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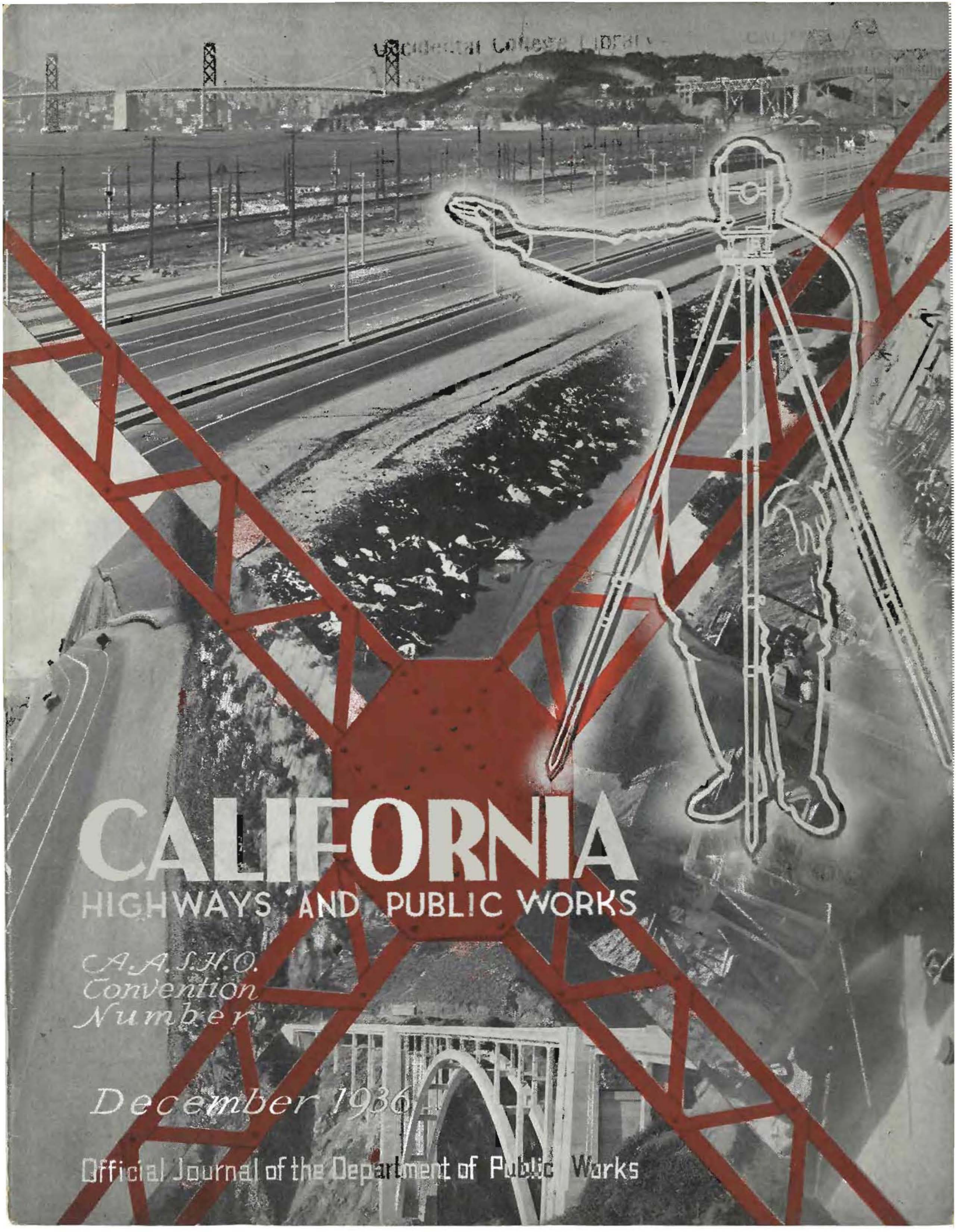
CALIFORNIA

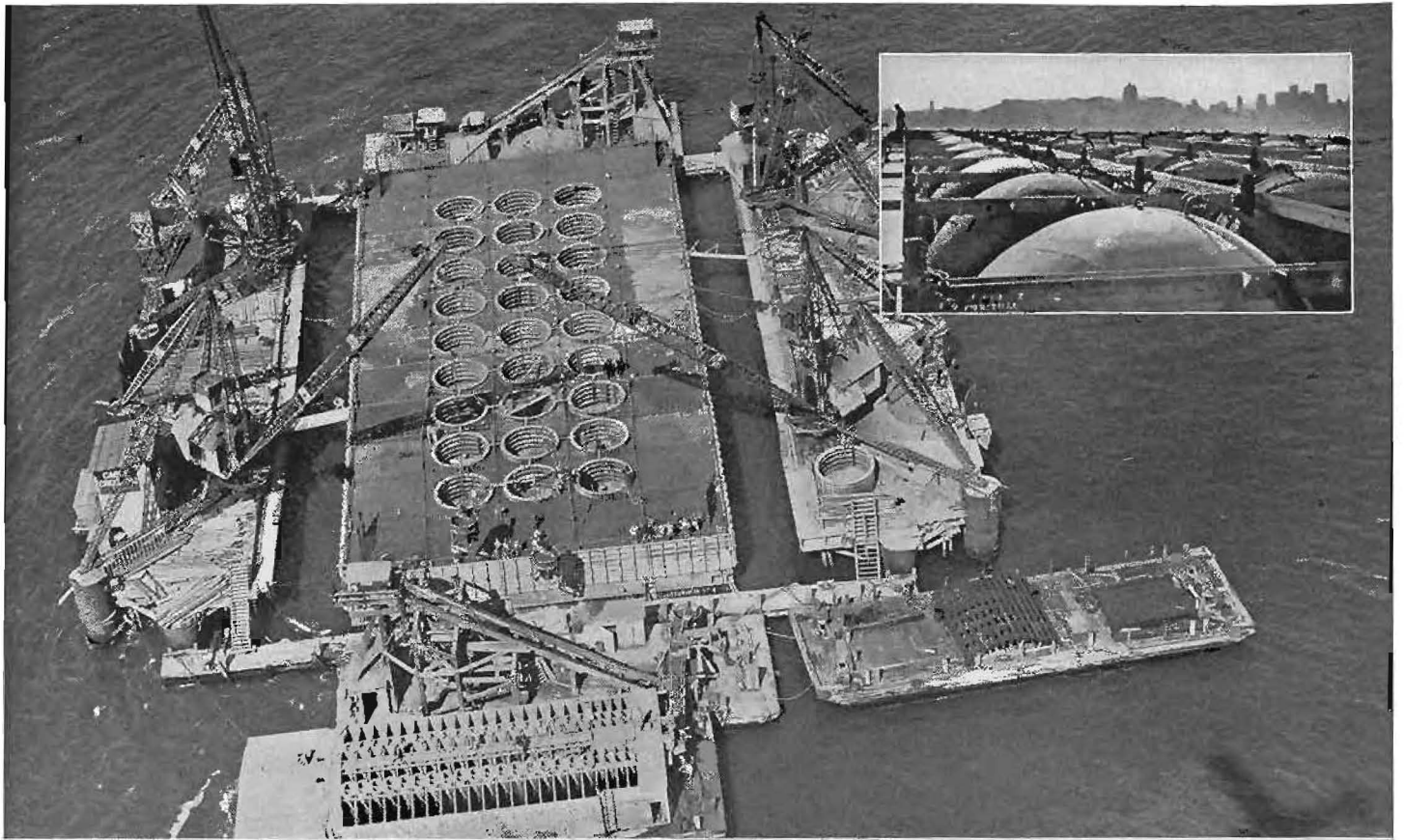
HIGHWAYS AND PUBLIC WORKS

*C.A.A.S.H.O.
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Views of flotation cylinder caissons used for the first time in bridge construction to build foundations for towers and central anchorage of San Francisco-Oakland Bay Bridge, which were shown on screen to delegates to convention of American Association of State Highway Officials by C. E. Andrew, Bridge Engineer. Upper—Showing how one caisson looked before pouring of concrete into steel tubes for sealing was completed. Inset—Air-tight domes on tubes through which air was pumped into cylinders, displacing the water, to make each cylinder act as air buoy until bottom of caisson rested upon rock. Lower—View of caisson from water level during sinking of cylinders.

Forty-four States Send 897 Representatives to Highway Convention in San Francisco

WITH only four of the forty-eight states of the Union missing on the roll call of delegates, the American Association of State Highway Officials held the largest and most important convention of its twenty-two years of existence in San Francisco December 7-10.

A total of 897 delegates, their ladies and guests from all parts of the Nation including Hawaii, participated in the sessions, representing a 115 per cent larger attendance than at any previous national meeting of State highway officials. Maine, New Jersey, Montana and West Virginia were the only absentees.

Men of outstanding prominence in road building emphasized in their addresses the imperative need for increased highway safety, higher standards of road construction by systematic rehabilitation of existing routes and improved new construction, greater cooperation with the Federal Government in the expenditure of government highway fund allocations, a determined stand against movements to reduce gasoline taxes and an unremitting campaign of education to prevent diversion of gas taxes to purposes other than highway building, maintenance and administration.

ATTENDANCE RECORD BROKEN

Not only was the convention remarkable for its new attendance record and the importance of its deliberations and accomplishments, but, on the word of its high officials, men who have attended many annual gatherings of the association, the entertainment provided for the delegates, their wives and members of their families by the California Division of Highways far surpassed anything in that line heretofore undertaken.

For four days, until adjournment on Thursday afternoon following the

election of new officers, the delegates were kept almost continuously busy with convention duties and pleasures arranged for them while their ladies were equally busy taking sightseeing trips on land and in the air, attending luncheons and other gay affairs.

Resolution No. 1

Adopted at Convention of
American Association of
State Highway Officials

WHEREAS, This Association, at their Annual Meeting held in Miami, Florida, one year ago, passed a resolution requesting the Congress to continue the allotment of regular Federal Aid for at least a two-year period; and

WHEREAS, The Congress at its following session did pass such legislation and has made regular Federal Aid available to the States for each of the fiscal years of 1938 and 1939;

NOW THEREFORE, BE IT RESOLVED, That the American Association of State Highway Officials, assembled in convention at San Francisco, California, December 10, 1936, express their appreciation to the Congress of the United States for its action, and pledge their sincere and earnest support in carrying out that part of this program which is entrusted to them.

The new president of the American Association of State Highway Officials elected by the convention is T. H. Cutler of Kentucky, succeeding Gibb Gilchrist of Texas.

Other officers and new members of the Executive Committee elected are:

Vice Presidents: First District, John V. Keily, Rhode Island; Second District, R. A. Harris, Mississippi; Third District, Ernest Lieberman, Illinois; Fourth District, James B. True, Wyoming.

Treasurer: W. W. Mack, Delaware (reelected).

Executive Committee: F. R. White, Iowa (term expires 1941); Frederic E. Everett, New Hampshire (term expires 1941); Arthur W. Brandt, New York (term expires 1940).

BIDS FROM SEVEN CITIES

The Executive Committee will meet next June at a place to be selected to pick the next convention city. At the San Francisco meeting Boston, New York, St. Louis, Columbus, O., Cincinnati, Hot Springs, Ark., and French Lake, Ind., all made bids for the next convention.

Practically all of the delegates were present in San Francisco by the afternoon of Sunday, December 6, and the evening of that day was given over to informal receptions for the visitors and their wives, under the auspices of officials of the Department of Public Works.

With Gibb Gilchrist of Texas, president of the association, presiding, the first general session of the convention was called to order in the Colonial ballroom of the St. Francis Hotel at 10.30 Monday morning.

WELCOMED BY DIRECTOR KELLY

As Director of the California Department of Public Works and the representative of Governor Frank F. Merriam, Earl Lee Kelly welcomed the delegates.

"On behalf of the Governor of our State, His Excellency, Frank F. Merriam, the official family of our Division of Highways and the millions of our friendly citizens, I welcome you to California, the land of romance and the place where golden dreams come true," said Director Kelly.

"Today we bring you greetings from our State with its more than six million people which but ninety years ago was just beginning to be populated by the pioneers of the gold-rush days. In these ninety years we have developed a mighty empire teeming with mineral, agricultural, industrial, commercial and recreational activity.

FROM TRAILS TO HIGHWAYS

"All of the great natural wonders of our State in the pioneer days were linked together only by the winding trail of the padres, which has given way in this short space of time to our magnificent bridges and to more than twenty thousand miles of beautiful paved highways in California.

"I am proud to stand before you today. I deem it a privilege to welcome you to this land of romance and of opportunity, and to this city by the Golden Gate. I hope that your visit will not only be of a constructive nature but that it will be one of happiness and pleasure to you, so that when you have returned to your homes you will look back on this occasion with remembrances of a friendly and hospitable people. May I express the wish that you will all soon come back again."

Urging the visitors to take advantages of arrangements made for them to cross the San Francisco-Oakland Bay Bridge, now a part of the California Highway System, Director Kelly paid a high tribute to State Highway Engineer C. H. Purcell and his staff who "conceived and built the magnificent structure spanning San Francisco Bay."

MAYOR ROSSI REPRESENTED

Owing to the fact that he was confined to his home by illness, Mayor Angelo J. Rossi of San Francisco was unable to be present to extend a welcome. He was represented by Alfred J. Cleary, chief administrative officer, who warmly invited all the delegates and members of their families to make free of the city and San Francisco's famed hospitality.

President Gilchrist, who is State Engineer of Texas, responded to the welcoming speeches and then launched into the delivery of his annual address. He won the undivided attention of the delegates.

Mr. Gilchrist said that stabilization of the business of building highways was one of the major accomplishments of 1936. Highlights of his talk were discussions of long range road plan-

ning, the growing problem of improvement of secondary highways, the need for increased safety on highways, diversion of gasoline tax funds to other than highway uses and the value of roadside beautification.

SOLD ON FEDERAL AID

"The best opportunity for long range planning ever offered became the lot of the States in 1936, the speaker declared. The advantages of long range appropriations are too

Resolution No. 2 Work Relief Funds

WHEREAS, it has been demonstrated that Highway Construction has been extremely efficient in providing employment during times of need; and

WHEREAS, Permanent public improvements have been obtained from such work;

NOW THEREFORE, BE IT RESOLVED, That the American Association of State Highway Officials, assembled in convention at San Francisco, California, December 10, 1936, requests the President and Congress of the United States, in the event that appropriations are made for work relief, to make available for highway construction a substantial portion of this appropriation; that this be made available through the Bureau of Public Roads to the Highway Departments; and this Association through the highway departments pledges its sincere and earnest cooperation in the expenditure of any funds allotted for this purpose.

many to enumerate. More time is given to location; more time is given prospective bidders to examine proposed work, with the result that bids will be submitted with less hazard and more time given to construct where such time is needed.

"The States are ready for this kind of thing and the entire country is sold on the principle of regular Federal Aid. If I were giving advice to highway officials it would be to plan construction programs not less than four years ahead and carry general layouts much further."

On the subject of Federal Aid, Mr. Gilchrist said:

"The appropriation of \$25,000,000 during each of the years 1938 and 1939 for secondary or feeder roads has met with popular approval and possibly will be made permanent. It will be necessary for the States to give increasing attention to this phase of the road building industry.

"One matter on which there seems to be a preponderance of opinion is that the work should be handled through the United States Bureau of Public Roads by the respective highway departments in the same manner as regular Federal Aid. This should apply whether county or road district money is used to defray a part of the cost."*

TESTIMONIAL TO A. W. BRANDT

Following the address of the president, F. E. Everett, State Highway Commissioner of New Hampshire, formally presented a testimonial to Past President A. W. Brandt of New York and in doing so reviewed Captain Brandt's war record and his achievements as head of the American Association of State Highway Officials.

Brief memorial services for departed members were held and then W. C. Markham, the veteran executive secretary of the association, made his annual report. Mr. Markham predicted that 1937 will be a banner year in highway construction. He said:

"Records of State highway departments show that mileages of improved roads will be greatly increased and so, naturally, that will mean increased expenditures during 1936, soon to close. We will close this year with virtually all of the regular and special Federal funds absorbed in contracts and will enter the coming year prepared to carry on a building program, involving construction only, of not less than \$400,000,000.

985,000 SURFACED MILES

"Everybody knows that the motor fees and gas tax paid by the people have been transferred into roadbeds, bridges and elimination of railroad crossings. In 1923 there were 80,200 miles of surfaced roads of all kinds in the United States. Today there are about 400,000 surfaced miles on the State systems alone, and over 585,000 surfaced miles on county and township roads.

* Mr. Gilchrist's address appears on page 22 of this issue.

(Continued on page 19)

\$800,000,000 Available Next Year if States Match Federal Aid Quotas

By THOS. H. MacDONALD, Chief, U. S. Bureau of Public Roads

TO DRIVE a modern motor car a quarter of a century measured by traffic conditions, into the past, is an illuminating and valuable experience. In a public enterprise such as ours—the building of a system of universal highways for a nation—the test of time is all important. It measures the adequacy of the vision into the future, and the competency of the means adopted to meet the imagined requirements.

My recent opportunity to study traffic conditions in many of the countries of the old world clarified many uncertainties, and indicated the very definite directions that Federal and State highway policies of the future should take. A vivid panorama passed in review, with all the variations from the streets of London where motor traffic is congested to the point of near stoppage, to the roads of Jugoslavia where the motor vehicle is yet so novel that the horses in common use are frightened and frequently behave badly, as was true in this country more than a quarter of a century since.

LONDON ROAD EXAMPLE

Doubtless selected examples rather than generalities from these other countries present the best means of conveying the valuable information that we may gain. Especially is this true because of the long-time aspects which alone determine the inherent soundness of the policies which give form to the undertakings.

Some eight years ago I inspected the newly completed Great West Road leading out of London. The construction had been undertaken for the purpose of providing employment, but its conception was to provide a wide thoroughfare of large traffic capacity to permit uninterrupted flow between the heart of London and the suburban and rural districts to the west. The roadway was paved at least 50 feet wide, and designed to carry heavy units.



THOS. H. MacDONALD

At that time a considerable part of its length was bordered by open fields. Today it is lined by continuous large industrial enterprises of many kinds. Traffic conditions are as congested as on the roads previously existing which this new highway was expected to relieve. It has lost its visioned function to move traffic expeditiously over a considerable distance, and has become a crowded, local service road.

If this actuality is projected against the by-pass designs which are in common use here, there is no essential difference in either the conception of their purpose or their design. The experience in this case leads directly to the conclusion that where the population is sufficient to make desirable

by-pass or radial distance routes, population and industries will gravitate rapidly and certainly to the new highways.

Because of the better traffic facilities offered, new enterprises will come into existence, and within a surprisingly short time we have only another city street with congested traffic. It soon loses its ability to serve the original purpose.

TRAFFIC SEPARATION ESSENTIAL

Other examples might be given, but the trend everywhere is so clearly defined, the conclusion is inescapable that to serve as by-pass or through distance routes, the design must carry on separate roadways the through and the local traffic, and the local traffic must be so adequately served that it will only be necessary to give access to the through highways at infrequent intervals.

France presents the opportunity to observe major projects undertaken for the relief of street and highway congestion in the metropolitan area of Paris. Here we get the conception of the dynamic instability of the great population centers when new transportation facilities become available.

Perhaps we have accepted the changing aspects of our own cities with the thought that these are characteristic of all youthful growth, but Paris is an old world city, itself ancient in comparison to any of our own. Nor is it a city that grew without direction. No single plan was adopted and adhered to through the years, but rather a series of progressive conceptions have been superimposed, each in harmony with those preceding.

ANCIENT PARIS STRUCTURES

Because of the lack of apparent change in recent years, Paris had taken on an unchanging atmosphere, neither old nor young, but of no period of time. Highways and

bridges of the time of Louis XIV and Napoleon are yet in service—a tribute to the ability and courage of the engineers and architects of a century and a half ago. Because of their long vision, and because the rulers who today stand out historically as great leaders, made it possible for their conceptions to become realities, important changes have been infrequent.

Today, however, major projects, forced by the growth of street and highway traffic, are under way, which will greatly modify and facilitate transportation in the area, but all are in harmony with, rather than destructive of, traditional values. So carefully are the projects designed to accord with the existing comprehensive plan for remodeling the city, with the old but yet fine buildings, with the principal boulevards and streets, and with the parks and other important public areas, that on completion they will have added greatly needed facilities presenting the appearance of graceful growth.

Paris is not static—it is dynamic—and from this situation we can obtain real wisdom. This example challenges the great fallacy, so common in this country, of regarding the physical environments of people as permanent—of regarding as almost sacred public works that have not yet physically deteriorated to the point of structural failure.

CIRCULAR AND RADIAL HIGHWAYS

We can get wisdom from what is being done there for two good reasons: first, the plans have been developed and the work is being executed by the National Department of Highways, the whole personnel of which has been trained in the Ecole des Ponts et Chaussées, the French School of Roads and Bridges, whose beginnings go back at least to Louis XV and possibly before. This organization is entitled to the highest respect for its engineering standards developed over a long period.

Second, there is the test of time—one and one-half centuries permit a sound perspective that distinguishes between enduring principles and short-lived stopgaps.

So it is of the highest significance that the competent French department of highways has selected, to meet two problems of traffic congestion, two distinctive types of highway planning—first, an intercepting circular highway enclosing the city,

Resolution No. 3 Secondary Road Funds

WHEREAS, The American Association of State Highway Officials has realized that improvements on the Federal Aid System have advanced to such a position in many states where State and County roads, as feeder roads to the Federal Aid System, can well receive recognition in the expenditure of Federal Funds; and

WHEREAS, This Association so expressed itself to the Congress last year, as embodied in Section 7 of the Act of June 16, 1935; and

WHEREAS, The Congress in that Act authorized an appropriation of \$25,000,000 a year for two years, to be expended under the provisions of the Federal Highway Act, which amount must be matched by the States;

THEREFORE, BE IT RESOLVED, That this Association, in convention assembled in San Francisco, California, December 10, 1936, hereby expresses its gratification of this action on the part of the Congress and recommends that the rules and regulations for the expenditure of these funds should provide that the State Highway Departments be the sole point of contact with the Federal Government and that the entire program, including selection of the system, designation of projects, the preparation of plans, award of contracts, and the prosecution of the work, be under the direct control and supervision of the various State Highway Departments; and

BE IT FURTHER RESOLVED, That the Traffic and Economic Surveys now being made cooperatively by the States and the Federal Government be used in the determination of the routes which are to be included in the Secondary or Feeder Road System and that the information obtained from these surveys also be used in determining individual projects within the system.

and second, motor highways, radial from the city, reaching for a considerable distance beyond to connect with the existing national highways. This idea sounds simple, but in the detail of design lies the assurance of permanent relief to the traffic, and self preservation of efficient functioning through a long future period.

OLD LINES FOLLOWED

There was a time when Paris depended for defense on fortified walls extending around the city. At intervals, gates provided for the flow of traffic to all parts of the nation. These lines yet remain the major radial highways within and without the city, perpetuated in a national system of highways, originally adequately conceived and subsequently adhered to faithfully.

On the location of the old fortification a modern highway is under construction. The abandoned walls have long since served their purpose, but through the years has been preserved, free from encroachment, the land which now becomes the right-of-way for a highway that will serve to carry traffic rapidly to connections with all of the radial streets and highways in and out of the city.

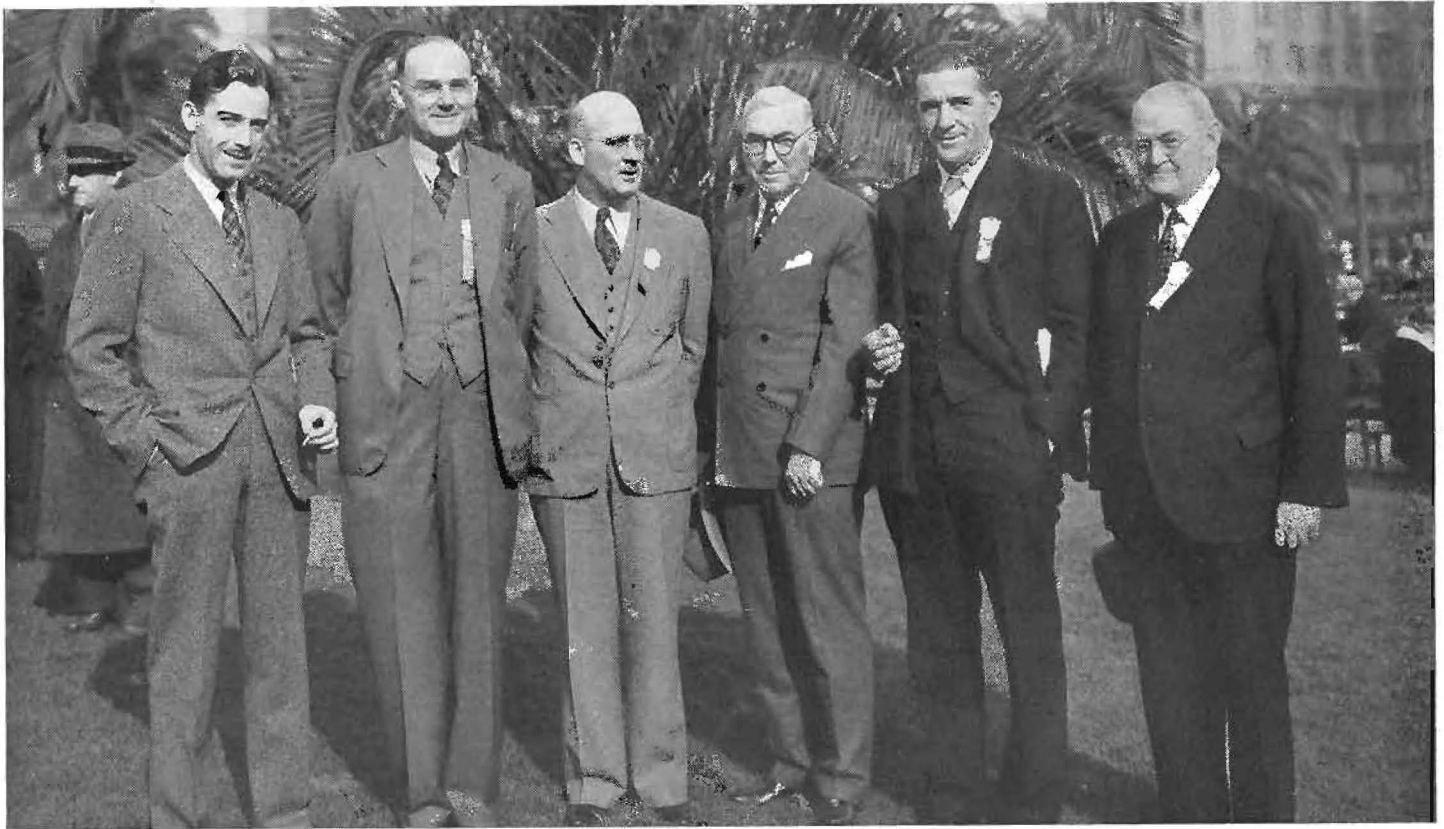
At intersections the new circular highway is carried under the major radial routes. At some points these underpasses are relatively simple tunnels, beginning and ending far enough back of the intercepted streets to leave their full width available for traffic. Others are multiple-lane tunnels branching to connect with several streets.

The design motive is to carry on separated levels the principal conflicting lines of travel to make possible a continuous traffic flow. The tunnel construction has necessarily provided for other underground services such as sewers, water and electric conduits.

NEW TUNNEL LIGHTING PRINCIPLE

A feature that is new and highly desirable is the equalization of the intensity of lighting within and without the tunnels. This is accomplished automatically by the use of the photoelectric cell control, an achievement in tunnel lighting which destroys the unpleasant reactions to driving underground.

It is my judgment that the French engineers have developed a new principle in the lighting of tunnels that will apparently overcome the



Convention comrades of American Association of State Highway Officials get together again in San Francisco. Left to right—L. V. Murrow, Washington, retiring Vice President; Gibb Gilchrist, Texas, retiring President; J. H. Dowling, State Highway Engineer of Florida; C. H. Purcell, California State Highway Engineer; Louis S. Cain, Territorial Highway Engineer of Hawaii; F. E. Everett, Executive Committeeman, New Hampshire.

generally unfavorable reaction, and will go far to popularize the use of this form of construction where it is the feasible answer to the problem.

Typical of the new radial highways is the St. Cloud auto road under construction on a wholly new location, to provide for a continuous flow of traffic to the northwest, beginning at the Seine River and connecting with the existing national system at a considerable distance from the city. A new bridge is under construction across the Seine, and this new highway will pick up the traffic at the bridge head.

PARK SETTING PRESERVED

After ascending a short grade to the level of a suitable soil stratum for tunnel construction, the line is carried beneath the St. Cloud hills. This ancient park and historic setting are thus left undisturbed, and beyond, the way lies through State forests and other lands on a wide right-of-way with all cross traffic separated. If pedestrians or bicycles are permitted, by-paths will be provided exclusively for them.

As a part of this new development program, many of the old city bridges over the Seine are being replaced by new structures, but great care is taken to preserve the architectural harmony of the new with the old. These examples typify the plans to expand highway facilities to meet new conditions where the problem is one of adding to a system of highways originally laid out on a well conceived national basis.

They sustain the principle that over a long period, a highway system originally well planned can be expanded to meet the growing needs without large abandonment of investment or changing to wholly new policies.

In Germany a wholly different situation is met. Until the present National Socialist Government took over the development, in 1933, of a national system of highways, the work was on a State and local basis. The situation is graphically described by Dr. Allmers, President of the National Association of the Motor Industry of Germany. Quoting Dr. Allmers:

"In Germany there was a hopeless state of disintegration as in the Middle Ages. State and provincial governments, district and communal authorities, made every effort to obstruct a sound development based on uniform principles. The Ministry of Transport was powerless, and years elapsed before applications were sanctioned by the competent governments of the federal states.

Every district road engineer built his roads in a different way, but nearly all of them built them in the wrong way, and only a few appreciated the requirements of automobile traffic and these few mostly lacked the necessary funds."

Here no national system had been planned and developed through the years, so it was necessary for the present German government to attack the problem of adequate national highways at the beginning. A two-part program was undertaken—the rehabilitation of the existing roads, which have been divided into national roads and highways of the first and second class. The work on these lat-

(Continued on page 15)

Great Progress Made in Mountain Road Construction

By LACEY V. MURROW, Director of Highways, Washington

THE history of the development of transportation is analogous to and parallels exactly the history of the progress of civilization. Only with the overcoming of the great natural barriers which separated one group from another, and the subsequent intermingling of ideas and accomplishments, has civilization been stimulated to new development * * *

The fact that mountain ranges have been the greatest factor in retarding the advancement of civilization is fully demonstrated in the settlement of our own country. For a period of one hundred and fifty years the Appalachian Mountains prevented the American civilization, composed of the thirteen colonies scattered along the eastern seaboard, from penetrating into what was then called "the West."

The first settlers crossed this barrier in the year 1767. However, it was not until 1806 that the Great National Pike was forced through the Cumberland Gap and it was not until forty-two years later, in 1848, that this road reached the border of what is now Illinois.

EARLY PROGRESS SLOW

In contrast to this slow advancement across mountain barriers we find that during the same period the Spanish colonists to the south and the French to the north, by reason of their ability to move along navigable water routes, were many years in advance of the settlers who arrived from the Atlantic seaboard. To further indicate the slow progress made in the early development of roads, it is interesting to note that Lewis and Clark reached the Pacific Coast in 1806, which was the same year that the Cumberland Pike was started. * * *

The crossing of the Rocky Mountains was made less difficult by reason of the strong incentive to reach California when gold was discovered in 1848. Although speed was of the ut-



LACEY V. MURROW

most importance, the difficulties and hazards of overland transportation were so great that many people chose the longer, time-consuming route around Cape Horn or across the Isthmus of Panama.

The next major step in removing mountain barriers was accomplished in 1869, when the first transcontinental railroad was completed. It was not, however, until the advent of the motor vehicle in 1900 that really rapid progress was made in the development of mountain transportation. In 1905 there were approximately eight thousand motor vehicles in the United States, while in 1936 motor vehicle registration reached the enormous sum of twenty-six million. In order that these vehicles might be operated it was of course necessary that highways be constructed and then properly maintained.

Perhaps the most interesting feature in the development of motor transport in so far as highways are concerned is again the removal or the

overcoming of mountain barriers. The topography of the country is such that this problem has been most pronounced in the western states. Most persons are familiar with the mountain roads built a number of years ago. With the advent of motor freight trucks and fast-moving passenger cars it has become necessary that careful study be given to the standards of location and construction on all primary highways, but particularly on those roads traversing high mountain ranges.

In the State of Washington all roads have been carefully segregated into one of five different classifications, this classification being determined generally on the basis of traffic density, and for each one of these classifications there have been established definite standards governing alignment, limiting grades, sight distances and superelevation.

Our mountain road location is generally subject to the following limitations: Maximum curvature, 10°; maximum grades, 5½%; minimum sight distance, 750 feet; superelevation based on Moyer's formula giving a maximum rate of .13 of a foot per foot of width.

In each of the four highways crossing the Cascade Mountains we have encountered marked differences in the types of soil and rock. Soils are found that exceed the extreme limits set for soil classification of A-1 to A-8. The rock at higher altitudes is generally of volcanic origin, breaks large, is coarse-grained and deficient in toughness. At the lower elevations the rock is generally basalt, granite and schist. Surfacing materials and aggregates for concrete or bituminous construction are available from large glacial deposits of sand and gravel.

OBSTACLES ARE NUMEROUS

The actual construction of mountain highways is more difficult than ordinary construction because of the shortness of the construction season,



With average total annual snowfall on some highways exceeding 600 inches, snow removal is a big problem in Washington as shown in this photo of highway crew at winter work.

the different types of materials encountered and the heavy yardage involved. In most of the western states you will find solid rock cuts in which the material excavated will total in excess of 75,000 yards.

We have just completed a project on the west side of the Cascade Mountains on which the yardage of one cut totaled in excess of 650,000 cubic yards. Where it is necessary to take support along steep canyon walls, there are many instances where the cut slopes will exceed 350 feet.

One of the major items of cost in the construction of these roads, particularly in and adjacent to the Olympic Mountains, is the item of clearing and grubbing, and in some instances the combined cost of these two operations exceeds \$2,000 per acre. On one contract recently completed, many of the trees averaged in excess of eight feet in diameter and there was removed an average of 50,000 board feet of merchantable timber throughout the entire length of the project.

It is most difficult to secure proper locations through this type of country. After the highway has been constructed and this heavy growth of timber

is later removed, it sometimes becomes very evident that the proper location was not secured. To overcome this and other problems incident to mountain locations, the use of aerial photography has become increasingly necessary and important. By proper use of the aerial method of mapping, it is comparatively easy to secure the best location the country affords. We have employed this method quite extensively in making reconnaissance and preliminary studies on all highway locations traversing difficult terrane.

SNOW REMOVAL PROBLEM

The maximum precipitation in the State of Washington is 160 inches, while the average precipitation for the state is 27 inches. Yet in eastern Washington there are hundreds of square miles with average annual precipitation of less than eight inches.

In the western portion of the state 70 per cent of the precipitation occurs between October 1 and March 31. Abnormally rapid runoff is occasioned by Chinook winds and by conditions caused by the proximity of the warm Japanese Current. All of these factors must be carefully considered in the design and construction of drainage facilities. Furthermore, it is

necessary that ample clearance be provided on all structures for the passage of large trees that have been uprooted and carried into the channel of the stream by heavy winds and slides.

One of the interesting problems incident to mountain location, construction and maintenance is that of snow removal. We have in the State of Washington two mountain passes on which the average total snowfall exceeds 600 inches per year and two other passes on which the total snowfall is in excess of 400 inches. The removal of this snow is handled by the combined use of blade and rotary plows. It is estimated that we remove annually from the primary highway system in excess of 35,000,000 cubic yards of snow. Much of this snow is exceptionally heavy and weighs as much as 40 pounds per cubic foot.

The major portion of the communication problem of the department is handled by our own short-wave radio system, all plows being equipped with both transmitting and receiving sets. In many instances our snow camps are far removed from telephone or telegraph communications and during the snow season this type of com-

munication is not reliable because of the damage to lines caused by falling timber.

We have found that our communication problem has been practically solved since we have been permitted to make use of radio, as the SnoGos can immediately contact each other, the summit station or the district and headquarters offices in case of emergency.

TUNNELS ARE IMPORTANT

Because of the ever-present danger of snow slides and because of the actual loss of life and property by reason of these slides during the past few years, it has been necessary that we give more consideration to the construction of tunnels wherever feasible, in order that grades and curvature may be reduced and the hazard of heavy snowfall may be eliminated.

Traffic in the mountainous sections of Washington is now making use of sixteen tunnels, having a combined length of 6490 feet, and we are at the present time considering the widening, ventilating and lighting of the old Great Northern tunnel through the summit of the Cascade Mountains, having a total length of 13,900 feet.

The construction of mountain highways in the State of Washington is not unlike the work that may be observed in most all of the western states, particularly in California and Oregon, as the Cascades and the Sierra Nevadas form a seldom-broken

chain from the Canadian boundary to central California.

But mountains have lost most of their terror. With the aid of funds provided by the Federal Government through the Bureau of Public Roads and by the various states through taxation of motor transport, it has been possible for the engineering profession to overcome in a large measure these obstacles to rapid transportation, just as most of the other natural resources have been harnessed into public service through Federal, State and municipal cooperation.

VISION IS REALIZED

Today we find that from our convention city two gigantic bridges have been thrown across the Bay of San Francisco to unite the surrounding cities into one metropolis. In southern California the long caterpillar of steel which has been creeping across the deserts from Boulder Dam has reached its destination, Los Angeles, bringing with it a steady flow of water that fell originally on the slopes of the distant Rockies.

The Moffat Tunnel has defied the stony barrier of the Rockies and has put Denver on a quick, direct trans-continental railroad route. At Grand Coulee, in eastern Washington, the waters of the Columbia are being impounded to furnish power and irrigation for a vast new agricultural empire, and Oregon can well be proud of the Bonneville project, which will harness this same river to provide electricity.

**Delegates From
Alaska, Hawaii,
British Columbia**

WHEN the roll of states was called on the opening day of the convention of the American Association of State Highway Officials some of the larger delegations were given ovations as their members arose as the names of their respective states were sounded.

In honor of one of its popular sons, Gibb Gilchrist of Austin, State Highway Engineer and retiring president of the association, the Lone Star State sent 29 delegates to the convention.

Missouri was a close second with 25 delegates and Kansas was a runner-up with 24.

DELEGATES FROM AFAR

The Kansans were accompanied by nine ladies and the Missouri and Texas contingents each brought seven of the fair sex.

Sharing applause with these delegations were four delegates from Hawaii, two from British Columbia and one from Alaska.

California, naturally, as host, led all the states with 248 delegates and their ladies officially registered.

Other honor states and the numbers of their delegates and ladies were:

	Delegates	Ladies
Florida -----	23	6
Arizona -----	15	5
Maryland -----	14	4
Nevada -----	14	4
Michigan -----	14	3
Oregon -----	16	4
Utah -----	14	2

During our own generation, mountain highways in the United States have developed from a vision to a successful reality. Every year engineers perfect some new points, some modernizing method to increase the comfort and safety of the mountain motorist.

There is very little pioneering left to do on the overland routes, only improving and expanding to meet traffic needs of the future. However, in order that we may retain faith in the vitality of our civilization, transportation is now taking to the air—and once again the mountains raise their heads, a treacherous barrier to be overcome by the pioneers of the airways.



Building a highway along the face of a sheer cliff in Washington state.

Message of Welcome by Governor Frank F. Merriam

\$144,380,687 is Total of Gas Tax Diversions

IN HIS address of welcome to the convention, Governor Frank F. Merriam said:

"The twenty-second annual meeting of the American Association of State Highway Officials is an occasion of more than usual significance. On behalf of the people of California, I sincerely welcome you as delegates to this convention. We invite you to accept the hospitality of our Division of Highways in the earnest spirit in which it is offered. We are glad to have you here.

"During your visit we want you to become familiar with the problems and plans involved in the construction and maintenance of our avenues of travel. We ask you to observe the inventions and methods which have enabled the State, cities and counties to build a system of roads and boulevards totaling approximately 95,950 miles in length. We particularly invite you to study our bridge building program together with our ways and means of financing these great projects.

"For those interested in beauty and magnificence, California has much to offer. Scenic attractions which vary from lofty mountains to vast deserts are all within a day's ride from the city. The romance of Old Spain and Mexico, the heroism of the argonauts of '49 still live within this area—milestones in the colorful history of the State.

"In the national parks nature has created an environment to which people from all parts of the world respond with enthusiasm. Lofty trees, thousands of years old, originating at a time when the world was overrun by strange creatures, still stand

serene and indifferent to the passage of centuries.

"In these places, where time has stood still, nature presents a scenic setting which should be visited during your stay. Sights, wonderful and inspiring, that will remain in your memory forever are yours for the visiting. Automobile caravan tours north and south have been arranged for you.

"In selecting California in which



GOVERNOR FRANK F. MERRIAM

to hold your convention, you have chosen well. To those who have never been here before, there is much to see, to learn, and to appreciate. And they are all yours, created for you and maintained for your enjoyment. See them and grow to admire them as we do, for in the field of engineering man is fast approaching the greatness of nature in his accomplishments for the comfort and convenience of humanity.

"WE WELCOME YOU."

UNANIMITY of opinion against gasoline tax diversion among delegates to the twenty-second annual convention of the American Association of State Highway Officials as expressed in general sessions and group meetings was one of the highlights of the Association's San Francisco gathering.

The Committee on Publicity and Public Relations adopted a resolution recommending that all States write into their constitutions, as five States already have done, prohibitions against the diverting of gasoline tax revenues.

\$10,000,000 INCREASE IN 1935

In its annual report, submitted to the convention, the Association said:

"Diversion of funds secured by motor license fees and the gasoline tax from the purposes originally intended, namely—highways—was increased during 1935. In 1935 there were fifteen States that did not divert any of these funds and two States diverted but a little over \$2,000 each. The reasons given for these diversions in most cases are called 'relief'; and despite the Hayden Amendment, penalizing a State for increasing these diversions, the total increased diversions of 1935 over 1934 amounts to over \$10,000,000.

"Reports from State Highway Departments show that \$33,909,671 in motor fees and \$101,471,016 in gasoline taxes were diverted, making a grand total of \$144,380,687.

"In addition to this, from the \$12,451,000 collected from Motor Carrier taxes, there was a diversion of over \$2,069,000. The diversions are reported as follows: \$86,404,383 direct to State Treasuries, and of this amount \$13,873,143 was then transferred to cities and counties. Relief was given \$15,365,016; education received \$30,773,143; the remainder, \$13,907,169, was expended for airways, harbor improvements, Confederate pensions, oyster propagation, parks, hospitals and various kinds of bond issues—not highway bonds."

Varied Aspects of Detour Construction Problems

By T. H. DENNIS, State Maintenance Engineer, California

THE subject originally assigned for discussion at this time was to be "Maintenance on Detours on Construction Projects Under Heavy Traffic." However, since common practice during recent years has tended more and more to relieve Highway Maintenance Departments of responsibility for this particular phase of maintenance work, I have taken the liberty to digress somewhat to also include other aspects of the detour problem.

"Maintaining Traffic" is now considered as a definite integral part of every construction project.

To satisfactorily accommodate regular traffic while construction is in progress is necessarily more expensive than under normal conditions, and this added cost must come from revenues allocated to the highway department. The decision as to how much may reasonably be allotted for this purpose must be made along with all other items entering into the cost of the proposed improvement.

GOES INTO CONTRACT

Since the movement of traffic must be integrated with each step of construction as the project develops, the logical consequence has been to specify "Maintaining Traffic" as one of the duties and responsibilities of the contractor.

Each construction job presents its own distinct detour problem and for this reason General Construction Specifications must be supplemented by Special Provisions which clearly indicate what will be required of the successful bidder in this regard.

It is this policy of delegating to contractors the task of "maintaining traffic" that has to a large extent removed the problem of "Maintenance on Detours" from the Highway Maintenance Departments. Naturally, knowledge concerning maintenance methods and costs enters into the determination of the type of detour chosen; but aside from this,



T. H. DENNIS

the present-day detour is primarily the problem of the location engineer and the construction engineer.

The ideal detour from the standpoint of the traffic which will use it the most would seem to be that which most nearly parallels the existing road and at the same time provides a minimum of inconvenience in the matter of time, comfort, and safety.

ROUTED THROUGH JOB

Regardless of how the through traffic is routed, local traffic originating within the limits of the contract must be given some sort of a traversable road. Any added expense for such a purpose is eliminated by a detour which closely parallels the existing highway, while at the same time the minimum mileage assured by this type of location works to the advantage of all traffic. As the result of such considerations, we find in the majority of cases that traffic must be routed through the job.

To care for heavy traffic the detour should be designed to provide for the continuous movement of at least one lane of traffic in each direction. One-way traffic controls are distinctly un-

satisfactory and can only be justified by extreme conditions. If resorted to at all, they should extend only the shortest possible distance.

Grade and alignment standards need be only high enough to assure a moderate rate of speed and obviate the possibility of heavy trucks' becoming stalled.

WIDE COST VARIATIONS

The one great problem presented by detours is that of accommodating their temporary nature to the fact that they must also be safe and dependable at all times while in service. For this reason the expenditures for detours can bear no very definite relationship to the total number of vehicles that will pass over them.

In an attempt to establish some such relationship over a period of years and covering many separate contracts, we have found the very widest variations, from as much as one-half cent per vehicle mile down to such infinitesimal amounts as to be almost negligible.

The complete costs properly chargeable to detours are difficult to ascertain where "maintaining traffic" is included in unit bid prices, as there is no way of determining how much was added by the contractor to his unit prices in view of the fact that he would have a large amount or small amount of traffic to handle. Only those additional units of work directly traceable to traffic maintenance requirements can be accounted for.

This does not mean that any part of the cost is escaped, for, regardless of our inability to segregate it, we may be sure that it forms a definite part of the total cost of the improvement.

MOUNTAIN AREA PRACTICE

Detours in mountain areas call for particularly well planned construction schedules, in order to utilize as detours in proper sequence certain

portions of the existing road and the new roadbed, which at comparatively small expense can be made serviceable as a detour long before the actual pavement is completed.

Slight shovel-widening of cuts and additions to existing fills at carefully chosen points, will often make it possible to maintain traffic through the job with only small inconvenience to both the public and contractor, and without going beyond the cross-sections of the proposed construction. To do this may very likely change the balance of quantities in the original mass diagram, but the savings over the alternate of building a separate detour will more than offset the added expense of overhaul.

In the valleys it is generally possible to provide a detour within the right of way alongside the existing road. Unless the natural soil is especially unstable, a comparatively small layer of suitable road or plant-mix oil surfacing material will be sufficient to furnish an adequate roadway for the short length of time it will be in service. The surfacing material can later be salvaged at small expense for use on the improved shoulders of the new highway.

TIME BIG FACTOR

The length of time a detour is to be in use is of especial importance. Detours for the entire length of a project from the time work is begun until the contract is finished are very expensive.

Every piece of the existing road should carry the traffic until construction operations make this impossible; and the new construction should be put in service as quickly as grading operations will permit. The material for subgrade can ordinarily be used as surfacing material for temporary traffic and with little expense can later be reshaped for the final pavement.

Where the existing traffic is heavy, any new roadbed constructed will be sufficiently wide to accommodate two lanes of traffic on each side of its center line by utilizing the shoulder widths, so that during pavement operations, if necessary the pavement may be laid one-half width at a time and still maintain traffic. Here, also, any surfacing material required for that part of the detour which is on the shoulders can be salvaged for the improved shoulder work or the new road.

In certain cases, existing county

roads offer a satisfactory means for detouring traffic. However, this is much less common than might be expected. Too often the increased mileage makes such a detour very objectionable to regular traffic, and, as

Resolution No. 4 Labor and Hours of Work

WHEREAS, The quality and economical performance of highway work is very largely dependent upon the ability of employees in the skilled and intermediate grades of labor; and

WHEREAS, There has been and is a distinct shortage of these classes of labor, and the present system of employment does not tend to train other men in these grades of labor; and

WHEREAS, Highway work is seasonal in character and it is difficult for labor to earn a proper annual income during the construction season;

NOW THEREFORE, BE IT RESOLVED, That the American Association of State Highway Officials requests that the rules and regulations on Federal Aid work be so changed as to permit the employment of labor in both the skilled and intermediate group directly by the Contractor, to the end that he can not only have control in the selection of such employees but will have opportunity to train other competent young men to properly fill these places as older men retire or find other employment; and

BE IT FURTHER RESOLVED, That the rules and regulations be so changed as to permit a maximum working month of sufficient hours so that labor employed upon highway construction will have opportunity to earn a reasonable annual income.

previously pointed out, local traffic along the line of the project must still be provided for. Where county roads do present the best solution, the consent for their use is obtained from

the county authorities and the necessary work of preparation and maintenance is handled either by the contractor or by State forces, all costs being assessed against the construction project.

Where bridges are to be replaced or reconstructed, it is often possible by slight changes in the alignment of the approaches to build the new bridge alongside the existing one, which can then remain in place until the new structure is ready for service. Where this is not possible, a temporary bridge with the necessary approaches is almost invariably the only solution, as existing bridges which might be used as detours are seldom to be found within a reasonable distance.

SOME IMPORTANT DETAILS

Many minor details, which, if considered separately, would appear to have no great importance, may very easily, if neglected, make all the difference between a detour which is accepted without complaint by the public and one which may bring a storm of criticism. Among such things are proper publicity in advance that a detour is to be used, directional and warning signs that can not be overlooked or misunderstood, adequate lighting, intelligent flagmen, and the reduction to an absolute minimum of the occasions when traffic is halted entirely. Where detours must cross railways at grade, it is mandatory that flagmen be on duty continuously.

Constantly increasing highway traffic demands increased highway facilities in the way of new roads, improved roads, replacement of worn-out pavements, and so forth, but it also demands reasonable provision for its movement while these new facilities are being prepared. The public which creates this traffic seems entirely willing to pay for these things. Their willingness to pay for adequate detours does not, however, justify the highway engineer in a lavish use of highway funds for a temporary benefit.

This situation challenges one to discover the nicest balance between the expenditures for the temporary and the permanent benefit of the public. The professional training of the engineer will tip the balance in favor of the permanent unless offset by appreciation of the fact that to all of us, as humans, immediate good has some very distinct advantages.

Auto Manufacturers Interested In Highway Safety Campaigns

By PAUL G. HOFFMAN, president, and D. G. ROOS,
technical advisor, The Studebaker Corporation

Progress made by the automotive manufacturers in keeping pace with modern highway construction by increasing the safety design of automobiles was outlined in a highly interesting paper prepared by Paul G. Hoffman, president of the Studebaker Corporation, and D. G. Roos, technical advisor to the corporation, and read by Mr. Roos at the San Francisco convention of the American Association of State Highway Officials. The address in part follows:

THERE are today four great methods of transportation which carry the major part of the world's passengers and goods—ships, railways, airplanes, and motor vehicles. Ships travel the ocean wastes. The highway is nature's. Therefore, the technique of ocean travel is concentrated on the ship, the personnel operating the ship and the creation of imaginary lines of travel and exact codes for governing the highly trained operating personnel. Density of traffic is not a problem. Speed, in spite of the fact that it has doubled in forty years, is not yet a problem.

Very much like it is air travel. The highway is nature's own. The travel lanes are imaginary routes along radio beams and at different levels. Little can be done with the highway of the air. Hence, elaborate control of the qualifications of operating personnel is necessary, as are also exacting tests and inspection and building codes for the airplane structure itself and specific codes of operation in flight. As yet density of traffic is not a problem of air flight. Speeds are the highest man has attained and greater speed is coming. Strangely enough, in a measure greater speed will mean greater safety.

Railways have a definite traffic problem. It is a major problem in their economy, but the railway builds and owns its right of way. It has its equipment and rolling stock designed and built to its requirements. It operates from top to bottom with highly trained personnel, with rigidly



D. G. ROOS

enforced codes learned from experience.

Unlike any of these, and yet carrying the greatest volume of traffic in the world is the highway system of the United States and unlike any of these, the three great factors of vehicle, highway, and operator are entirely separated from each other in control. Problems in highway transportation arise therefore from maladjustment between the capacities of the driver, the car and the highway and it is not an academic question to ask how the balance between the three factors of driver, car, and highway, is

to be established to produce an effective and satisfactory result.

It is inconceivable and, I believe, would not be tolerated by the public, which is our boss and yours, to destroy the facility of the vehicle and stultify its development, though all recognize that pending driver and highway improvement the capacity and characteristics of the vehicle must be subject to reasonable control.

MAGNIFICENT ACCOMPLISHMENT

Our present highway system, with all of its difficulties, is a magnificent accomplishment. It has no parallel anywhere else in the world. It has been made possible by great skill in highway engineering backed up by aroused public opinion and a demand for adequate highways. The automobile manufacturers have a fundamental interest in highways. They are the right of way over which their rolling stock must travel. Without adequate highways, the country could never have been motorized to the extent that it has, and further growth and development of the motor vehicle in both volume of production and improved characteristics is dependent on further growth of our highway system, both as to extent and type of highway.

It is unnecessary to call your attention to the fact that the problem of highway traffic is dynamic, not static. In 1908 there were about 200,000 motor cars in the United States. The annual mileage of these cars was about 80,000,000 miles, the average

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Cutler of Kentucky, New President True of Wyoming, Vice President

VETERAN of the World War with two citations for bravery under fire and nationally known for his accomplishments in the field of engineering, Thomas Henry Cutler, newly elected president of the American Association of State Highway Officials, assumes the responsibilities of his important office excellently equipped to fulfill the duties devolving upon him.

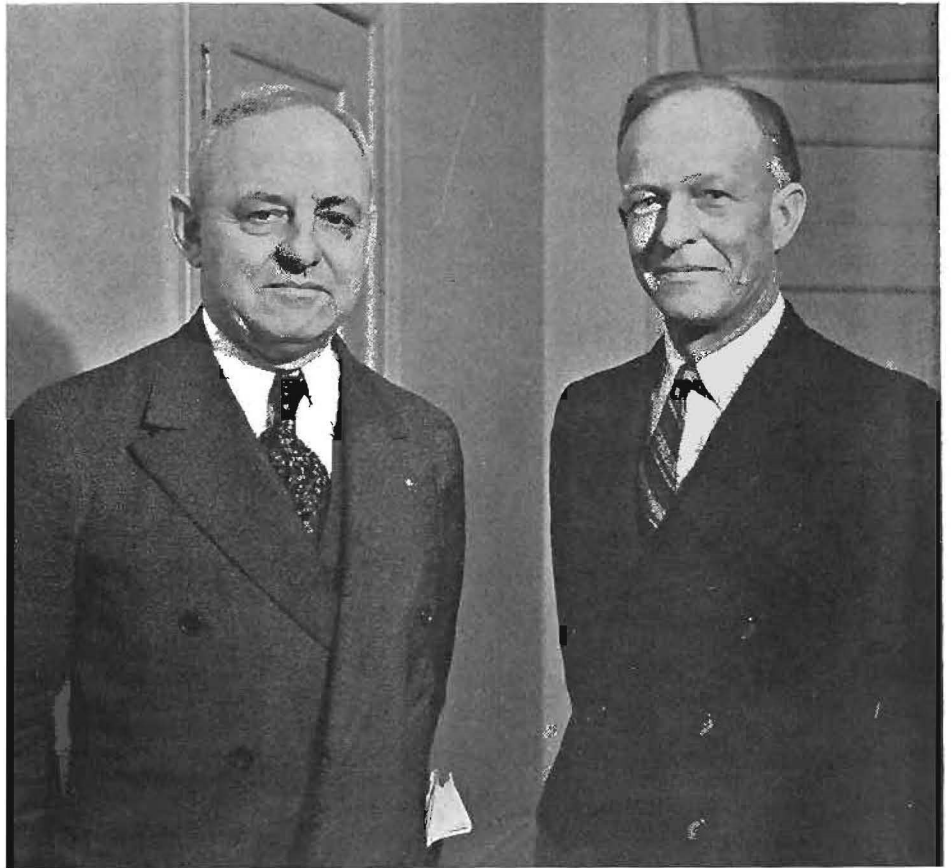
Born at Fort Scott, Kansas, August 12, 1882, Mr. Cutler received his degree of Bachelor of Science in Mining Engineering at the University of Kentucky in 1903.

Upon his graduation from college, Mr. Cutler entered the employ of the C. & A. Railroad as a draftsman. During 1904 he was chief of party, location and maintenance for that corporation and in 1905 accepted the post of chief of construction with the Illinois Steel Works, South Chicago. From 1906 to 1909 he was Chief Division Engineer for the same corporation at Gary, Indiana. For seven years, 1910-17, he was engaged as a construction engineer and contractor at Gary.

Mr. Cutler entered the service of his country in 1917 and served as Captain of Engineers, Division of Gas Officers, 26th Division. He served with this outfit for nine months, being commissioned a Major in the Chemical Warfare Service in September, 1918. He won his citations in field combat.

After the war, Mr. Cutler became associated with the Missouri State Highway Commission and from 1919 served successively as Project Engineer, Assistant Division Engineer, Assistant Construction Engineer, Construction Engineer and, since February 1, 1927, as Chief Engineer of the Missouri Highway Commission.

Mr. Cutler was secretary of the Gary school board and treasurer of the Gary Y. M. C. A. He was secretary and later president of the Mississippi Valley Conference of State Highway Departments, vice president and member of the executive committee of the American Association of



THOMAS HENRY CUTLER

JAMES B. TRUE

State Highway Officials, president and member of the executive committee of the American Road Builders Association, member of the Works Commission of the State Planning Board of Missouri, U. S. Delegate to the International Road Congress, and is a member of the American Society of Military Engineers, the Missouri Historical Society, Engineers Club of St. Louis and Alpha Tau Omega.

Mr. Cutler's home is in Jefferson City, Missouri.

They elected James B. True of Cheyenne, State Highway Superintendent of Wyoming, to succeed L. V. Murrow of Washington to that office.

The new vice president of the Association was born in El Paso, Texas, in 1887, was educated in the

public schools of Denver, Colorado, Denver University and University of Wisconsin. He was an officer and field engineer in Shoshone, Colorado, during 1907. In 1908 he went to Garden City, Kansas, to be resident engineer for the U. S. Sugar and Land Company. He returned to Colorado the following year to become engineer for the Antlers Orchard Development Co. at Silt. In 1910 he went to Suffield, Alberta, Canada, where for three years he acted as Division Engineer for the South Alberta Land Co.

In 1913 he returned to his native land and the State service until 1919, when he went into private practice.

Called back into State service, Mr. True was appointed State Highway Superintendent of Wyoming.

How Ladies Were Entertained Impressions of a Hostess

By MRS. JOHN HUNT SKEGGS
Chairman of Hostesses

NOT the least of the Convention's activities were those especially planned for the ladies.

They arrived—about two hundred in number—from Maine to California and Honolulu, Montana to Florida; and departed, we feel, with an impression second to none of previous conventions, due to the hospitality extended to them by our California hostesses and the activities so thoughtfully and ably arranged by the entertainment committee, under guidance of Mrs. George McCoy and Mrs. Chas. H. Purcell.

The program was initiated by a delightful luncheon at the Sir Francis Drake Hotel, under the supervision of Mrs. Clarence Morris and Mrs. Walter McGinn, followed by a style show from Joseph Magnin's. There was a "Shirley Temple" and a "Jane Withers," but the spice of the display was the personality of a "Mae West," who stole the show, assisted by Al Lyon's orchestra.

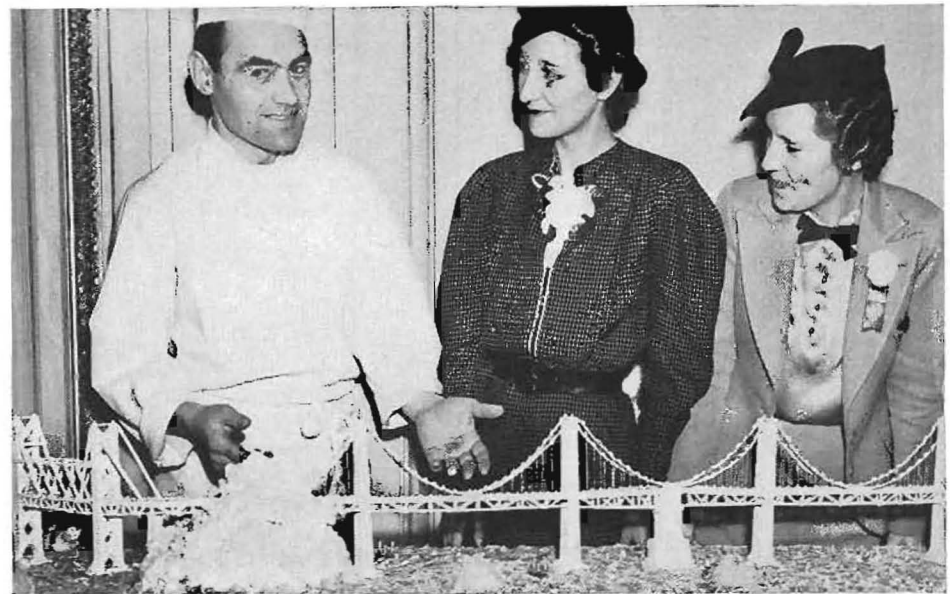
Monday evening the delegation at large cavorted aboard the Show Boat. From the deck to rathskeller we feasted and danced, not to one orchestra, but to two.

Tuesday a caravan of 156 of the fair sex motored to Palo Alto, where a lecture was given at Stanford University Chapel, relative to the history of the university and its rebuilding following the earthquake of 1906. After luncheon, they browsed about the Allied Arts, with its old pewter, antique silver, Swedish glassware, and modern pottery in a setting almost semitropical, with strictly Spanish architecture. There the caravan dispersed, some expressing a desire to return via Bayshore, others taking Skyline Boulevard back to the city. It may not be amiss to quote Mrs. E. H. Flannery of Little Rock, Ark., who exclaimed after the trip was completed: "In the East it has always been the impression that Californians are prone to brag about their State. But I can understand now, for I have concluded it is next to heaven."

No particular affair arranged for



They enjoyed being among the California hostesses at luncheon given at Hotel Sir Francis Drake to ladies of American Association of State Highway Officials. Left to right—Mrs. C. H. Purcell, Mrs. George McCoy, Mrs. Earl Lee Kelly.



Chef Marcel Behr of Sir Francis Drake Hotel proudly shows sugar replica of Bay Bridge to Mrs. Gordon Lloyd, Austin, Texas, and Mrs. Gale Moss, Topeka, Kansas.

the lovely visitors overshadowed any other, for Wednesday morning there were 102 responses to the airplane flight out of Mills Field over the bay area. Am sure our guests are most grateful to Director of Public Works Earl Lee Kelly for this featured treat,

since a goodly number heretofore had either never been tempted or sufficiently urged to fly. The weather man was exceedingly thoughtful, and they all returned thrilled.

Added to the other enjoyable features was banquet night, with its

(Continued on page 17)

\$800,000,000 Available Next Year If States Match Federal Aid Quotas

(Continued from page 5)

ter classes is administered, under general direction of the Inspector General of German roads, directly by the States and Prussian provinces.

The second part of the program is the laying out and construction of a wholly new system of roads known as the Reichsautobahnen, under the immediate supervision of the General Inspector. The system as planned consists of about 4300 miles, which gives roughly three lines across Germany north and south and three east and west. The literal translation of the word Reichsautobahnen is national auto road, which gives immediately a vision of these great national thoroughfares, built on their own new wide right-of-ways to provide for a continuous flow exclusively of motor traffic over the whole mileage without conflict with the cross traffic on intersecting highways or railroads.

The design calls for very easy gradients, long sight distances and long radius curves. There is some difference in these standards as applied in different areas, depending upon the general topography.

TRAFFIC SEPARATION DESIGN

The section design calls for two roadways, each approximately 29 feet in overall width, separated by a sodded strip 13.65 feet wide. Each roadway consists of a Portland cement concrete slab 24.37 feet, an inside curb 1.3 feet, and an outside curb 3.25 feet, in width. These curb strips are covered with a bituminous mix, thus giving the grayish-white center a wide black border.

Cross highway traffic is generally carried over the autobahnen without materially raising the level of these cross roads, meaning that sections of the autobahnen are placed in deep cuts. The autobahnen in some cases is carried over railways. Various types of access roads have been developed, depending upon the actual amount of traffic eventually expected.

The clover leaf design is in less general use with its 4-way connections than the so-called trumpet design. At the present time, upwards of 1000 miles of the autobahnen have been completed, although all of this mileage is not as yet open for public use.

As a national system, relative to

the area of the country, this conception of the German Government goes far beyond any modern similar undertaking by any nation, when measured by miles, by the generous dimensions of the typical design, and by all of the auxiliary work, including structures, approaches and landscaping.

HEAVY GRADING INVOLVED

The construction features, as will be inferred from the description of the design, involve heavy grading. The carrying of the autobahnen below cross roads to provide high clearances alone accounts for heavy yardage because of the wide sections.

The slopes are designed to permit the quick establishment of ground cover, and all the work, even that recently finished, is well sodded. The top soil has been conserved and replaced, and in an inspection covering most of the completed mileage there was no evidence of unprotected slopes or destroying erosion.

Mechanical equipment in service is for large scale production. For hauling, use is made of industrial locomotives and small narrow-gauge steel dump cars rather than trucks which are common in this country. In the operations of pavement construction the curbs are first built. These provide tracks for steel rails on which move the combined mixer and distributor, the tamper and the finishing machines.

A very dry mix concrete is used, and is heavily tamped. The quality of construction is good. The surfaces are smooth riding, and both the design and workmanship of the structures are particularly good. While the structures are largely of reinforced concrete or of reinforced concrete substructures with steel superstructures, there are variations in the larger viaducts. In a few examples observed, masonry arches were used; long highway viaducts were largely of steel.

Where construction has been fully completed the meticulous attention which has been given to the final finish is praiseworthy, and the large scale operations reflect high-class engineering and efficient supervision. The German officials in charge, from General Inspector Doctor Todt, through the whole staff and including

the workmen, can be proud of the high quality of the work they are producing.

ANTITHESIS OF AMERICAN SITUATION

There is little basis for comparison of this undertaking in Germany and the highway improvement going forward in this country. The situation in Germany is the very antithesis of that in the United States. Here the highway builders have been waging an almost losing struggle to provide highways for the already developed motor traffic. In Germany the system of superhighways is being built largely ahead of the highway traffic.

Germany has recognized the utility of highway transport to the extent of having embarked on the building of these large capacity highways, and as a complementary national policy there has been put into effect every inducement to encourage the development of motor traffic. In all of Europe the motor car has previously been looked upon as a luxury and taxed as such. The relatively slow development there resulted from high priced cars and taxation handicaps against their utilization.

Germany has not only done away with special taxes on the motor car in recognition of its potential general utility, but is actually permitting the cost price of trucks and business cars to be deducted from income on which taxes are paid. The encouragement thus offered by the Government has been so outstanding that the licensing of new cars jumped from 41,000 in 1932, to 180,000 in 1935, an increase of 340 per cent.

In addition the industry has been brought under governmental supervision, so that the commercial practices which had brought demoralization of the business have been rectified. Those most importantly interested now give highest praise to the stabilization of the industry which has thus been effected by the Government. Here we have an unusual expression of faith in the utility of highway transport.

While the highway program was undertaken as one of the means for providing employment, which, accord-



Builders of California's highways foregather at convention with Uncle Sam's head man in national highway construction. Left to right: Earl Lee Kelly, State Director of Public Works; Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads; C. H. Purcell, State Highway Engineer, and G. T. McCoy, Assistant State Highway Engineer.

ing to reports, in 1932 reached one out of each three who were able to work, the policy of highway building represents a large investment on the part of the Government which there is no immediate possibility of recovering directly from imposts on the road users.

UNITED STATES MUST RAISE STANDARDS

Since conditions are so dissimilar, what relationships are there, then, which we can take as warning or which we can emulate?

The most important is that we must grasp this highway problem in this country more firmly. We must raise our standards to the new levels demanded by the universal utility of the motor vehicle.

Two distinct programs are indicated: First, the systematic rehabilitation of existing highways by the actual incorporation of new construction to promote safety and greater utility. * * * The second program is the long-time plan which will be based upon the principles illustrated by these examples from other countries, and by wide experience in our own country.

The highway transport surveys now under way are basic. It is my deep

seated hope that the highway department of each State will recognize the essential quality of the information which is being gathered. If the program of the next five to ten years is to provide the public with highway service that is not now even approached in any State, it must rest on this transport survey foundation.

The underlying soundness of planning a belt line intercepting highway plus radial roads on new right-of-ways to serve the metropolitan areas, and introducing the new feature of providing this complete service only for the passenger motor vehicle, is supported by the traffic studies heretofore made.

SOCIAL SERVICES INADEQUATE

These studies indicate the overwhelming preponderance of passenger motor vehicle movements in the metropolitan areas, particularly on week-ends and holidays. To provide free flow highways leading from the cities well into the country, and to permit the distribution of vehicles on these radial highways, from and to their own quadrants in the city over one or more belt line highways, will add im-

measurably to the potential utility of the motor vehicle to the urban dweller, and such development will be supported by this increased use.

This conception goes further, however, and recognizes that the trend of the world is toward a greater recognition of social values. The motor car is one of the instruments from which we are not securing the potential social services in the nightmare of congested streets or highways at times of peak traffic. Unfortunately there is no way to stagger Saturdays, Sundays and holidays. The city dweller either makes use of his car along with his tens of thousands of neighbors, or does not use it.

These radial roads will be reserved for automobile traffic. There is need in some limited sections of the country for the extension of such roads until they connect with those radiating from other large centers of population to form continuous routes wholly disconnected from our present system of highways. To the extent that other traffic, such as pedestrians or bicycles, may use such routes, separate ways must be provided.

But the design must go a step further than does the design of the German, the French or of our own roads, and provide for the complete separation of local from through travel by parallel service roads. The exclusion of local travel, as on the German roads, is unthinkable. In fact, the expanding of the cities by the development of small acreages for homes is dependent upon the provisions for local traffic service.

In our programs, both for the rehabilitation and for the long term plan, we must accept as an essential the separation of grades at major highway intersections. This is one of the most important factors in stepping up the safe utility of our existing highways.

FUTURE OBJECTIVES

Notwithstanding the very extensive operations which have been carried on cooperatively by the State highway departments and the Bureau of Public Roads, for the past several years, this discussion is largely devoted to the problem of lifting the standards of future operations rather than to the recording of the activities of these immediate years, which have been filled with earnest endeavors to give the maximum of employment.

The State highway departments and the highway contractors merit an expression of sincere appreciation on the part of the Federal officials for their diligence, patience and effective efforts to carry into effect regulations which were diverse and difficult. This problem of employment is yet with us and to a large degree will remain with us, but we can, in addition, recognize more fully that we must intelligently look at what we are doing, and determine the method of attack on these problems of highway traffic that are growing constantly more difficult.

Since the emergency programs to provide employment were undertaken in 1933, the highways put under way by the State highway departments and the Bureau from funds under the immediate direction of the Bureau have reached more than 62,000 miles. This is equivalent to at least 12 highways across the country from north to south, and an equal number from east to west. More than 21,600 miles have been included in the construction programs of the last 18 months only.

Even this immense program has

been too slow. It has not with sufficient rapidity absorbed the funds available for construction. There are many causes that have delayed the beginning of work on important projects, particularly right of way difficulties, but I am bringing this observation into the discussion here since we have now to face the formulation of a new large program for the coming year.

Highway construction, including State and Federal funds, can reach above \$800,000,000 if the states all meet their Federal aid apportionments. The only way that the public can be led to see its loss in the drag in State programs because of diversion of highway funds to other than road purposes is by the formulation of the timely programs that are possible if these funds are conserved and used for the purposes for which these special taxes are levied.

As an integral part of the present highway policy, the participation in the improvement of major traffic routes within the cities and the grade crossing elimination projects are rapidly maturing facilities of the utmost value. In our new program there is the introduction of the secondary road improvement program as a part of the permanent highway legislation.

Without going fully into the approach to this important new development, two principles will be observed in the regulations which are issued—first, that the Federal Government will deal only through the State highway departments, and second, that the application of the funds will be upon a definite secondary road system.

This year when the need exists to raise the standards of highway planning and engineering to higher levels, it is particularly fitting that the Association should meet in San Francisco. The intelligent vision that has produced the Bay Bridge fills the heart of every highway department member with pride to be in and of the fraternity.

The maturity of the conception, the graceful design, the complexity of the problems overcome, and the now apparent tremendous economic influence that the bridge will exert, are symbolic of what highway transport means to our nation.

The completed bridge is an en-

How Ladies Were Entertained

(Continued from page 14)

delightful program arranged by Mrs. Frank Balfour. Master of ceremonies was our own Leo Carillo, who parried for honors in witticism with Governor Merriam. Jean Parker of "Sequoia" fame was there in person, and all enjoyed the dancer from Coconut Grove, the Convention Ensemble of eight blended voices, Haskell, the Magician; impersonations by the original Syd Chatton, etc.

TRIP OVER BRIDGE

Possibly the highlight of the Convention at large was the interest displayed by the complete delegation and their wives, who motored over the new San Francisco-Oakland Bay Bridge in a parade of over one hundred cars, thus paying their respect to the colossal engineering feat of Mr. Charles H. Purcell—not losing sight, I'm sure, of the men who dared the heights under perilous conditions to make a structure of beauty and convenience for their fellow men.

Thus endeth my impression of the results of our efforts to make the Highway Engineers of America welcome and happy during their sojourn in our midst December 7-10th, 1936.

May I take this opportunity of expressing my appreciation to the corps of gracious hostesses who so ably assisted me.

May their holiday wishes,
Whether they sail low or soar high,
Cross the Bridge to Glorious Fulfillment

And be of a permanency comparable
in structure to those bridges of our
pride and joy.

"Oh, Fred, the baby has swallowed the matches. What shall we do?"

"Here, use my cigarette lighter."

during record of devotion to the public service of the State Highway Officials of California. To the members of the State Highway Department and the Director of Public Works, the congratulations of the highway officials of the nation. To Charles H. Purcell, Chief Engineer, to C. E. Andrew and the corps of able engineers assisting them, the acknowledgment of us all of a public service faithfully and manfully carried through to a magnificent success.

Managing Director Balfour Tells How Program Clicked

TO Managing Director Frank C. Balfour and his staff of assistants is due a large measure of credit for the success of the convention, particularly from the viewpoint of the delegates in attendance.

The Division of Highways began actual preparations for the convention last September when State Highway Engineer C. H. Purcell was chosen general chairman, with Governor Frank F. Merriam, Director of Public Works Earl Lee Kelly and Mayor Angelo J. Rossi of San Francisco acting as honorary chairman.

At that time Mr. Balfour was named managing director and the following committees were appointed:

PERSONNEL OF COMMITTEES

Executive—C. H. Purcell, chairman; Harry A. Hopkins, Philip A. Stanton, H. R. Judah, Paul G. Jasper and William T. Hart, the latter five all members of the California Highway Commission.

Finance—Harry A. Hopkins, chairman; Jno. Skeggs, George T. McCoy, E. R. Higgins, F. C. Balfour, Harold Norton and Clarence E. Baen.

Transportation—Edward J. Neron, chairman; R. H. Stalnaker, S. V. Cortelyou, J. W. Vickrey, T. H. Dennis, L. H. Gibson, Paul G. Jasper, T. E. Stanton and L. V. Campbell.

Entertainment—Clarence Morris, chairman.

Subcommittee in charge of banquet—George T. McCoy, Chairman; Jno. H. Skeggs, Fred Grumm, R. H. Wilson and L. I. Hewes.

Subcommittee in charge of Show Boat—F. W. Panhorst, chairman; J. G. Standley, C. C. Carleton, C. H. Sweetser, Clarence Morris, Julien Roussel.

Subcommittee in charge of Los Angeles Caravan—L. H. Gibson, chairman; S. V. Cortelyou, J. G. Standley, Justus Craemer, Julien Roussel and Jno. H. Skeggs.

Subcommittee in charge of Redwood Empire Caravan—Paul G. Jasper, chairman; Chas. H. Whitmore, C. C. Carleton, F. W. Panhorst, J. W. Vickrey and R. H. Wilson.

Weeks in advance, an elaborate program of entertainment for the womenfolk was arranged and it was successfully carried out by the Ladies' Entertainment Committee, headed by Mrs. George T. McCoy, the Ladies' Reception Committee, of which Mrs. Jno. H. Skeggs was chair-



FRANK C. BALFOUR

man, and the Ladies' Transportation Committee directed by Mrs. C. H. Purcell.

The office staff which handled preliminary details of the convention and saw it through to the end was highly commended by Mr. Balfour. To Miss Helen MacLachlan, his secretary, and to Miss Genevieve Henderson, Miss Ethel Connolly and A. M. Nash, his assistants, he attributed the smoothness with which the business of the convention was conducted.

"In my opinion," said Balfour, "the registration of delegates was handled most efficiently. We pride ourselves on the fact that no delegate was detained longer than two minutes at the registration desk, even though he was not preregistered and it was necessary for us to type his registration card and type a slip with his name and State on it for his badge.

"We had 897 registrations, consisting of 559 accredited men delegates,

219 ladies and 114 guests such as materials men, equipment men, contractors, etc., of whom approximately forty per cent were from out of the State. The 219 ladies of the delegates represented considerably more than double the highest feminine registration at any previous meeting of the Association. The 559 men represented forty per cent more than have attended any previous convention. This large registration, in my opinion, was a tribute to California State Highway Engineer, C. H. Purcell."

According to Balfour, the attendance at the banquet tendered to the delegates and their ladies and guests by the Division of Highways at the St. Francis Hotel on Wednesday night, December 9, was the largest of any similar event in the history of the hostelry.

"In my estimation," he declared, "Mrs. Jno. Skeggs, Mrs. George T. McCoy and Mrs. C. H. Purcell collectively did a marvelous job."

LADIES ON COMMITTEES

Assisting these chairmen were the following committee members: Mesdames J. S. Bright, Walter McGinn, Everett Walsh, Clarence Morris, Edward J. Neron, Earl Lee Kelly, C. C. Carleton, P. A. Stanton, H. R. Judah, Harry Hopkins, W. T. Hart, P. G. Jasper and J. W. Howe.

A very busy lady was Mrs. Clare P. Balfour who arranged for all the music and entertainment both on the boat ride on San Francisco Bay and the annual banquet at the St. Francis Hotel.

Owing to the various sightseeing trips and the two automobile caravans traveling south and north at the close of the convention, motor transportation was of vital importance.

TRANSPORTATION PLANS CLICKED

"The Transportation Committee under Edward J. Neron," said Balfour, "and particularly Russ Stalnaker, L. V. Campbell and Adolph N. Sutro, did an exceptionally fine job. Transportation, as you know, makes or breaks a convention, and every car on every trip was in line, on time, left on schedule, and returned on schedule.

The Wednesday afternoon caravan trip over the Bay Bridge moved through San Francisco traffic to the University of California campus and returned to the hotel in a caravan, exactly three minutes ahead of schedule.

Forty-four States Send Delegates to Highway Convention

(Continued from page 2)

"It is true that many people think Uncle Sam should not tax gasoline, but from 1917 to 1924 his total contributions for highways was \$452,000,000 over an eight-year period. During the past year alone he authorized the expenditure of \$525,000,000 for State roads alone."

Mr. Markham called attention to the fact that during the last year the highway departments have constructed 2456 bridges, eliminated 480 railroad crossings and added 25,800 miles of improved highways to State systems.

13 STATES ANSWER

At the conclusion of Mr. Markham's report, the first roll call of States was held and only representatives of Maine, New Jersey, West Virginia, Georgia and Montana were missing. However, the Georgia delegation had sent a telegram announcing its members would report on the morrow, which they did.

During the noon recess, the ladies of the convention were entertained at a luncheon, style show and floor show at the Hotel Sir Francis Drake, which was tendered by a committee of wives of officials of the Division of Highways headed by Mrs. Charles H. Parcell, Mrs. George T. McCoy and Mrs. John H. Skeggs. Later in the afternoon the womenfolk were entertained in the Persian Room of the hotel.

Vice President W. F. Callahan of Massachusetts presided at the afternoon general session of the convention, which was devoted to an address by Thomas H. MacDonald, Chief, Bureau of Public Roads, United States Department of Agriculture.

MACDONALD FORECASTS CHANGES

Mr. MacDonald recently toured European countries, studying road design and construction abroad, particularly in Germany and France. He was impressed with Germany's construction program involving the creation of 4300 miles of super-highways.

"We must grasp the highway problem in this country more firmly," he declared. "We must raise our standards to the new levels demanded by the universal utility of the motor vehicle. Two distinct programs are indicated. First, the systematic re-

habilitation of existing highways by the actual incorporation of new construction to promote safety and greater utility. The second program is the long-time plan which will be based upon the principles illustrated by these examples from other countries, and by wide experience in our own country.

"The highway transport surveys now under way are basic. It is my deep seated hope that the highway department of each State will recognize the essential quality of the information which is being gathered. If the program of the next five to ten years is to provide the public with highway service that is not now even approached in any State, it must rest on this transport survey foundation.

BELT LINE PLANS

"The underlying soundness of planning a belt line intercepting highway plus radial roads on new right-of-ways to serve the metropolitan areas, and introducing the new feature of providing this complete service only for the passenger motor vehicle is supported by the traffic studies heretofore made."

Mr. MacDonald asserted that if all the States meet their Federal Aid apportionments, highway construction, including State and Federal funds, can reach above \$800,000,000 next year.*

The afternoon session was adjourned in time to enable the delegates and their ladies to assemble on the Embarcadero at 6.30 o'clock and go aboard the S. S. City of Sacramento for a night trip around San Francisco Bay.

SHOW BOAT TRIP

This feature of the entertainment program, unique to the out-of-state visitors, took the place of the usual family dinner, always in the past held by the association on convention opening day.

From the steamer the visitors were afforded opportunities for close inspection from the water of the brilliantly illuminated San Francisco-Oakland Bay Bridge, the Golden Gate Bridge and other points of interest.

* Mr. MacDonald's speech in full begins on page 3.

While the *City of Sacramento* cruised about the bay, there was continuous entertainment and dancing, and from 7 to 9 o'clock an excellent buffet supper was served. The boat ride was one of the highlights of the convention.

WOMAN SPEAKER HEARD

Tuesday's general session started promptly at 9 o'clock in the morning with Vice President James D. Adams of Illinois in the presiding officer's chair. The delegates heard an interesting address on "Roadside Beautification and Treatment" by Mrs. Frank W. Sorell of San Antonio, Texas.*

Following Mrs. Sorell's talk, Mr. MacDonald, Chief, Bureau of Public Roads, exhibited and explained a number of slides reproducing photographs of various examples of highways in Europe and this country designed to show the progress made in road building and to reveal types of construction which had been found to be unsuitable.

An address that was of particular interest to bridge engineers among the delegates was delivered by C. E. Andrew, Bridge Engineer of the California Division of Highways, and one of the builders of the San Francisco-Oakland Bay Bridge.

LADIES TAKEN ON TRIP

While the delegates were listening to these speakers, their ladies were taken on a motor sightseeing trip down the beautiful San Francisco Peninsula through Burlingame, San Mateo and Redwood City to Palo Alto and Stanford University, and entertained at a luncheon at the Allied Arts Inn.

Immediately following adjournment of Tuesday morning's general session, group meetings began and continued throughout the day. In these meetings many important subjects dealing with the problems confronting the nation's highway builders were discussed at length by authoritative speakers and later formed the basis for resolutions and recommendations presented to the convention and to the association's standing committees.

* Mrs. Sorell's address appears on page 23 of this issue.



Group Picture of Delegates to Convention of American Association

A number of papers read at these meetings, which are not touched upon in this issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS, will appear in future issues of this magazine.

DIVIDED HIGHWAYS DISCUSSED

The group meeting concerned with administrative problems was presided over by Harry A. Hopkins, chairman of the California Highway Commission. Discussion was opened by M. D. Van Wagoner, State Highway Commissioner of Michigan. His subject was: "Are the States Ready to Assume Economic Problems Involved in Starting a Program for Divided Highways?"

Among other subjects taken up by this group were what states can do to publicize their highway work the matter of greater governmental aid in the construction and maintenance of highway facilities, future Federal and State policies in the construction of feeder or local roads, what improvements can be made in relief legislation in respect to highway construction and is the nation's highway system an asset or a failure.

Charles Ross, general counsel for the State Highway and Public Works Commission of North Carolina, pre-

sided over the group meeting which discussed legal affairs having to do with highway rights of way, construction and maintenance. About thirty attorneys and Right-of-Way Agents of various States attended this meeting.

C. C. Carleton, Chief Attorney for the California Division of Highways, introduced an additional topic which called forth much discussion. It was: "Acquiring Property not Located Within the Highway Right of Way Sought to be Acquired for the Highway use Itself, For the Special Purpose of Moving Thereon Buildings and Other Improvements Existing Within the Limits of the Highway Right of Way Sought to be Acquired for the new Highway Use."

After a review of the present practice in the different States it was the concensus of the group that a further study of this subject should be made during the coming year.

In view of the fact that safety on the highways was one of the paramount questions before the convention considerable interest was evinced in the sessions of the Traffic Control and Safety Group over which W. F. Rosenwald of Minnesota presided.

J. W. Wheeler, Highway Commis-

sioner of Indiana, opened the discussion on "The Nation's Annual Bill for Incompetent Motor Vehicle Drivers."

Mr. Wheeler advocated that the auto industry construct cars so that the drivers will have more than the present 5 per cent vision.

Joining in the discussion, Ray Ingels, Director of the California Motor Vehicle Department, declared that the highway death rate in this State was due largely to the carelessness of pedestrians.

"Pedestrians," he said, "do not know how to cross streets properly. Due to education of children in traffic safety precautions we have a low death rate among children. Adults should be educated in the same way. For greater safety and a lower death rate we should have a stricter licensing of motor vehicle drivers, sidewalks on highways, more underpasses and the teaching of all children in the fourth year of high school to operate automobiles, a practice now in effect in Indiana."

The entire subject of traffic problems, including traffic lane markings, no-passing zones, a national system of uniform traffic laws, traffic control devices and signing, was thoroughly



Meeting of State Highway Officials at San Francisco, December 7-10, 1936

gone into by the delegates attending the meetings of this group.

Numerous matters having to do with publicity, particularly the question of educating the public to the evils of gas tax diversions, were taken up by the Public Relations and Publicity Group of which J. D. Adams of Indiana was chairman.

While of a highly technical nature, the discussions of the Uniform Accounting Group were of much interest to the auditors of the various State Highway departments, the men upon whom devolves the big job of keeping track of and disbursing the millions of dollars spent on highways. State Highway Engineer H. D. Barnes of Kansas presided.

An interesting paper on "Proper Method of Accumulating Maintenance Cost Detail and Control of Cost Detail with Actual Expenditures" was read by E. R. Higgins, Comptroller of the California Department of Public Works.

With A. L. Gemeny, U. S. Bureau of Public Roads, in the chair, bridge engineers of many State Highway departments participated in the meetings of the Bridges and Structures Group.

Some of the problems of general

interest to bridge engineers in connection with the building of the San Francisco-Oakland Bay Bridge were discussed by C. E. Andrew, one of the builders of the great transbay structure.

Other topics considered were working unit stresses for concrete bridge design in their relation to the physical properties of the concrete and steel, which was ably handled by G. S. Paxson, Acting Bridge Engineer of Oregon; the esthetics and design of handrails and curbs for highway bridges, which Morris Goodkind of New York discussed; present limitations on the use of welding in steel bridge construction, explained by O. J. Eidmann, State Engineer of Design of Kansas, and kindred subjects.

The Materials and Research Group, H. S. Mattimore, Engineer of Tests, Pennsylvania, presiding, discussed such subjects as requirements for uniformity of grading of aggregates for dense graded plant mix and dense graded road mix bituminous surfacing, quality of aggregates for bituminous work, the use of cut-back asphalts, methods of accelerating viscosity tests of liquid asphaltic materials and the oliensis and other

solubility tests for bituminous products.

TESTS AND SOIL SURVEYS

Basing his remarks on extensive tests made in the Sacramento laboratory of the California Division of Highways, T. E. Stanton, Materials and Research Engineer, read a paper on "Pre-formed Expansion Joint Materials for Concrete."

One of the important subjects considered by the Road Design Group, O. L. Kipp, Construction Engineer, Minnesota, presiding, was soil surveys and subgrade design for most economical use of local subgrade materials, a topic which was discussed at length by C. S. Pope, Construction Engineer, California Division of Highways.

Other speakers were A. R. Nichols, Minnesota, who talked on highway landscape architecture; A. E. Palen, Bureau of Public Roads; W. E. Jones, Engineer of Design, Iowa; S. M. Rudder, Assistant Chief Engineer, Missouri; H. E. Surman, Illinois; C. F. Bedwell, New Jersey.

Fred J. Grumm, Engineer of Surveys and Plans, California Division of Highways, read a paper dealing

(Continued on page 33)

Retiring President Sounds Warning Against Diversion

By GIBB GILCHRIST, State Highway Engineer of Texas

Stabilization of the business of building highways was hailed by Gibb Gilchrist of Texas, retiring president of the American Association of State Highway Officials, as one of the outstanding accomplishments of 1936, in his address before the convention. He urged that all states plan highway construction programs not less than four years ahead, called gas tax diversion a major threat to highway progress, said Federal appropriations for secondary or feeder roads have met with popular approval, and declared the number of accidents on highways can and must be reduced. Following is Mr. Gilchrist's address in part:

THE year 1936, as contrasted with 1935, might be termed one of recession but not of retrogression in highway affairs.

It has been a year for stabilization and for planning. It has also been one of disillusionment as our people, having become accustomed to large expenditures for highways, do not like the idea of having them curtailed. In my state our program for 1937 is somewhat less than half of what it was for 1936 and it is difficult for us to adjust ourselves. It is to be assumed this has been the experience of the great majority of states.

What has been lost in quantity might be said to have been largely regained in other ways. The various relief programs have undoubtedly benefited the states in many ways. Designs have been improved by larger experience. Our engineering organizations have generally advanced and they have a feeling of confidence that has not always prevailed. While in amount the allocation is much smaller than heretofore, it must be remembered that it is just as great as any regular federal aid appropriation in the past. The best opportunity for long-range planning ever offered became the lot of the states during 1936.

HAYDEN CARTWRIGHT ACT

The Hayden Cartwright Act of 1936 included two distinctly new things—it gave to the states with the 1936 apportionment already enacted three full years of regular federal aid beginning July 1, 1936, and second, but not least, a policy was inaugurated in providing \$25,000,000 for each of the years 1938 and 1939



GIBB GILCHRIST

for secondary or feeder roads to be matched equally by the states. This policy will be popular and therefore will possibly be permanent. Many other things were done by the Act of 1936 but these two stand out as opportunities.

The railroad crossing section is new in the company it keeps and perhaps will appear in other acts, but over a period of years may be considered temporary in long-range prospect. Crossing protection at isolated places is in many instances the best answer and is becoming more popular as devices are improved. Again, with the

changing popular opinion on road location, and the willingness of public authorities to permit proper location, many crossings can be eliminated by relocation.

In my own experience several times as many crossings of railroads have been eliminated by relocation as by separation. In view of improvements in railroad equipment, however, highway officials should not lose sight of the fact that while the number of vehicles crossing railroad tracks has perhaps decreased, the number of actual crossings has not, and that in itself presents quite a problem, the answer to which is perhaps elimination, as far as practicable, and then protection by signals and otherwise.

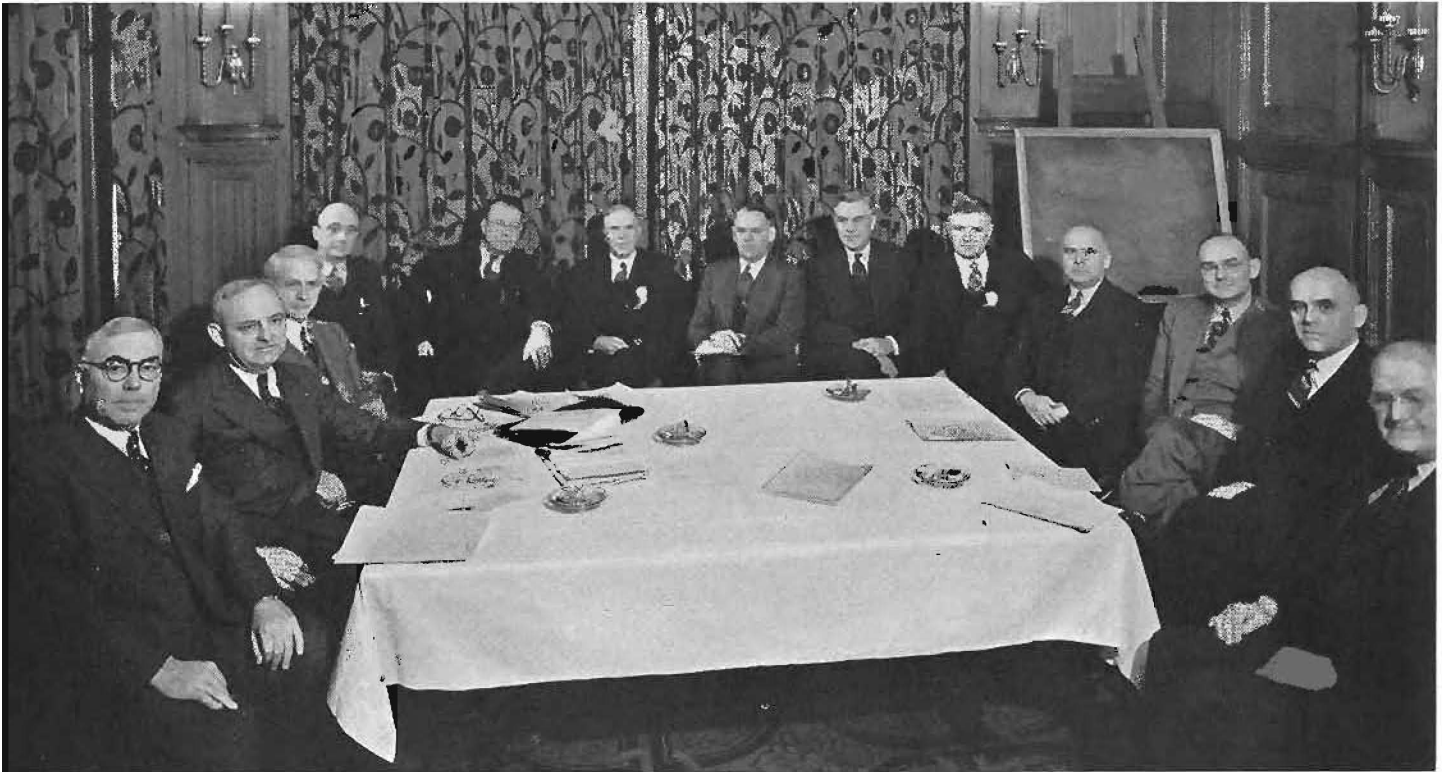
LONG RANGE PLANNING

It is to be hoped that the states have taken full advantage of the opportunity for planning that the three-year program affords. The plan could and should go much beyond three years, but that much definitely is in sight.

The states are ready for this kind of procedure—the entire country is sold on the principal of regular federal aid and if I were giving advice to highway officials it would be to plan construction programs at all times not less than four years ahead and carry their general layouts much further.

SECONDARY OR FEEDER ROADS

We have much to learn about the secondary and feeder plan. Much of the discussion at this convention will concern regulations for carrying out that mandate and we will be anxious



Members of Executive Committee of American Association of State Highway Officials Convention. Left to right: C. H. Purcell, California State Highway Engineer; T. H. Cutler, president-elect, Kentucky; W. C. Markham, secretary, Washington, D. C.; A. W. Brandt, New York; P. G. Peterson, Utah; H. G. Shirley, Virginia; J. T. Ellison, Minnesota; C. B. Treadway, Florida; F. R. White, Iowa; T. H. MacDonald, Chief, Bureau of Public Roads, Washington, D. C.; Gibb Gilchrist, retiring president, Texas; W. W. Mack, treasurer, Delaware; F. E. Everett, New Hampshire.

that a proper start be made. We are all somewhat alike on our regular Federal Aid System but in our secondary and feeder problems we are as unlike as the topography that makes up our terrain. Some states have a small percentage of roads outside their Federal Aid System and in some the Federal Aid System constitutes only a small percentage of State roads.

Mr. Thomas H. MacDonald of the Bureau of Public Roads has very fairly submitted to the states the questions with which we will be concerned. How shall the system be designated; how shall the funds be apportioned; with what funds shall the government money be matched; how shall the roads be maintained; what standards of location and design shall be used—these and others and on which some divergency of opinion will be apparent—but they will be answered and the problem solved.

DIVERSION SERIOUS MENACE

It is evident that there must be broader latitude than has been necessary on the Federal Aid Highway System. One matter on which there seems to be a preponderance of opinion is that the work should be

handled through the Bureau of Public Roads by the various state highway departments in the same manner as regular Federal aid. This should apply whether or not county or road district money is used to defray a part of the cost.

Diversion and attempted diversion of motor vehicle transportation taxes continues to be one of the most serious menaces to a sound well-planned highway program. Several threats of diversion have been successfully combated during the past year and other battles have not been so successful.

Some of the attempts have been centered on providing funds for some form of relief, old age pensions or unemployment insurance and other measures with which we sympathize, but more and more the thinking public is beginning to realize that the use of these funds from motor vehicle taxes for the purposes foreign to those for which they were provided is simply a form of legal pick-pocketing and have taken steps to prevent it.

Five states, I believe, have adopted constitutional amendments that guarantee funds collected from the motor-

ing public shall be used for highway construction and maintenance.

The Congress of the United States itself has said that if the proceeds of motor vehicle taxation are not applied to highway, the tax is "unfair and unjust." It is to be hoped that section 12 of the Hayden Cartwright Act will be strictly and impartially enforced because it acts as a barrier in those States not yet protected by constitutional law.

The tax is, roughly, 30 per cent of the sales price and is a sales tax on a specialized commodity levied on the sound theory that a system of good roads is essential to social, commercial and industrial progress. Good roads are one of the nation's chief assets and States have come to be judged, in a measure, by the progressiveness with which they handle their road problems.

It would be an idle contention to argue that the motorists would submit to the heavy levies they now bear for purposes other than highways and it would be a brave "diversionist" who would be willing to submit his question to popular vote. Past diversions have crippled highway programs and strong steps

should be taken to guard against further disruption of programs from this source.

Gradually the problem of accidents on highways is being recognized and is shown in its true light. There has been a tendency to get away from scare-heads of certain forms of publicity and ghastly descriptions of individual cases and to view the situation sanely. We are also getting away from comparisons with fatalities or casualties during the wars in which the Republic has engaged and tending more to comparing our accident rate with other forms of human activity in which many millions of people are engaged.

The 1936 edition of the National Safety Council on "Accident Facts" shows that in 1934 approximately 24,000 lost their lives in falls, and nonfatal accidents of this nature reach into the hundreds of thousands. The same report shows that 31,500 people met accidental deaths in their homes during 1935, and that this represented more than 30 per cent of all accidental deaths.

REASONABLE EXPECTANCY RATE

We are too prone to consider the number of fatal accidents on highways in the thousands without thinking of how many vehicle miles were involved in the movement of traffic and how many people were riding in motor vehicles. I wonder if a cross-section of the people of the country on any active day would not show just about as many people riding in or walking among motor vehicles as would be found in their own homes or at work away from possible motor hazards. The highway accident record can and must be reduced, but the rate is perhaps not as far above the horizontal of reasonable expectancy as we might have been led to believe.

The three "E's," advocated by the National Safety Council, are important—Engineering, Education and Enforcement. In my opinion, the road designer should remember at all times that the finished product should be of such quality that the sane, sober and alert driver could travel any highway with reasonable safety, barring defects in his own equipment. Conditions can easily be created in road construction that do not give sufficient warning to a driver of this type. The road designer at the same time should realize that mental haz-

ards are in fact real, and should remove them as far as possible. Narrow shoulders dropping off on a steep slope into a deep ditch or gully are frequent examples of mental hazard.

EDUCATION IN SCHOOLS

Education of motor vehicle drivers, and the enactment and enforcement of stringent laws regarding the use of the highways may be considered the most effective and quickest means of reducing the accident rate to or below the normal expectancy.

Speed is with us to stay and when you have the combination of a modern motor vehicle and a modern highway, the full utility of neither is developed if at all times the vehicle is kept under the legal speed limit on the open road. This limit in my State is 45 miles per hour for automobiles and a recent speed test checked in each of our 25 divisions showed that the average speed of 8600 vehicles was 47.7 miles per hour, nearly 3 miles on the average greater than the speed limit of the State.

Not enough motor vehicle officers could be employed to enforce the speed limit, but with a very small per annum charge, driving and license regulations could be enforced that would have a material effect. Many States are doing this now and many others will follow. The road builders have led in many activities and it is absolutely essential that steps in every State be taken to, first, remove hazards for the sane, sober and alert driver and to educate, control or punish all of the others, and to furnish men to see that the job is done.

ROADSIDES AND SIGNS

More and more of the States are looking to the aesthetic side of highway construction and to roadside improvement. The Bureau of Public Roads is to be commended for initiating this step generally in all the States, although a number had progressed quite a bit prior to that time.

As highways have been permanently located and sufficient right-of-way obtained, the designing engineer has tentatively become in his own way the landscape engineer, and with the technical advice of trained landscape engineers, has begun a revolution in the design and construction of cross-sections that bids fair to show more marked improvement and more visual evidence in the next few years than

any single advance that has been made.

OUTDOOR ADVERTISING EVIL

Outdoor advertising either inside or outside the right-of-way may be put in two classes—one being where a sincere attempt has been made to improve the sightliness of the signs and represents an attempt to detract as little as possible from the roadside appearance; the other is where small boards or metal signs, probably unauthorized, are tacked to fences, trees, barns, etc., and with no attempt at symmetry or appearance.

Outdoor advertising can be done in a manner that would improve the roadsides. Much progress may be made along this line.

On a trip to Mexico City the past summer, it was noted that the new highway was reasonably free of this distraction, but where bill boards had been erected, they were in almost every case advertising American products.

The matter of unattractive outdoor and roadside advertising along our highways is one that would merit the continued and increased attention of highway officials. It has been suggested that where intensive planting projects are proposed, in securing the right of way, an easement be secured against disfigurement in this manner. What profit is it to spend public funds to improve the roadside and then have the effect nullified by unsightly and multi-colored signs?

Automobile manufactures and dealers, oil companies and others having products used on highways or in connection therewith might well take the lead in a new form of outdoor advertising which may be designed to enhance and not detract from attractiveness of the roadside.

PUBLIC RELATIONS IMPORTANT

Since the traffic pays the major portion of the cost of highway construction and maintenance at this time, the public relations angle becomes more important. Reference is made particularly to the attitude taken by highway employees toward the traveling public and especially highway employees engaged in work on the highways. An attitude of indifference toward the public creates ill-will, but on the other hand, the reverse is true when employees coming in touch with the traveling public go out of their way to be helpful and to assist in movement of traffic.

Highway Has Its Limitations In Contributing to Safety

By R. E. TOMS, Chief, Division of Design, U. S. Bureau of Roads

Responsibility for highway accidents can not be placed wholly upon the shoulders of the highway engineer, R. E. Toms, Chief, Division of Design, U. S. Bureau of Public Roads, asserted in an address before the convention of the American Association of Highway Engineers. The driver and the vehicle must be considered in analysing the accident tolls. Mr. Toms made some valuable recommendations relative to future highway construction in its relation to highway safety. His address, in part, was as follows:

HIGHWAY safety, to the extent that is possible, must result from bringing the three elements of the safety triangle into proper balance, namely, the highway, the driver and the vehicle. Each is subject to limitations that make the ideal unattainable. The purpose of this paper is to present the practical and economical limitations of the highway in contributing to highway safety.

The development of the automobile for the first time placed mechanical transportation at the disposal of the individual to be used when desired subject only to the limitations of a roadway for operation. Prior to that time all mechanical transportation had been developed for mass movement, and in mass transportation responsibility for development of the vehicle, the roadway upon which it moved, and its operation generally was directed by a single agency which made possible coordination between these elements.

In the case of railroad transportation the roadway had to be constructed before any vehicle could be operated over it. Changes in the character of vehicle required changes in the roadbed, but always the roadway was changed first to accommodate the improved vehicle.

How different has been the development of motor highway transportation. The vehicle came first. Roadways suitable for the vehicle followed. The cost of providing the roadways by and large has been collected from the owners of the vehicles during their usage of the roadways. In no other



R. E. TOMS

way would it have been possible for highway transportation in this country to have attained its present development in the relatively short period since the motor vehicle came into existence.

The rapid changes in the development of the motor vehicle have created a tremendous problem for the State highway departments. Each year new models of the vehicle are placed on the market embodying advancement in design and perfection of operation. These changes are along the lines of economy of operation, mechanical safety, greater speed and more flexible power. These ve-

hicles are being operated on highways that originally were constructed 15 or 20 years ago. During this period the average rate of road speed has nearly doubled. It is not surprising, therefore, that a considerable percentage of our older highway construction is obsolete for present-day conditions and in urgent need of reconstruction to provide adequate and reasonably safe operation.

The greatest obsolescence is on our main highways because they represent the first and consequently the oldest construction. We are faced with the problem of obsolescence because we have constructed highways that have a longer life than the vehicles operating over them. If it were possible to replace the highways with the same frequency that vehicles are replaced, then each replacement of the highway could be made with improvements in design standards comparable to the changes made in the vehicle itself.

PROUD OF ACCOMPLISHMENT

The continuous improvement of a limited system of highways carrying the major portion of total highway traffic constitutes the first phase of highway improvement. This has been accomplished in many of the States. In other States this objective, due to limitations of funds, has yet to be reached. Highway officials have no reason to be ashamed of this accomplishment. They have provided and are maintaining the roadways used by 26 million vehicles. In the main they are dependable roadways, but not

always safe roadways except for the careful driver. The second phase of highway improvement which we are now facing and which is past due in some States must deal with the reconstruction or modernization of existing highway facilities to make them adequate for the volume of traffic using them and safe for reasonable usage.

To design or plan a utility with intelligence the uses to which it will be subjected during its period of expected life must be known. The essential elements that affect the adequate design of a highway are the speed, number, width, length and weight of vehicles to be accommodated and the safety, comfort and pleasure of travel to be afforded. The width, length and weight of vehicles concern physical characteristics which largely have been controlled by legislation. * * * Volume of traffic, speed and safety remain elements that must be appraised.

QUESTION OF SPEED

It is not the purpose of this paper to advocate unrestricted speed, or to appeal for a curtailment of speed, but rather to consider it from a wholly realistic standpoint. We know that the present-day motor vehicle is capable of attaining speeds of 70 to 80 miles per hour or more. We know that a straight road with sufficient vision may be traveled at a speed limited only by the performance of the vehicle. We know that the majority of traffic on the open road when not restricted by continuous, sinuous alignment moves at a speed of 40 to 60 miles per hour or more. We know that the trend in highway traffic as well as in all forms of transportation definitely is toward higher average speeds.

We know that in States having fixed maximum speed limits some tolerance is permitted by the enforcement authorities. We know that operators of vehicles in States having relatively low fixed speed limits, disregard these limits and the possibility of arrest by so doing. We know that no State has yet been able to establish an enforcement agency large enough definitely to restrict speed to a stated limit. We know that providing curvature on highways that safely can be traveled at high speed does not encourage high speed any more than straight sections of road. We know that excessive speed for the road curvature encountered contributes to

the accident toll. We know that never in history has a top limit been fixed and maintained beyond which a utilitarian development shall not pass. We know that speed is a very essential element in adequate road design.

With this knowledge the only conclusion that possibly can be drawn is that highways must be designed to permit safe operation by reasonably careful drivers at a speed of 60 miles or more per hour.

Resolution No. 5 U. S. Route Markers

WHEREAS, There has been created a system of United States numbered Highways by the American Association of State Highway Officials; and

WHEREAS, The Secretary of Agriculture of the United States has approved the markers and emblems with which such highways are marked; and

WHEREAS, In certain cases there has been unauthorized use of such emblems or markers, and since there have been advertising signs similar in appearance used along the highways; now therefore

BE IT RESOLVED, That the American Association of State Highway Officials, in convention at San Francisco, California, on December 10, 1936, recommends that the emblem used for marking these highways be copyrighted by the American Association of State Highway Officials and its use permitted only as markers on highways which are approved by the Executive Committee of this Association.

SAFETY ELEMENT IMPORTANT

The safety element is of prime importance to every individual user of the highway. The highway engineer has a very definite responsibility to build this element into the highway to the extent that it is physically and economically possible.

We read many suggestions from well intentioned individuals about designing highways that will automatically correct for the mistakes of the driver, and that practically all of the accidents could be eliminated by applying known knowledge to traffic control. These are desirable ob-

jectives but are they possible? The answer is no, emphatically no.

The Holland tunnels under the Hudson River between New Jersey and New York City exemplify practically all known conditions that make for safety of highway travel. They have roadways in each tunnel 20 feet in width between curbs that are used solely by traffic moving in one direction so that there is no opposing traffic.

There are no collision points because there is no cross traffic. There are no railroad grade crossings. There is no pedestrian traffic. The roadways are dry at all times so that drivers are not subjected to changing roadway conditions occasioned by rain, sleet or snow. The roadways are lighted day and night. Vehicles are not permitted to stop. There are no roadside distractions, such as signs or choice bits of scenery to attract the attention of the driver. Traffic officers are stationed at fixed posts commanding the best view of the greatest length of tunnel to report mechanical breakdowns so that the hazards of stalled vehicles may be reduced to a minimum. There are elevated walkways that may be used by the officers in proceeding to the scene of accidents. Wrecker service is available on call to quickly remove disabled vehicles.

Drivers using the tunnels are awake because they have to stop to pay toll before entering. They usually are alert because they are encountering something new and different. There is no deadening monotony of mile after mile of the same type of roadway and the same scenery. The only unfavorable traffic condition is that there is no possibility of turning out on to a shoulder to avoid rear-end collisions. The tunnels were opened to traffic nine years ago last month. It was expected that the one hundred millionth vehicle would travel through the tunnels last month.

ACCIDENTS WILL CONTINUE

Despite these unusually favorable traffic conditions there have been five fatalities in the Holland tunnels since they were opened to traffic. Three of the fatalities were to motorists and two were to employees. This has been hailed as a remarkable record and it is a remarkable record. The tunnels are 1.77 miles in length. Five fatalities for 177 million vehicle miles of travel is equivalent to one fatality for each 35½ million vehicle miles traveled under practically ideal conditions for safety.

Approximately 16 billion gallons of gasoline were consumed in highway travel in this country in 1935. Assuming the average vehicle to travel 12 miles per gallon of gasoline consumed, the consumption of this gallonage of gasoline resulted in a probable traffic of 192 billion vehicle miles. If it were possible to duplicate the safe travel conditions in the Holland tunnels on all of the streets and highways of this country, the fatality experience of the Holland tunnels applied to the 192 billion vehicle miles of highway and street travel in 1935 would result in 5400 fatalities for the year. This serves to give some idea of the practical aspects of highway safety.

We know that highway fatalities in cities of over 10,000 population accounted for approximately 12,000 of the total fatalities in 1935. It is evident, therefore, that despite



San Franciscans greet Hawaiians at San Francisco convention of highway officials. Left to right: Mrs. Jack Moskowitz, Honolulu; F. L. Klein, Highway Engineer, U. S. Bureau of Public Roads, San Francisco; Mrs. F. L. Klein; F. A. Kittredge, Chief Engineer, National Park Service, San Francisco; Mrs. C. H. Sweetser, wife of District Engineer, Dist. 2, U. S. Bureau of Public Roads, San Francisco; Jack Moskowitz, Highway Engineer, Honolulu, and Mrs. F. A. Kittredge.

ideal traffic conditions there will continue to be a staggering total of fatalities from highway and street use.

There are those who would create the impression that the increase of fatalities in highway and street travel is due largely to the increased speed of this travel. Accident statistics and other studies do not support this viewpoint. As a matter of fact the total fatalities measured in terms of highway and street usage were less in 1935 than they were in 1920 when speeds were materially lower than they are at the present time.

DRIVERS ACQUITTED

There were 827,000 accidents on streets and highways in 1935 that caused personal injuries from which there were 37,000 fatalities. Nearly 1,200,000 vehicles were involved in these accidents, 95 per cent of which apparently were in good mechanical condition.

It is conservatively estimated that there are 44 million drivers in this country who at various times operate the 26 million vehicles. Assuming that all of the vehicles involved in accidents resulting in personal injury in 1935 were at fault, these accidents were caused by less than 3 per cent of the drivers using the highways. As it is unreasonable to assume that every vehicle involved in these accidents was at fault these conditions probably were brought about by not more than 2 per cent of the drivers.

The essential facts are that, regardless of the speed at which travel moves at the present time, 98 per cent of the drivers operating vehicles on the highways were

not involved in the accidents that resulted in fatalities or personal injury last year. On the face of this record it would seem absurd to use the wealth of the nation in building so-called foolproof highways. A much more logical approach to the problem would be to expend the proper amount of effort to keep the fools off of the highways.

The safety element has its economic aspects. No one will disagree that four-lane highways with traffic in opposite directions separated by medium strips or parkways, grades separated at intersections, and all other details embodied in the construction that makes for highway safety would be a nice thing to have and contribute immeasurably to the safety and pleasure of travel. However desirable they may be they are not possible except on a very limited mileage of our State highway systems. Our State highway systems comprise approximately 324,000 miles of highways that represent the principal routes of highway travel in the State. In 1932 less than 2000 miles of this total had been improved with four or more traffic lanes.

Assuming that it would be desirable to improve 5 per cent of the State highway mileage with four or more traffic lanes with opposing traffic separated, grades at intersecting highways separated, border roads to eliminate unrestricted access from abutting property, and sidewalks for pedestrian traffic where needed, the expense involved in this undertaking alone would amount to approximately four billion dollars.

When these figures are considered we must admit that in so far as we can visualize the future at this time from 95 to 97 per cent of the State highway mileage in this country may never progress in improvement beyond a two-lane highway. This has an important bearing on the safety aspect.

ALWAYS HUMAN ERROR

Engineering ingenuity can never entirely compensate for human error and the possibility of mechanical failure. There are definite economic and practical limitations to the highway's contribution to the safety of highway travel. Within these limitations there is no occasion to condemn the highway engineer or the highway for accidents or fatalities that result from improper or careless usage. The problem of the highway engineer is to strike a balance between what is wholly desirable from the standpoint of safety and convenience and what can be accomplished with the means at his disposal. Experience has demonstrated conclusively that we can not expect traffic to fit the roads. The roads must be designed to carry the traffic.

The obligation of the public with respect to motor vehicle transportation can never extend beyond providing roadways that may be used with safety by the reasonably careful driver. A highway that can be traveled with safety by the reasonably careful driver will be designed for the speed which observation of the general trend indicates will be the average for the greater percentage of highway traffic in the years ahead.

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Beautification of Highways Inducement to Tourist Travel

By MRS. FRANK W. SORELL

Chairman, Texas Citizens' Highway Beautification Organization

THERE is an increasing desire on the part of the traveling public for more beautiful, comfortable, and interesting highways over which to travel. There is a matching desire of the citizens of all states to hear the tourists say who pass their way—"It has been a pleasure to travel through your beautiful state."

To reach that standard of beauty and comfort expected by the traveler of today, a state needs an organization of its citizens to cooperate with the state highway officials and be under their guidance. The state highway departments of many states are landscaping and keeping neat the highway rights of way but this limited beautification alone does not make a beautiful state, for the highway department's authority ends with the city entrance and the private property line facing the rights-of-way.

A traveler does not keep his eye focused constantly on the roadway. His gaze wanders out to a distance of say 300 yards on either side. He is traveling for pleasure. Although the right of way may be beautiful, he finds himself being irritated by the unsightly things he sees in the distance. Here is where a big field for educational work by the citizens' organization with the private property owner in regard to highway beautification is of value. All state highway departments are organized on a somewhat similar plan.

CITIZENS' ORGANIZATION

At the request of the Texas State Highway Department, the citizens formed an organization and have been working in coordination with the Department for three years. The highway officials appointed a state chairman, whose duty it was to form a citizens' organization for roadside beautification and improvement. In



MRS. FRANK W. SORELL

starting this movement it was very noticeable that the women were already beauty conscious and attached much importance to roadside beauty. Allowing for a few exceptions, the men thought only of the construction of more miles of good roadbed. It is amazing, the change in viewpoint of the men since they have seen demonstrated what the beautification organization has done for the roads. Now many men are numbered among our most enthusiastic members.

The first thing I learned was that this work meant much more than rushing in and planting trees and shrubs and sowing flower seeds. Time was taken to study the type plan of organization used by the Texas State Highway Department. The same method of organization was used by the citizens so that the two organizations function smoothly together.

Texas is divided into twenty-five highway divisions, with a division

engineer centrally located in each division. The state chairman appointed a woman division chairman in each of these twenty-five divisions, living in the same town with the division engineer, women being chosen as they usually have more time to give to civic work than men. The division chairmen are chosen for their ability as leaders and organizers.

DUTIES OF DIVISION CHAIRMEN

Immediately upon her appointment, this division chairman appoints a county chairman in each county seat and takes up the work of organizing the counties in her division into a working unit. It is her duty to keep in touch with her county units and report all progress and assistance required to her division engineer, or, if further help is needed, to report it to the state chairman, who will take the problem up with the State Landscape Architect or State Highway Engineer. A division chairman appoints county chairmen or renews appointments in each county in her division in May of each fiscal year.

DUTIES OF COUNTY CHAIRMEN

On the county chairmen falls a large mantle of work, for they form the county organizations and arouse the interest of all county citizens in the movement to make their county an outstandingly beautiful unit of the state's plan for roadside improvement. They seek members from men's luncheon clubs, all women's clubs, chambers of commerce, county officials, county farm and home demonstrating agents, and rural property owners living adjacent to the state highways, and city resident owners whose property touches the street that is used as the highway route through their city.

The county chairmen call the citizens together and form the organization by electing all other officers that

are needed for a perfected organization. Then county chairmen appoint vice chairmen in all the towns in the county that touch a state highway. If this method is systematically carried out by each county chairman there will not be a community in the entire state that will not receive information in regard to the movement to improve every mile of roadside adjacent to a state highway. To sustain interest, meetings of the county organization are called on a designated day of each month, where the definite achievements and new plans are discussed. Reports are sent to the division chairman, who, in turn, sends to her division engineer and state chairman reports of all her county chairmen. In this way, the state highway officials are kept in constant touch with the work accomplished by the 254 counties in the state.

LANDSCAPE ARCHITECT IN CHARGE

The State Landscape Architect fills an important need in the organization. While all citizens' clubs and private citizens are encouraged to participate in this work, the Landscape Architect sees to it that they do not interlap in their work. He sees that their plans are artistic and practical, and that all rules for safety are followed out in accordance with his plan for the entire state.

Once a year the State Highway Engineer calls a group meeting of all the division engineers, division chairmen, and county chairmen together with the state chairman and State Landscape Architect where the work and needs of the organization as a whole are discussed. Each county group must use its own initiative in taking care of the individual needs of its county. There are several committees, however, that are recommended by the state chairman for the use of all counties. After the discussion of each of these necessary committees there are some slides to be shown that will help to demonstrate some of the improvements that have been accomplished in Texas by the committees. Outstanding among them is the one portraying what a poor rural family accomplished in making the surroundings of their home beautiful with personal work and the expenditure of the small amount of \$3.90 in cash.

Some of these general committees carried on by the local highway repre-

sentatives and citizens' chairmen are as follows:

WAYSIDE PARKS

This committee secures as many small wayside park sites as are needed by the department in its county and has the land deeded to the state. These park sites vary in size from a half to three acres. They must be woodland or otherwise beautiful spots that are adjacent to the highway. After the land is deeded to the state, the division engineer turns the park into the highway. From then on the parks are the State Highway Department's care. They are cleared of underbrush and sodded, and masonry entrances and drives are constructed. For those who care for out-door cooking and eating, concrete benches, tables and fire places are built. Scattered over the state are 500 such parks that are a joy to those who wish to draw out of the moving traffic for a short rest or to enjoy a picnic. The National Youth Administration participated in the improvement of 123 of these parks. The rest were built by the state's regular maintenance forces. One thousand such parks are the goal the department has set for Texas.

PRIVATE PROPERTY ENTRANCES

This committee encourages all property owners with entrances into the state highways to plant around their entrances, shrubs and trees, and if possible to build artistic gateways of rock and native wood and in this way help to beautify the highways. A note of interest is given when people place the name of their home on the gateway.

REMOVAL OF SIGNBOARDS

This committee tries to get the property owners adjacent to the highway right of way to remove all signs on their property and to be particularly careful to remove all signs that have been nailed on the trees as these are a menace to the health of the tree. The committee also tries to keep as many signs as possible from city entrances by appealing to the merchants not to use the signboard as a medium of advertising.

BEAUTIFUL CITY ENTRANCES

The planting of trees, blooming shrubs, and evergreens indigenous to the county help to make the city entrance attractive. A number of cities have added ornamental rock work and

pillars, also, giving the entrances the name of some historic person.

BEAUTIFICATION AROUND PUBLIC BUILDINGS

This committee encourages the idea of beautification and improvement around all public buildings such as the court house, post office, churches and public schools. The chairmen of these county committees working with the chairman of school boards, county judges and commissioners, are showing outstanding improvement in the landscaping surroundings of public school buildings and court houses.

COMMITTEE ON CONTESTS

The State Highway Department cooperated with the citizens this year by having three contests. In each county an attractively decorated plaque was awarded to the most attractive gasoline station located on a state highway; a similar award was made for a public school that had its entrance on a state highway; and an award was made to a private property owner living adjacent to a state highway whose home came up to the highest standard of neatness, landscaping and general arrangement. The citizens' group handled these contests.

BEAUTIFICATION AROUND RURAL HOMES

This committee encourages the home owner to keep the land between his home and the highway clean, to remove all unsightly utility places to the rear of his home and if this is impossible, then to screen them from view of the traveling public with evergreens.

GASOLINE STATIONS COMMITTEE

This committee encourages all gasoline stations to be neat, to remove all unsightly posters littering up the stations, to keep sanitary restrooms, to use native shrubs as much as possible in landscaping around their stations, and to keep them in general good repair.

The mail boxes that heretofore have been unsightly because they were nailed to various types and sizes of posts are now being standardized by the State Highway Department. The boxes are being placed on a regulation removable 4x4 pine pedestal placed in a concrete base. The department paints the boxes and pedestals.

"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."

Divided Roadway Design for Multiple Lane Highways

By FRED J. GRUMM

Engineer Surveys and Plans, California Division of Highways

THE divided roadway is a method of defining in a manner satisfactory for prevailing speeds and characteristics the paths on which vehicles traveling in opposite directions may operate without conflict. It is not a recent innovation. Excellent examples constructed years ago are to be found in many parts of our country.

The relatively small volume of traffic and lower rates of speed in the earlier days of highway development hardly, if at all, justified the additional cost of this refinement. We were still struggling with the problem of getting the traffic "out of the mud." Two-lane roads, well surfaced or paved, were the adequate solution for so nearly every case that the few multiple lane roads were really curiosities.

The 15- or 16-foot pavements, with invisible center line outlived their capacity and usefulness when the marginal and central latitude for two 6-foot vehicles was pinched by increased speed of operation. Wider trucks hastened the obsolescence.

CAME THE TRAFFIC STRIPE

Then followed the almost universal designation of 10-foot traffic lanes, at first depending on the unmarked neutral central area and then having the division outlined or defined by the traffic stripe. The longitudinal construction joint in the cement concrete pavement served a like purpose. Addition of wider shoulders, adequately treated, induced the motorist, for a time at least, to ply closer to his respective edge of the road and away from the more serious source of interference.

Designs so constructed, marked and signed were and, for most of our highway mileage, still are very efficient. If used under normal expectation of reasonable care on the



FRED J. GRUMM

part of the traveling public, it is doubtful that separation of traffic by further division raises the efficiency rating.

Most of our State highway mileage has and probably always will have a two-lane standard with shoulder width and border treatment consistent with the amount of traffic or with the zones of curvatures that indicate rational speed. On a large mileage of our roads, volume of traffic will not justify, for indefinite period, more than a two-lane standard.

Although a two-lane standard is the minimum required or constructed on practically all of this mileage, much of it carries a traffic volume that earns less in gasoline tax than the cost of construction and maintenance.

Continued improvement of greater mileage of these secondary roads, landscaping, grade separation, wider right of way, relocation, etc., eating up the earnings of the more heavily traveled multilane roads, do not permit us to go to a divided road design where only a two-lane capacity is justified. Moreover, dividing two lanes by a separating strip, without going to a four-lane standard would probably lead to additional hazard because, since the separation must be on a level crown to allow for passing, traffic would use it carelessly for a passing lane.

This leads to the conclusion that the principle of divided roadways should be applied only for more than two-lane traffic. Relief from hazard on the two-lane road may come from widening of the lanes, however, not to the extent of inviting risk of three-lane use. Also by proper shoulder treatment.

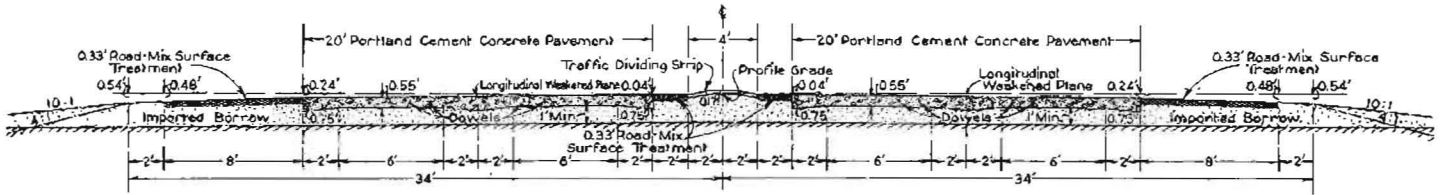
THREE-LANE HIGHWAYS

Where traffic volume requires we have been building a divided two-lane road. But instead of being so called it has been termed a three-lane roadway—and incidentally some other unpleasant and misleading names. This design depends on a central width safe for passing which means that it be at least 10 feet wide. It does not admit of interior curbs or appreciable roll in crown for the central strip.

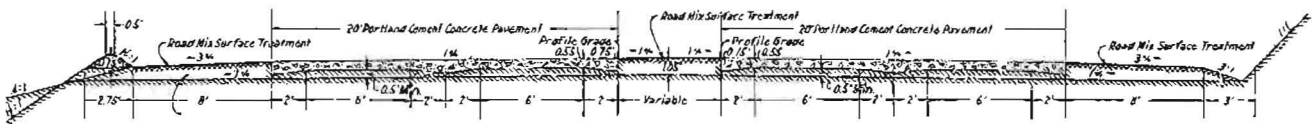
Unnecessary deviation from the outer lanes is discouraged by striping. Additional encouragement for the driver to stay within his lane can be provided by special design such as variation in type of surface. For instance with two outer lanes constructed of Portland cement concrete and the central lane of bituminous type or asphalt concrete:



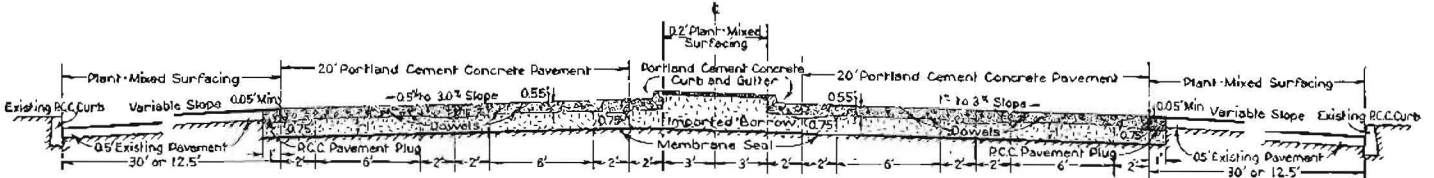
This view of section of East Bay approach to San Francisco-Oakland Bay Bridge shows one type of divided highway where a central raised strip is used for illumination standards.



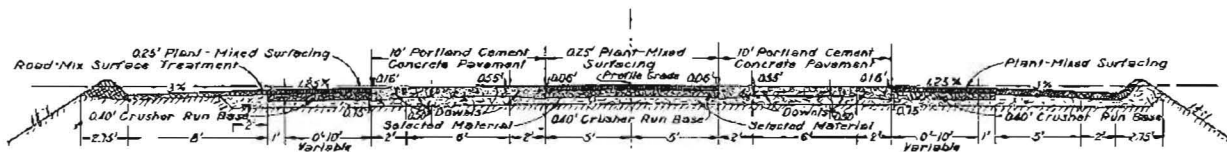
Typical cross section plan of divided roadway with raised dividing strip.



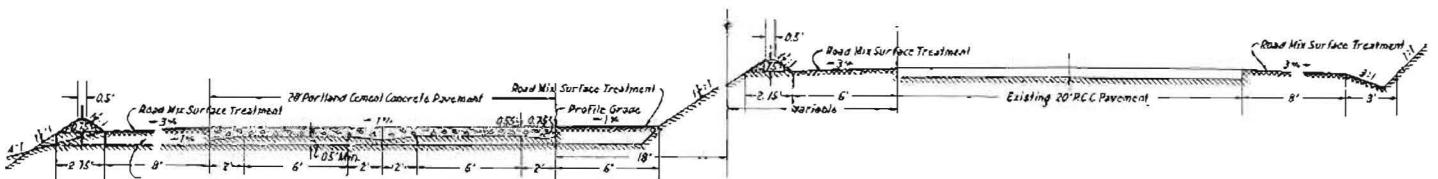
Typical cross section plan of divided roadway with 6 feet to 10 feet separation.



Typical cross section plan of divided roadway with raised dividing strip and curbs used where light standards are installed.



Three-lane roadway with variation in surfacing of lanes. Convertible into divided 4-lane roadway by addition of lanes and conversion of center lane into separation strip.



Typical cross section plan of divided roadway with roads at different levels.

1. There is a contrast in surface that plainly outlines individual lanes;

2. The rougher surface of the dividing lane reduces traffic to keep on or return to the hard, smooth outer lane;

3. A strong, smooth pavement is furnished in the two outside lanes where the slower moving trucks normally travel and impose the greater stresses;

4. The lighter type of surface is placed at a saving in cost where smaller wear and less frequent loads occur;

5. The design is adaptable to future expansion into a divided multiple lane highway by additional outer lanes at which time or subsequently the central strip can be revised into a separation by planting or otherwise.

THREE-LANE TRANSITIONS

In the progressive steps of expanding our State highways to adequately serve increasing traffic volume, the three-lane pavement or surfacing widths, as transitions between two and four-lane capacity roads are well serving an economic measure. Their efficiency has been demonstrated particularly under peak loads and where at times unequal volumes of traffic pass in opposite directions. It has been frequently observed how quickly the congestion on a two-lane pavement completely disappears when traffic passes onto the three-lane section.

The actual hazard of vehicles contending for the central lane has been overrated, as the three-lane roads, when constructed as they should be, are safe where ample sight distance is available and where an adequate shoulder width and treatment can be provided.

We find in California reports for the first half of the 1936 calendar year, for instance, that the percentage of accidents per vehicle mile of traffic is almost the same whether for two, three or four-lane roads. Omitting accidents that involved only single vehicles, or about one-third of all accidents reported and, which by their nature have little bearing on this relation of roadway widths, we find that, where two or more vehicles are involved, "approaching accidents" are very little more frequent than "overtaking accidents" on three-lane roads although considerably in excess on two-lane roads.

FAVORABLE ACCIDENT PERCENTAGES

This evidence is contrary to the impression that on the three-lane road, contention for the central lane is the one great source of trouble. Still further reflecting a relatively consistent performance on three-lane roads, the records show the three-lane roads compare favorably with the two-lane roads in the percentage of accidents involving two or more vehicles caused by vehicles turning from the same road and by vehicles conflicting from intersecting roads. The percentages of these kinds of accidents are higher on four-lane roads than on either three-lane or two-lane roads.

I want to stress the importance of a practice or policy embodying this progressive type of expansion in capacity of our highways, when increasing traffic volume demands greater service than is afforded by the two-lane road, few states have the available revenues—we have not in California—to jump from the two-lane road to divided four-lane construction long before the traffic volume requiring that capacity is reached, especially when this condition is presented in many instances.

ECONOMY IN ADAPTATION

We are presented with the situation of having to adapt or bring to a more adequate state of improvement highway systems composed, in the vast majority, of roads already existing and partially improved; of making these roads serve the purpose by revision of grade or alignment when necessary, by widening and by the addition of refinements that produce safety and comfort of travel. In but the smallest fraction of cases are we building entirely new roads. To accomplish this task properly and economically seems to me the most important phase of the problem.

Dealing with roads of four or more lanes the possibilities for variety of design are greater and conditions are presented for closer application of highway economies. Each problem must be approached on its own merits but for purposes of discussion we may consider divided multiple roadways:

1. As in reconstruction adaptable to existing pavements;

2. As in new pavement construction.

In each case character of improvement is influenced or determined by conditions presented in three locations:

(a) An open rural highway; (b) an immediate urban approach; (c) an avenue within a developed municipality.

Under the first class: Adapting existing roadways to divided four-lane or multiple lane roadway, we may enumerate a number of cases:

INTERMEDIATE TYPE SURFACE

Case 1. Two-lane roadway with intermediate type of surface. Perhaps an unusual situation since traffic volume would ordinarily require a higher type of pavement, but which might occur when utilizing a secondary road for new primary routing. Solution is more or less simple. Lends itself readily to progressive step construction.

Case 2. Two-lane roadway with high type pavement. Probably the predominant case. Several methods present themselves for consideration:

(a) Construction of dividing strip and two additional lanes all on one side if not limited by right of way considerations.

(b) Destroying or covering all or part of one lane for dividing strip and building one new lane on one side and two on the other, or equal additional width on each side.

(c) Jacking lanes apart if Portland cement concrete and of design practicable to that method. (Thickened edge section presents difficulty.)

ON DIFFERENT GRADES

(d) Building a separate two-lane roadway adjacent to existing road but even on different grades, brought together frequently enough for cross-overs.

(e) Converting by progressive construction first into three-lane and later to four-lane type by adding in the first step additional width required for dividing strip. Most easily accomplished when resurfacing is indicated.

Case 3. Three-lane roadway with intermediate type of surfacing. Again perhaps an unusual condition.

Case 4. Three-lane roadway with high type pavement. This presents again the more usually encountered condition and a greater loss of original investment to provide for conversion to the divided four-lane design. These roads where naturally constructed with intention of adding a fourth lane, are usually decentered as to right of way on this account.

An exception is where the central

(Continued on page 38)

Forty-four States Represented at Highway Convention

(Continued from page 21)

with the transition from two to three, three to four, four to five or six lane roads.*

Subjects discussed by the Road Construction Group covered a wide range and included bituminous treatments on the basis of local materials, compaction of fills, specifications for concrete pavements and specifications for bituminous-filled brick pavements. E. C. Lawton, Chairman, Commission on Road Construction, New York, presided, and among the speakers were H. C. Coons, Michigan; E. M. Turner, Construction Engineer, Tennessee, and C. M. Hathaway, Illinois.

Leading off with a talk by T. H. Dennis, Maintenance Engineer, California Division of Highways, on the subject: "Maintenance of Detours on Construction Projects Under Heavy Traffic,"** the Maintenance Group discussed such topics as winter maintenance of slippery pavements, relation of maintenance cost caused by climatic conditions and that caused by traffic, maintenance of roadside trees and shrubs and repair and maintenance of plain and reflector signs.

The sessions of this group were presided over by R. H. Baldock, Oregon State Highway Engineer, and among the speakers were G. H. Delano, Massachusetts; J. B. Early, Texas, and J. N. Bishop, Oregon.

The general and main topic of the Roadside Planting and Development Group, conducted by John L. Wright, Connecticut, had to do with means of reducing the maintenance cost of improved roadside areas.

TALK ON PLANNING SURVEYS

Governor Philip F. La Follette of Wisconsin was scheduled to deliver an address at Tuesday afternoon's general session on "The Financing of Public Works," but was unable to attend the convention. The delegates listened to an enlightening talk by H. S. Fairbank, Chief, Division of Information, U. S. Bureau of Public Roads, on the subject: "State-wide Highway Planning Surveys."

With Vice President L. V. Murrow of Washington in the chair, the general session of Wednesday morning proved an interesting one due to ad-

resses by three outstanding authorities on "Highway Safety."

R. E. Toms, Chief, Division of Design, U. S. Bureau of Public Roads, Washington, D. C., treated the subject from the angle of "Properly Designed and Constructed Highways."*

AUTO INDUSTRY REPRESENTED

D. G. Roos, South Bend, Indiana, Technical Advisor to the Studebaker Corporation, and former president of the Society of Automotive Engineers, read a paper jointly prepared by himself and Paul G. Hoffman, president of Studebaker Corporation, addressing himself to "The Construction and Supervision of the Motor Vehicles Which Use the Highways."**

As Director, Public Safety Division, National Safety Council, Chicago, Sidney J. Williams devoted himself to the subject: "Responsibility of and Control Over the Driver on the Highways."

At the conclusion of the addresses, the Standing Committees of the Association, of which there are fifteen, went into executive sessions.

Meanwhile, many of the ladies attending the convention enjoyed seeing San Francisco, the city's two great bridges, the site of the 1938 Exposition and other points of interest from the air. As guests of the Division of Highways, as many of the wives of delegates as desired were taken on aeroplane trips from Mills Field beginning at 9.30 Wednesday morning. They were taken to the field from the St. Francis Hotel in convention automobiles and returned in time for lunch.

VISIT BAY BRIDGE

All in all, Wednesday was a very active day for both delegates and their ladies. Leaving the St. Francis at 1.30 p.m., the visitors were taken in automobiles across the San Francisco-Oakland Bay Bridge to the University of California campus, where they stopped for ten minutes; were then driven through Oakland, back across the bridge to the San Francisco Embarcadero, thence along San Francisco's famous waterfront to the Marina and through the Presidio, one

** Mr. Roos' address begins on page 12.

of the most charming of scenic trips of which the city by the Golden Gate boasts. The sightseers were returned to their hotels at 5 o'clock in time to prepare for the dinner tendered them in the St. Francis Hotel by the State Division of Highways.

From an entertainment point of view, the dinner was the highlight of the convention.

The Colonial and Italian banquet rooms of the St. Francis proved inadequate to hold the hundreds of guests at the banquet and Parlors A and B on the mezzanine floor were utilized to accommodate the overflow. The dinner attendance was the largest in the history of the hotel.

BANQUET GAY AFFAIR

Leo Carrillo, noted Hollywood movie actor and Native Son was master of ceremonies and Miss Jean Parker, M. G. M. screen star, was guest of honor.

At the conclusion of the dinner, tables were cleared out of the two large banquet halls and the guests were seated for the entertainment to come. To Director Earl Lee Kelly of the Department of Public Works fell the pleasant duty of introducing the prominent guests at the speaker's table and Master of Ceremonies Carillo.

Only one speech was permitted and the honor of making that was delegated to Governor Frank F. Merriam.

The Governor was in high good humor and his facetious remarks, interspersed with serious description of the glories of California and the magnitudinal accomplishments in road building and bridge construction of the Division of Highways, made an outstanding contribution to the evening's program.

Under the infectious direction of Leo Carillo the entertainment moved along in swing time and the singers, dancers and other artists who took part were repaid with generous applause for their contributions.

Two addresses featured the general session of Thursday morning. L. V. Murrow, Director of Highways, Washington, talked on "Interesting and Unusual Mountain Road Construction," and H. S. Mattimore,

(Continued on page 40)

* Paper read by Mr. Grumm appears on page 20.

** Remarks by Mr. Dennis appear on page 10.

Auto Manufacturers Interested in Highway Safety Campaigns

(Continued from page 12)

speed about fifteen miles per hour. The wildest visionary could not have foreseen that 28 years later there would be 27,000,000 motor vehicles averaging 40 to 45 miles per hour, running up a yearly total of 200,000,000,000 car miles per year which, translated into terms of passenger miles, would be at least 400,000,000,000 passenger miles per year. In the light of these figures it is astonishing that accidents and fatalities are not more than they actually are when one considers this gigantic growth in both density and speed of traffic.

BETTER AND SAFER ROADS

In 1908, apart from a few miles of macadam, our roads were dirt, sand, and gravel. Since then, we have built nearly 1,000,000 miles of improved gravel and 200,000 miles of concrete and macadam. We have two lane, three lane, four lane, and six lane highways. Yet, as spectacular as the development has been, we are face to face, in our opinion, with the need of even more spectacular development than we have had since 1908. We need more highways, and we need better highways and safer highways. We have mutually a difficult problem in education and control of our 40,000,000 motor vehicle operators. We have mutually a problem in building safer motor vehicles.

Manufacturers have been accused of building cars and trucks that are too powerful, or too fast, for general use. What we manufacturers have done in the interest of safety I propose to tell you. What more can still be done is a matter for collaboration and discussion.

Let us point out that we must design and build to meet public demand or else go out of business. The public wants power and performance. They will reject and refuse to buy a product which is retrogressive as regards any of the fundamentals of performance no matter what attributes the vehicle may have. That safety is and always has been a vital consideration in motor car design I propose to touch on now.

Although human progress in mechanical arts moves at a very rapid pace today, progress is made by such gradual increments that we rapidly accept improvements and incorporate

them in our daily economy, losing completely consciousness of the gains made until we stop and momentarily look back, making comparisons between "then" and "now."

From the very beginning the first pioneer builders and designers of motor vehicles have had the importance of designing safety into their vehicles drilled into them by grim necessity. For no sooner had they succeeded in getting a motor vehicle designed and built, that would run with

Resolution No. 6 Federal Trust Funds

WHEREAS, On regular Federal Aid highway projects it is the custom to advance the Federal share and to secure reimbursement; and

WHEREAS, This method of payment takes up for a time State funds that otherwise might be used to provide additional construction; and

WHEREAS, This method does not permit the fullest use of available State funds; now therefore

BE IT RESOLVED, That this Association recommend to the Congress that an amendment be passed to the Federal Highway Act that will permit advancing regular Federal Aid funds as has been done with National Industrial Recovery highway funds in establishing the Trust Account revolving funds.

a fair degree of regularity than it became the target for the distrust and animosity of every lover of horse flesh and every competing form of transportation and for ridicule on the part of the general public.

ENGINEERING PROBLEMS

And it may be noted here that the first vehicles built were dangerous. Mechanical failures were frequent. Brakes were brakes in name only. Fire hazard and explosion hazard was a thing to be reckoned with.

Steering was poor, the entire problem being but little understood. Performance consisted in merely getting the vehicle to go somehow, but to go. The passengers had little or no comfort or protection from the weather. A journey of 100 miles was a fatiguing adventure, but having all the thrills of a voyage of discovery.

You see, therefore, that the automotive engineer was before the bar of opinion to demonstrate that the motor car could be made a safe means of transportation. The problem was a difficult one because outside of the question of safety, so many other engineering problems arose in connection with the vehicle itself to make it perform reliably and satisfactorily.

When the motor car industry got under way at the beginning of the century, alloy steels were little known and little used except in ordnance. The demands for better steels required for automotive equipment stimulated the science of metallurgy, in fact, subsidized and created it with the result that one new alloy steel after another was invented. Heat treatments perfected and the physical properties of steels and their resistance to fatigue multiplied by 2½ and even 3. Today the largest consumers of alloy steels are the motor vehicle manufacturers.

MECHANICAL FAILURES FEW

The tonnage of alloy steel in relation to carbon steel is mounting steadily and invading other industries, particularly the railway and aviation industries. Today so perfect is the control of alloy steel manufacture, so high the quality of the steel and accurate the treatment, that mechanical failures due to defective material are but a minute percentage of the few mechanical failures that occur.

Perhaps in no one single item has more progress been made in the direction of safe motor cars than in body design and construction. Those of you who can remember the motor car of, say, 1904, can recall an open car with the passengers perched on the top, back to back, or in a tonneau with a door on the back, out of which occasionally an incautious passenger fell.

The windshield, when there was one, flimsily attached to the dash, the



Official welcome at Mills Field for distinguished guests of American Association of State Highway Officials. Left to right: Leo Carrillo, noted movie actor, who was master of ceremonies at annual banquet of Association; Earl Gilmore, president of Gilmore Oil Co.; Jean Parker, Hollywood star, who was guest of honor; Earl Lee Kelly, Director of Public Works; Justus F. Craemer, Assistant Director of Public Works.

structure of wood glued and screwed together and covered with aluminum or, if it happened to be a sedan, a body high in the air, unstable and with no inherent structural strength, which broke open like a strawberry box in event of a crash; baggage piled on the top of the roof, careening along the road like a ship in a gale.

The wooden structure entailed heavy hinge and door pillars, as well as thick windshield pillars, which resulted in bad visibility and blind spots. Huge windows and windshields of plate glass added to the hazard of an accident. Today, the all-steel automobile body is so safe travel in the automobile what the steel pullman and steel passenger coach is to safety in railway travel. Not only is the structure of the body lighter and stronger, but it no longer is considered separate from the chassis and contributes enormously to the strength of the combined assembly of body and chassis. Its ability to resist impact, to bend, or yield with high resistance and not break up is a real safeguard in an accident. Steel permits narrower door posts and hinge pillars, as well as windshield pillars, and hence gives better vision.

To further improve vision, the

windshield wiper was developed, first hand operated, and then power operated, and now the defroster is offered to eliminate the very dangerous effects of frosted or clouded windshields. Only a few years ago we had to drive with open windshields in a storm if we wished to see.

The open car has almost disappeared, and with it the hazard due to rolling over, which very often was fatal. The all steel closed body makes such an accident a very minor hazard.

Instrument boards are more legible and the controls placed near at hand so they can be operated easily without taking ones eyes off the road.

It would be impossible to properly evaluate the reduction in mortality and serious injury due to the perfection and use of safety glass. The manufacturers of safety glass have accomplished marvels in the improvement of its shatter resisting qualities under wide temperature ranges and under different types of impact. The cost of adding this feature of safety to the motor car has been high and the public has been reluctant to allow the manufacturers to pass this cost on, even though its benefits are so obvious. Here legislation has helped the manufacturers by making its use

compulsory and the increased volume of production of this glass has enabled its producers to lower costs.

Ventilation has been improved and the body sealed against fumes, both in the interests of hygiene and protection from toxic gases which affect a driver's reactions.

ELECTRIC STARTING

We, many of us, remember the days when we had to start an automobile engine with a crank. Many a broken arm or worse occurred from a backfire. The electric starter definitely removed this hazard. Strangely enough, in spite of its high cost, its appeal to the public was more as a labor saving device and a surer means of starting the engine than from its greater safety. With it went the old acetylene head lamps and oil side lamps and in their place came the generator and storage battery and electric light. Head lamps have been improved and a great amount of work done on the study of adequate illumination versus head light glare.

If we could obtain a car of the vintage of 1904 or even 1915 and compare its steering with that of the car of today, I believe most of us would

(Continued on page 40)

Highway Has Its Limitations in Contributing to Safety

(Continued from page 27)

It will have traffic lanes wide enough for ample clearance at the speed for which it is designed. It will have shoulders wide enough for stopping, no deep side ditches, a consistently smooth non-skid surface, and an alignment, profile and cross section which at no place will confront the traveler with the unexpected or slow traffic to such an extent that the impatient driver is encouraged to take unnecessary risks.

When highway traffic moves at high speed greater clearance between the vehicles is required for safety. There is also a greater reluctance of drivers to travel near the edge of the pavement, particularly if the shoulders of the road are soft. The clearance provided for two-lane highways should be ample for two traffic lanes, but not enough to invite the possibility of its use as a three-lane road. For this purpose a 22-foot paved roadway width is indicated.

We have failed in many instances to provide highways in which all component parts of the highway structure are safe for travel at the prevailing or design speed. The inclusion of short sections of highway in which the design as to curvature, sight distance or other details falls below the general standard of the road constitutes a very serious fault because at these places the driver encounters the unexpected, particularly at night.

We have failed in many more instances to provide highways on which overtaken vehicles may be passed with safety. The design standards of this association with respect to sight distance are in need of a thorough overhauling. They are in effect nonpassing minimums which do no more than allow a vehicle, traveling at high speed, to be brought under control and stopped to avoid contact with a stationary object in the roadway ahead.

A safe passing sight distance is a function of the speed of the passing vehicle, the overtaken vehicle and the speed of a vehicle approaching from the opposite direction. If the differential in speed between the passing and the overtaken vehicle is large, the safe passing distance is much less than when this differential is small. It increases if more than one vehicle is to be passed. We must revise our conception of sight distance if we are to provide highways on which overtaken vehicles may be passed with safety. There has been but little conscious effort on the part of highway designers to consider this phase of highway design. We have been more or less content to be satisfied with an 800 foot sight distance.

SOME RECOMMENDATIONS

The sight distance required for three-lane construction should not be less than the minimum safe passing sight distance for two-lane construction. For relatively high road speeds, therefore, this sight distance is exceedingly large and difficult to obtain except in very easy topography. Where restricted sight distance is encountered at only a few places, added safety may be obtained by providing four traffic lanes at such locations. If

these locations occur at frequent intervals, the obvious thing to do is to provide four traffic lanes at once.

A three-lane road with inadequate sight distance in effect becomes nothing more than a wide two-lane road, except for the relatively small percentage of drivers who

Resolution No. 7 Central America Cooperation

WHEREAS, An appropriation made by Congress for cooperation with the Governments of Central America has disclosed the fact that those countries are willing and able to cooperate in bridge and road construction; and

WHEREAS, Such appropriations when expended as heretofore largely for products of American heavy industries produce the threefold advantage of providing orders to American mills and supply houses, increasing exports and at the same time expressing in tangible and valuable form the good will of the United States toward the nations cooperating; now therefore

BE IT RESOLVED, That the Association of State Highway Officials advocates the continuation of such appropriations on a scale which will continue to develop cooperation within the capacities of the several Central American Governments; and

BE IT ALSO RESOLVED, That the Association favors the further investigation of a route for an inter-American highway southward from Panama and recommends that Congress make further provision for such work.

have no compunction about taking unnecessary risks.

Where traffic is congested on two-lane highways every effort should be made to expand the facilities into a four-lane highway with traffic in opposite directions separated by a neutral strip or parkway. A neutral or median strip $3\frac{1}{2}$ to 4 feet in width

and constructed of contrasting color or material flush with the roadway surface of the traffic lanes serves the same purpose as a wide center line marker and to this extent encourages and makes possible a greater width of separation or clearance between opposing lines of traffic. The hazard of head-on collisions, however, is not eliminated because there is common surface in the center of the highway that is accessible and can be used easily by impatient drivers in the traffic streams moving in opposite directions.

In addition to practically eliminating head-on collisions with opposing traffic, the four-lane highway with traffic in opposite directions separated by a parkway may be designed to decrease the hazards at intersections. On heavily traveled four-lane roads it is almost impossible to obtain a sufficient break in traffic going in the two directions to permit cross movement of vehicles without extreme danger unless traffic control lights are used. If the roadways are separated a sufficient width to provide a safety island between the lanes of opposing traffic, cross movement may be effected in two operations.

The fact that considerably more than one-half of the fatal motor vehicle accidents occur during the hours of dusk and darkness, although traffic during these periods probably is not over one-fourth of the 24-hour total, is evidence of the fact that the speed of the motor vehicle has increased beyond the range of its headlights.

We must begin to consider whether the expense of lighting some of our highways would not be justified wholly from the standpoint of safety of operation. By no stretch of the imagination is it possible to visualize rural highway lighting on any but a small percentage of our principal State highways. While the cost of installing highway lighting is not excessive, the annual cost of operation in many cases would entail a charge equal to or greater than all other maintenance items of the highway.

PEDESTRIANS CARELESS

A heavily traveled highway is not a safe place for the pedestrian. Collisions between motor vehicles and pedestrians accounted for 35 per cent of the highway fatalities in 1935 in rural areas and cities of less than 10,000 population. This points definitely to sidewalk or footpath construction as an adjunct of highway design.

The highway engineer's contribution to highway safety consists essentially of omitting no detail of design within economic limitations that makes for the safety of travel. This guiding principle will provide highways that can be used by the reasonably careful driver with safety—highways on which overtaken vehicles may be passed with safety, and highways on which the driver is confronted with no conditions that constitute a hazard without ample notice or warning of such conditions. When this has been accomplished, the highway will occupy its proper place in supporting the safety triangle. Beyond this safety must rest with the individual.



DIVISION OF WATER RESOURCES

OFFICIAL REPORT

FOR THE MONTH OF

November, 1936

EDWARD HYATT, State Engineer

Irrigation Districts

An application for investigation and approval of a bond issue in the amount of \$700,000 has been filed with the District Securities Commission by Imperial Irrigation District. The directors of the district have approved the form of a contract offered by the Rural Electrification Administration and are planning the construction of transmission and distribution lines to serve rural areas. The district has recently completed construction of the first unit of a Diesel stand-by plant at Brawley which will be enlarged to serve other areas in the district pending the construction of hydro-electric plants along the line of the All-American Canal.

Economic studies of newly proposed irrigation districts on the line of the Friant-Kern Canal are now in progress. The water supply requirements of these areas, and their ability to pay the necessary costs of acquiring the same, will be determined from the present investigation of soils, crops and land valuations. A separate report will be rendered on each district and recommendations made as to changes in the boundaries proposed.

FLOOD CONTROL AND RECLAMATION

The three new drainage pumping plants in the Sutter By-pass are practically complete, and will be ready for operation when necessary. The War Department is doing some final finishing-up work, but the contract work has been completed and accepted.

Bank Protection Program

Excellent progress has been made by the War Department on the construction of bank protection works on the Sacramento River under the State-Federal cooperative program of Juoc. 1932. At this time 24 project units have been approved to an estimated cost of \$500,000 inclusive of levee set-backs and partial set-backs amounting to \$95,000, which work is classed as new construction under the Sacramento flood control project.

Included in the approved units is 19,612 lineal feet of lumber mat under water protection and rock bank paving, with partial levee set-backs approximately 11,587 feet in length. There is also included 6575 lineal feet of levee set-back without bank protection. Wave wash bank protection, consisting of a rock wall without pavement or set-back, is provided in four places, with a total length of 893 feet.

Work has been completed at the Colusa weir, Campbell-Dwyer ranch, Colusa Bridge, Hamilton Bend and Alaska Packers Association. Work is now under way at Steidl-

meyer ranch, Cecil's Lake, Burke ranch, Edwards Break, Chickory Bend, Lisbon pump and Walnut Grove. Two complete plants are in operation and it is expected that the entire program will be completed.

Sacramento Flood Control Project

During this period the incidental right-of-way construction in connection with the new levees on the Sacramento River above Colusa has been practically completed, about 25 men having been engaged during the period on this work. The largest single job was the construction of a new pumping plant at the Keller ranch.

IV. WATER RIGHTS

Supervision of Appropriation of Water

Nineteen applications to appropriate water were received during the month of October, 14 were denied and 15 were approved. In the same period 13 permits were revoked.

On October 1st reports were requested from 1310 permittees and 571 of these reports were filed during the month. These reports are now under study with a view to determining the status of each project.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

Due to lack of rainfall during the past month there has been no increase in the stages of the Sacramento and San Joaquin Rivers. The flow of the Sacramento River at Sacramento is about 5500 second feet.

The summer crops are all harvested and in some places winter irrigation of the orchards is under way. The degree of the salinity in the lower Delta and upper bays has not changed greatly during the past month. The number of stations for salinity sampling in the Delta have now been curtailed so that throughout the winter, sampling will be continued at the permanent stations only.

CALIFORNIA COOPERATIVE SNOW SURVEYS

The general storm that occurred during the closing days of October, brought an end to the extreme fire hazard existing throughout the mountains and permitted the Forest Service to cooperate in the establishment of many of the new snow courses previously planned for the coming winter. Engineers from this office working with the personnel of several of the national forests, selected, laid out and permanently marked new snow courses.

Stocking of the last of the shelter cabins has been completed. Snow measuring equipment, food, blankets, and wood have been

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

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

Vol. 14, DECEMBER, 1936 No. 12

placed in each cabin for the use of the snow surveyors, while in the mountains, during the dead of winter.

With all of the details and necessary preparatory work attended to, everything is now in readiness for the field work of the 1936-1937 snow season.

FEDERAL COOPERATION

Topographic Mapping

Progress was made in the topographic mapping of the Avenal Quadrangle in San Luis Obispo and Santa Barbara Counties and on the Downieville Quadrangle in Sierra and Plumas Counties during the month of October.

Stream Gaging

Water Supply Paper 791 of the United States Geological Survey is now available. This is a report of cooperative stream gaging in the Pacific Slope Basins in California for the year 1935 and contains rating tables for some of the more important gaging stations.

Central Valley Project

The United States Bureau of Reclamation continued work during the month on the preparation of plans necessary for starting construction on the initial units of the project. Preliminary investigations and exploration work have been continued at Kennett and Friant dam sites as has the survey along the Contra Costa Conduit and Friant-Kern Canal. Appraisers are working in the field evaluating lands and necessary rights of way to be acquired. The Division of Water Resources is conducting surveys and making investigations in the San Joaquin and Sacramento valleys preliminary to the acquisition of properties and water rights and the preparation of agreements necessary for the construction of the project.

Divided Roadway Design for Multiple Lane Highways

(Continued from page 32)

lane has been purposely constructed of a type that can be conveniently converted into a dividing strip after its service has largely repaid its cost. With this exception the problem resolves itself into a question of how much of the pavement can be abandoned. As in Case 2, several methods are available.

LOSS OF PAVEMENT

Case 5. Four-lane roadway with high-type pavement. It is evident that in this case there will be a loss of pavement in amount equal to the determined width of the dividing strip. Practically all of the existing four-lane mileage is constructed of high-type pavement, much of which represents comparatively recent investment.

This class of road, except for the hazard ascribed to them for want of a dividing strip, will serve expected traffic for many years while funds are being used to provide adequate facilities elsewhere. The question arises immediately whether benefits derived from dividing these roads will be as great as the benefits, including safety, which could be provided at equal expenditure on roads elsewhere.

In all cases involving revision of the existing roadway to the divided multilane road there are features of construction other than replacement of pavement. They again require careful examination and contribute their share to the final determination of the problem. Physical limitations may react on the practicable adaptation of the old pavement to the new roadway design.

RIGHT OF WAY FACTORS

Right of way width will usually be a major item for consideration. Right of way usually has been acquired on the basis of providing for specific widths of roadway, shoulders, parking areas, drainage, trees or roadside development, poles, sidewalks and curbs. Many of these features are not readily susceptible to a revision of typical section without encroachment on areas planned for their use or for other purposes. This then leads to the alternative of acquisition of additional right of way taken from highly developed adjacent land.

Other numerous incidental losses

and costs are encountered, such as: loss when expensive subgrade treat-

Resolution No. 8 Inter-American Highway

WHEREAS, It has been proposed to construct a motor highway along the Pacific slope of the Western Hemisphere from Fairbanks, Alaska, to Santiago, Chile, and thence to Buenos Aires; and,

WHEREAS, This proposed highway traverses twelve republics of Latin America, four states of the United States, British Columbia and the territories of Yukon and Alaska and will serve a contiguous territory of more than five million square miles in area and a population in excess of 63,000,000 people; and

WHEREAS, This projected highway traverses the potentially rich and populous west coast states of the Republic of Mexico and connects in the City of Mexico with the Inter-American Highway now completed from Laredo, Texas, to the City of Mexico; and

WHEREAS, It appears that this Pacific coast route will when completed greatly accelerate motor travel to Mexico and thereby give impetus to the southerly extension of the Inter-American Highway.

NOW THEREFORE BE IT RESOLVED, That this association does hereby endorse the Inter-American Highway together with its Pacific Coast extension to and into the Territory of Alaska and urges upon the Congress of the United States that it extend to the nations of Latin America and the Dominion of Canada the utmost of cooperation in the development of this international project.

ment was placed beneath pavement that will not be continued in use. Subgrade treatment will usually be

adverse to planting contemplated within the dividing strip.

Gutter lines, curb lines and sidewalks may be disturbed. We have, for instance, constructed a considerable mileage of State highways to a 76-foot width with gutters and curbs installed. This is a six-lane pavement width with two parking lanes of eight-foot width each adjacent to the curbs and with adjacent property highly developed.

Bridges must be widened or rebuilt. Drainage structures corrected.

Public utility facilities removed. Pipe lines may fall beneath pavement instead of in the open shoulder where they have previously been placed under permit.

DESTRUCTION OF PLANTINGS

Fences, poles, trees will be disturbed. Not the least of these are the trees or plantings. With the added interest taken by the public in recent years in roadside development, destruction of planting meets with even more serious opposition.

All of these complications together with the losses in previous investment and new project costs make the conversion into a divided multilane road of a highway not previously laid out with this ultimate design in view, a project often difficult to justify. Conditions must be particularly favorable or the function of the road must have changed unexpectedly.

Under normal conditions only selected sections need be considered for treatment with a nominal division strip. Under extraordinary circumstances the objective of new design overshadows all objections and the project approaches the character of a new undertaking.

We must in this consideration recognize the evidence of accident analysis which shows that dividing roadways can only minimize a relatively small percentage of accidents prevalent on four-lane roads unless the improvement includes other features, such as grade separations of both rail and road, pedestrian protection, embodiment of the free-way principle, side service roads and the like.

In itself the divided roadway cannot materially increase the four-lane capacity. It will probably induce

greater speeds leading to new complications or increase of hazard of different character. For instance, if one or both sides of the divided roadway should be carrying a fairly heavy volume continuously, traffic would probably adjust itself to reasonably careful operation.

As soon as traffic lightens the play of excessive speed and passing occurs. It is then a question whether the dividing strip eliminating the 22 per cent of "approaching" accidents on our present undivided four-lane roads may not also induce an increase in the 38 per cent of "overtaking" accidents we now record.

Likewise there is doubt as to how much of the 19 per cent of accidents occurring in turning from the same road (left-hand turns mostly) on present four-lane roadways and the same percentage of accidents occurring at intersecting roads, will be cured by the dividing strip.

A dividing strip at least equal in width to the length of a car would probably prevent an increase of the intersecting road accidents if not contribute to a reduction in hazard.

DIVIDING STRIP WIDTH

The width and character of the dividing strip has an important part in this design. We are concerned more immediately with the minimum width. This, in my opinion, should probably be 4 feet. This minimum can hardly provide all of the benefits which the dividing strip seems to offer.

The elimination of approaching headlight glare for instance may be provided by shrubs or plants of proper height. The difficulty and hazard of maintaining such planting in a narrow strip would bar such treatment. Conversely the wider strip with planting leads to increased initial and maintenance costs. The narrower widths will probably be employed primarily in converting our existing pavements into divided roadways.

We favor the raised dividing strip or zone but until the problem has been more thoroughly studied we are constructing this raised division with an ogee curve design of temporary character, such as plant mix. Except where installations within the dividing strip require (such as light standards or similar structures), the vertical face curb is not encouraged. The sloping face or ogee curb design

is probably the more acceptable type for permanent installation.

The separate problem of providing for drainage induced by the installation of a division strip, for instance where horizontal curvature requires superelevation will influence the design.

Again the location of the project with attendant varying conditions

Resolution No. 9

An Appreciation

WHEREAS, the Twenty-second Annual Meeting of the American Association of State Highway Officials at San Francisco, California, has been made extremely successful not only by the work of its own officers and members but by the sincere interest of His Excellency Frank F. Merriam, Governor of California; the careful, considerate planning of the Division of Highways of the Department of Public Works, State of California; the hospitality of the St. Francis Hotel; and other individuals and organizations; and

WHEREAS, Not only the delegates but also the many ladies who have been present at this meeting have so keenly enjoyed the very fine program of entertainment which has been arranged for them by these people;

THEREFORE, BE IT RESOLVED, That this Association expresses its sincere appreciation to His Excellency Frank F. Merriam, the Division of Highways of the Department of Public Works, the management of the St. Francis Hotel, and all other individuals or organizations who have contributed toward the success of this Convention.

may dictate different design. I should say that on rural roads where few intersections or entrances of side roads prevail the simplest type of effective division and of reasonable width is likely to be preferable and more satisfactory than on a project in urban area.

The principle of dividing the road-

way has been applied on our California highway system. We have constructed or under construction 65.3 miles of which 55 miles is four-lane divided roadway. Planned for early construction is 27 miles more of the latter type.

Specially designed three-lane roads readily convertible into four-lane divided roadway total 47 miles. We have plans for early construction of this type for 10 miles more. The longest stretch of divided four-lane road is 18 miles and is planned for construction early next year.

These roads include division widths from as little as 4 feet of arched strip to wider curbed designs and also to roadways entirely separated even as to grade. The design has been selected to best meet local conditions. They have been necessarily limited to type that would not jeopardize by cost our ability to consistently treat similar conditions in like manner.

NEW CONSTRUCTION POSSIBILITIES

Our studies are being extended into consideration of where new construction on our highways may permit the use of four-lane divided roadway. It is a foregone conclusion that we cannot adopt, with present limited revenues, a policy of supplying widths of pavement for in excess of widths adequate for present and near future volume. We feel justified in moderate application of division of roadway design in certain localities and our immediate efforts no doubt will be limited to such projects where new construction or reconstruction is contemplated.

In the advisory capacity to the public that pays the bill, the engineer should be inclined to council a conservative policy. There is no cause to regret that the progressive improvement of highways for the benefit of as many sections of the state as possible has proceeded on the basis of pay as you go and build as you can pay.

The value of the roads we have built up from a few pioneer trails to the many surfaced highways is expressed in the class and type of travel they have induced. We are not in the red, either in our accounting records or in the inventory value of our facilities. We can probably attain a more adequate status with current revenues if demands of the road users remain consistent with their contributions toward the requisite highway construction, maintenance and patrol.

Auto Manufacturers Interested in Highway Safety Campaigns

(Continued from page 35)

allege that someone had purposely "rigged" the older model. The columns whipped about, the steering gears themselves were in many cases reversible and the geometry of the steering connections so bad that "wheel fight" was terrific. Fortunately speeds were low so that the car could be managed, but the steering effort with reduction of 10 and 12 to 1 was prodigious and fatiguing.

Today, large steering wheels are made so that they will bend not break, with comfortable gripping sections and structures that absorb vibrations. Correct steering geometry, reductions in steering ratio of 18 or 20 to 1 with high efficiency steering gears makes steering well nigh effortless and control of direction easy. Self righting or directional trend gives the car "steering sense." The structure of the steering gear and connections has been improved so that mechanical failures are comparatively unknown, as all parts are protected against dirt and wear.

TIRE ADVANCE NOTABLE

To the tire manufacturer must go great credit for keeping pace with the ever growing demands made on them. In 1906 a complete tire repair kit, extra casings and tubes, and a complete knowledge of how to repair tires were part of the equipment of every motorist. The tire would have been a distinct hazard if speeds had been high but wheels were large and tires were small in section and speeds were low so it merely meant extra work when a blow out or puncture occurred. Today wheels are smaller, tire sections are larger for comfort and low center of gravity. Today the tire perfectly meets the demands. It is a hazard only when the operator is guilty of gross neglect by operating with inadequate inflation pressures or driving at high speed with worn out casings.

RIDING COMFORT

All cars ride reasonably well on a good road. It might be thought, therefore, that the riding problem and its attended problems were becoming easier for automotive engineers, but better roads have merely served to contrast how badly a car rode on bad roads and improved concrete high-

ways have caused us to be deluged with a shower of complaints as to how we can eliminate the noise and attendant jar of car going over the joints in concrete highways. Riding comfort has a bearing on safety inasmuch as it affects fatigue and hence alertness of an operator.

Noise and vibration were both serious problems in very early cars. The wide use of open cars in the early days of the industry made this problem somewhat less acute as time went on, but the sudden rise in demand for closed cars brought this problem again, and more acutely, to the front. The growing use of steel bodies still further accentuated the problem. High frequency vibrations and droning noises have a distinct numbing effect, as well as fatiguing effect, on the human nervous system. The last two years have seen great progress made in subduing both noise and vibration until this year a new standard of excellence has been set but there must be further progress along these lines, especially on cars capable of high speeds.

In 1906, brakes can only be describe as "awful." They were exposed to mud, water, and dirt. They were undersized and capable of stopping a car from 30 miles an hour in 75 or 80 feet if in good condition. They had very poor life and needed constant adjustment. Today a car with four wheel brakes in good condition can stop in 35 feet from 30 miles an hour, in 41 feet if in fair condition, and in 60 feet if in poor condition.

WAGE SAFETY CAMPAIGN

The gasoline tank began its journey from the front of the car and under the front seat to the rear end of the car many years ago. It met with some stubborn resistance on the way but the interests of safety demanded that the fire hazard be removed. Hence the rear location which is universal on passenger cars and on the side locations which are used on trucks.

The interest of the automotive industry in the highway safety is not restricted to building safety into its vehicles. Safety activities have been carried on for years but during the past twelve months the industry has

contributed to a safety campaign which is being carried on energetically among organizations with a total direct membership of over seven million. The American Automobile Association, the American Federation of Women's Clubs, Parent Teachers Associations, the American Legion, Farmers Grange, have enthusiastically enlisted for this war on accidents. They constitute a mighty force and you can count on their interest and full support for any campaign you inaugurate for protecting and expanding our highway system.

You have shown us your capacity for leadership by taking America out of the mud—now we ask even more—give America the safest highway system in the world.

44 States Are Represented at Highway Convention

(Continued from page 33)

Engineer of Tests, Pennsylvania, took as his subject "The Most Recent Developments in Highway Research."

Following these addresses, the convention went into a business session, receiving the reports of the executive committee, the treasurer, the auditing committee, committee on resolutions, nine of whose resolutions were adopted, the nominating committee and reports of standing committees.

Election and installation of new officers brought an end to the convention.

While the convention was winding up its affairs, the ladies were taken on a motor trip to interesting points in San Francisco, and were entertained at an informal tea in the Western Women's Club.

At 5 o'clock the beautiful color film, "California Highways," produced by the Division of Highways, was shown in the Italian Room, and at 8.45 Thursday night delegates and their wives were taken on a tour of Chinatown.

On Friday and Saturday two automobile caravan trips were offered to members of the association and their families. Starting Friday morning, transportation was furnished to delegates wishing to go home via Los Angeles with stops at the Big Trees, Del Monte and Santa Barbara, while another caravan took visitors over the Redwood Highway to Eureka.

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