they were in early 1947 when the dollar value of essentially the same physical volume was 33 billion.

Building Costs and Trends

Present building costs and trends by The Dow Service, Incorporated, as published in *The Appraisal Journal* of April 1949, are as follows:

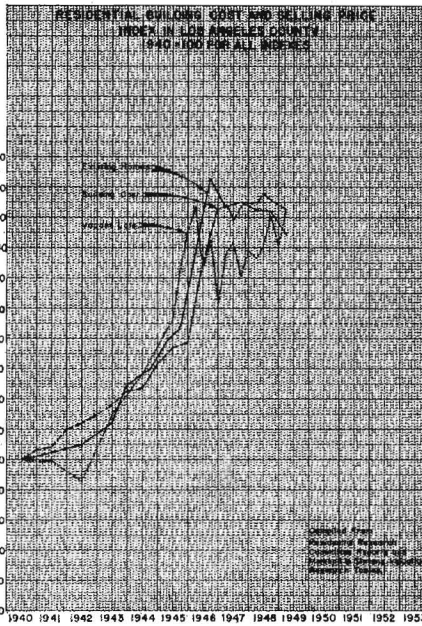
"A fact of economics is that there is nothing more impermanent than the crests and troughs of cycles. Having reached a 'ceiling,' or, conversely, a 'floor,' one does not stay long at that particular point. A crest or a peak in building construction costs was recently reached. That peak was established in the months of July, August and September of last year.

"The first general evidence of a break in building costs throughout the United States is seen in early returns in the current Dow Service Daily Building Reports Cost Survey. Preliminary data from one-third of the 150 cities being surveyed, usually enough for a reliable cross-section preview of the final report, due in April, reveal a definite halting of the upward surge for the first time in 11 years. This is due primarily to substantially lower lumber prices; improvement in the production rate of building mechanics; disappearance of premium pay arrangements and a general abundance of building materials, equipment, appliances and accessories. The national situation discloses a reduction in costs ranging from 1½ percent to 5 percent, depending upon credit given for better production.

"Rocky Mountains and West Coast States. Materials down 7 percent, labor down 3 percent. Net, down 5 percent.

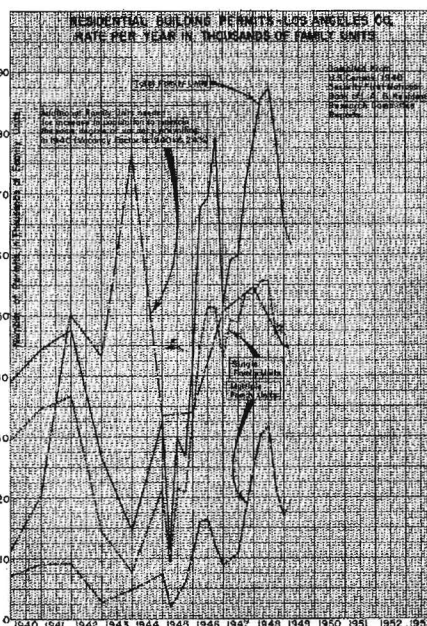
More Work for Dollar

"The building mechanic is doing more work for each dollar he receives than he did a year ago. And last year he worked a little harder than the year before. Last year, an improvement of 7 percent was estimated, raising the production rate to 75 percent compared to 1926, the effective per dollar wage came down to \$1.33 to the builder and \$1.53 to the owner, respectively. The present rate of productivity is estimated to be 81 percent, making the dollar wage paid cost \$1.24 to the builder



and \$1.43 to the building owner. Such figures can never be applied specifically and will vary from one construction project to another even when adjacent, but they do serve a useful purpose as a means of measurement. Among other things, they see a scramble to preserve profit margins in real estate and building at the sacrifice of quality in construction.

"It takes an annual income of \$5,000 to \$6,000 to support a \$12,000 house and live at the same time; \$6,000 to \$7,500 for the \$15,000 house; and \$7,500 to \$9,000 for the \$18,000 house, without taking into consideration the



higher living standards of the latter field. These are prime factors to keep in mind when mass-producing houses.

Mortgage Venture Capital

"Conservatism of mortgage venture capital will be the controlling influence upon the volume of construction activity in 1949, and that is the one factor best destined to bring about a 25 or 35 percent reduction in building costs, such as the lenders seem to have hit upon.

"It would seem that mortgage lenders ought to reconsider their present 25 to 35 percent slashing policy. We believe we are presenting a composite authoritative view when we say if there must be some discounting of the present inflationary period, it should not exceed 15 percent on the basis of the foreseeable future.

"Contractors and suppliers are finding that orders are being 'shopped' around, they are not being handed out as freely as they were a year ago without competitive price testing. The change from a seller's to a buyer's market has been in progress for many months, many contractors not quite realizing what hit them."

California Farm Land

We wish to call your attention to the fact that the Wholesale Commodity Index, as of April 23, 1949, was 156.9, a drop from 184.98 of a year ago. In times past, a drop in commodity prices has always presaged a drop in farm land and urban real estate prices.

California farm land prices, from a survey published in the Wall Street Journal on February 4, 1949, indicate that values of vineyards, fruit, nut, and other specialty crop acreage (except lemons) have dropped 30 percent to 50 percent from their postwar high in 1946. Demand for the crops these lands produce has fallen, but production has remained heavy and the inevitable surpluses have depressed prices and farmers' profits. Present demand for land is slack, and turnover is small.

Orange land in Southern California is down an average of 40 percent from 1946 values.

Vineyards are down about 35 percent.

... Continued on page 62

Turkish Student Studies California Highways

By EARL T. SCOTT, District Engineer

HALIT Z. SARMAN, awarded a scholarship by the Turkish Government, was sent to the United States to complete his education and to get experience in highway construction and maintenance. He has spent the last year in District VI of the California State Division of Highways at Fresno because climatic and geographic conditions are similar there to those of Turkey.

Mr. Sarman, after spending six weeks at the Headquarters Laboratory in Sacramento, went to Fresno. His first two months were spent in the Surveys and Plans Department. Following the above assignments he went out on construction projects for two months and spent a month in the Right of Way Department. He has made a study of the district's accounting methods, spending three weeks in that department, part of which time was in the field offices. Mr. Sarman has been in the Maintenance Department for the past two months and intends to spend the rest of his training period in that department since he expects to be assigned to maintenance work upon returning to Turkey.

After attending primary schools in his homeland, Mr. Sarman spent six years in college in Turkey prior to being sent to the United States by the Turkish Ministry of Public Works to do post-graduate work and to get practical experience in the highway field. He came to the United States in November, 1946, and took English at Queens College, Flushing, New York. After learning to speak the English language, Mr. Sarman attended Iowa State College from September, 1947 to June, 1948, receiving his Master of Science degree in Highway Engineering. The topic of his thesis in that institution was "Stabilized Soil Roads for Turkey." In the summer of 1948 he took a two months field trip, which was arranged by the Public Roads Administration, in Kansas, Missouri and Texas to study stabilized roads in those states. After that trip he came to California



Halit Z. Sarman

for a year of practical training as he felt that California was one of the leading states in the country in the field of highways.

Mr. Sarman has fitted into our organization very well. He has a pleasing disposition and is very well liked by the Highway Department employees. He has worked along with the other employees in the various departments and has taken part in not only the highway work, but also in social activities. He is a fine young man and is popular with both sexes. District VI has enjoyed having Mr. Sarman as its guest worker. (Not being a citizen of the United States it has been necessary for Mr. Sarman to work without pay.) He might be called an Ambassador of Good Will from the distant Republic of Turkey.

Strategy

Continued from page 39 . . .

was familiar, the committee decided to call a tribal meeting. The tribal meeting was attended by both men and women of the tribe and was very democratic in nature. If the Indian women of the tribe at one time had no voice in the affairs of the tribe, that custom has long since been forgotten, for at this meeting the women presented, by far, the most difficult questions to be answered and demanded very thorough explanations of the different phases of the transaction. This was particularly true relative to the taking of access rights. A resolution was passed at this tribal meeting, authorizing the Indian Tribal Committee to sign the resolution of consent and agreement, which is one of the documents prescribed by the Department of Interior.

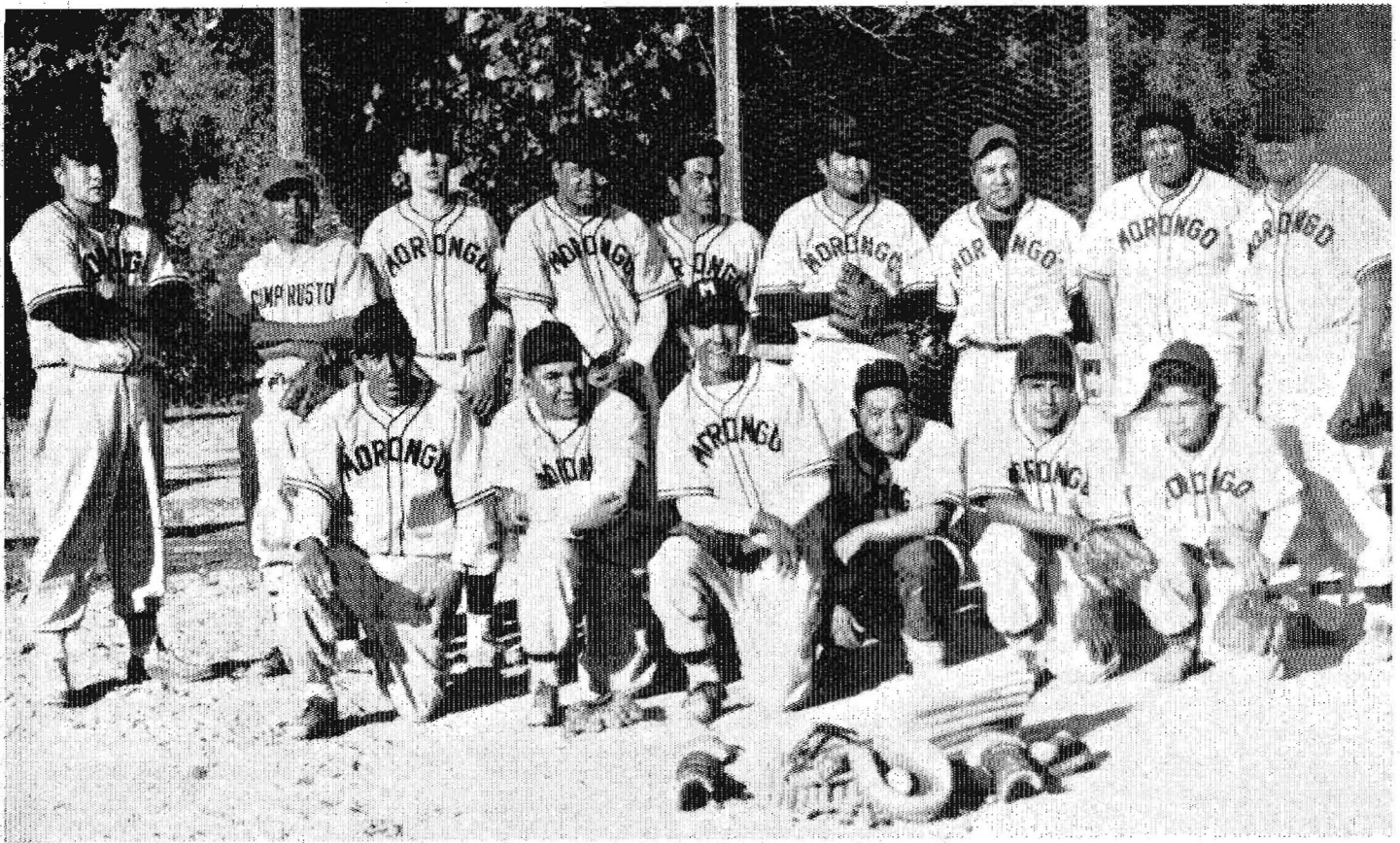
Tribe Consents

After receiving the consent of the tribe, application for the right of way was made to the Department of the Interior, consisting of:

1. Letter of application, in triplicate;
2. Linen tracing, in duplicate, showing all engineering data applicable to the right of way acquisition;
3. Four prints of the tracing;
4. Resolution of Consent and Agreement of the Tribe, in three counterparts, executed by the Morongo Indian Tribal Committee;
5. State warrant, made payable to the Treasurer of the United States of America, in an amount twice that of the total payment for land, damages, and access rights, which amount was agreed upon with the tribe.

Federal Procedure

In transactions of this sort, the money paid for the lands acquired goes into the tribal revolving fund, which is held in trust for the Indians by the Federal Government in the same manner as are lands, and may be used by the tribe for such things as maintenance of fences, construction of irrigation ditches, pipe lines, and other items that benefit the tribe as a whole. When the entire transaction is finally approved by the Department of the Interior, the



Morongo Braves baseball team. This picture was taken just after the Braves had won a game from the Moreno Cubs by a score of 19 to 1. Back row, left to right, Louis Martin, Manager, Harley Pacheco, George Pelonis, Leonard Linton, Bill Lynos, Charley Martin, Biff Andreas, John Martin, Lloyd Marcus. Front row, left to right, Salvador Rios, Calvin Martin, Paul Martin, John O'Brien, Theodore Linton, Charley Miguel

additional amount above the original purchase price, previously deposited with the Treasurer of the United States of America, is returned to the State.

After completing the acquisition with the tribe, each Indian holding an individual allotment fronting on the highway was contacted and the State's offer for land and access rights was made to them and accepted, the same as in any other individual right of way transaction. A "Statement of Owner of Allotted Indian Lands to Accompany Application for Right of Way" was signed by each individual allottee and forwarded, in triplicate, with the letter of application being made for the entire right of way. Payment for the right of way across private allotments was made in the same manner as that for tribal lands, i.e., funds being deposited with the Federal Government and later disbursed by the proper agency to the allottees.

Final approval of the transaction was had from the Assistant State Director under authority vested in him by Sec-

Bids and Awards

Continued from page 49 . . .

San Jose, \$163,312; Chittenden & Chittenden, Auburn, \$168,390; O'Connor Bros., Red Bluff, \$169,842; J. Henry Harris, Berkeley, \$186,490. Contract awarded to Grant L. Miner, Palo Alto, \$139,846.

YOLO AND SACRAMENTO COUNTIES—Across Sacramento River at Capitol Avenue, the existing steel bridge to be cleaned and painted. District III, Route 6, Sections C, Sac. Pacific Bridge Painting Co., San Francisco, \$26,625; Martin Fried, San Francisco, \$38,552. Contract awarded to Fred T. Judd, Berkeley, \$24,888.

F.A.S. County Projects

ALPINE COUNTY—Between 7 miles east of Markleeville and Mono County line, about 5.5 miles

retarial Order No. 2252 and the order of the Commissioner of Indian Affairs, which approval is placed upon one of the prints previously forwarded to the Department of the Interior and then returned to the district and subsequently recorded in the State Highway Map Book in the County Recorder's office of Riverside County.

to be graded and drainage facilities to be installed. District X, Route 959. Tyson & Watters Co., Sacramento, \$110,610; Karl C. Harmeling, Stockton, \$113,075; Westbrook & Pope, Sacramento, \$119,324; Isbell Construction Co., Reno, \$124,516; W. C. Lefever & D. Gerald Bing, Sacramento, \$132,372; Louis Biasotti & Son, Stockton, \$134,173; M. Malfitano & Son, Inc., Pittsburg, \$135,275; Harms Bros., Sacramento, \$141,287; Fredrickson Bros., Oakland, \$154,224. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, \$79,747.90.

MONTEREY COUNTY—On Del Monte Blvd., between east city limits of Monterey and Seaside junction, about 2.7 miles to be graded and surfaced with plant-mixed surfacing on crusher run base. District V, Route 662. A. G. Raisch Co., San Francisco, \$250,161; Louis Biasotti & Son, Stockton, \$260,739; Rand Construction Co., Inc., Bakersfield, \$289,575; Stolte Inc., Oakland, \$298,915. Contract awarded to Granite Construction Co., Watsonville, \$242,422.60.

INYO COUNTY—Between southwest end of Wildrose Canyon and Death Valley National Monument about 5.7 miles to be graded, imported borrow placed and a penetration treatment applied to the central portion. District IX, Route 1065. W. C. Lefever & D. Gerald Bing, Sacramento, \$37,318; Guerin Company, Los Angeles, \$37,865; Phoenix Construction Co. Inc., Oilfields Trucking Co., Bakersfield, \$39,011; Arthur A. Johnson, Laguna Beach, \$41,352; Davis & Swartz, Bakersfield, \$41,975; Covina Construction Co., Covina, \$47,696; Anderson Company, Visalia, \$48,881; Tyson & Watters Co., Sacramento, \$64,421. Contract awarded to Dicco Inc. & Dix-Syl Construction Co., Inc., Bakersfield, \$36,687.

Real Estate Trends in State of California

Continued from page 59 . . .

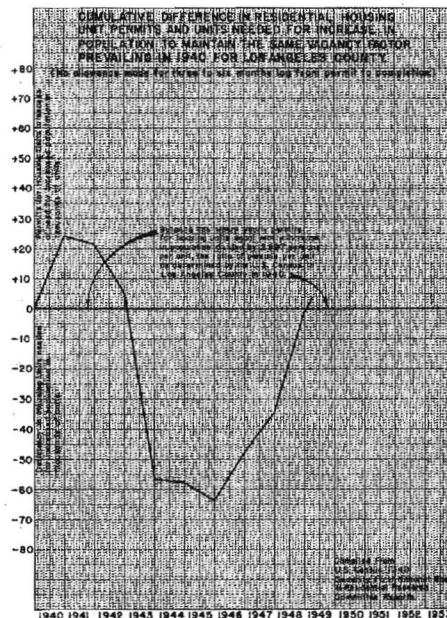
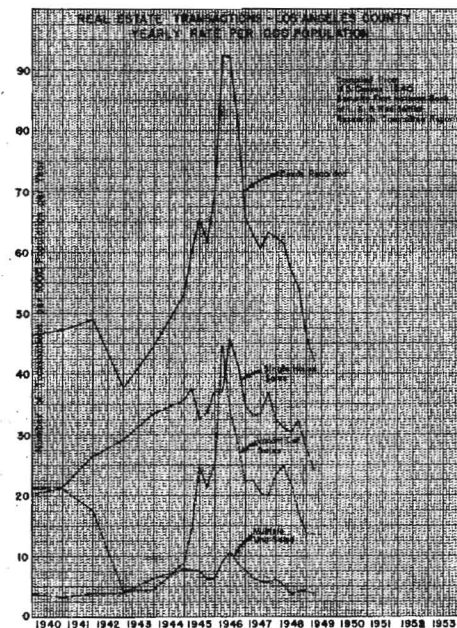
Date groves are off 50 percent. Olive and walnut lands are down about 50 percent.

Up to now the troubles of the specialty crop growers haven't become a general farm real estate ailment. Farm economists think there are at least two good reasons why not. For one thing, prices of truck-crop, grain and pasture lands rarely climb to the heights that specialty crop lands reach in boom time. Even in normal periods, their price levels are well below the specialty crop lands.

Basic crops, like corn, wheat and cotton are underwritten by the Government parity price program. Prices soften, but the federal price props keep them from collapsing. That makes those lands a better real estate bet.

From data compiled from the United States Census, the Monthly Summary of Business Conditions in Southern California by the Security-First National Bank of Los Angeles, and the Residential Research Committee of Los Angeles County, we have prepared the accompanying sheets as follows:

- Cumulative Difference in Residential Housing Unit Permits and Units Needed for Increase in Population to Maintain the Same Vacancy Factor for Los Angeles County.
- Residential Building Permits—Los Angeles County Rate per Year in Thousands of Family Units.
- Percent of Vacancy in Family Units in Los Angeles County.



Real Estate Transactions—Los Angeles County Yearly Rate per 1,000 Population. Residential Building Cost and Selling Price Index in Los Angeles County. Index to Market Prices for Single Family Dwellings in Los Angeles County by Age of Property. Index to Market Prices for Single Family Dwellings in Los Angeles County by Price Bracket. Index to Market Prices for Single Family Dwellings in Los Angeles County by Geographical Area.

NORTH SACRAMENTO CITED FOR PEDESTRIAN PROTECTION

NORTH SACRAMENTO has been cited for its record of no pedestrian deaths during 1948 in the nation-wide Pedestrian Protection Contest sponsored by the American Automobile Association and its affiliated clubs.

Notification of the citation was contained in a letter sent to Mayor Kenneth R. Hammaker by D. E. Watkins, secretary and general manager of the California State Automobile Association.

The contest, conducted annually for the past ten years, honors states and cities making the most effective efforts to cut down pedestrian accidents. All states and 1,484 cities were entered in 1948. In California, the contest is sponsored by the California State Automobile Association and the Automobile Club of Southern California, affiliated AAA clubs, and by the State Department of Motor Vehicles.

In Memoriam

EDGAR FARRAR RICHARDSON
1907-1949

Edgar Farrar Richardson, Associate Highway Engineer, Eureka District of the Division of Highways, passed away after a long illness.

Mr. Richardson, better known as "Ed" to all his associates, was born August 12, 1907, at Grants Pass, Oregon, the son of a construction engineer.

After completing his schooling at the University of Nevada, he joined the engineering forces of the California Division of Highways in 1928 as a chainman in District IV. During the succeeding years he was employed on numerous projects in that district, including the tunnel and 19th Avenue approaches to Golden Gate Bridge.

During the war years, in 1942, he transferred to District I, where he attained Associate Highway Engineer status. He served as Resident Engineer on several projects, and was on the important Noyo River River Approach project near Fort Bragg when he was taken ill. In spite of the long illness that followed, he always maintained a cheerful attitude.

He is survived by his widow, Hazel Chisholm Richardson, and a son, Edgar Farrar, Jr.

Ridge Route

Continued from page 22 . . .

struction is estimated to cost about \$925,000 and it is now anticipated, because of the excellent progress being made by this contractor, that completion will be in December of this year.

Application for federal aid funds to assist in financing the last five of these contracts was denied by the Federal Government because of conflict of federal regulations relative to federal power withdrawals.

Boom Attachment For Heavy Fork Lift Proves Value

By L. D. CRAIG, Stores Coordinator

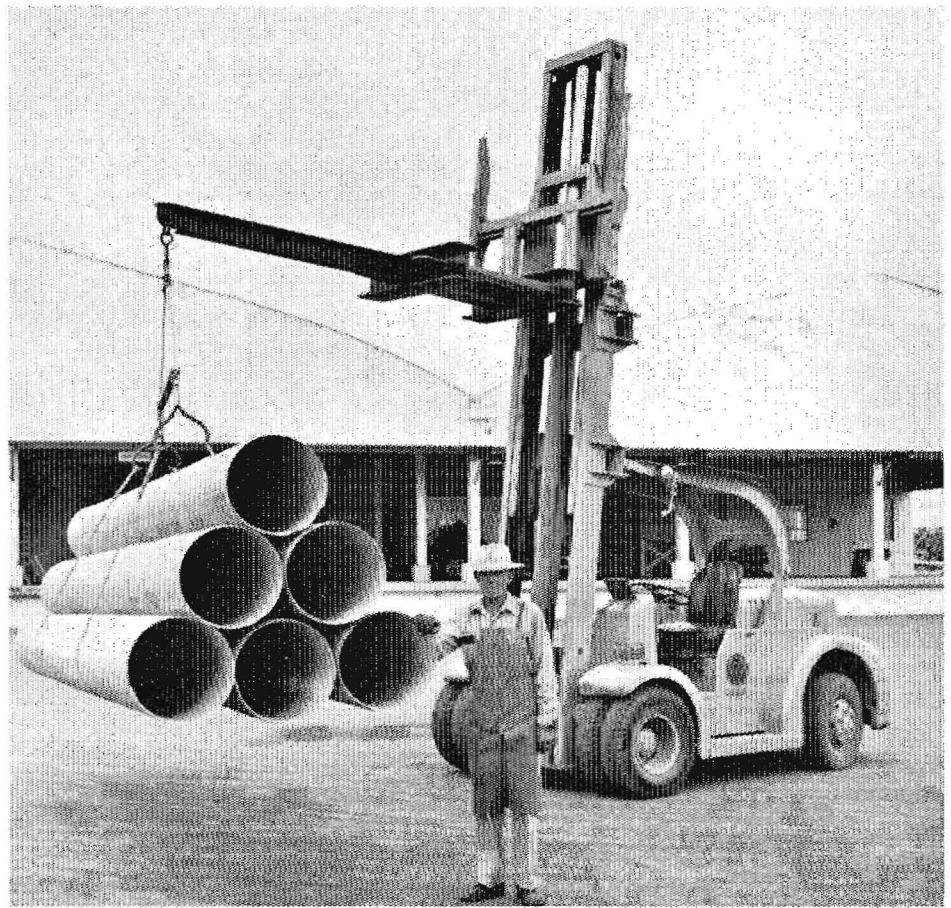
A SIMPLE BOOM attachment for a seven and one-half ton fork lift truck, which has the facility of being attached or detached almost instantaneously, has been devised by George Sloan, yard boss at the Stores Department warehouse in Sacramento.

This large lift truck is in almost constant use in the warehouse yard and handles a diversity of items for which the forks alone are not readily adaptable. It was therefor necessary to utilize a boom attachment for handling such items as beams, reinforcing steel, culvert pipe and long lengths of lumber.

Existing crane attachments for the lift truck require a minimum of about two hours to change, which feature is very unsatisfactory, considering the varied use to which the equipment is put. After considerable thought Mr. Sloan devised an attachment that could be changed on a moments notice and which has proven satisfactory.

Design of Attachment

The attachment, as shown in the accompanying sketch and photograph, is constructed of welded steel H beams and consists of a 10-foot boom crossed with a double tee. The web of the H beams forming the double tee are slotted to permit free entry of the lift truck forks. The boom, when lifted by



George Sloan, yard boss at the Stores Department warehouse, Sacramento, standing beside boom attachment which he designed

the forks, then extends horizontally as a cantilever that can be raised vertically as part of the load carriage to its full height of 21 feet and is capable of handling a maximum load of six thousand pounds at the outer end.

More specifically, the boom consists of a 6-inch x 22.6-pound H beam 10

feet long, to which are welded two 10-inch x 42-pound H beams 45 inches long to form the double tee.

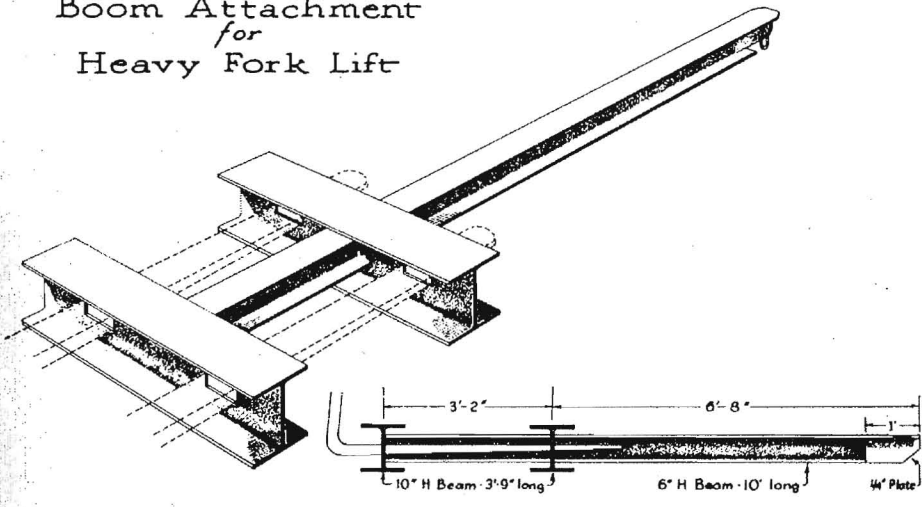
A hole is drilled in the outer end of the boom for attaching various types of rigging, such as slings, bridles and hooks for handling timbers, loose bundles, reinforcing steel, long lengths of culvert pipe and piling.

Method of Operation

To use the boom the operator of the lift truck merely inserts his forks into the slots of the cross tees while the boom is lying on the ground and then tilts his lifting columns slightly to the rear. This prevents the boom from sliding off, and by raising the forks the boom is hereby raised accompanied by its rigging. When finished, the operator lowers the boom to the ground and backs his lift truck so that the forks are disengaged from the slots.

The boom has enabled two men and the fork lift to unload a 60-ton car of steel H beams in two hours' time,

Boom Attachment for Heavy Fork Lift



whereas four men and the conventional forks required about eight hours. On a recent occasion the boom attachment, without further manpower assistance, was able to load 14 tons of grader blades into a closed truck in 30 minutes, as compared to 16-man hours required for manual loading.

The boom attachment was originated during July, 1948, and because of the ease in attaching or detaching, its flexibility and simplicity has greatly improved the efficiency of the lift truck for handling diversified items. It has proven to be a great labor-saving device and has materially reduced warehouse handling costs.

Mr. Sloan has received many compliments for his ingenuity.

Prison Labor

Continued from page 28 . . .

tude of the road project and the time it will take to construct.

If construction by prison labor is to proceed in an orderly manner with a fixed inmate quota and construction organization, funds must be allotted and expended uniformly over a definite length of time.

Economic coordination of the time element, camp estimate of cost, construction procedure, and uniform expenditure of funds have been found, over the years, to require a minimum camp tenure of five years in one location. This period of time warrants substantial buildings of a semiportable nature.

The fourth article in this series, covering feeding and nutritional accounting, will appear in the next issue of California Highways and Public Works.—Editor.

Traffic Experts Attend Highway Parley In Sacramento on July 19

The institute of transportation and traffic engineering of the University of California conducted a conference on highway capacity in the California Junior High School, Sacramento.

Delegates to the conference were welcomed by R. M. Gillis, Assistant State Highway Engineer in behalf of the State, and H. E. Davis, acting director of the institute.

Fairfield By-Pass

Continued from page 44 . . .

facilities. The 1948 traffic census indicated 14,600 vehicles daily on the state highway immediately east of Fairfield.

In 1947, electric traffic signals were installed on Texas Street (state highway route) at intersections with Madison Street, Webster Street and Union Avenue in the City of Fairfield at a cost of approximately \$8,900. Without the traffic signals, local traffic had considerable difficulty in getting to and from the business area and particularly in crossing the highway traffic.

Cooperating with the Federal Bureau of Public Roads, a one-mile length of test section of hard grade high yield point reinforcing steel in the concrete pavement was placed.

Construction Design

These tests involve the placing of ½-inch steel bars longitudinally, a portion at 4 inches c.c. and some at 5 inches c.c. with ½-inch spacer bars at 5 feet c.c. The steel was placed in the mid point of the section. Special strain gauges and other testing apparatus has been installed to secure the test data by the Research Department.

The project is constructed as a four-lane divided highway, consisting of two 24-foot, 8-inch wide thick Portland cement concrete pavement travel lanes on 4-inch cement treated subgrade on 6 inches of imported borrow with 36 feet of separation with 3-inch plant mix on 6 inches of untreated crushed rock border, 3 feet wide at the outside and 2 feet wide at the inside of the pavement. The shoulder area beyond the borders is being seal coated.

Twin reinforced concrete bridges, each 80 feet long, are constructed

across Ledgewood Creek at the beginning of the project.

At the county road connection, west of Fairfield, traffic actuated signals and highway lighting is to be installed. Railway crossing warning signals will be installed at the Sacramento Northern Railroad crossing west of Fairfield. At the county road intersection, northeast of Fairfield, highway lighting will be provided.

Proposals for the grading and paving contract were received June 30, 1948. Parish Bros. of Benicia submitted the low bid and a contract was awarded to them for the project.

The major items of work involved:

367,000	cu. yds. of roadway excavation
18,800,000	sta. yds. of overhaul
93,000	tons of imported borrow
123,500	cu. yds. cement treated subgrade
33,400	tons untreated rock base
8,600	tons plant mix surfacing
27,850	cu. yds. Portland cement concrete paving
390,000	lbs. reinforcing steel
2	reinforced concrete bridges

Proposals for the traffic actuated signal system, highway lighting and railroad crossing warning signals were received September 8, 1948. A contract was awarded to the low bidder, L. H. Leonardi Electric Construction Company of San Rafael.

The total construction cost of this 4.7 miles of four-lane divided highway will amount to approximately \$1,300,000.

W. L. Hurd, Associate Highway Engineer, is the resident engineer for the State on both contracts.

highway capacity of the highway research board.

The afternoon session of the conference was presided over by J. W. Vickery, Assistant State Highway Engineer.

It featured a discussion of California practice by J. C. Young, Traffic Engineer of the Division of Highways, and examples of the use of traffic engineering techniques.

The program was presented by D. Grant Mickle, Traffic Safety Engineer of the Automotive Safety Foundation.

EARL WARREN
Governor of California

CHARLES H. PURCELL
Director of Public Works

FRANK B. DURKEE
Deputy Director

HIGHWAY COMMISSION

C. H. PURCELL Chairman
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GEO. W. SAVAGE, Secretary Sacramento

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FRED J. GRUMM Deputy State Highway Engineer
J. G. STANDLEY Assistant State Highway Engineer
R. M. GILLIS Assistant State Highway Engineer
F. W. PANHORST Assistant State Highway Engineer
J. W. VICKREY Assistant State Highway Engineer
R. H. WILSON Assistant State Highway Engineer
T. E. STANTON Materials and Research Engineer
T. H. DENNIS Maintenance Engineer
A. M. NASH Engineer of Design
EARL WITHCUMBE Construction Engineer
H. B. LA FORGE Engineer of Federal Secondary Roads
L. V. CAMPBELL Engineer of City and Cooperative Projects
EARL E. SORENSON Equipment Engineer
H. C. McCARTY Office Engineer
J. C. YOUNG Traffic Engineer
J. C. WOMACK Planning Engineer
I. O. JAHLSTROM Principal Bridge Engineer
STEWART MITCHELL Principal Bridge Engineer
E. R. HIGGINS Comptroller

Right of Way Department

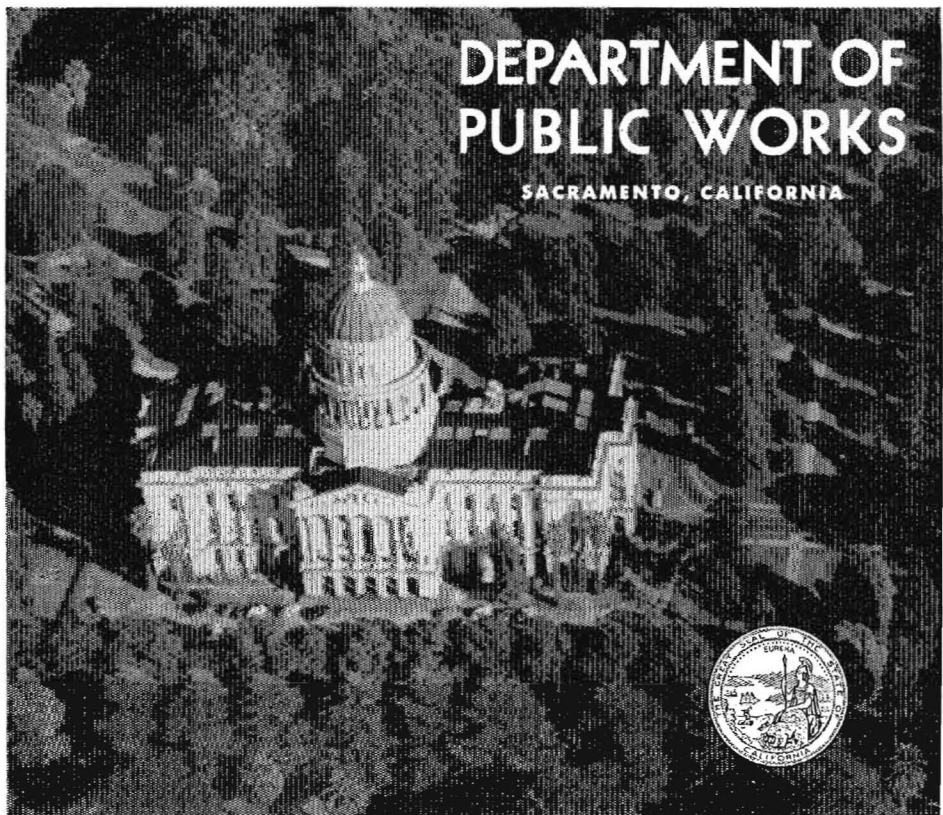
FRANK C. BALFOUR Chief Right of Way Agent
E. F. WAGNER Assistant Chief
GEORGE S. PINGRY Assistant Chief
R. S. J. PIANEZZI Assistant Chief
E. M. MacDONALD Assistant Chief

District IV

JNO. H. SKEGGS Assistant State Highway Engineer

District VII

S. V. CORTELYOU Assistant State Highway Engineer



DIVISION OF HIGHWAYS

District Engineers

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F. W. HASELWOOD District II, Redding
CHARLES H. WHITMORE District III, Marysville
B. W. BOOKER District IV, San Francisco
L. A. WEYMOUTH District IV, San Francisco
L. H. GIBSON District V, San Luis Obispo
E. T. SCOTT District VI, Fresno
P. O. HARDING District VII, Los Angeles
W. L. FAHEY District VII, Los Angeles
M. E. CESSNA District VII, Los Angeles
E. Q. SULLIVAN District VIII, San Bernardino
S. W. LOWDEN District IX, Bishop
C. E. WAITE District X, Stockton
E. E. WALLACE District XI, San Diego
HOWARD C. WOOD Bridge Engineer, San Francisco-Oakland Bay Bridge and Carquinez Bridge

DIVISION OF CONTRACTS AND RIGHTS OF WAY

Legal

C. R. MONTGOMERY Chief
ROBERT E. REED Attorney
GEORGE C. HADLEY Attorney
HOLLOWAY JONES Attorney

DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

RALPH A. TUDOR Chief Engineer

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer Chief of Division
A. D. EDMONSTON Assistant State Engineer
GORDON ZANDER
Principal Hydraulic Engineer, Water Rights
T. B. WADDELL
Principal Hydraulic Engineer, Central Valley Project
G. H. JONES Principal Hydraulic Engineer, Sacramento River Flood Control Project
W. H. HOLMES Principal Engineer, Design and Construction of Dams, Supervision of Dams
P. H. VAN ETEN
Principal Hydraulic Engineer, State-Wide Water Plan
GEORGE B. GLEASON
Supervising Hydraulic Engineer, Los Angeles Office
T. R. MERRYWEATHER Administrative Assistant

DIVISION OF ARCHITECTURE

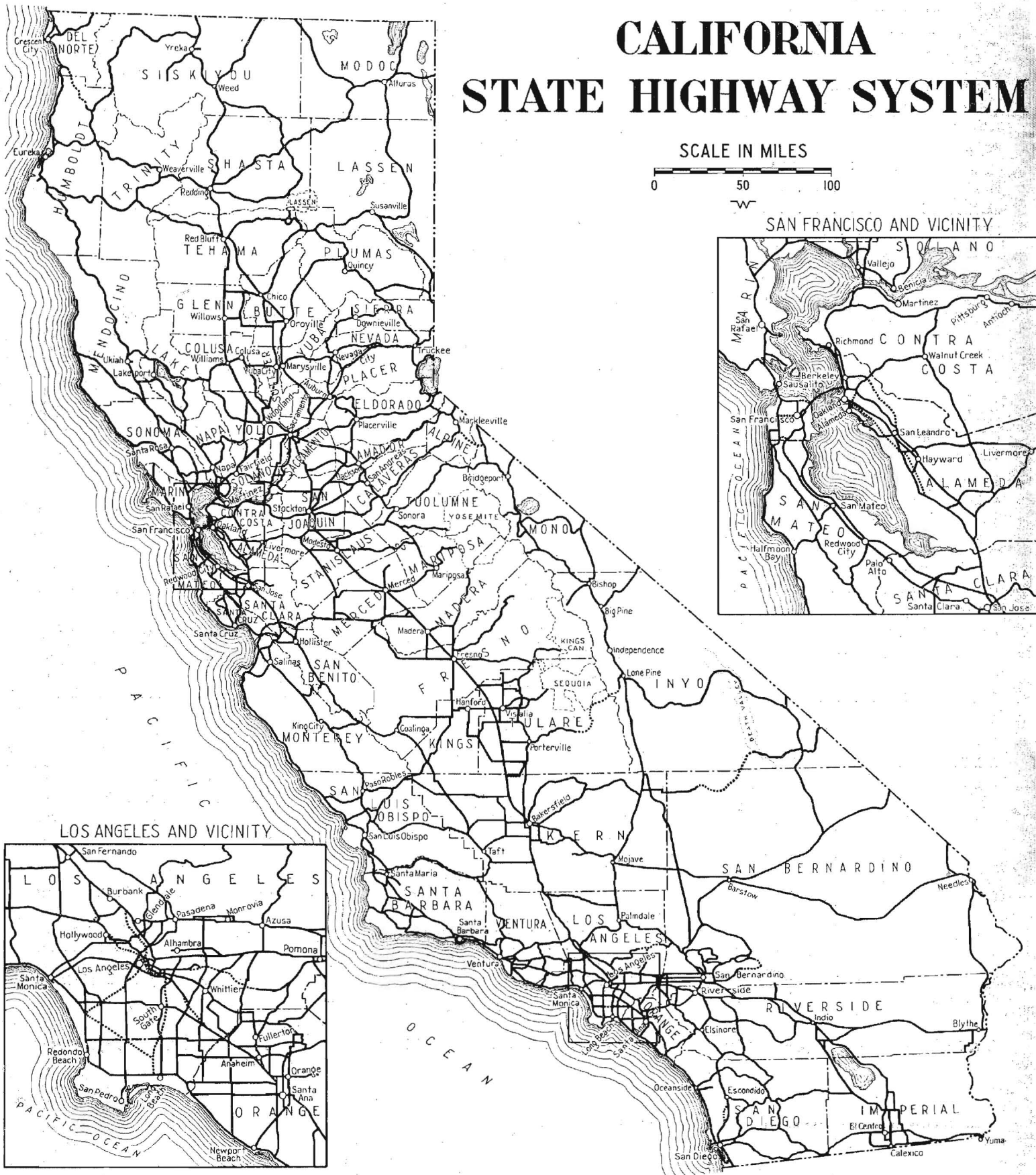
ANSON BOYD State Architect
W. K. DANIELS Assistant State Architect (Administrative)
P. T. POAGE Assistant State Architect (Design and Planning)

Headquarters

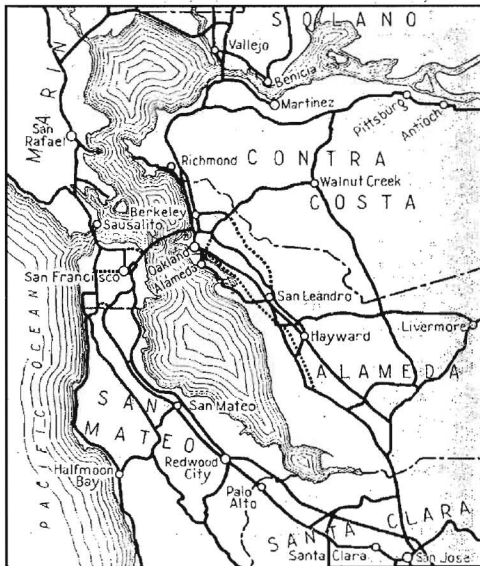
A. F. DUDMAN Principal Architectural Designer
H. W. DeHAVEN Supervising Architectural Draftsman
D. C. WILLETT Chief Construction Engineer
CARLETON PIERSON Supervising Specification Writer
FRANK A. JOHNSON
Principal Structural Engineer (State Buildings)
C. A. HENDERLONG
Principal Mechanical and Electrical Engineer
WADE HALSTEAD
Supervising Estimator of Building Construction

CALIFORNIA STATE HIGHWAY SYSTEM

SCALE IN MILES



SAN FRANCISCO AND VICINITY



LOS ANGELES AND VICINITY

