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HIGHWAYS AND PUBLIC WORKS



*View of Eastern Slope of the High Sierras
north of Bishop on U.S. 395 (State Route 23)*

Official Journal of the Department of Public Works
APRIL • • 1937

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

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Annual Survey Shows Rural Road Accidents Keep Pace With Normal Traffic Growth

By T. H. DENNIS, Maintenance Engineer

WHILE total traffic on rural roads of California's State Highway System increased approximately 12 per cent during the last six months of 1936, the number of accidents increased 38 per cent.

This is revealed by the second six months' survey of accidents for last year just completed.

In reviewing the records for the entire twelve months' period for the year 1936 it is found that 7665 accidents involving motor vehicles were reported as having occurred on the rural portion of the State highway system. This compares with a total for 1935 of 6824, showing an increase of 12 per cent, which corresponds very closely with the increase in total traffic during the same period.

However, the total accidents reported for the first six months' period numbered only 3209, considerably less than 50 per cent of the year's total.

The increase in the number of accidents may be accounted for to some extent by the fact that the vacation period for nearly everyone comes during the second half of the year and there is a correspondingly large amount of travel in unfamiliar surroundings. However, one is forced to the conclusion that those who drive, and that means nearly all of us, fail to realize or simply refuse to recognize that driving a motor vehicle can never be an automatic process and that unless care and judgment are exercised at all times the inevitable result is accident.

TWO TYPES OF ACCIDENTS

Although the accident rate for the full year is higher than was observed when summarizing the first six months' period, the general patterns as to location, type, and contributing causes remain much the same.

In general the accidents reported have been considered in two main groups: those where only a single motor vehicle was involved and those involving two or more motor vehicles. This is for the reason that in single-car accidents the question of traffic is largely eliminated. Accidents in each group, and the combination of the two, have been analyzed as to type, location with respect to lane widths of roadway, and the reported contributing causes.

A separation of single-car accidents into the natural divisions of "Collision," "Noncollision," and "Pedestrian" results in respective percentages of 36 per cent, 44 per cent, and 20 per cent. These figures for the full year show very little change from corresponding percentages of 35 per cent, 46 per cent and 19 per cent found in the analysis of the first six months' period. Taking more specific categories, "Drove off road" and "Turned over" account for 40 per cent of all single-car accidents, the same percentage found for the first six months' period. "Collision with pole or tree" 11 per cent, "with bridge or culvert" 6 per cent compare with previous percentages of 10 per cent and 5 per cent.

TWO-CAR MISHAPS

Where more than one motor vehicle is involved the "Course being pursued" provides probably the most satisfactory group basis for review.

Vehicles "Approaching each other on the same road" accounted for 42 per cent of all two-or-more-car accidents; "Overtaking on the same road" 29 per cent; "Paths intersecting while traveling the same road" (including left or U turn, right turn, coming out of parking space) 16 per cent; "Paths intersect-

ing but while vehicles were traveling different roads" 12 per cent. This group covers the commonly designated intersection accident and includes intersections with private roads.

These accident types have been grouped to show various relationships when the different lane widths of roadway are also taken into consideration.

HEAD-ON COLLISIONS

"Approaching" accidents as noted above are by far the most numerous of all types and naturally the most serious, being made up of direct head-on collisions and side-swipe head-on collisions. This type constituted approximately 46 per cent of the two-lane accidents, 33 per cent of the three-lane, and 21 per cent of the four-lane. These percentages show some slight change from the first six months' figures, which were 44 per cent, 38 per cent, and 20 per cent. They would seem to indicate that as the number of lanes is increased the approaching type of accident decreases.

"Overtaking" accidents, made up of direct and modified forms of rear-end collisions, are the second most numerous of the four main groups, being respectively 27 per cent of all two-lane accidents, 34 per cent of the three-lane, and 39 per cent of the four-lane. The first six months' period showed respective percentages of 29 per cent, 33 per cent, and 36 per cent.

Here we find a reverse tendency from that noted with respect to the "approaching" type, in that rear-end collisions are of much less frequent occurrence than head-on collisions on two-lane roads, while they are of slightly greater frequency on three-

(Continued on page 8)

New Los Gatos-Santa Cruz Highway Saves Five Miles

By JNO. H. SKEGGS, District Engineer

ANOTHER link in the improvement of the Los Gatos-Santa Cruz Highway, Route 5, one of the heaviest traveled recreational and business highways of the State, was recently completed with the opening to travel of the Scott's Valley reconstruction at the Santa Cruz end, affecting a saving of 5 miles.

This highway connects the Santa Clara Valley with Santa Cruz bay districts, climbing over the Santa Cruz mountain spur of the Coast Range, and is the main access road from the San Francisco bay cities to the vacation resorts in the mountains and the seashore playground of the Santa Cruz area.

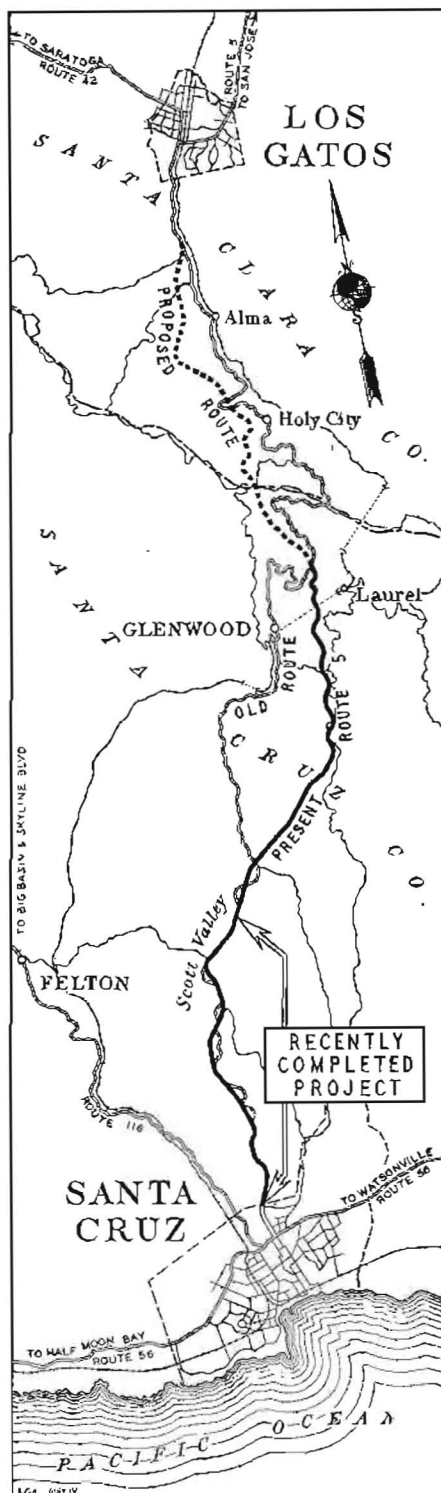
Since the early days of the automobile, this road has been popular with Bay District motorists, and was among the first of the mountain roads to be selected for improvement after the creation of the California Highway Commission.

FIVE MILES SHORTER

Early construction followed a new alignment through virgin country for the greater portion of its distance, and was considered a bold location for its day. A glance at a map showing the old State highway and the new and proposed relocation, with an indicated saving of 5 miles in distance, will serve to show what great changes have occurred in location standards.

Before 1920 the travel had become so heavy that the graveled surface was totally inadequate to carry the traffic. About that time the major portion of a 25-mile stretch was surfaced with a 15-foot concrete surface, widened on the curves; and, since most of the road was on curves, there was very little that escaped this widening.

Within a few years this improvement also became inadequate, and on Sundays and holidays it was often impossible to get out of line in the entire 25-mile trip.



Some relief was afforded by the improvement of the Skyline Boulevard and other parallel roads constructed by the State and the counties, but this route, being the most direct, continued to draw the bulk of the travel.

TRAFFIC RELIEF IMPERATIVE

Further relief was thus imperative, and studies were undertaken a number of years ago to determine the best routing, which resulted in a recommendation for a radical change of location and reconstruction on a new line.

The first contract under this program was let in 1932 and provided a four-lane highway through the heavy mountain sections where curvature is naturally limited, and a three-lane construction through the valleys and flats where easier curvature alignment could be secured. Contracts for further improvement have been continuously under way since 1932.

The high light of the recently completed project in Santa Cruz County, between Scott's Valley and one mile north of Santa Cruz, is the straightening of the old highway through the well-improved and subdivided Scott's Valley.

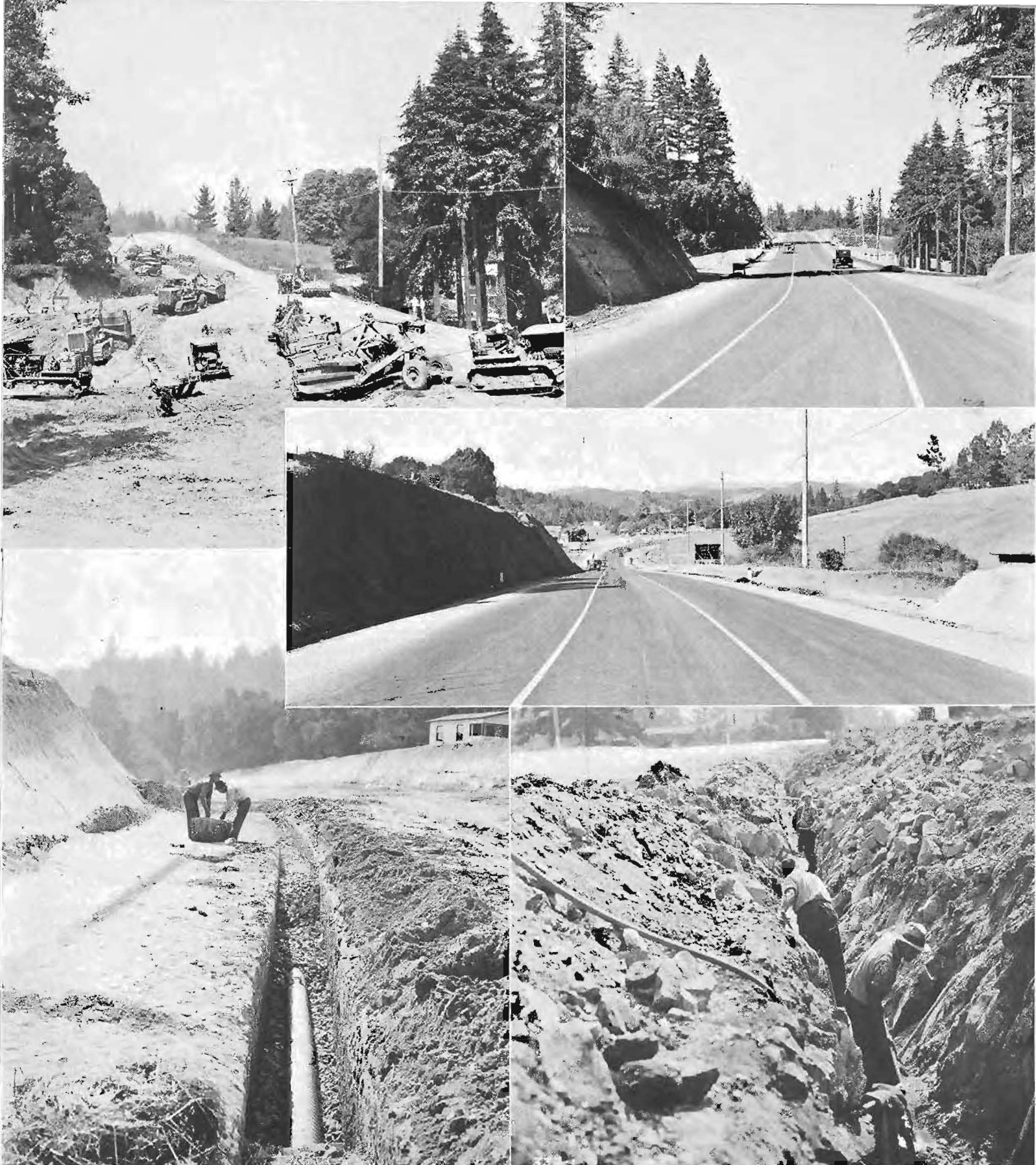
CURVATURE STATISTICS

The following statistics of curvature and length afford a graphic picture between the old and the new:

	No. of Curves	Total Curvature	Minimum Radius	Length of Line Miles
Present	34	1586° 28'	100	4.23
Proposed	12	351° 36'	750	3.93
Difference	22	1235° 02'	---	0.30

This is a country of heavy winter rainfall, with a light, sandy easily eroded top soil. The weather and the soil conditions foster plant growth, and formerly many fine stands of redwood were found throughout the valley. The steeper gulches are still

(Continued on page 17)



Views of improvement of Scott's Valley link of the Los Gatos-Santa Cruz Highway during and after construction. Upper left: Scene showing grade construction work. Upper right: Section of completed highway at same point showing width of pavement. Center: Looking north toward Camp Evers on newly finished highway. Lower left: Drain being laid under subgrade. At right: Excavation in rock formation for installation of side drainage.

Building Divided Highway Link on L. A.-Pomona Airline Lateral

By R. J. HATFIELD, Resident Engineer

WIDENING of the last section of the realigned Los Angeles-Pomona Lateral which will provide a 27-mile direct line highway forty feet wide with only two electric "Stop and Go" signals and only two boulevard "Stop" signs for its entire length will be completed next month.

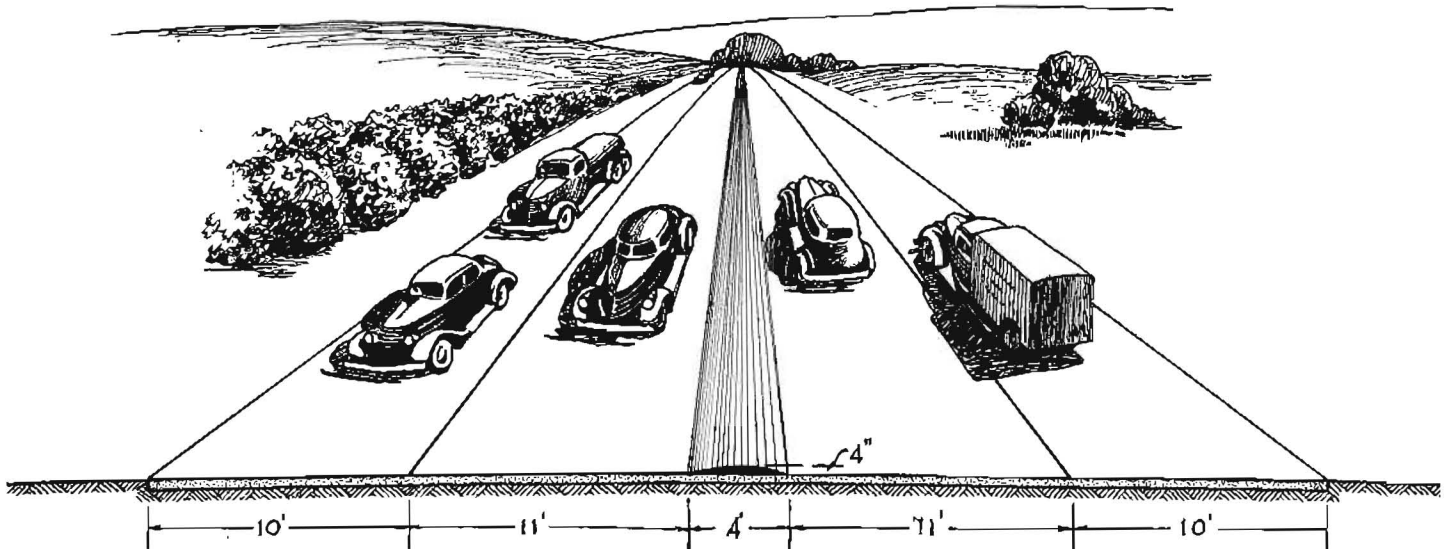
Originally a pioneer mail route, this super-highway, then a county road, was taken into the State highway system by the Legislature in 1931. Improvement operations were started in 1932 and this month saw the laying

Los Angeles Civic Center to Pomona.

In the 50's Richard Garvey Sr., government letter carrier, packed the mail between Los Angeles and an army post on the Colorado River. It is related that Mr. Garvey, laying out the course he would pursue, followed the flight of crows eastward and westward and thus laid out a route that ran straight from Los Angeles to Pomona. Through Monterey Park and easterly, a portion of the present highway is known as Garvey Avenue, preserving by name the memory of

county improvement on Garvey Avenue through Monterey Park and El Monte, and Holt Avenue west of Pomona, the newly adopted route traversed land intensely devoted to agricultural pursuits, walnut orchards and orange groves.

The necessary land, for highway right of way, valued at \$2,000,000, was almost entirely secured by donation. The far-seeing property owners who wholeheartedly cooperated in the improvement, are today realizing benefits in the form of dividends from



Sketch shows 46-foot pavement with raised bituminous strip 4 feet wide in center creating a 21-foot lane for traffic in each direction on easterly 6.3 miles of the new Los Angeles-Pomona Lateral. The strip is 4 feet wide in the center and feathered at edge to meet pavement.

of the last stretch of widened concrete pavement on this unusual airline thoroughfare.

Starting at a point three-quarters of a mile east of the Los Angeles City Hall, the highway runs through the southwest corner of Alhambra to the city of Monterey Park and thence to El Monte and through walnut orchards and orange groves and the rolling Kellogg hills to Pomona.

The completed highway will have a 40-foot concrete pavement with wide oiled shoulders and no grade intersections with major streets from the

the pioneer who first mapped it.

In 1931 the California State Legislature, aided by a large straight-edge and an accurate map, found Mr. Garvey's "navigation" good and adopted the forgotten mail route as a State highway, thus providing for an airline link in Southern California's most popular eastern and southwestern tourist and freight route which has definitely contributed to the present unprecedented development of the cities and communities to the east of the metropolitan center.

With the exception of existing

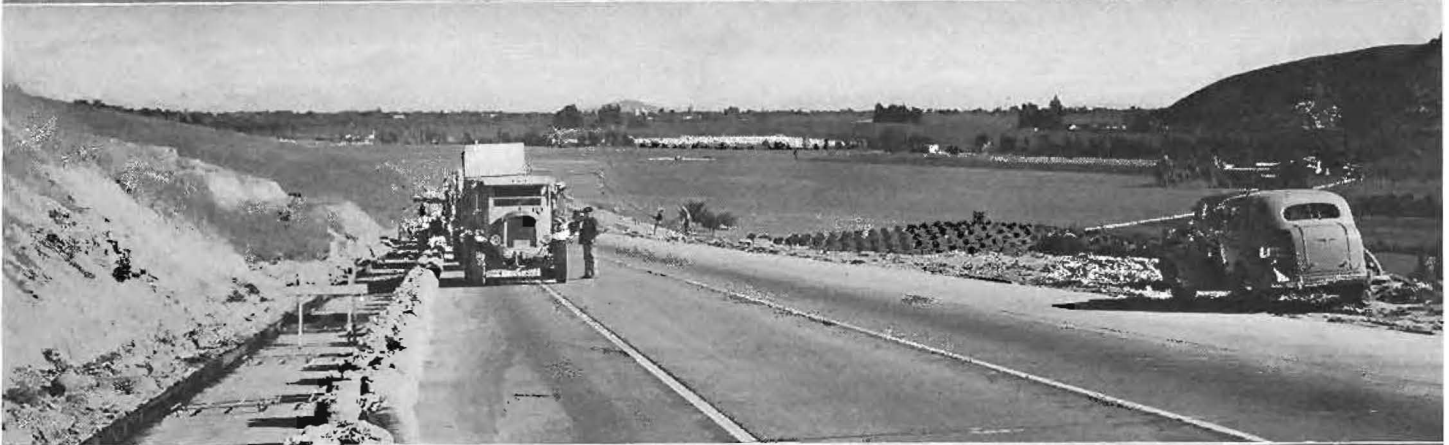
enhanced valuation of real estate, the annual aggregate of which far exceeds the estimated total right of way purchase value of 1931-32.

In 1932 construction operations were commenced on a portion of the new alignment. Contracts for grading, paving, bridges, grade separations, and landscaping were awarded and completed in rapid succession.

BIG TRAFFIC INCREASE

In April, 1935, the last "Road Closed" barricades were removed and Southern California's 27-mile direct

(Continued on page 20)



Views of realigned Los Angeles-Pomona Lateral, unusual airline highway, which provides a 27-mile stretch of road with only two "Stop and Go" signals and only two boulevard "Stop" signs for its entire length. Upper: Completed section of 40-foot pavement, widened from three to four lanes, west of Pomona. Center: Shows line of trucks dumping material used in laying additional 5-foot strip of pavement at left of roadway. Lower: Concrete mixer and mechanical finishers operating on Garvey Boulevard near Kellogg Hills one of links in new highway which will be completed in May. This project entailed the construction of a 10-foot widening strip and 8-foot plant mixed shoulders for a distance of 18.7 miles.

Snow Removal This Season Will Cost State \$500,000

W. A. SMITH, Assistant Maintenance Engineer

THE cost of snow removal from State highways during the 1936-37 winter season will be practically a half-million dollars on 5000 miles of road by the time all routes are open to traffic.

This is \$150,000 more than required during any previous year.

There have been seasons when more snow fell at the higher elevations, and single storms of longer duration have been weathered. The increase in cost is due to a comparatively heavy fall in valley and foothill sections; the short time between storms, and drifting which blocked the roads behind the plows.

On two routes—the sections of U. S. 99 between Castaic and Grapevine in Los Angeles and Kern counties, and between Dunsmuir and Yreka in Siskiyou County—traffic was tied up or endangered where little trouble had been experienced previously.

ICE HAZARD ON RIDGE ROUTE

On the Ridge Route section, four storms occurred, with snowfall of from two inches to twelve inches in depth. Normally, this small quantity of snow is easily handled with the equipment available. The traffic is so heavy on this route that the snow was packed to ice almost as it fell and before the plows could clear the pavement. Few of the vehicles using this road were equipped with chains and, consequently, could not negotiate the slippery grades. The situation thus became hazardous at once. It was necessary for the traffic officers to close the road at various times to all traffic not equipped with chains until the ice could be scarified and bladed from the surface.

The section between Dunsmuir and Yreka is an area of reasonably heavy snowfall, and suitable rotary equipment is provided. The storms of late January and early February reached blizzard proportions, and the road was closed to traffic, except for one or two short periods, from January 31 to

February 6 in spite of the efforts of snow removal crews.

VALUE OF SNOW REMOVAL

Snow removal work serves three distinct types of traffic: (1) through traffic, which includes trucks, buses and passenger cars engaged on the highways as a matter of business; (2) traffic which serves the more isolated communities and is more or less intermittent; and (3) the recreational traffic. The benefits to the people of the State can not be measured strictly on the basis of cost as compared to volume of traffic thus developed.

In the case of concerns engaged in hauling materials and supplies for example, there is a direct loss due to delays to their equipment whenever a regularly traveled road is closed by snow. There may also be a loss due to damage to the commodity—such as milk, fresh vegetables, etc. There is the further loss to the merchant and the consumer who are relying on delivery of such supplies.

SNOW SPORTS CONSIDERED

In the case of the small community, the ready means of transportation has established a dependence on the larger centers of distribution. Stocks of necessities must be replenished every few days and, while the number of vehicles which use a given road may be limited, the importance to the community served and the suffering which may follow on failure to keep open the line of communication may be very real.

The development of snow sports areas is a decided asset to the State. Such development relies on the ability of the highway organization to maintain an open road and, once resorts have been established as a result of snow removal operations, there is a definite responsibility to continue the service.

The considerations mentioned call for nice judgment and a certain amount of fortitude when proposals for extension of the service are presented. It is necessary to consider the following conditions: Will the grade, alignment and surface permit operation of the equipment required? Does the existing traffic demand and the probable development, within a reasonable period, justify the expense? Are funds available without seriously curtailing more necessary work?

UNCERTAINTIES INVOLVED

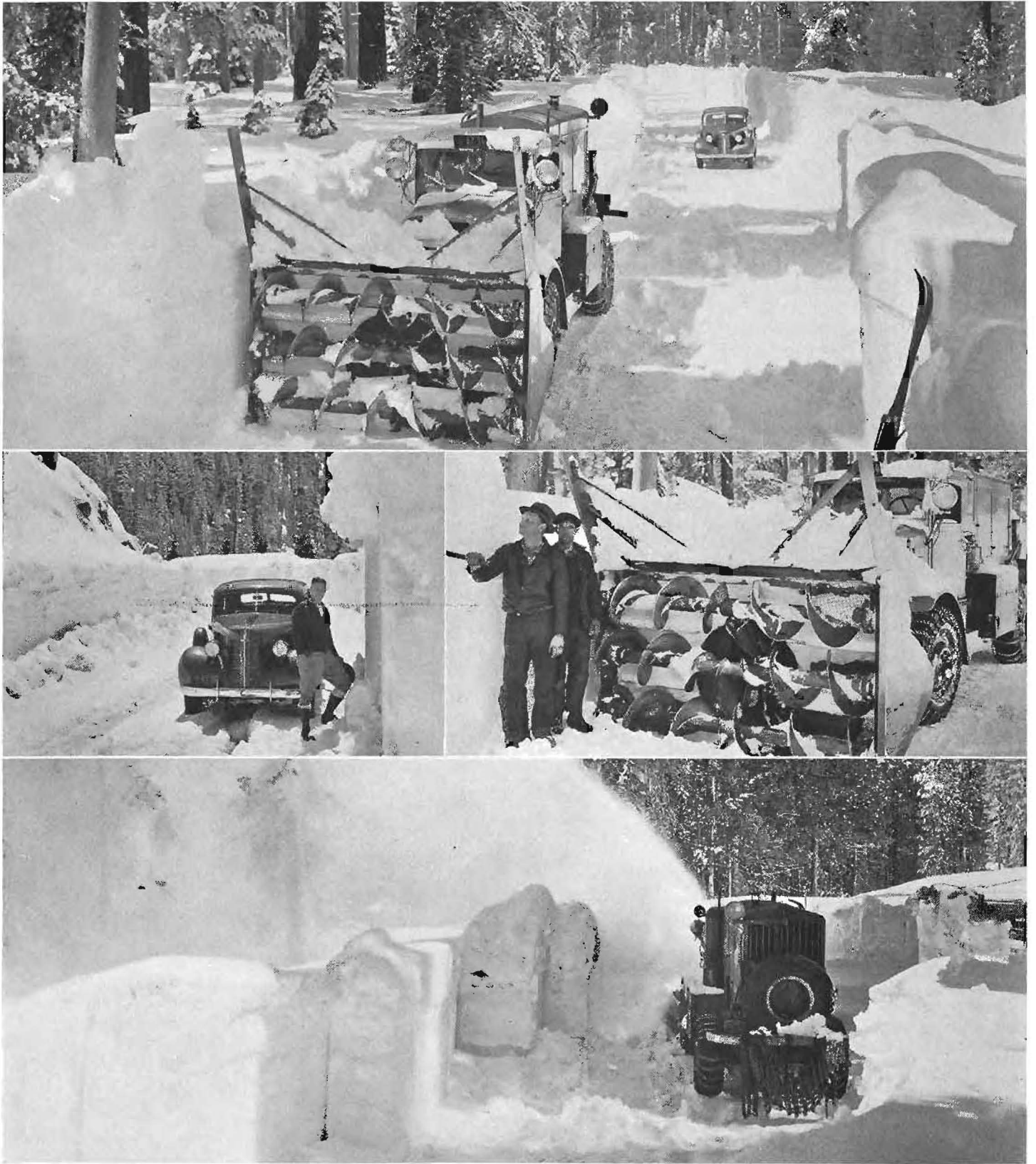
Even with the established program, the uncertainties of weather and traffic need can not be foreseen. It is essential, of course, to limit the organization and equipment. Each winter there is an equal chance that a minimum of equipment will take care of the situation. Actually, that was the case for three years prior to 1934.

On the other hand, during the past winter additional equipment requiring an investment of \$250,000 could have been used to advantage for short periods of time. As several months are required to secure delivery, and since more equipment means more shop and living facilities, little can be done once the winter season has started.

The spirit of the men assigned to the mountain areas is admirable. The work is hard on men and equipment. During storm periods, operations are necessarily continuous. Many times it is not possible to provide a relief operator at the end of a regular shift. In such cases the men carry on until they can be relieved. Each member of the crew feels a personal responsibility for the success of the work.

The various Districts have furnished detailed information as to storm periods, records of snowfall,

(Continued on page 22)



At top—Snow removal operations in deep drifts of forest area on Placerville-Lake Tahoe link of U. S. 50 at Echo Summit with auger blower equipment. Center, left—A fifteen-foot drift on the Slippery Ford grade broken through for stalled traffic. Center, right—Close-up of auger blower rotary and crew, showing improved type equipment with three rows of augers. At bottom—Widening operations in the deep snow necessitate repeated backing up and bucking the banks at short intervals of progress.

Speed and Traffic Density Major Factors in Multi-lane Road Accidents

(Continued from page 1)

lane, and of very much greater frequency on four-lane. It seems natural to conclude that speed differential combined with greater average density of traffic must in large measure give rise to this situation.

CAUSES OF ACCIDENTS

The standards of alignment, grade, and surface average much higher on multiple-lane roads; and this fact, combined with the increased sense of freedom of movement that a wide road gives, undoubtedly tends to higher speed. If through speed excessive for the conditions that exist, a driver maneuvers himself into a position where his only choice is between an attempt to escape an oncoming car or one traveling in the same direction, he naturally chooses the one likely to cause the lesser impact.

Accidents resulting when the paths of vehicles intersect while both are traveling the same road, such as left turn, U-turn, right turn, and coming out from parking space, rank third in total number among the four general groups. Of all accidents reported for two-lane roads they account for 14 per cent, compared with 19 per cent for both the three-lane and four-lane. Here again, average density of traffic undoubtedly is of major influence. When the number of lanes is increased, it is naturally more difficult to move across these lanes of travel as is necessary in making a left turn. Left or U-turn accidents make up 90 per cent of the total in this general group. It may be found advisable on the more heavily traveled multiple-lane roads to entirely prohibit left or U-turns except at specifically indicated points.

The fourth and last of the main groups comprises those accidents that occur when the paths of vehicles that

are traveling different roads intersect: the ones that happen where two roads meet or cross each other at grade. This type of accident accounts for 11 per cent of all reported accidents on both the two-lane and three-lane roads, and for 17 per cent on four-lane roads. These percentages are almost identical with those recorded for the first six months' period. They constitute somewhat less than 12 per cent of all accidents involving two or more cars. This comparatively small percentage is due to the fact that this

vide the maximum of clear unobstructed sight distance at all intersections.

COMBINATION OF CAUSES

Many accidents are the result of a combination of causes and it is not always possible or necessarily desirable to have the reporting officer indicate only one situation or action as being the cause of a particular accident.

Of the 7665 total accidents reported for the year, 2374, or 31 per cent, were those where only a single motor vehicle was involved. Corresponding with these 2374 single-car accidents, 2867 items of cause were reported as having contributed to their occurrence.

In order of importance among the specific causes listed, "Speed excessive for conditions" is first with 22 per cent, having been noted in 638 instances. "Driver intoxicated or had been drinking" was reported 399 times or 14 per cent of all causes given. Pedestrians were involved in 486 cases or 17 per cent. A comparison on the same basis of percentage of all contributing causes reported for the first six months' period shows: "Speed" 21 per cent. "Driver intoxicated or had been drinking"

14 per cent, and "Pedestrian involved" 17 per cent. Minor causes for the full-year period were: "Driver asleep," 167 cases or 6 per cent; "Faulty tires," 157 cases or 5 per cent; "Wet pavement," 114 cases or 4 per cent. The percentages in these categories for the first six months' period were respectively 3 per cent, 5 per cent, and 3 per cent. There was a very sharp increase noted in the number of cases where drivers were reported as having been asleep.

Naturally, where two or more vehi-

Causes Contributing to Single Car and Two-or-More Car Accidents

(January 1, 1936-December 31, 1936)

Group	Single Car		Two or More Cars		Total	
	No. of Times Reported	Per cent of Total Causes	No. of Times Reported	Per cent of Total Causes	No. of Times Reported	Per cent of Total Causes
Condition of Vehicle	371	12.94	441	6.20	812	8.14
Condition of Driver	713	24.87	1560	21.94	2273	22.78
Speed	638	22.25	912	12.83	1550	15.53
Violation of Right of Way	282	9.84	3684	51.80	3966	39.74
Roadway	247	8.62	427	6.00	674	6.76
Pedestrian	486	16.95	23	0.32	509	5.10
Miscel. or Undetermined	130	4.53	65	0.91	195	1.95
Total	2867	100.00	7112	100.00	9979	100.00

NOTE: Total causes reported are in excess of the total number of accidents, due to the fact that many accidents result from a combination of causes.

study covers only rural State highways, where the number of intersections per mile is very much less than through incorporated territory.

Extreme cases where the traffic is exceptionally heavy on both intersecting highways, may justify actual grade separation; but the infrequency of such conditions, along with the very high initial cost of the structures, will always limit its application. The average speed on rural highways is relatively high, and for this reason it is particularly important to pro-

Accidents Involving Two or More Vehicles Showing Course Pursued

Type of Accident Course Being Pursued	Number of Lanes									
	Two		Thres		Four		Miscl.		Total	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Overtaking.....	1049	27.15	298	34.33	179	39.34	29	27.88	1555	29.39
Approaching.....	1795	46.46	287	33.06	95	20.88	36	34.62	2213	41.83
Paths Intersecting (On same road).....	548	14.18	170	19.59	87	19.12	24	23.08	829	15.67
Paths Intersecting (On different roads).....	431	11.15	98	11.29	79	17.36	11	10.58	619	11.70
Undetermined.....	41	1.06	15	1.73	15	3.30	4	3.84	75	1.41
Total.....	3864	100	868	100	455	100	104	100	5291	100
Per cent.....		73.03		16.41		8.60		1.96		100

cles are involved in an accident the contributing causes are more numerous and complex. For the 5291 separate accidents of this type, 7112 causes were reported as contributing factors. Although a very great variety of causes go to make up this total, a comparatively few specific types account for the bulk of all causes reported.

"Driver intoxicated or had been drinking" appears 1133 times or 16 per cent; "improper passing" 1074 times or 15 per cent; "Speed excessive for conditions" 912 times or 13 per cent; "On wrong side of road, as distinct from improper passing" 506 times or 7 per cent; "Improper turn" 480 times or 7 per cent; "Following too closely" 489 times or 7 per cent; and "Improper signal" 321 times or 5 per cent. These seven items represent 70 per cent of all causes reported, the remaining 30 per cent being split up into a multitude of various items, no single one of which accounted for any important percentage of the total.

Again comparing the record for the first six months' period we find that the pattern remains much the same throughout the year. Computed on the same basis of percentage of total causes reported, the first six months' period record was: "Driver intoxicated or had been drinking" 15 per cent; "Improper passing" 17 per cent; "Speed excessive for conditions" 11 per cent; "On wrong side of road as distinct from improper passing" 7 per cent; "Improper turn" 7 per cent; "Following too closely" 8 per cent; and "Improper signal" 9 per cent.

The elimination of the causes found in these main groups, which go to

make up such a large majority of all causes reported, would seem to lie principally in regulatory, or a combination of educational and regulatory, measures.

For the full year the accidents in which pedestrians were involved amounted to 6.64 per cent of all accidents reported. This compares with a percentage of 6.39 for the first six months' period. Such accidents rarely involve more than a single motor vehicle.

ACCIDENT FREQUENCY

Evidence of drinking on the part of the pedestrian was reported in 24 per cent of the cases, showing little change from the 25 per cent recorded for the first six months' period. Since there are comparatively few intersections on rural highways, pedestrian accidents occurring at such points were only 7 per cent of the total. The vast majority (74 per cent) involved persons walking on or along the highway or attempting to cross at places other than at intersections. Eight instances were reported where "children playing in road" were involved, but the victims of pedestrian accidents are almost invariably adults who should be aware of the dangers but who forget or fail to realize the extreme caution necessary on their part, particularly on rural highways where pedestrian traffic is rare and presents an unexpected situation to the motorist.

Vehicle-miles-per-accident is the true measure of the hazard of motor vehicle operation. As noted above, during the year 1936, 7665 motor vehicle accidents were reported as having occurred on the rural portion

of the State highway system. The estimated total vehicle miles of travel during this same period on the rural State highways were approximately 7,211,000,000. This estimate is based on the regular summer traffic count taken at more than 1300 points over the entire system, and supplemented for the determination of seasonal changes by some 40 carefully selected points throughout the State at which counts are taken each month during the year.

From these figures it is seen that the ratio of accidents to vehicle miles traveled is 1 to 941,000. The corresponding ratio for the first six months' period was 1,061,000, indicating, as was previously stated, that the accident rate has been more serious during the latter half of the year. This change has not been confined to any type of accident, cause, or location. There have been slight variations back and forth but comparative percentages have remained much the same.

Of the rural State highways, 99 per cent are either two-lane, three-lane, or four-lane; in fact, over 94 per cent are two-lane roads.

ACCIDENT COMPARISONS

An endeavor has been made to indicate certain relationships between accident frequency and roadways of the different lane widths on the basis of "Accidents per mile of highway," "Vehicle miles per accident," and "Density of traffic" or "Proportionate utilization of road capacity." While the number of vehicle-miles-per-accident is a definite measure of the actual hazard of motor vehicle travel, no accurate comparison of

functional value as among various types of roads can be made without taking into consideration to what proportion of their rated capacities such roads are actually operated.

It is immediately apparent that when taken as a group the two-lane roads will show the lowest rate of accidents per mile of road, due to the many thousands of miles where there is comparatively little traffic. Likewise, three-lane roads show less concentration of accidents than the four-lane. The rates of accident concentration per mile are respectively: 0.484, 2.625, and 4.215.

Compared on the basis of vehicle-miles-per-accident, the two-lane roads also show a better record but on this basis of actual hazard the advantage is slight, even though the same situation still remains: that of having a relatively low average number of vehicles per day over these two-lane roads.

STATISTICAL COMPARISON

The number of vehicle-miles-per-accident were 991,000 for two-lane roads, 851,000 for three-lane, and 717,000 for four-lane, while the corresponding numbers of vehicles for an average 24-hour day were 1236 for two-lane; 6533 for three-lane; and 8771 for four-lane. These extreme differences between average daily traffic on two-, three-, and four-lane roads can be accounted for only to a limited extent by the traffic capacities of the various lane widths.

The two-lane road has been estimated to have a capacity, under average conditions, of 1000 vehicles per hour; while the three-lane road, with only one-half more lanes, has been treated as having twice the capacity of the two-lane, or 2000 vehicles per hour; and the four-lane road, with twice the number of lanes found on the two-lane road, has been rated at 3.2 times the capacity, or 3200 vehicles per hour.

Even on these capacity bases it is found that the two-lane roads as a group utilize only 5.46 per cent of their 1000 vehicles-per-hour capacity, while the three-lane roads use 12.72 per cent of their 2000 vehicles capacity, and the four-lane roads 10.75 per cent of a 3200 vehicles-per-hour rated capacity. The comparatively small difference between two-lane and three-lane roads in the vehicle-miles-per-accident rate becomes even less important when it is disclosed that

traffic on two-lane roads would have to be increased to two and one-third times its present volume to reach a point where they would be utilizing the same relative percentage of capacity as that now found on three-lane roads. The ratio of capacity use between two-lane and four-lane roads is approximately 1 to 2.

THREE-LANE ACCIDENTS

In view of the rather widely discussed question of traffic accidents on three-lane roads, it is interesting to further analyze this situation so far as it concerns the records on the rural State highways in California for the past year. When accidents involving a single motor vehicle are considered separately, the question of traffic is of minor importance. In this type of accidents we find the vehicle-miles-per-accident rate for three-lane roads is much better than for two-lane, being 3,827,000 miles per accident for the three-lane as against 2,968,000 miles per accident for the two-lane. This is probably due to the fact that the three-lane highway is wider and of higher average standard in surface, grade, and alignment.

Accidents where two or more vehicles are involved, taken as a group, show a better vehicle-miles-per-accident record for the two-lane than for the three-lane, the rates being respectively 1,719,000 and 1,411,000. If no further inspection were made the conclusion might be made that the three-lane design was inherently less safe than a two-lane and tended to encourage accidents. If the provision of a third lane could adversely affect traffic safety, it would appear that such influence would be confined to accidents between approaching vehicles—in other words, to some type of head-on collision. It has already been pointed out that the ratio of "Approaching" accidents to the total of all accidents on three-lane roads is less than the similar ratio on two-lane roads.

THREE LANES HAVE ADVANTAGE

If we compare further the actual number of "Approaching" accidents on three-lane roads and on two-lane roads with the total vehicle miles generated on the two road types, we find that there was one "Approaching" accident on three-lane roads for every 3,280,000 vehicle miles, while the corresponding rate on the two-lane was one for every 3,198,000

vehicle miles: practically the same rate but with whatever slight advantage there is being in favor of the three lanes. And this advantage accrues to the three-lane road group in spite of the fact that no allowance has been made for the very great disadvantage it must overcome in carrying nearly five times as much actual average daily traffic, or two and one-third times as much if compared on basis of capacity.

"Overtaking" or rear-end accidents and "Paths intersecting while traveling the same road" (mostly made up of left-turn accidents) occur somewhat more frequently on the three-lane than on the two-lane roads. Road intersection accidents account for practically the same percentage on both types of roads.

It can scarcely be argued that the fact that a third lane has been provided could be the cause for an increase in the number of either "rear-end" or "left-turn" accidents. On the contrary, it is quite likely that this added width has made it possible for numerous drivers to avoid impending rear-end and left-turn accidents.

INCREASED LANES SOUND

The full year's record of accidents continues to add weight to conclusions to be drawn from the record shown in the first six months' period: that from the standpoint of safety the present method of meeting traffic development by adding an additional lane to the existing two-lane pavements is basically sound.

On four-lane roads "Approaching" accidents were shown to be 21 per cent of the total on this type of road. In actual numbers there were 95 such accidents reported, or one for every 4,740,000 vehicle miles. This is a much better rate than for either the two-lane or the three-lane, but is much less than could reasonably be expected when two lanes have been provided for traffic in each direction. It indicates flagrant disregard of right of way on the part of a large percentage of the traffic.

"Overtaking" or rear-end accidents are more frequent on four-lane than on either two- or three-lane roads. This is true both in percentage and on actual vehicle-miles-per-accident basis. In comparison with three-lane roads, this does not even have the support of a larger ratio of capacity utilization, for the three-lane roads are

Accidents by Lane Widths Showing Road and Vehicle Mileage

ACCIDENTS INVOLVING A SINGLE VEHICLE

Number of Lanes	Road Mileage	Per cent	Total Accidents	Accidents per Mi.	Thousand Vehicle Miles	Per cent	Thous. V. M. per Accident	Avg. No. Vehicles per 24-hr. Day	Rated Capacity Veh. per Day	Per cent of Capacity Utilized
2	11,969.0	94.36	1936	0.162	5,740,577	79.61	2968	1310	24,000	5.46
3	421.3	3.32	246	0.584	941,391	13.05	3827	6105	48,000	12.72
4	149.0	1.17	152	1.020	450,376	6.25	2963	8259	76,800	10.75
Misc. Widths	145.6	1.15	13	0.089	78,759	1.09	6058	1478	-----	----
Location of Accident not known	-----	----	27	-----	-----	----	----	----	-----	----
Total	12,684.9	100	2374	0.187	7,211,030	100	3038	1553	-----	----

ACCIDENTS INVOLVING TWO OR MORE VEHICLES

2	11,969.0	94.36	3856	0.322	5,740,577	79.61	1489	1310	24,000	5.46
3	421.3	3.32	860	2.041	941,391	13.05	1095	6105	48,000	12.72
4	149.0	1.17	476	3.195	450,376	6.25	946	8259	76,800	10.75
Misc. Widths	145.6	1.15	29	0.199	78,759	1.09	2716	1478	-----	----
Location of Accident not known	-----	----	70	-----	-----	----	----	----	-----	----
Total	12,684.9	100	5291	0.417	7,211,030	100	1363	1553	-----	----

ALL ACCIDENTS

2	11,969.0	94.36	5792	0.484	5,740,577	79.61	991	1310	24,000	5.46
3	421.3	3.32	1106	2.625	941,391	13.05	851	6105	48,000	12.72
4	149.0	1.17	628	4.215	450,376	6.25	717	8259	76,800	10.75
Misc. Widths	145.6	1.15	42	0.288	78,759	1.09	1875	1478	-----	----
Location of Accident not known	-----	----	97	-----	-----	----	----	----	-----	----
Total	12,684.9	100	7665	0.604	7,211,030	100	941	1553	-----	----

operated on an average at 12.72 per cent of their capacity, compared with 10.75 per cent for the four-lane.

CROSSING HAZARDS

Accidents occurring when the paths of vehicles intersect while traveling the same road, made up chiefly of left-turn movements, are of only slightly greater frequency on the four-lane than on the three-lane roads; but in those that result from conflict of right of way at road intersections the percentage for the four-lane roads is quite definitely higher. This is the natural result of the hazard of crossing several lanes of traffic and also because the four-lane roads are found in the more densely populated areas, where road intersections occur at comparatively short intervals.

Theoretically, if the four-lane road were divided into two one-way roads of two lanes each, the approaching accidents should disappear altogether. Practically this would not be 100 per cent true, for there would always be the occasional driver who would run by his destination or intersecting road

and insist on turning around and making his way back against approaching traffic. But even if the 21 per cent of approaching accidents were entirely eliminated, the vehicle-miles-per-accident rate would still be unsatisfactory when considered in the light of the excellence of facilities which are provided for safe travel, with two lanes of roadway in each direction and the high standards of surface, grade, and alignment which are found on the four-lane highways.

SPECIAL STUDIES MADE

The total mileage is comparatively small and is made up of many short stretches in widely scattered areas. Under such circumstances general statements are very likely to be misleading unless hedged about by qualifications, and for this reason special studies are being made of particular sections of these highways.

In order to present a more concrete view of the general accident situation, the various small administrative units of the rural State highways—sections that average approximately ten miles

each—were classified both for concentration of accidents, or "accidents per mile," and for hazard of accident, or "vehicle-miles-per accident." Those with the poorest records in both groups were combined, with the result showing that over 46 per cent of the accidents were reported on less than 7 per cent of the road mileage. Still further concentration shows 17 per cent of total accidents on approximately 2 per cent of the mileage. It is particularly noteworthy that the highway sections in these groups in nearly every instance represent the highest standards of construction and maintenance.

Disconcerting as many of these records may be, it is only by the exact establishment of the pertinent facts for intelligent study that it becomes possible to outline a course of action with any reasonable hope of solving this vital problem of safety on our highways. Additional detailed tabulations on which this article is based may be obtained by writing to the editor of California Highways and Public Works, Sacramento.

How U. S. and State Routes Are Designated by Numbered Markers

By F. M. CARTER, Assistant Maintenance Engineer

AMONG the highway signs used by the California Division of Highways for the protection and convenience of motorists on State roads are those which come under the classification of "Guide Group." This group covers Route Markers, Destination, Location and Information signs and in this, the fourth of a series of articles on highway signs, discussion will be confined to Route Markers.

Guide signs are used to furnish the traveler with directional and locational information.

U. S. Highways and main State through highways are indicated by numbered route markers. The same general system of marking is used for both the U. S. and the State highway numbered systems. The outline of the official shield of the United States is used in all states for numbering U. S. highways.

DIRECT ROUTES FOLLOWED

These U. S. Highway numbers are selected by the Executive Committee of the American Association of State Highway Officials, through the authority vested in them by the government. The procedure followed by this Committee is to adopt the most direct routes through the various states where State highways are available.

It is imperative that a U. S. numbered highway shall at all times be in the best possible condition, and because of this the route follows State highways which assure the best of maintenance for traveling.

The present policy of the Committee is to eliminate all duplicate routings, to reduce the number of alternate routings, and to hold such highways to the least possible number consistent with proper guidance.

METHOD OF SELECTION

The procedure, when a new numbered highway is proposed by interested committees and public bodies, is for the Association of State High-

way Officials to refer to each State that portion of the proposed route traversing the state.

When the routing has been approved as to each State and by the necessary governmental units the matter is then decided by the executive committee of the A. S. O. S. H. If such decision is favorable, the number is designated and the executive secretary issues the description of the approved route and the signs are placed by the various States traversed by that route. A gridwork of numbered U. S. highways has resulted from this procedure until practically all available routes are so designated and numbered.

NEW ROUTES NOT WANTED

The tendency now is to discourage any additions to this U. S. numbered highway system.

In selecting numbers for these U. S. routes the general policy was to start from the northern part of the United States with the smallest even number for the east and west routes and from the eastern (Atlantic Coast) part with the smallest odd number for the north and south routes. The numbers then increase consecutively from north to south and from east to west.

In the U. S. numbered highways, while the numbers may conform to the above method at the origin of the route in the east, they may be out of sequence when reaching California. For the most part, however, the system conforms to the above outlined method.

In California, for instance, considering the east-west routes and starting at the most northerly, we find the U. S. numbered highways are as follows:

40-50-66-60-70-80

Starting at the eastern border of the state, we find on the north-south routes:

91-395-97-99-101

In addition to the number 395 we

find 399-299 and 199 for the odd numbered routes, and 466 for the even numbered routes.

These higher numbers are selected to designate routes of a much shorter length starting from one of the regular highways, taking the last two numbers from the highway of origin, and adding another number, which shows the approximate location of the highway in the state or states.

SYSTEM IN THIS STATE

Using the original system for numbering U. S. highways, the State of California, through the Division of Highways, has numbered the through State highways. The even numbers are on the east-west routes, and the odd numbers designate the north-south routes. The numbers are alternated between the north and the south so that each section may have low numbers.

The State highway route numbers for signing should not be confused with the legal highway numbers designated by legislative action and used for departmental and legal purposes.

A numbered sign route sometimes covers many different numbered highways in traversing from one part of the state to the other. It is necessary in obtaining through information for the traveler to carry the sign numbers as far as possible. Practically all of these important State highway numbered routes are now signed and the various information maps show these routes by number. With this information, the traveler can plan his journey before leaving his origin and, through the easy way of following numbered shields, arrive at his destination with the least possible confusion and delay.

The marker or shield used for the State numbered route system is in the shape of an acorn, with the California Bear at the top and the words, "State Highway" across the bottom of the shield.

(Continued on page 17)

"Guide" Group of California Road Sign System



Placed in advance of an intersection where two U. S. or State highways meet or are coincident.



On same post with U. S. or State shield. Indicates routing temporary.



Standard marker used to define U. S. highways. Placed at frequent intervals in rural areas and cities to guide traffic over U. S. routes.



New Identification Directional Sign to be placed in advance of important intersections of numbered highways. This directs traffic straight ahead or to right.



Placed above U. S. or State shield to mark a detour on closed route.



This prominent sign is placed approximately 800 feet in advance of an intersection where four U. S. or State numbered routes meet or are coincident.



This new sign is the same as above except that traffic is directed either to the right or the left.



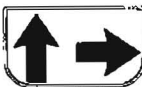
Indicates business route through city for motorists desiring to use it.



Placed above U. S. shields to designate an alternate route.



Standard marker to define U. S. highways. Is reflectorized.



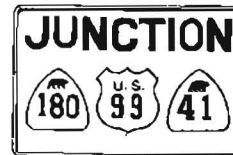
Indicates designated route may be followed by going straight ahead or turning to the right.



Standard shield used to mark State sign routes. Placed at frequent intervals in cities and rural areas along a State sign route.



Right or left arrow used with U. S. or State shields to indicate a turn or proper direction of the route.



Placed in advance of an intersection where three U. S. or State numbered highways meet or are coincident.



Placed approximately 300 feet in advance of intersection with a U. S. or State numbered highway.



Indicates designated route may be followed by going ahead or turning to the left.



Used with U. S. shields or State markers to indicate that traffic may turn either right or left to follow marked highway.



Placed approximately 300 feet in advance of the end of either a U. S. or State numbered highway.



Used with U. S. or State shields to direct traffic straight ahead.



Same as standard shield on State sign routes but is reflectorized.

Figueroa Street Viaduct Project in Los Angeles



Center span is 200 feet long, one of the largest plate girder spans in the country. The other steel spans are 104 and 122 feet long.

By PAUL R. WATSON, Resident Engineer

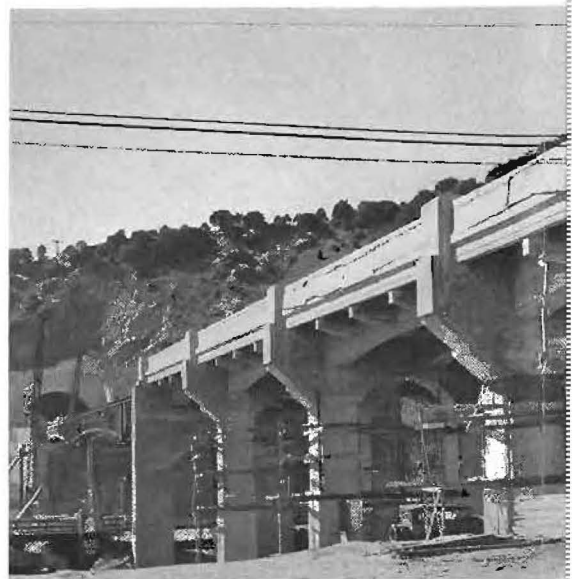
FOR many years the city of Los Angeles has felt the need of an additional through traffic highway to the north to relieve congestion on North Broadway. Figueroa Street, one of the main north and south arterials in the city, was the logical street to be extended. A barrier formed by the Elysian Park hills and the Los Angeles River made this undertaking very expensive. However, the project has been carried forward one step at a time as funds became available.

The first step was taken in 1928 when plans were ordered for the first tunnel under Elysian Park. The final or fourth tunnel under the Elysian hills was recently completed. The

final barrier is the Los Angeles River and the Southern Pacific tracks over which the Figueroa Street Viaduct is now being constructed.

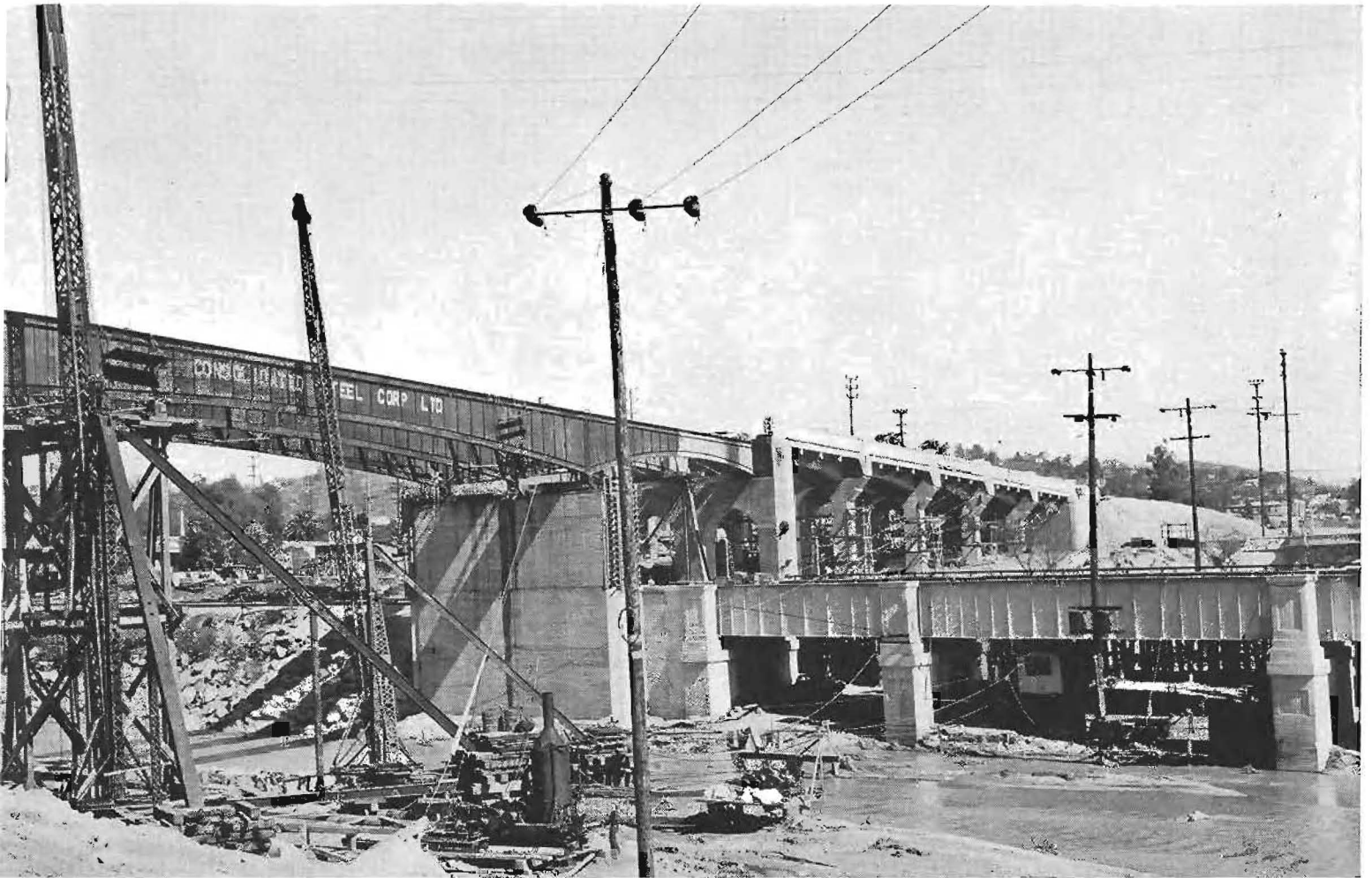
VIADUCT COST \$625,000

This viaduct is nearing completion. The viaduct project is the largest one in the southern part of the State to be financed from funds set aside by the Federal Government for grade crossing elimination. It is being constructed under the supervision of the Bridge Department, of the State Division of Highways. Plans for the structure were prepared jointly by the bridge engineers of the city of Los Angeles and the State. The work when completed will cost \$625,000.



View of section of the Figueroa Street Viaduct showing construction.

Viaduct Crosses 2 Railroads, River and Highway



27 feet respectively. Reinforced concrete spans are supported by girders 4 feet thick at center and 7 feet at haunches.



Showing the massiveness of the reinforced concrete construction.

The structure is a northerly extension of Figueroa Street on a direct line with the four tunnels under Elysian Park hills. It crosses the tracks of the Southern Pacific Railroad which occupy both banks of the Los Angeles River. It also crosses the Los Angeles River, San Fernando Road, and the street car tracks of the Los Angeles Railway Company on said road.

The project includes the construction of the viaduct proper; the construction of 850 feet of roadway embankment and pavement to make connection with Figueroa Street at Avenue 22, north of the river; the building of a retaining wall along the embankment on the westerly side of the approach; the construction of 700 lineal feet of slope paving along the westerly bank of the Arroyo Seco, and the construction of a southerly

connection to the tunnel road under Elysian Park.

PUBLIC UTILITIES RELOCATED

In connection with the construction of the viaduct pier footings, it was necessary to relocate a large sewer pipe which parallels the structure, relocate various public utilities on San Fernando Road, and to temporarily relocate various tracks of the Southern Pacific Railroad which interfered with the foundation work.

The northerly approach to the viaduct is 74 feet wide between curbs, with 5-foot sidewalks on both sides. The width of the structure is 44 feet between curbs, plus sidewalks.

The viaduct consists of five continuous reinforced concrete girder spans, and three continuous steel plate girder spans, all resting on concrete

(Continued on page 27)

Honors Conferred on C. H. Purcell the Man Who Built Bay Bridge

IN RECOGNITION of his work as Chief Engineer of the San Francisco-Oakland Bay Bridge, State Highway Engineer C. H. Purcell was given an honorary degree of Doctor of Laws by the University of California at the Charter Day exercises held in Berkeley on March 23.

Mr. Purcell was presented by Professor Charles Derleth, Jr., chairman of the Department of Civil Engineering at the university. In conferring the degree, President Robert Gordon Sproul characterized Mr. Purcell as a "resourceful public servant; organizer and leader of men; builder of great bridges and highways; an engineer who has bound together with bands of steel the citizenry of a great commonwealth which expanse of water had previously divided."

HONORED BY ALMA MATER

Mr. Purcell previously had been honored by his alma mater, the University of Nebraska, which on June 10, 1935, conferred upon him the honorary degree of Doctor of Engineering, the highest honor bestowed by universities upon men pre-eminent in the field of engineering.

Further tribute was paid to Mr. Purcell on Wednesday evening, April 7, when more than one hundred friends tendered him a dinner at the Palace Hotel in San Francisco. Governor Frank F. Merriam, Dean Harry F. Grady and Harrison S. Robinson were the principal speakers. Seated at the speakers' table were Director of Public Works Earl Lee Kelly, Alfred J. Cleary, Chief Administrative Officer of San Francisco, representing Mayor Angelo J. Rossi, who was ill; and City Attorney John J. O'Toole.

The committee in charge of the dinner was composed of W. N. Burkhardt, George T. Cameron, Leland W. Cutler, Sidney M. Ehrman, Joseph R. Knowland, Clarence Lindner, Daniel J. Murphy and Harrison S. Robinson. Born in North Bend, Nebraska, January 27, 1883, Mr. Purcell attended Stanford University for one year in 1902. The death of his father called him to Chicago, where he re-

mained for twelve months and then entered the University of Nebraska, graduating as a civil engineer in 1906.

BUILT OREGON BRIDGES

Mr. Purcell built his first bridge across Bitter Creek in Wyoming

where he was a resident engineer for the Union Pacific. He later had engineering experience in Nevada, South America and Oregon. He was the first bridge engineer for the Oregon State Highway Department, Assistant State Highway Engineer of Oregon and bridge engineer of the Columbia River Highway.

After several years as a bridge engineer with the U. S. Bureau of Public Roads, Mr. Purcell was appointed State Highway Engineer of California in 1928.

In October, 1929, the Hoover-Young San Francisco-Oakland Bay Bridge Commission was created and Mr. Purcell became a member of it and its secretary. He was authorized to make an investigation, traffic survey and prepare a preliminary plan and design, including financing, for a bridge across San Francisco Bay.

Mr. Purcell's completed report was adopted by the commission and in January, 1931, he was named chief engineer for the Bay Bridge, continuing to administer the duties of his office as State Highway Engineer.

All Californians are familiar with the financial delays and difficulties encountered by Mr. Purcell, the State Administration and the Department of Public Works in obtaining through Congress and the Reconstruction Finance Corporation the funds necessary for the building of the bridge. However, these funds were obtained, largely through Mr. Purcell's efforts in Washington, and the Stanford freshman who had worked as a messenger boy in the Chicago Grain Pit began the stupendous task of bridging San Francisco Bay.

Payments of special fees and taxes by motor car owners in the United States last year reached \$1,400,000,000, the greatest total ever reached for a single year, according to a preliminary report received by the California State Automobile Association.

True Builder Is Honored

In every great construction project there always is to be found one man on whom the final authority falls, who bears the ultimate responsibility for the undertaking.

In the building of the San Francisco-Oakland Bay Bridge—the greatest bridge ever constructed—that one man was Charles H. Purcell, who stepped from the routine and moderately compensated desk of highway engineer to carry on modestly, successfully, the great job of spanning the bay.

Recently the University of California honored itself by granting a degree to Mr. Purcell, making him one of the university's alumni.

More recently the recognition of a public banquet in honor of the bridge builder was given here. Citizens high in public and civil life paid their tribute to the man who by his achievement may well be considered first in his profession.

Only engineers can realize the task which Mr. Purcell met and conquered; but all who leap over the bay on the strong, perfect causeway instinctively feel grateful to the builder, and it is appropriate that he is receiving recognition for his job well done.—*San Francisco Examiner.*

How U. S. and State Routes Are Designated by Numbered Markers

(Continued from page 12)

In conjunction with these shields the left, right, and double pointed arrows and the junction signs complete the information and guidance for the motorist.

The positioning of these shields and markers is uniform for both the U. S. and State numbered highways and unlike the warning group of signs these guide signs should be frequently and judiciously placed with the policy of having what may seem too many rather than too few shields.

AID TO STRANGERS

It must be remembered that the signing of these numbered routes is for the stranger to the locality and not for the local citizens who know all the short cuts and best routes. To obtain the proper impression such as is received by the stranger it is only necessary for the local citizen to travel in unfamiliar sections of our State or in other States. He will then appreciate these numbered routes with frequent shields and markers.

The shields are placed at all major intersections in urban areas, at every other block in residential areas and, in the open country, at intersections, if there be any, otherwise at intervals of three miles.

The shields and markers must be placed so as to be readily seen by the motorist. On routes through rural districts they should be placed not less than 8 nor more than 10 feet from the edge of pavement on the right hand side, and 3 feet 6 inches above the pavement. If two or more shields or markers are used on the same post, the lowest shield or marker should not be lower than 2 feet above the pavement.

USE OF ARROWS

Turn arrows are placed in advance of and at the near corner of all turns of the route and double pointed arrows in connection with the numbered shield facing traffic entering the numbered route at important intersections advise the motorist that he has arrived at the point of entering the route.

When coincident routes approach an intersection where one route turns

and the other proceeds the usual advance turn arrow is placed and at the near corner of the intersection the turn arrow, with shield for the turning route and the vertical arrow with shield for the continuing route give the necessary guidance. When one numbered route crosses or joins another route, junction signs are placed facing the approaching traffic, giving number of route intercepting or joining the route being traveled.

TEMPORARY SIGNS

When two numbered routes run on the same highway, the two numbered shields are placed on the same post. In some cases numbered routes are carried temporarily over other than the designated route because of unconstructed portions of the regular highway. Plates with the word "Temporary," are placed over the numbered shield on such temporary routes.

When the same numbered route separates to come together again at a point farther on, an alternate plate is placed over the shield. These alternate routes were originally marked E and W, or N and S. But a recent ruling of the A.S.O.S.H. executive committee changed this designation, making one the main numbered route, and the other the alternate route.

The most direct, easiest, and quickest traveled highway is designated as the main numbered route, and the other highway as the alternate.

Sometimes in metropolitan areas, when the numbered highway does not pass through the central business area, a numbered route with the plate "Business Route," placed over the shield on the same post, is carried from the main route through the central business district and back to the main numbered route.

When it becomes necessary to detour a numbered highway, shields with the plate "Detour" should be placed along such detours at much more frequent intervals than on the regular route.

"Say, porter, did you find a big roll of money under my pillow?"

"Yessuh. I did, suh, and I thanks you, suh, very much, suh."

New Los Gatos-Santa Cruz Highway Saves Five Miles

(Continued from page 2)

clothed with redwood; and, because of the plant growth, the soil, instead of eroding as usual, accumulates on the slopes, forming a deep, damp mantle of loam on the porous granite base. While this makes a wonderful seed bed, it is an extremely treacherous foundation for a heavy fill.

Boring and trenches disclosed that there was an underground sheet of water moving on top of the granite, and it was decided to attack this problem in a thoroughgoing manner. Therefore, on most of the larger fills, practically the entire earth blanket was stripped to bedrock and an imported rock blanket was substituted as a fill base, to provide free drainage and prevent saturation of the fill. Also, heavy rock toe walls were constructed at the lower sides of fills to prevent, as far as possible, the entire fill from taking a toboggan ride down the steep canyon slopes. Deep trenches were dug into the rock across the fill base and above the upper slopes of the fills to concentrate and cut off as much water as possible.

A minor problem was to provide driveway approaches to the numerous suburban homes along the route, some of them high above the grade of the roadbed and others far below it.

The length of this project was 3.93 miles, and the cost was \$252,692.

Highway Crew Catch Two Gasoline Thieves

During the last two months, considerable quantities of motor fuel have been drained from tanks of tractors and other equipment in use by Highway Superintendent B. M. Gallagher on the Maricopa and Casitas Pass roads. The thievery was always committed at night.

Early in the morning of March 24, three of Superintendent Gallagher's crew caught two men in the act of draining gas from a Division of Highways tractor. The pair was taken to Ventura jail where they confessed to six different counts of gasoline theft and in the afternoon received their sentences.

Surfacing Improvements on East of Sierra Highway

By C. CLEMAN, District Maintenance Engineer

TOURISTS and sportsmen motoring into picturesque Mono County this summer will find greatly improved roads for pleasure trips through the Mono Lake and Walker Canyon areas which afford delightful scenic views and abound in fish and game.

Better economic conditions throughout the country have resulted in an increase of recreational traffic with a consequent influx of fishermen, hunters, tourists and vacationists into the many attractive summer resort and camping sections in the Sierra Nevada Mountains.

Highway improvement by stage construction has been going on for several years in the eastern Sierra range country north of Bishop. The Division of Highways has completed several reprocessing projects on roads in Inyo and Mono counties with the result that motor travel in those regions this summer will be greatly facilitated.

U. S. 395 IMPROVED

The allocation of additional betterment funds in 1936 permitted the improving of various sections of bituminous treated surfaces which required immediate attention in order to improve the riding quality and forestall reconstruction on certain stretches where money would not be available for reconstruction in the near future.

A number of sections of U. S. Highway No. 395 in Mono and Inyo have been improved. Between Conway Summit and Mono Inn, 6.7 miles of low type dust oiled surfacing was reprocessed, additional oil applied to the material and later sealed. The same method of improvement was used on portions of the Walker River Canyon road between Bridgeport and Coleville.

A class "A" seal coat was applied, not only to the reprocessed sections of U. S. Highway No. 395 in Mono County, but also to those sections

which showed surface leakage or ravel. Permeability tests were made at definite intervals and the locations recorded where the surfacing showed leakage, signs of ravel, pavement cracks, etc. The seal coat was applied by the A. S. Vinnell Company, under contract with A. P. McCarton as Resident Engineer, for a total net distance of 46.7 miles between Convict Creek and Antelope Valley in Mono County. Approximately 0.15 gallons per square yard Type MC-3 liquid asphalt and an average of 11 pounds of screenings were applied.

BEAUTIFUL SCENERY

The oil cake on the section between Conway Summit and Mono Inn was widened from 16 to 18 feet. The view along a section from Conway grade is undoubtedly one of the most spectacular in this part of the country. The changing colors reflected from the waters of the lake are an inspiring sight even to the local residents who have had an opportunity to look at it many, many times. Beyond the lake the famous snow capped Mono craters can be clearly seen.

The westerly portion of State Route 40, between Leevining and Benton, traverses the south lake shore and then disappears in the wooden section near Mono Mills. The floor of the valley in the foreground comprises the Conway Ranch, after which this section of road has been named. The Sierra Nevada Mountains rise high in the background to complete this inspiring view. Traveling southerly approximately 7 miles from this point, the highway skirts the westerly edge of Mono Lake.

ROAD REPROCESSED

The highway along the water's edge of Mono Lake was constructed by the Isbell Construction Company in 1934, under Contract 69VCI, M. W. Ellis, Resident Engineer. This is a standard 24-foot graded roadbed, surfaced the full width with selected material,

having a compacted thickness of 0.25 of a foot, of which the central 20 feet was bituminous treated by the road mix method. An application of $\frac{1}{2}$ gallon per square yard of light fuel oil was spread upon the subgrade as a tack coat. The bituminous binder considered as asphaltic road oil cutback with 18% kerosene solvent and applied at an average rate of 2.1 gallons per square yard. The mixing units consisted of two 10-foot blades, towed by 60-h.p. tractors.

These units made repeated turnings of the material until a complete mixture of oil and aggregate of uniform texture and free from compressed masses had been obtained. The mixed material was spread in thin layers with a pneumatic tired power grader. Continuous blading and rolling were necessary to acquire the smooth and even surface obtained.

RAVELING PREVENTED

A rubble masonry retaining wall has been constructed at the base of raveling cut slopes to prevent loose rock and slough deposits encroaching upon the traveled way. These walls have greatly decreased the cost of maintenance by reducing daily patrolling by a Maintenance Foreman or maintenance crew. The average actual cost of this type wall is approximately \$3 per lineal foot. Instead of the material depositing upon the roadbed, it is retained behind the wall, which is removed periodically as required.

Another scenic section of highway parallels the West Walker River, in what is commonly known as the West Walker River Canyon, an attractive spot for fishermen and tourists, was graded to a 24-foot standard section in 1931. An inspection of this section during 1936 disclosed that slight leakage occurred and some shoulder ravel. Approximately $2\frac{1}{2}$ miles of this section was reprocessed last fall and a Class "A" seal coat applied.



Three views of newly reprocessed highways leading to recreational areas in Mono County. Upper: New alignment along shore of Mono Lake. Center: View from Conway Grade looking over Mono Lake with Mono craters in background. Lower: Looking into Long Valley from Sherwin Grade, north of Bishop, with snow-covered Sierra in background.

Building Divided Highway Link on L. A.-Pomona Airline Lateral

(Continued from page 4)

line highway was available with a saving of three miles over any previous existing route.

Within a few months this super-safety boulevard had become a crowded four-lane highway from Los Angeles to Monterey Park and a hazardous overloaded three-lane road between Monterey Park and Pomona.

Without benefit of publicity the Los Angeles-Pomona Lateral became almost immediately the southland's most cosmopolitan artery. Heavy out-of-state tourist travel, pleasure seeking motorists bound for the all-year resorts in the San Bernardino mountains, an ever increasing tide of commuters together with slow moving, heavily laden motor transports from the southwestern United States and produce from the Imperial Valley, combined to create a traffic volume of 14,435 vehicles during the July 14, 1935, traffic count taken on the 30-foot pavement between El Monte and Monterey Park.

Traffic census figures for July 12, 1936, taken at the same location showed an increase to 18,271 vehicles.

WIDENING NECESSARY

During the current winter season heavy travel to the very popular desert resorts and increased out-of-state winter tourists raised the total Saturday and Sunday volume of traffic, on the 30-foot pavement to above 40,000 vehicles. Not only was the highway overcrowded but the variety of speeds employed by the different types of vehicles made it doubly hazardous.

On July 10, 1936, or fifteen months after the opening of the highway between Los Angeles and Pomona, the State Highway Commission allocated the sum of \$342,000 for the purpose of widening the existing 30-foot Portland cement concrete pavement to 40 feet between Monterey Park and Pomona, a distance of 18.7 miles and the placing of plant-mixed surfacing on the shoulders from the westerly end of the project to the west slope of the Kellogg hills.

Plans were rushed to completion and in September, 1936, a contract was awarded to the successful bid-

der, Griffith Company of Los Angeles. The contract was amended in November of that year and a supplemental allotment of funds in the amount of \$55,000 was made for the purpose of providing a separated roadway for six miles through the Kellogg Hills to Pomona.

The contract as amended now consists of the placing of two 5-foot wide strips of Portland cement concrete with 8-foot wide plant-mix shoulders on both sides of the existing pavement on Garvey Avenue from Monterey Park to Valley Boulevard.

From Valley Boulevard to the east end of the contract at Pomona, the existing pavement will be widened to 40 feet by constructing a single 10-foot wide strip of Portland cement concrete, while the adjacent graded shoulder is to be surfaced with an 8-foot width of plant-mix to the west slope of Kellogg hills. On the easterly 6.3 miles of the contract through the Kellogg hills to the City of Pomona, the pavement will be completed to 46-foot width.

WORK NEARS COMPLETION

The contractor, though hampered considerably by rains and cold weather, has made excellent progress. All concrete pavement was placed by April 1st, and the work will be completed by May 15.

The purpose of the 46-foot pavement is to provide width in order to separate opposing lines of traffic by placing a 4-foot wide raised bituminous strip in the center of the pavement, creating a 21-foot lane for traffic in each direction separated by the 4-foot raised strip feathered at the edge to meet the pavement.

This improvement will separate the roadways and prevent traffic from crossing over to the opposing lane, but it will not present any serious obstacle that might cause damage to a vehicle in case it encounters the dividing strip.

The dividing of the westerly end of the Los Angeles-Pomona Lateral is in keeping with the State's desire to build safe highways.

Motorists Give Aid to Highway Planning Survey

THE Division of Highways of the State Department of Public Works, with the cooperation of the Bureau of Public Roads, has recently mailed to a large sample of the State's motor vehicle registration a questionnaire post card asking for data on residence of owner, make and year of vehicle, travel during a 12-months' period, average gasoline consumption, and fees paid.

The study is a phase of the State-wide Highway Planning Survey, which has been in progress for several months, and the several correlated features of which have been designed to yield information which should prove of great value to highway officials attempting to plan in the interest of the motoring public a program of highway operations for a considerable future period.

Questions relating to Motor Vehicle registration and license fees are included to facilitate arriving at actual comparisons between contributions for highway purposes received from urban residents and those received from rural residents. As explained on the card, there is no way of identifying an individual vehicle owner with the information received, no postage is required in returning the questionnaire portion, and the returns are for the Planning Survey's exclusive use.

MANY MOTORISTS RESPOND

The mailing of the cards from Sacramento started on March 19th and thousands of well executed responses have already been received. Planning Survey officials are hopeful of a particularly high percentage of returned cards. Vehicle owners who receive cards have been asked to use particular care in answering Question One, which has for its objective the accurate fixing of the vehicle ownership by county and by rural areas and particular urban places in the various population groups. This has been given as the most important part of the questionnaire.

Responders are asked to make some attempt at answering questions that cover miles traveled and average gasoline consumption.

Ladies Get Free Auto Service on Trans-Bay Span

LADIES are preferred patrons of the San Francisco-Oakland Bay Bridge. Chivalric treatment of the fair sex is part of the code of the bridge maintenance crew. Should a woman motorist have tire trouble on her trip across the span, the maintenance men will service her car free of charge. But the male must pay. If he wants a tire changed, the fee is 50 cents.

This and other interesting stories of State operation of the Bay Bridge were related by Director of Public Works Earl Lee Kelly in a radio interview over station KPO in San Francisco on the evening of April 7.

With an average of 24,000 cars using the bridge daily, Mr. Kelly said, there were only seven accidents on the span during March, bringing the total of accidents on the bridge and its approaches to 50 for the four and a half months since it was opened.

GAS IS FURNISHED

If a motorist runs out of gas, Mr. Kelly said, the maintenance crew will provide him with three gallons of fuel at 30 cents a gallon, which, he added, is cheap enough when it is considered that such emergency gas is hauled an average of two miles to the car serviced.

"In March," Mr. Kelly said, "the average number of vehicles serviced per day was 22. That means that one out of every 1120 cars was serviced in one way or another. Six hundred and eighty-one cars were attended by the maintenance crew last month, bringing the total serviced since the opening of the bridge last November to 2,930. Some 378 drivers ran out of gas during March. That's about 13 a day. Eighty-seven tires were changed and 215 vehicles were towed off the structures. Only one fire was reported last month, making a total of ten since the bridge opened."

NO PEDESTRIANS ALLOWED

Director Kelly said that there has been only one instance where counterfeit money was passed to a toll collector and this was in the case of an innocent person who handed a col-



Toll Sergeant J. Y. Borden inspects one of "cat's whiskers" used to reduce electric static in automobiles passing through toll gates of the San Francisco-Oakland Bay Bridge.

lector a counterfeit one dollar bill on the Oakland side. When he reached the San Francisco end of the span a Highway Patrol officer was waiting for him and escorted him back to the administration building where he explained he himself had been duped and did not realize he had passed bad money.

"Regarding the matter of pedestrians," Mr. Kelly said, "I would like to point out that the addition of pedestrian facilities to the bridge would have cost approximately \$2,750,000 more; and that the number of pedestrians interested enough to cross the 11½ miles of bridge and approaches would have been too few to have paid for these added facilities.

"The speed limit is that of all of our highways, forty-five miles an hour. There is some impression that motorists must go at this rate or suffer a penalty and there is still another impression that forty-five miles is the minimum. Both these impressions are

wrong. First, the bridge offers a magnificent vantage point for scenic interest, and there are motorists who want to drive leisurely and enjoy the beauties of their trip. It is permitted these motorists to drive slowly, but they must use the outside lane along the bridge rail."

One of the features of the Bay Bridge which goes unnoticed by many motorists is the so-called "cat's whisker" device designed to eliminate electric shock occasioned when a driver passes coin to a toll collector. The "cat's whisker," placed on the pavement in front of each toll collection booth, consists of a small steel plate upon which is mounted vertically a thin piece of flat flexible steel. Each car crossing the bridge contacts this device which grounds the static charge generated by a moving car and thus prevents an electric charge which otherwise would be felt by driver and collector when coin is exchanged between them.

Snow Removal This Season Will Cost State \$500,000

(Continued from page 6)

dates when various roads were closed, etc. This information is useful in connection with administration, but it is not possible to condense it within the limits of this article.

Considerable snow fell on the coast counties. Work was required to reach Mt. Hamilton in Santa Clara County and to clear the road over Mt. St. Helena in Napa County. There was a total fall of eighty-four inches on Ridgewood Summit and sixty-two inches on Rattlesnake Summit—both in Mendocino County. Over Oregon Mountain, on the Redwood Highway in Del Norte County, there was a total fall of 215 inches from December 24 to March 22.

As mentioned above, the Pacific Highway was closed for several days. The roads between Weed and Klamath Falls, Mt. Shasta and McCloud, and Yreka and Etna were likewise closed.

HARD WORK IN SISKIYOU

Conditions in the Siskiyou area were the most severe that have been experienced since snow removal work was started in that territory. Sections between Susanville and Doyle, Alturas and Cedarville, Susanville and Alturas, and Alturas and New Pine Creek—in Modoc and Lassen counties—were closed for periods varying from two to twelve hours. Temperatures as low as 36° F. below zero and heavy winds occurred in this area.

In the Sacramento Valley, 7 inches of snow fell at Woodland, 23 inches at the Lake County line, 14 inches at Willows, and 11 inches at Chico. On the Downieville lateral, 326 inches fell at Camptonville. Yuba Pass Summit was closed December 29, reopened January 9, and again closed January 16. This Pass has been opened during the past week. At Steep Hollow, east of Nevada City, 434 inches of snowfall was recorded, with an exceptionally heavy fall for the entire Nevada City and Grass Valley area.

At Norden, on Donner Summit, 403 inches fall has been recorded to March 25, with a probable 40 inches normal additional fall to the end of the season. On this route, for the period from January 28 to February 24, the road was closed to all traffic for an aggregate total of 58 hours, 25 minutes.

During the same period heavy truck traffic was shut off for 284 hours, 55 minutes.

BLIZZARD CONDITIONS

It is to be understood that the snow removal equipment operated at all times. Traffic was held up because of poor visibility and resulting hazard.

Above Pine Grove on Route 34, to Camp Connell on the Big Trees road, and to Stoddard Springs above Sonora, only normal work was necessary.

East of the Sierras, between Markleeville and the State line, the fall was fairly heavy, and blizzard conditions made the work of the crew difficult. Likewise, on U. S. Route 395 from the State line to Bishop, a fall of 318 inches at Crestview and temperatures ranging as low as -38°, accompanied by heavy winds, made it necessary to tie up the equipment at times and allow the road to close. As soon as conditions permitted, the route was opened intermittently during the stormy period and has been in generally good condition.

TRAFFIC CONTROL PROBLEM

In the San Bernardino territory, the heavy traffic to Lake Arrowhead, Pinecrest, Big Bear and the Los Angeles Playground presents a problem of control as well as of snow removal to provide parking space and prevent tie-ups which might prove serious. Under the conditions, the available equipment was hard-pressed.

A section of Route 43 was closed for some time. Service to Big Bear was by way of Victorville and the Cushenbury Grade. The road to Camp Angelus was likewise closed for a time. The situation at both locations was complicated by earth and rock slides.

In the Los Angeles area, the delay on the Ridge Route has been described. The Angeles Crest Highway, San Gabriel Canyon and Maricopa roads were closed for short periods only. In the San Diego territory, no particular difficulty was encountered during the winter, although more area was covered and the expense was greater than normal.

West of the Sierras in the San Joaquin Valley, the road to Tehachapi and to the Women's Prison, the

Walker Canyon, portions of Route 142 leading to Greenhorn Mountain, Coffee Camp to Quaking Aspen Meadows, Squaw Valley to Kings River through General Grant Park, Badger to Pinehurst, Tollhouse to Big Creek, Coarse Gold to Yosemite, and the El Portal route—all required more than the usual amount of work.

In connection with the removal work, some 2000 miles of road was sanded as icy conditions required. Every effort was made to safeguard traffic during the season by placing warning signs, insisting on use of chains, handling traffic under one-way control, and closing the road entirely as weather and road hazards made necessary.

The next phase to be undertaken is the opening of the routes where traffic conditions have not justified a year-round service. Several of the mountain routes are not sufficiently improved to make it possible to operate the heavy equipment required. Usually these roads are primarily recreational in character, and traffic would be intermittent at best, as there are no established communities along the line which do not have an outlet.

HASTE NOT ADVISABLE

It has been the experience of the highway organization, however, that practically nothing is gained by starting opening work too early in the season. When the weather warms up, the snow at the lower levels melts rapidly, and conditions at the higher elevations improve in corresponding degree. By delaying until the proper time, it has been found that the summits can be cleared by practically the same date, and at a considerable saving in expense over that which is necessary if opening is forced while the snow pack is frozen.

A list of the mountain routes to be opened, showing elevations and dates when it is expected the work will be accomplished, is as follows:

Rte.	Summit	Elevation	Program dates
21	Bucks Ranch	5700	May 1 to 15
47	Butte Meadows	--	April 15
83	Lassen Park	--	April 15
11	Echo Summit	7365	Apr. 20 to May 10
38	Emerald Bay	6500	May 15 to 20
34	Carson Pass	8650	May 25 to June 5
24	Ebbetts Pass	8800	June 5 to 15
13	Sonora Pass	9624	June 16 to 22
40	Tioga Pass	9941	June 10 to July 1



Relief for Snowbound

Chamber of Commerce,
Nevada City, California,
February 6, 1937.

Director Earl Lee Kelly,
Public Works Building,
Sacramento, California.

Dear Mr. Kelly:

Upon receipt of a letter from a business house in Washington, California, twenty or twenty-five miles from Nevada City, this afternoon, conveying the message that people in that little city were practically, hopelessly snowed in and with food supplies exhausted, claiming that the four or five miles of county road from Washington to the Junction House on the Tahoe-Ukiah Highway could be negotiated, but from that point for four or five miles, Nevada City way, it was impassable excepting with the use of skis. To the end of getting immediate relief for those in Washington, we contacted Senator Jerry Seawell at Roseville and was assured that he would immediately contact the proper State Department.

Before 12 o'clock today we heard from Mr. Stanley, in your office, and after acquainting him with the situation he showed positive interest and assured us that we would hear from him a little later. Within a reasonable time, Mr. Stanley phoned back to say that this afternoon, or this evening, there would be sent to this district on trailer, a 75 Cat and Bulldozer, and that work would be begun tomorrow upon that stretch of highway which today is impassable.

We are giving you and your office this letter promptly for the purpose of expressing appreciation by both the citizens of Nevada City and the little town of Washington.

Yours very truly,

CHAMBER OF COMMERCE,
F. E. CONNEA,
President.

April 7, 1937.

Mr. C. H. Purcell,
State Highway Engineer.

Dear Sir:

Following is a copy of a letter addressed to Foreman Rex Farmer from Mrs. Harry Fenn, which will be of interest to you:

"I am writing you in regard to a trip my husband, mother and I took to Bakersfield.

"On our return we had trouble with the fuel pump which failed to function

correctly. We had no light or proper tools with which my husband could work. It was about 12 or 1 a.m. and we were afraid we were stalled until daylight. About that time, one of your men from the maintenance crew came by and helped us out of our predicament. He gave us a lantern to help heat the inside of the car as it was quite cold and windy that night. He fixed the fuel pump and followed us clear up the last grade of the Ridge Route to see that it was fixed properly. We had no more trouble getting home.

"I can't tell you how much we appreciated his help and wanted you to know how much we were helped."

The employee referred to by Mrs. Fenn was W. H. Smullin on night patrol duty on the Ridge Route during the winter storms.

S. V. CORTELYOU,
District Engineer.

Advertising the State

Mr. John W. Howe,
Editor Official Journal of the
Department of Public Works.

Dear Mr. Howe:

Just a word to voice my appreciation of the splendid magazine gotten out by the Department of Public Works.

I consider it the best piece of advertising in the State today. When the general public are more acquainted with our highways and bridges the more they will appreciate the wonders of the whole State.

The lessons taught in the publication on the lines of motoring safety are worth more than the cost of getting out the magazine.

Kindly keep up the good work, as you are doing a lot to help eliminate motoring hazards.

Very truly yours,

J. A. KASCH,
Cowell Portland Cement Co.

Clearly Portrays Progress

Stanford University, Calif.,
February 27, 1937.

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

Gentlemen:

I have enjoyed reading your periodical, "Highways and Public Works," from the standpoint of a citizen who is interested in

the great engineering undertakings that are improving our California from day to day. I have never had the opportunity to read a magazine that so clearly and skillfully portrays the progress of these many and varied projects.

Sincerely,

COLUMBUS BALDO.

Agricultural Council of California,
Sacramento, Calif., April 6, 1937.

Mr. Earl Lee Kelly,
Director of Public Works.

Dear Mr. Kelly:

This letter is late, but it is, none the less, sincere.

During the heavy freeze in January of this year, when the entire citrus crop was in danger of destruction by the severe cold, some of our growers in Tulare County ran out of fuel, and the only way to get a supply of the solid fuel required for their particular kind of orchard heaters was to truck it over the Ridge Route from Los Angeles. This fuel had to be in the heaters that night, and it was essential that good speed be maintained in getting it over the Ridge Route, which was so heavily covered with snow that they were operating a one-way line.

I have before me a letter from P. E. Simpson, Assistant General Manager, Fruit Growers Supply Company, Los Angeles. This, as you probably know, is owned and operated by the California Fruit Growers Exchange, which is a farmers cooperative marketing association handling "Sunkist" oranges, lemons and grapefruit. In his letter, written March 1, after they were able to clean up the rush incident to the freeze, Mr. Simpson expresses the genuine appreciation of himself and his organization for the fine work done by Mr. Dennis in having his men on the Ridge Route see that the truckers got through with this fuel in time.

We want you to know of this situation and to assure you that such service is greatly appreciated by the farmers I represent, as it evidenced a real recognition of the opportunity for public service in an organization such as yours, and when Mr. Dennis and his men put themselves out very decidedly in order to render this valuable assistance in a most critical situation, we feel they deserve the very highest commendation.

Cordially yours,

R. H. TAYLOR,
Executive Secretary.

California Sends Delegates to Mexican Road Congress

By EDWARD J. NERON, Deputy Director of Public Works

WITHIN a year Californians will be motoring over picturesque highways from Nogales to Mexico City if plans laid at the International Road Congress in Mazatlan in Mexico last February are carried out.

At a convention of highway officials of the Southern Republic, California, Oregon, Arizona and British Columbia held in Mazatlan February 22-25, assurances were given by the Mexican government that work will be started at once on the Nogales-Mazatlan-Guadalajara link of the International Pacific Highway which ultimately will extend from Alaska to Buenos Aires in Argentina.

A report outlining the construction of the new road from the Mexican west coast to Mexico City submitted by T. H. Dennis, Maintenance Engineer of the California Division of Highways and engineers of the Automobile Club of Southern California and the California State Automobile Association was adopted by the convention.

MEXICO ATTRACTS CALIFORNIANS

It was the pleasure of myself and Mr. Dennis to represent Governor Frank F. Merriam and Director of Public Works Earl Lee Kelly at the congress, which was attended by the Governors of four Mexican states and by General Federico Montes, Commanding General of the State of Sinaloa, and Federal Secretary of Communication Vincente Cortez Herrera, personal representatives of President Cardenas of Mexico.

Since the opening last year of the Laredo-Mexico City Highway thousands of American motorists have driven from the Texas border city to the capital of Mexico. Hundreds of Californians have traveled 1500 miles to Laredo in order to make the 760-mile run to Mexico City.

With the completion of the Nogales-Mazatlan-Guadalajara road there

should be a big influx of motorists from California into Mexico and this State should benefit in a large way from Mexican visitors.

CONVENTION ENTHUSIASTIC

The purpose of the Mazatlan convention was to devise ways and means of financing the building of the proposed west coast highway, some 1630 miles long, between Nogales and Guadalajara. The route will pass through the states of Sonora, Sinaloa, Nayarit and Jalisco eventually forming a loop road with the present Laredo-Mexico City highway in addition to serving local needs. Such a highway undoubtedly will stimulate tourist interest in our historic neighboring republic.

The large attendance at the congress, the enthusiasm displayed and the business-like handling of the affairs of the convention augur well for the success of the undertaking.

Numerous communities from the four Mexican states were represented, the delegates being selected from many business, farming and political groups and travel bureaus. Entire harmony prevailed on the questions of routing.

MUST CONQUER BAD LANDS

The main problem confronting the Mexican highway officials in connection with the new road is in getting across the barrancas of Nayarit and Jalisco. Here is a short stretch of deep gorges. As soon as a highway is constructed through these bad lands it will be possible to drive from the California border via the west coast to Mexico City in dry weather. Motorists will be able to visit such points of interest as Culiacan, Mazatlan, Tepic, the Barrancas, Guadalajara, Chapala and Patzcuaro lakes and Morelia enroute to the Mexican capital.

The California delegation gave assurance of complete cooperation in

(Continued on page 28)





Scenes enroute from Nogales to Mazatlan, Mexico, and prominent figures at International Road Congress held there last February. At top, Speakers Table, left to right: C. Francisco Parra, Governor of Nayarit; Paul J. Montet, Governor of Jalisco; Edward J. Neron, Deputy Director of Public Works, California; General Federico Montes, Commanding General, State of Sinaloa, and permanent chairman of Congress; Governor Alfredo Delgado, Sinaloa; Hon. I. Soto, Director of Publicity, Sonora; Senor M. Blanco, President West Coast Highway Association of Mexico. Top center: One of several man-power ferries on Nogales-Mazatlan route. Left center: Stretch of fair road. Right: Mexican highway sign on good, graded gravel road and below bad section of road through dry wash.



During the last week of February and the first few days of March, this season's second progress survey of snowpack conditions throughout the mountains was made by all those organizations and parties participating in the field work of the California Cooperative Snow Surveys.

The results of the snow surveys revealed that the snowpack of the Sierra, in all watersheds lying south of the Stanislaus River, was from 5% to 20% better than at the same time a year ago. Over the area lying between the Stanislaus River on the south and the Feather River on the north, the snowpack was from 10% to 30% behind that of last year, while the watershed of the Upper Sacramento-McCloud-Pit Rivers showed only 60% as much snow as at this time last year. This last named watershed is the only one that showed any considerable shortage when the amount of snow on the ground is compared with the amount normally present at the end of the snow accumulation season—generally assumed as April 1st. In all other watersheds, the snowpack was within 20% of the April 1st normal, below in the north and above in the south. In the Upper Sacramento-McCloud-Pit area, however, the March 1st snowpack was only 40% of the amount normally found there at the first of April.

IRRIGATION DISTRICTS

Two irrigation districts in Tulare County were formally organized during the month to contract for purchase of water from the Friant-Kern Canal of the Central Valley Project, the Lindmore District, embracing an area of 32,000 acres lying west of Lindsay and Strathmore, and the Exeter Irrigation District consisting of 13,000 acres, including the town of Exeter and a highly developed strip along the foothills.

A report was made to the Board of Supervisors of Kings County on March 18th, approving organization plans of the Kings River Delta Irrigation District comprising 3100 acres on the northern edge of Tulare Lake bed near Stratford.

District Securities Commission

The District Securities Commission held its regular meeting in Sacramento on March 4th for consideration of applications presented by districts operating under its supervision. Among other matters, assessments levied by Byron, Bethany and Oroville-Wyandotte Irrigation Districts for the year 1936-37 were given approval. A refunding bond issue in the amount of \$96,000 by Jacinto Irrigation District was considered and approved for certification by the State Controller. A contract providing for the expenditure of \$17,535 for purchase of water meters by Paradise District was authorized to conserve the water supply.

FLOOD CONTROL AND RECLAMATION

Sacramento Flood Control Project

During this period a series of rains occurred which made necessary the operation of the drainage pumping plants in the Sutter By-pass. A small amount of routine maintenance work and patrolling was done. The dragline has continued clearing canals tributary to Pumping Plant No. 2.

The storms during the period caused two rises in the Sacramento River and its tributaries, but at no point was the stage high enough to cause alarm. On the new levees along the Sacramento River above Colusa and on the Feather River south of Marysville, a small amount of wash occurred, but the levees were not endangered and the damage was limited to the earth material washed away. The U. S. War Department installed temporary protection at the Sartain and Terrill ranch north of Colusa.

Relief Labor Work

During this period approximately 120 men were engaged in clearing the overflow channel of the Feather River north of Marysville and near Nicolaus. SRA Transient Camp No. 7 in the Sutter Basin furnished approximately 50 men for clearing in the Tisdale By-pass, but considerable time was lost on account of rains.

A WPA flood control emergency project has been set up, for which \$250,000 has been allocated for use throughout the State "to provide for necessary emergency work when danger to life or grave risk to property is engendered by flood, or thaw conditions." Under this project relief labor may be transferred promptly from other projects to points where danger exists. Transportation, materials and other costs must be defrayed by the State or local interests. The activities under this project in District No. 2, which

includes all of the Sacramento Valley except in San Joaquin County, are cleared through this office.

SUPERVISION OF DAMS

Application for approval of the plans and specifications for enlargement of the Crater Lake Dam owned by W. F. Dressler and F. H. Settelmeyer of Minden, Nevada, was approved on February 20, 1937. This dam is an earthfill 30 feet in height with a storage capacity of 320 acre-feet and is estimated to cost \$3,000.

At the Caljalco Dam of the Metropolitan Water District cut-off excavation has been practically completed.

The fill at San Gabriel Dam Number 1 of the Los Angeles County Flood Control District is reported to be approximately 70% complete.

Work on the enlargement of O'Shaughnessy dam of the City and County of San Francisco has been resumed following a temporary lay-off due to the extremely severe winter season.

Work at the Empire Weir of the Tulare Lake Canal Company has been deferred because of extreme floods in the Kings River.

WATER RIGHTS

Supervision of Appropriation of Water

During the month of February, 19 applications to appropriate water were received. 11 were denied and 16 were approved. Eight permits were revoked and the rights were confirmed under 5 permits by the issuance of license.

Reports have been prepared covering 192 field inspections made during the 1936 season and the preliminary lists for investigation during the 1937 season are prepared. Two hundred and thirty-three cases are tentatively listed, some of which doubtless will be eliminated.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

Intermittent storms during the past month have resulted in a large sustained stream flow into the Delta with the result that the water in Suisun Bay is fresh as far as Bullshead Point, and the effect of the high stages on March 22d (80,000 c.f.s. at Sacramento and 11,000 c.f.s. at Lathrop resulting from the storm over the week end) should further freshen up San Pablo Bay.

Figueroa Viaduct Nears Completion

(Continued from page 15)

piers and abutments which are skewed to meet the existing conditions. The south abutment parallels the tracks of the Southern Pacific Railroad. Piers on each side of the Los Angeles River parallel its course at the site, and the tracks of the Southern Pacific on the north bank. The north abutment and north pier parallel San Fernando Road.

The concrete span over San Fernando Road and the Los Angeles Railway tracks has a clearance of 22 feet. The roadway at San Fernando Road is 27 feet above the street. The viaduct is on an easy two and one-quarter per cent ascending grade in a southerly direction to meet existing highway through the tunnels. The roadway is approximately 51 feet above the Southern Pacific tracks near the mouth of the tunnel. The center of the 200 foot span over the river roadway is approximately 72 feet above the stream bed.

Reinforced concrete spans are supported by four girders with curved soffits which have the appearance of flat arches. Girders vary from about 4 feet in thickness at the center of the spans to 7 feet thickness at the haunches. Over the Los Angeles River and the Southern Pacific tracks there are three structural steel plate girder spans of variable length.

200-FOOT GIRDER SPAN

The center span over the Los Angeles River is 200 feet in length and is one of the longest plate girder spans in the country. The other two steel spans are 104 and 127 feet in length respectively. The steel girders like the concrete girders also have curved soffits.

The design of the steel girders is somewhat unusual. The ordinary plate girder has a single web plate, flange angles, and cover plates. In the construction of the viaduct girders double web plates were used with a filler plate between.

Clinton Construction Company is general contractor on the project.

"The boss just made me manager of his doughnut factory."

"Congratulations. Are you in charge of everything?"

"Yeah, the hole works."

Highway Bids and Awards of Contracts for the Month of March

GLENN COUNTY—Between 4 and 6 miles east of Butte City, 4 reinforced concrete slab bridges on concrete pile bents to be constructed and roadway approaches to be graded and roadmix surface treatment to be applied. District III, Route 45, Section C. Earl W. Heple, San Jose, \$56,681; F. O. Bohnett, San Jose, \$52,208; Peter J. McHugh, San Francisco, \$54,952; Frederickson & Watson Construction Co., Fredrickson Bros., Oakland, \$53,438; Lord & Bishop, Sacramento, \$55,241; N. M. Ball Sons, Berkeley, \$57,438; Frank C. Amoroso & Sons, San Rafael, \$59,629; A. Soda & Son, Oakland, \$67,741; Contract awarded to Charles Kuppinger, Lakeport, \$48,289.

LOS ANGELES COUNTY—Between Fenwick St. and Terra Bella St., in Los Angeles, 2.9 miles to be graded and paved with asphalt concrete and Portland cement concrete. District VII, Route 9, Section L.A. Match Bros., Elsinore, \$159,788; George J. Bock Co., Los Angeles, \$141,802; Claude Fisher Co., Ltd., Los Angeles, \$140,715; Dimmitt & Taylor, Los Angeles, \$157,468; Gogo & Rados, Los Angeles, \$152,636; Griffith Co., Los Angeles, \$136,294; P. J. Ahmadzick, Los Angeles, \$140,249; United Concrete Pipe Corp., Los Angeles, \$130,734; J. E. Haddock, Ltd., Pasadena, \$127,794; B. G. Carroll, San Diego, \$129,271; Oswald Bros., Los Angeles, \$129,635; Contract awarded to O. O. Sparks & Mundo Engineering Co., Los Angeles, \$121,320.

LOS ANGELES COUNTY—Two reinforced concrete girder bridges across Big Tujunga Wash. 1 across north branch, consisting of 12 spans each 54 feet, to be widened and reconstructed, and the other across the south branch consisting of three 55-foot spans and two 18-foot end cantilevers to be constructed. District VII, Route 9, Section L.A., J. F. Knapp, Oakland, \$145,815; R. R. Bishop, Long Beach, \$154,965; Bent Bros., Inc., Los Angeles, \$176,360; Oscar Oberg, Los Angeles, \$141,842; Andy Sordal, Long Beach, \$157,276; T. A. Allen Construction Co., Los Angeles, \$141,489; Gates and Huntley, Los Angeles, \$151,082; Atlas Construction Co. and C. F. Robbins, Pasadena, \$141,416; Charles J. Dorfman, Los Angeles, \$139,665; O. O. Sparks and Mundo Engineering Co., Los Angeles, \$133,682; Griffith Co., Los Angeles, \$158,329; J. E. Haddock, Ltd., Pasadena, \$144,024; Carlo Bongiovanni, Los Angeles, \$187,994. Contract awarded to Byerts & Dunn, Los Angeles, \$124,887.

PLACER COUNTY—Between Rocklin and Loomis, about 2.9 miles to be graded and paved with Portland cement concrete. District III, Route 17, Section A. Fredrickson & Westbrook, Lower Lake, \$129,466; N. M. Ball Sons & Larsen Bros., Berkeley, \$124,443; A. Teichert & Son, Inc., Sacramento, \$127,488; Fredrickson & Watson Construction Co. and Fredrickson Bros., Oakland, \$127,711; Hanrahan Co., San Francisco, \$129,054. Contract awarded to Basich Bros., Torrance, \$122,902.36.

SAN DIEGO COUNTY—Apply diesel oil to roadside vegetation. District XI, various routes and sections. Weed Eradicators Inc., Santa Ana, \$1,960; Gilmore Oil Co., Los Angeles, \$1,858; Regal Oil Co., Long Beach, \$1,536. Contract awarded to Consumers Oil Co., Los Angeles, \$1,254.30.

SAN DIEGO COUNTY—Between Las Flores Underpass and 1 mile south of San Onofre. 8.0 mi. to be graded, paved with Portland cement concrete, and plant-mixed surfacing on crusher run base to be placed. District XI, Route 2, Section D. United Concrete Pipe Corp., Los Angeles, \$489,284; Basich Bros., Torrance, \$463,754; W. E. Hall Co., Alhambra, \$485,407; Lewis Construction Co. & Bodenhamer Construction Co., Los Angeles, \$461,640; Gogo & Rados, Los Angeles, \$470,117; Southern California Roads Co., Los Angeles, \$511,812; V. R. Dennis Construction Co. San Diego, \$468,845; Griffith Co., Los Angeles, \$429,164; Oswald Bros., Los Angeles, \$482,985; George R. Daley Corp., Los Angeles, \$504,874; C. O. Sparks and Mundo Engineering Co., Los Angeles, \$493,248; Sharp & Fellows Contracting Company, Los Angeles, \$454,309; B. G. Carroll & C. B. Grove, San Diego, \$509,112; Metropolitan Construction, Los Angeles, \$429,644; J. E. Haddock Co., Ltd., Pasadena, \$481,555. Contract awarded to David H. Ryan, San Diego, \$411,880.35.

SAN JOAQUIN AND STANISLAUS COUNTIES—Between Vernalis & Gates Road, 4.6 miles to be graded and roadmix surface treatment applied. District X, Route 110, Section A. Peter J. McHugh, San Francisco, \$53,898; Charles L. Harney, San Francisco, \$60,973; George French Jr., Stockton, \$54,446; Lee J. Immel, Albany, \$50,696; Leo P. Piazza, San Jose, \$49,398; Louis Biosotti & Son, Stockton, \$51,571; United Concrete Pipe Corporation, Los Angeles, \$57,052; A. Teichert & Son, Inc., Sacramento, \$48,762; Hanrahan Company, Sacramento, \$58,904; Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, \$56,819; Earl W. Heple, San Jose, \$51,981; Claude C. Wood, Stockton, \$54,827; E. A. Forde, San Anselmo, \$57,387; N. M. Ball Sons & Larsen Bros., Berkeley, \$57,231; J. R. Reeves, Sacramento, \$65,458. Contract awarded to Basich Bros., Torrance, \$46,285.80.

SAN LUIS OBISPO COUNTY—Widen creek across Santa Margarita Creek, 13 miles north of San Luis Obispo. District V, Route 2, Section C, F. O. Bohnett, San Jose, \$8,000; Theo. M. Maino, San Luis Obispo, \$9,060; Robert D. Patterson, Santa Barbara, \$10,685. Contract awarded to Earl W. Heple, San Jose, \$7,186.06.

Wife—I expect all my daughters to make brilliant marriages.

Husband—You can't expect them to follow you in everything, my dear.

"I'm quitting my job as Mr. Brody's secretary."

"Well, he'll never have as pretty a one as you again."

"You're darn right. I'm marrying him."

California Sends Delegates to Mexican Road Congress

(Continued from page 24)

working out a program for construction of the highway and of future assistance in helping to increase motor travel over the road.

Among the California delegates was H. W. Keller, vice president of the Automobile Club of Southern California, who conceived the international highway about six years ago and who last year made a trip to Mexico City and convinced the Mexican government of the importance of calling the Mazatlan road congress.

WILL ISSUE ROAD BONDS

The congress generally favored the issuance of bonds of small denominations to stimulate a wide interest and encourage general subscription by the small investor. The bonds would be backed by the Bank of Mexico and eventually retired with the tax collected in the four states from the sale of gasoline. The present price of gasoline in our money is 28 cents, of which 8 cents is tax. This tax is now collected by the National government which fixes the tax as well as the price of gasoline per gallon.

At the Mazatlan meeting the states were assured that the government would forego this tax and match any amount they could raise from this source.

The meeting also favored the plan offered by E. E. East, Chief Engineer of the Automobile Club of Southern California, of organizing and equipping a competent Maintenance Department which would immediately begin to recondition the present road.

PLAN IS ADOPTED

This organization would grade to a turn pike section all mileage now on a suitable location, realigning the balance as funds permitted. Sections now impassable during the winter season by reason of poor sub-soil would be stabilized with sand or gravel, of which there is an abundance within economical haul. Road standards would be continually adjusted to traffic needs on a pay as you go basis.

While there are a number of large rivers between Guaymas and Mazatlan, these are now either being ferried across or forded and a continuance of this practice would work no great hardship until they could be more

adequately provided for. As traffic justified, the surface of these roads could be treated with oil, particularly adjacent population and industrial centers.

The total mileage involved in this West Coast road is approximately 1630 miles of which 250 miles is already completed.

Stanton Has New Hobby. Collecting His Own Obituaries

"Some one else may write, you will never read, your obituary."

State Highway Commissioner Philip A. Stanton of Anaheim does not accept this old saying as a truism.

Two years ago, when Commissioner Stanton was at the point of death after a long illness and his physicians held out no hope for his recovery, California newspapers prepared and set in type news and editorial obituaries highly eulogistic of Mr. Stanton and his extended public career. These never appeared in print. Commissioner Stanton made a miraculous recovery and resumed his active duties as a member of the Highway Commission.

Mr. Stanton has many friends in the newspaper game and the idea of collecting the obituaries they had written about him appealed to him. He has obtained a number of them, typical of which is one that starts off in this vein:

"Death of Phil Stanton, whose passing came this week after a prolonged illness, removes a citizen who had given unstintedly of his time, his ability and his fortune to the betterment of California government."

"Some one else may write, you will never read, your obituary," quotes Mr. Stanton. "But I did," he adds.

SOME SECTIONS COMPLETED

The longest section of completed work lies between Nogales and a point 30 miles South of Hermosillo, a distance of 210 miles. The remaining sections cover approaches to the towns of Sinaloa, Mazatlan and Guadalajara. These sections are built to modern standards and are a delight to travel. Of the intervening sections, particularly those driven by the invited guests, it would be more charitable to omit their description, beyond saying, they could be travelled once, at 10 miles per hour.

In the main the road traversed broad plateaus flanked by either low hills or mountain ranges. The northern part resembled our Mother Lode country, that near Mazatlan, the territory in and about Victorville in San Bernardino County.

While the majority of traffic met is of the equestrian, burro back, and ox-cart types, still in the larger towns of Hermosillo, Guaymas, Los Mochis, Culican and Mazatlan modern taxis vied for business with the two and four wheeled horse drawn cabs. The drivers of each zealously blew their horns at every street intersection and then proceeded at full speed down the narrow streets, forcing pedestrians to leap for their lives. With it all, however, was a spirit of play, not evident here.

One will be bound to remark the universal courtesy displayed by the Mexican people to all visitors, particularly Californians, and it seems the desire of most of them to visit our State. The magnificent churches, the town plazas and markets offer an attraction that few will not appreciate. The building of the West Coast Highway will make those things more easily accessible to Californians, and California nearer to the people of our neighboring republic.

"Dobbins, the critic, has roasted my picture unmercifully."

"Don't mind that fellow. He's no ideas of his own; he only repeats like a parrot what all the others say."

"Poor ole Bill! 'E's so shortsighted 'e's working himself to death."

"Wot's 'is short sight got to do with it?"

"Well, 'e can't see when the boss ain't looking, so 'e 'as to keep on shovelling all the time!"

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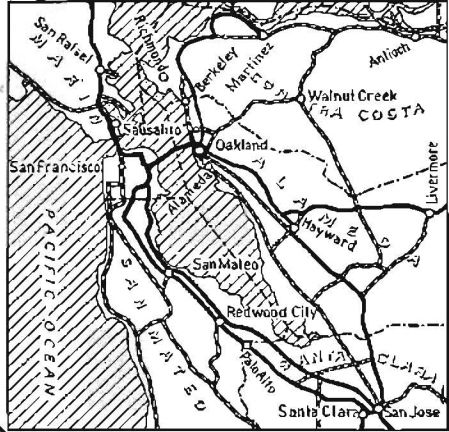
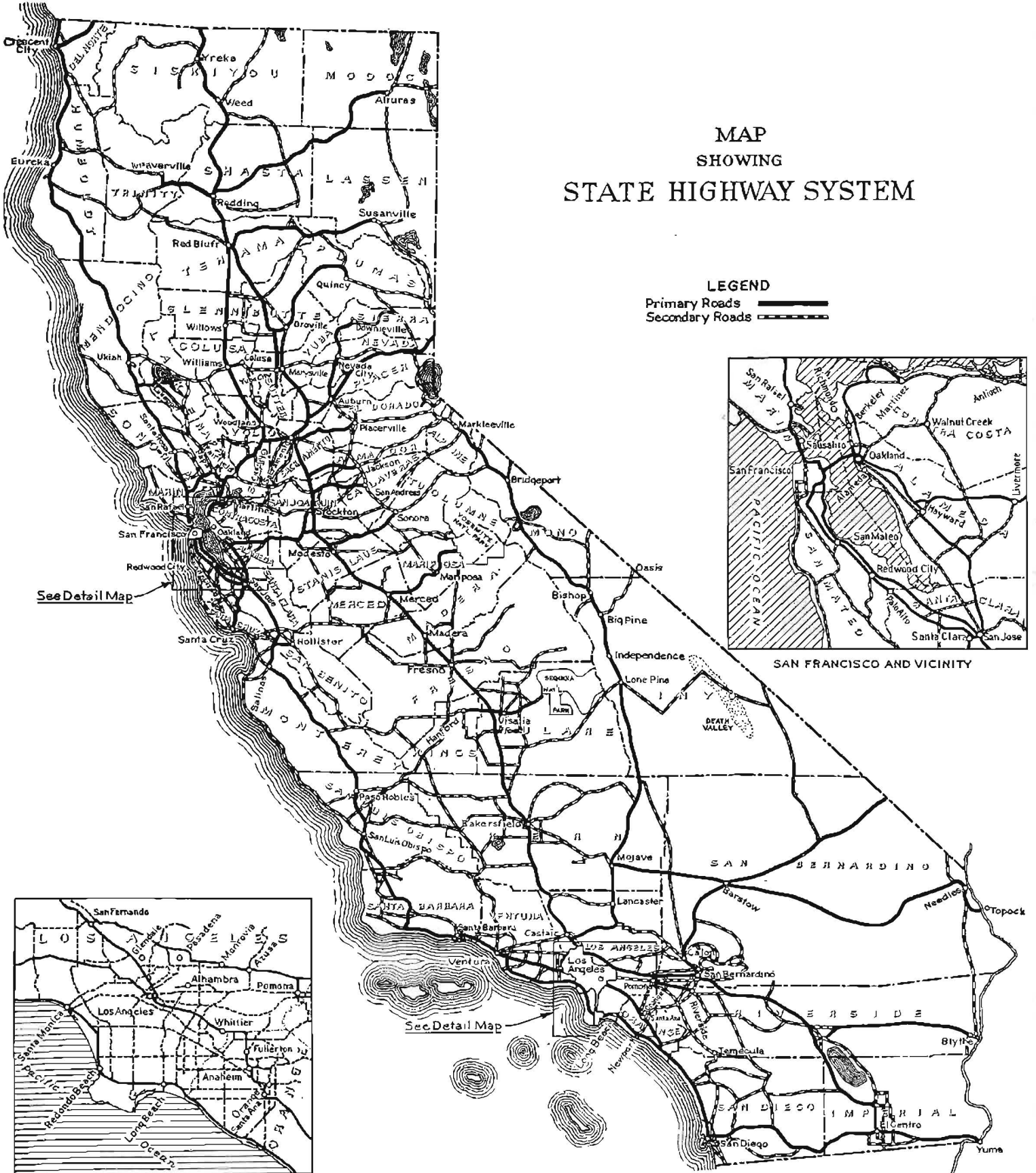
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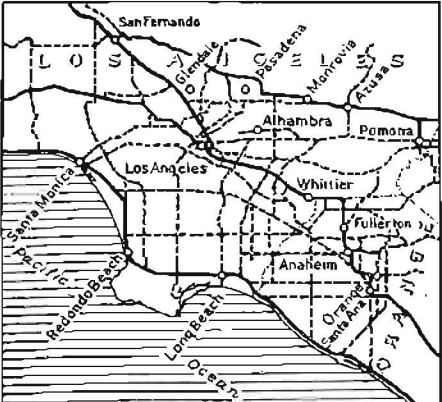
MAP
 SHOWING
 STATE HIGHWAY SYSTEM

LEGEND

Primary Roads 
 Secondary Roads 



SAN FRANCISCO AND VICINITY



LOS ANGELES AND VICINITY