

EDWIN Q. SULLIVAN STORY

Chapter I

Something over 60 years ago, I spent a night on the property on which the District Office is now located. It came about in this way: My home was in San Diego, but I went to Monrovia for a summer vacation, to visit with a boy friend of my own age. It was quite the custom in those days to ride your bicycle as far as you could go, in a 10 or 12-hour day and then return home on the train. We got up in Monrovia at break of day and started out. I do not recall any pavement at all; the road for the most part was two ruts in the gravel or sand and we rode along side by side, each in one of the two ruts. At noon, we reached a point near Cucamonga where an irrigation ditch crossed the road, and we sat down under a cottonwood tree near a farm house to eat our lunch. A nice motherly woman came out with a pitcher of milk. She pumped us dry, as to who we were, what we had seen and where we were going. She asked in detail about everyone we had met on the road. We had only met a few farm wagons during the morning and since we had stopped and talked to each driver, we were able to tell her all the news. We arrived in San Bernardino toward dark and proceeded to the hotel which was located on the present District Office property. The architecture of the hotel could be described as 'Victorian Gingerbread.' I remember the high ceilings, the hugh bedrooms and the large bed. The price for a room for the two of us was \$1.00; the cost of dinner that night was an excessive amount, namely, 35 cents. I think I had never before paid this much for a meal, so the next morning we went up town and had breakfast for 20 cents - ham and eggs, oatmeal mush, toast and coffee.

San Bernardino was the County Seat, and we spent the day riding around town. I recall the rows of hitching posts with saddle horses and framers' wagons tied in front of the many saloons. Loafers sat along the curbs. We were impressed by the metropolitan aspect of the city. Before we left town, we went back to our hotel and the clerk took us out back to see beautiful Warm Creek meandering through the large cottonwoods and alders. Town Creek entered Warm Creek on the present State property and boys were along the two creeks fishing. Town Creek now crosses Third Street in a culvert and enters Warm Creek at the northeast corner of the State Highway property. Both creeks, now dry, were then beautiful streams, Warm Creek being over 20 feet wide and at least 2 feet deep. There was an artesian well on the property under considerable pressure; this well still existed when the State bought the property in 1923 and was still under some pressure.

Chapter II

Prior to 1914 there was no State Civil Service, and I believe I took the first Civil Service examination given for a job in the State Division of Highways. It was given in the Hall of Records in Los Angeles during a period of 'depression.' There were several hundred who took the examination but less than 50 handed in their papers. If you failed, you had to wait a year to take another examination but if you did not hand in your papers you could take the next one within a few months. The examination lasted two days; the first half-day was devoted to testing the applicant in arithmetical knowledge and accuracy; it took the applicant through mathematics up to geometry and trigonometry. The next half-day took the applicant through spherical geometry and trigonometry, each problem getting harder as you went, including solution to complex compound highway curves. The third half-day took the applicant through calculus, strength of materials and simple design. The fourth half-day consisted of designing either a bridge or the choice of designing another complex structure. The job paid \$150 per month. Jim Stanley took this same examination, and we were both given appointments in Dunsmuir in District II. I met him for the first time in District II office.

The District Engineer was allowed to have an automobile. It was considered that the public would be prejudiced against the Department if the State furnished too many automobiles. Each resident engineer could have a horse and buggy for his group of engineers or in lieu of a horse and buggy, two saddle horses were furnished for each contract. Horses were rented from local livery stables.

The first automobiles had windshields but no 'tops'. It was five or six years before a hand-operated windshield wiper was permitted on a State car. The Equipment Department suggested a raw potato to rub on the windshield to aid vision in rainy weather. Some bold spirits put hand-operated windshields wipers on State cars at their own expense but this was at risk of a severe reprimand.

The first motor vehicle that I had in State service was a motorcycle. I was permitted to furnish this motorcycle at my own expense. The State reimbursed me to the extent of 1½ cents a mile of travel. Nothing was allowed for repairs or maintenance, though 2,000 or 3,000 miles was good mileage for tires in those days. Some of the assistant resident engineers were allowed bicycles even during the horse and buggy period; a small monthly rental was allowed for these bicycles; I do not now recall the exact amount.

After a few years of this sort of transportation, the State began furnishing cars to the Resident Engineers, but it was many years before hand-operated windshield wipers were permitted. In those days, the Equipment Department

was under the direct supervision of the District Engineers but headquarters office kept a tight reign on all equipment to make sure that no 'luxury' items, such as hand-operated windshield wipers appeared on State cars. It was considered the public would frown on such luxuries for a State employee.

Chapter III

District VIII was formed in 1923. District VIII consisted of all of San Bernardino, Riverside and Imperial Counties. The gas tax had gone into effect and it was realized that something had to be done for the interstate connections. I came to San Bernardino as District Engineer. Mr. R. M. Morton was Chief Engineer, and he instructed me to concentrate the energies of the District on passable connections to the Arizona and Nevada borders at the earliest possible time.

The present road location to Las Vegas had not yet been conceived. The road to Blythe was a mere trail. The road to Yuma, from the edge of the cultivated area in Imperial Valley to the Sand Hills, consisted of tracks in the sand with an 8-foot plank road across the Sand Hills and two deep ruts from the Sand Hills to Yuma.

The principal road entering California was the Needles road. When I started work in District VIII, the road between Victorville and Needles had not yet been physically taken into the system in the sense that any construction or maintenance work had been done by the State. Between Barstow and Needles, the County had at one time attempted to 'oil' the road but the 'oil' had long since disappeared except for one stretch, 8-foot wide about 10 miles near Essex. This 10-mile stretch was a 'marvel,' since it had 'stood up' while all the rest of the oil had all been ground up into the sand or soil and blown away in the wind, leaving only two ruts. This was the heaviest traveled road into California. It is my recollection that over 300 vehicles a day passed over this road, headed for the promised land of Hollywood and Los Angeles. Almost no traffic proceeded in the opposite direction. It required two days to make the trip from Barstow to Needles.

We were not at first required to do anything on the Blythe Road but Headquarters was under great pressure to do something for the road to Yuma. The road to Blythe was all but impassable.

It required two hard days of travel to reach Yuma from San Bernardino. I will describe my first trip over each of these roads in later chapters.

Chapter IV

My first trip to Needles from San Bernardino was memorable. I was told by the County Surveyor that the trip could not be made in less than three days. The first day to Barstow, the second day to Ludlow, and the third day to Needles.

The County had built a 16-foot oiled macadam road from San Bernardino to Summit. This road wound up through the Cajon Pass with 50-foot radius curves, a very high crown and with no shoulders. The speed limit at that time was 30 miles per hour, and it was possible to stay on this road at that speed. The State had built a 16-foot high crowned oiled macadam road with no shoulders from Summit to Victorville on good alignment. From Victorville to Barstow, the road was two ruts in the sand and gravel.

I had a brand new Reo, the pride of my heart. The State, by 1923, had come to the point where they furnished a cloth 'top' with side curtains that had celluloid peep holes. There was a celluloid window through the cloth back of the 'top.'

We went out to Barstow the first day and spent the night. The next morning we were up at 3 a.m. and started off before light, determined to make it all the way to Needles in one day. It was second gear or low gear work all the way; it was before the days of 'balloon' tires and the hard tires of the car sank into the sandy ruts and at times the transmission and differential would drag. When we met cars from the opposite direction they were always in strings of 10 or 15 cars since no one could pass anyone and the slowest cars set the pace.

When you met anyone, if you were a gentlemen, you were supposed to turn out leaving two of your wheels in one of the ruts and the opposing traffic would reciprocate. I recall in one caravan we met a string of 10 or fifteen cars and all the cars turned out save one. Just as I got opposite this one car, it jumped back into the two ruts and scraped along my nice new Reo. On the running board of this opposing car was tied, among other things, a tall round old-fashioned coal oil heating stove. This coal oil stove scraped along my nice new Reo, rolling around and around between the two cars, scratching and spilling coal oil over the side of my car. After we got by each other, we both stopped and looked over the situation and called it a draw.

Before we got into Needles that night, it was 11 o'clock and pitch dark. A Reo of those days had long thin 'brake rods' on both hand breaks and foot brakes. The wiring was in loose wires running under the car from the battery which was located under the car. Before I reached Needles, all brake rods had 'crystallized' and broken. The wiring of my nice new car was all broken, and we came into Needles without lights.

It was indeed too long a trip for one day!

Chapter V

In the last chapter I described my trip from San Bernardino to Needles. I will now describe the return trip from Needles to San Bernardino. After a day and a second night in Needles, an early morning start was made with the plan of spending the night in Ludlow. The Ludlow people had requested a meeting with me and I telegraphed ahead that I would be there.

Ludlow was a very small town but with a boom atmosphere. There were great numbers of automobiles parked around on vacant land, with the owners mending tires and putting on new springs. There was a large barn in town about three stories high, but with the hay cleared out. The barn was a relic of the old teamster days. Nailed up on the walls of this barn were literally hundreds of automobile springs. The proprietor made the proud boast that he had the largest assortment of automobile springs in the United States. These springs he sold to the travelers who were spending the night in Ludlow.

It was claimed that about 200 people stopped in Ludlow to rest up each night after the trip from Needles. Most were camped around town in tents or they slept in their cars. There were some cabins and a "hotel" of ancient vintage. They had reserved a room in the "hotel" for me.

The meeting that night was in the school house. Extra benches were placed in the school house and about 30 to 40 people crowded in and stood up at the back of the room. I was seated behind the teacher's desk. A series of local people made speeches to me. The burden of the speeches was that the oil put on by the County had all disappeared and that if only the State would pitch in and pave the road, Ludlow would boom and become a real city. The speeches addressed to me went on for several hours and when they were all done, I finally made a brief talk of 15 minutes in which I stated that the Chief Engineer had instructed me as District Engineer to concentrate on doing something to relieve this road situation. I said I could not promise them paving because at that time paving cost \$15,000 to \$20,000 per mile and such an expenditure was utterly unthinkable. All I could promise was to make a thorough study of the situation. I assured the people that I would do my best. With that I wearily went to bed. The next morning I made it to Barstow without difficulty and the next day I got to the District headquarters in San Bernardino.

As a footnote, I might remark that within two years we had a road that could be traveled without difficulty at 35 miles an hour and no one ever stopped at Ludlow after that, except to get food or fill up with water and gasoline. Ludlow lost practically all highway business and was no longer a boom town.

OPENING OF THE DISTRICT OFFICE Chapter VI

I had come to Los Angeles on October 1, 1923, and until November 1, my headquarters was in the District VII, Los Angeles Office. My trip to Needles and return was prior to the opening of the District VIII Office.

We have been negotiating with the City of San Bernardino to use the top of the City Hall (rent free). The City Hall was in its present location but it was a different building (the 'old' building has since been torn down and the present 'new' City Hall has been built). The top floor had 10 rooms; the City moved out of several of the rooms they were using and we occupied all ten rooms.

The first staff payroll carries two names that almost everyone now in District VIII will know, namely, E. Q. Sullivan, District Engineer at \$350.00 per month and Verna Neville, stenographer at \$110.00 per month. District VIII now knows Verna as Verna Lawrence who recently retired from being head of District VIII Personnel Department.

I want to pay tribute to Verna. She was my secretary for many years. She was a young girl just out of high school. She was of brilliant intellect and was a person of great charm and beauty. She met all visitors who came to call on me. I knew no one at all living in District VIII and my assistants were equally strangers to the local people of District VIII. Vera found out the names of each caller, questioned them as to who they were and what they wanted in a manner to please and not to offend them. She wrote their names on small printed forms, together with notes as to who they were and what they wanted. She then brought them in to me and introduced them. Verna's small printed forms were pasted in daybooks and we soon had an invaluable record of the public who were interested in highways. Verna was a perfectly wonderful secretary, destined for promotion to head District VIII Personnel Department.

District VIII had a population at that time of perhaps 300,000. There were three counties, San Bernardino, Riverside and Imperial County. These counties had 15 supervisors. There were 22 cities and about 110 councilmen. It seemed to me that most of these dignitaries called at our office within a very short period of time (in a subsequent reminiscence I will outline why we have all these visiting dignitaries calling on us).

The second staff payroll of December 1, 1923, has 25 names and some "old-timers" may remember a few of them. They are now all either in retirement or have passed away. The following are some of the names that "old-timers" may remember:

R. A. Berman, Chief Draftsman at \$235.00

Howard Noble, Chief of Party at \$200.00

Marie Noble, Cook at \$80.00

C. B. Wirshing, Asst. Dist. Engineer at \$258.00

R. L. Young, Resident Engineer at \$280.00

I have photostat copies of these payrolls and will be glad to show them to anyone who may be interested, although I feel quite sure no one would remember any of the other names.

I do not have photostats of the first Maintenance Payrolls but Joe Stanton was working in the District, as Construction Superintendent in Maintenance, and must have been on the first Maintenance Payroll. He was later promoted to district Maintenance Engineer at which time his name would appear on the Staff Payroll. Ben Bond was a young lad at the time and was probably also on the first Maintenance Payroll. There may be one or two others who were very young in 1923 who were on the first Maintenance Payroll, but if there were any others, I cannot now recall who they were.

AUTOMOBILES OF 1923

Chapter VII

To get a clear picture of the early problems of District VIII, it is necessary to discuss the automobiles of 1923.

Model T Fords dominated the traffic, but there were several other makes of good cars. Probably the best car for the desert of that day was the 4-cylinder Dodge. The Dodge was one of the first popular cars to come out with an oil pump to circulate oil through the motor. The first Dodges with this oil pump had the oil pump attached to the under side of the crank case just above the front axle. Front axles were of heavy steel and were similar to the axles on wagons and crossed under the car from wheel to wheel. There were leaf springs and the front axle on these early Dodges would crash up against the oil pump and break the oil pump if you hit a chuck hole too hard. To cure this difficulty, it was necessary to place blocks of wood to prevent the springs from closing to a point where the axle could smash the pump. By the time we started work on our desert roads most cars had oil pumps inside the crank cases and this was also true of the Dodge. My beautiful Reo had such an oil pump, but it did not oil all of the motor parts and the "splash" oiling at "high speed" did not take care of a bearing in the front of the motor that actuated the timing device. If my Reo exceeded 35 miles an hour, (say 40 miles per hour) it would run about ten minutes at such an excessive speed and this bearing would then invariably burn out. The Dodge was free from such troubles and could be driven up to 45 miles an hour; at 45 miles an hour the motor sounded as though it would jump into your lap but it would keep going without burning out bearings.

Cars purchased by the State usually had "fabric" tires, and the State required State employees to wear them out. Such tires averaged about 3,000 to 4,000 miles. The State would then furnish (for desert use) "over-

sized" "Cord" tires. These Cord tires were far superior to "fabric" tires. "Fabric" tires were simply canvas coated with rubber. Cord tires were the forerunner of "balloon" tires. "Balloon" tires were the forerunner of the present-day low pressure tires. "Balloon" tires did not appear until a number of years after our efforts on our desert roads. Prior to "Balloon" tires, all tires were narrow and carried 50 to 60 pounds of pressure. Needless to say, such tires sank into the sand and were "murder" to car springs when the wheels dropped into chuck holes.

Fan belts were about as thick as a man's thumb and lasted only about 1,000 to 2,000 miles. Water pumps were on the same shaft as the fan belt and all water pumps on all cars invariably leaked around the shaft. The Equipment Department finally installed extra large grease cups; if you used the old reliable wagon wheel "Mica Axle Grease" in the special enlarged Equipment Department grease cups, the water pump would not start to leak until you had driven perhaps 100 miles. If you remembered to screw down the grease cup with the "Mica Axle Grease" before 100 miles, you would not have to put in a new bushing on the water pump shaft for perhaps a few thousand miles. If you forgot to screw down the grease cup and the water leaked on the fan belt, the belt would surely break.

It is my personal opinion that the greatest advance in the manufacture of automobiles to date is the present automobile fan belts, some of which are guaranteed for the life of the car. Manufacturers have also done something to stop that accursed leaking of the water pump, and I consider this the second most important advance in automobile design. All other auto design advances to date fade into insignificance compared to these improvements.

TRUCKS OF 1923

Chapter VIII

Trucks had just begun to come in general use in 1923 when District VIII was formed. Before 1918 there were practically no trucks in use on California highways.

One of the most successful and greatest war efforts of World War I ("the big war" according to Fibber McGee,) was the development of truck factories and the great number of trucks furnished the allies in Europe. At the end of the war these factories were going full blast, and leading Americans with imagination realized that trucks had a great future.

The Federal Government agreed with the truck manufacturers not to bring any of the war trucks home from Europe because the capacity of the truck factories in the United States was far greater than any possible domestic consumption.

There were great numbers of trucks which were only partly completed. There were also a large number on the docks ready for shipment to Europe.

A final U.S. Government decision was made within a year or two that the war trucks still in the United States be given to the States for use in developing highways. California received a large number.

I recall the best of these trucks were the "Nash Quads". These were four-wheel drive trucks. Like all trucks of that day they had hard rubber tires. Both in the front and rear of the "Nash Quads" there were couplings similar to railroad car couplings; it was possible to couple up these trucks in trains of four or five and with a four-wheel drive they were designed to plow through the mud of "Flanders Fields" in the "big war." I was a construction superintendent in District II at this time, and I recall that about ten of these "Nash Quads" were assigned to my construction work. These trucks were wonderful.

The only trucks that I recall coming out of the war with pneumatic tires were the so-called "G.M.C. Aviation Trucks". I was given one of these trucks. It had cord tires and would travel at 25 miles per hour. We used it to haul men to and from the work.

A gift from the Federal Government in connection with these trucks was an enormous quantity of castor oil; lubricating oil was in short supply during the war and farmers all over Southern California and the southern states were asked to grow castor beans from which castor oil was manufactured for lubrication purposes. This castor oil was *said* to be even better than the standard bituminous lubricating oils. When it was used in a truck or an automobile it smelled to high heaven; the nauseating stench was unbearable in an automobile. The Equipment Department was firm in demanding that all of this war surplus castor oil be used before any mineral oil could be put in a crankcase of a State motor vehicle. I recall that State employees paid for mineral oil out of their pocket for a long time to avoid the sickening stench of castor oil in State passenger automobiles. Trucks had no cabs and the stench was more bearable in trucks.

The great capacity of the truck factories soon brought trucks into general use. District VIII was formed exactly five years after the end of the "big war" and in a period of two or three years prior to the formation of District VIII even farmers started using trucks.

"DIRT" STATE HIGHWAYS

Chapter IX

I mentioned in Chapter III the one 10-mile stretch of 'oiled road' on the Needles road that had stood up and which was considered a 'marvel.' This was the only piece of the oiled road in 160 miles that had not ground up and blown away in the wind. At the center of this 10-mile stretch of oiled road was a gasoline pump and a little shed service station known as Chambless. This old service station is about a mile or two north of the present state

highway and last week I took another look at this 'marvelous' old stretch of oiling. It is still there and in fairly good condition, though of course, it has not been in use for many, many years.

There had been a good deal of oiling done to county roads throughout the State but 'oiled roads' were very much out of favor. At this period 'oiled roads' were considered to be almost a complete failure; witness the failure of 150 miles out of 160 miles of the county oiling of the Needles road.

However, there was the 10-mile stretch that was a 'marvel' of success. I determined to examine all other attempts at oiling roads that I could find, to see if any others were as successful as this 10 miles. In the meantime, I knew I must do something immediately to relieve the situation on the Needles road.

It occurred to me that if automobiles could travel at high speed, namely 35 to 45 miles an hour, possibly by getting rid of soft dust with its crooked ruts, or in the hard ground by getting rid of crooked ruts and chuck holes, traffic might be able to speed up and stop forming two ruts. This was a large order since many cars did not have the power to travel at 'high speeds' except on good pavement. However, cord tires were coming in and it seemed logical to think that perhaps if we could get rid of soft dust, and get rid of the chuck holes in hard ground, perhaps the cars could speed up to 35 or even 45 miles an hour. Such speeds were utterly impossible in ruts because ruts were so crooked. At such speeds cars would turn over if their wheels were in the crooked ruts.

The basic plan was to fill all ruts and chuck holes and stir up soft dust so the wind could blow away the fine material and thus leave firmer coarse material behind to sustain traffic.

We started the program on the Needles road with road graders. Most road graders prior to that day were drawn by horses and were light in weight, since horses could not pull a heavy road grader. Heavy graders were only beginning to come in use; they were dragged by tractors. However, the best type of road grader for this work was old-fashioned horse-drawn graders, pulled by very small crawler type tractors. We obtained a number of these with the idea of 'floating' the graders over the soft material, thus filling the ruts and winnowing out a maximum of dust. We also had the idea of not digging too deep into hard material; only just deep enough to gather enough material to fill the ruts and chuck holes. We did not want to loosen up the hard material anymore than we could help.

Prevailing winds on this road blow at right angles to the road. It occurred to me that after grading the roads to eliminate the ruts and chuck holes, we might then follow up with drags and that this would aid the wind in blowing away the smaller sizes of the soft material.

Ford had turned out wheel tractors and we had obtained some of these wheel tractors. To these wheel tractors we attached drags and the Ford wheel tractors could pull these drags at 10 to 15 miles per hour. At first we

used wooden drags; we then developed wooden drags with metal cutting edges for the hard ground. For the soft ground we found by experiment that light wooden drags with bristle brushes facing the road surface, in lieu of metal cutting edges, would stir up small-sized material to blow away in the wind; later on steel bristle brushes were substituted for bier bristle brushes. This development did not come all at once and was the result of the loyal cooperation and the best thoughts of Joseph Stanton, Maintenance Engineer, the maintenance superintendents, and the many foremen, equipment operators, and laborers who were encouraged in every way we could think of to make suggestions, manufacture equipment, and try out experiments on their own. Joseph Stanton and myself followed every improvement of technique and tried out every promising suggestion that was made. We wrote letters of commendation and gave everyone credit for any new thoughts. Within a period of two years we had a 'dirt road' that was really a revolutionary improvement over any previous desert dirt road. As mentioned in Chapter V, within two years the road all the way to Needles could be traveled at 35 miles per hour by the average car.

Success in making a road that could be traveled at 35 miles an hour on the desert, at very nominal cost, seems at this time to be only simple good sense, but the fact is that it was revolutionary for that day. We had road foremen and superintendents come in from Arizona, Nevada, and Utah and even as far way as New Mexico, when word was received that such a road was possible.

On February 11, 1924, the following editorial appeared in the San Bernardino Sun: **Not "Fair" But "Good"**

"It is to be hoped that we have heard the last 'knock' aimed at the condition of the Old Trails Highway between this city and Needles, so long as it is maintained in its present condition. When it is possible for motorists to cover the 248 miles from the Colorado River town to this city in seven hours, or a maintained speed of 35 miles an hour for the entire distance it might indicate that the driver who complains about the condition of the road really ought to consider the condition of his stomach. It is not the highway that is bothering him.

Early last week a party of highway officials, including representatives of the State Highway Commission, the Federal Government, and the Automobile Club, made a trip of inspection over the desert roads, returning via Needles. The State has been in charge of the Old Trails now for several months, and its maintenance crews are located at strategic points along the 160 miles from Barstow to Needles. They have not paved the road, but the log of this trip is in evidence to show that it has been greatly improved, and has been made a 'good desert road,' which in many ways is the best road in the world except a real pavement.

Of course, it is impracticable to talk of paving the entire distance now. The experiment in constructing the pavement from Summit to Victorville

established the fact. Distances are too great and the cost is too much. But so long as the State Highway Engineers will keep the road in such condition as to make it possible for the ordinary car to maintain a speed of 35 miles an hour for seven hours and cover the distance between San Bernardino and Needles in that time, the motoring public will not only be content but enthusiastic."

The foregoing editorial was copied in most of the Los Angeles papers. I think it well expressed the general public reaction to our 'dirt roads.'

OILED STATE HIGHWAYS

Chapter X

Early success in the first days of District VIII can be traced to the wonderful cooperative effort of everyone in the Maintenance Department. Also, it would be unfair if I failed to pay special tribute to T. E. Stanton who was at that time, Assistant State Highway Engineer and to R. M. Morton, State Highway Engineer. Both of these wonderful men gave me a free hand and encouraged my experiments in every way. I was, of course, betting my reputation on my experiments but they in turn, took final responsibility in allowing me to bet my reputation.

Next came oiling. As mentioned in Chapter IX, oiling on county roads throughout the State, had been prevalent but it had failed so miserably and so universally that it was in very low repute at this time. However, I had the nagging problem of the one 10-mile stretch at Chambless that was a "marvel" in having stood up like pavement, while the balance of the 150 miles to Needles had failed, ground up and blown away in the wind. I finally purchased a powerful compound magnifying glass such as are used by geologists to examine small crystal structures. We took a good many samples of this "marvelous" piece of road. I discovered that the voids in the aggregates were not filled by oil but that the particles were thoroughly coated with oil. Examining portions of other oiled roads that bled or rolled up in corrugations, on old county roads of ill repute, we found that invariably the voids between the particles were filled with oil.

We finally believed that we could make a road every bit as good as the "marvelous" ten miles near Chambless if we reduced the dust to a minimum and applied *just the right amount of oil* and thoroughly mixed it, until all the particles of the aggregate were all coated. The great difficulty was to determine the right amount of oil. This problem was solved by our superintendents and our many foremen and equipment operators. They reduced the dust by winnowing it out in the wind under dragging and traffic. We put on oil uniformly at about one gallon per square yard, and mixed it with road graders, bringing up from below more and more aggregate that was free from dust, until the appearance of the particles was similar to the appearance of the particles on the "marvelous" Chambless piece of road. The road mix surfacing was then laid down and traffic was allowed to consolidate

it, helped by continuous reshaping with graders and then dragging with broom drags. The results were amazing to us and everyone else. Of course, we immediately found that one gallon was not enough in sandy material, even though free from dust. At first one gallon was considered ample for coarse material. Later on we used the minimum of 1½ gallons per square yard on coarse material, and up to three gallons per square yard on free from dust sandy material.

Superintendents, foremen, and equipment operators were sent from all over District VIII to observe successful jobs and all soon learned the technique. The cost was roughly \$1,000 per mile for each applied gallon of oil per square yard. In other words, we found we could build "paved" desert roads for from \$1,500 to \$3,000 per mile.

Engineers were sent to us from all the Western States by the Bureau of Public Roads (now known as the Public Roads Administration) to be schooled. The Bureau of Public Roads later on sent engineers to us from all over the world to observe our work. They came from Egypt, Australia, South Africa, Chile, Peru, wherever there were desert roads and lack of finances to construct conventional pavements.

CREDIT FOR OILED STATE HIGHWAYS

Chapter XI

About ten years after our success with these "oiled roads", I was introduced to the National Asphalt Institute convention in Los Angeles by Dr. Hughes, then head of the western area of the Public Roads administration. Dr. Hughes was kind enough to introduce me as the "Father of Light Bituminous Pavements." In his introduction he stated that I had invented the light bituminous pavements for arid regions that had made possible the use of automobiles throughout the world in arid and semi-arid regions a great many years before it was financially possible to build conventional pavements in such places. I was much embarrassed by this introduction because I realized that credit was really due to the united effort of the many individuals of my wonderful organization. Upon my retirement, in 1950, Mr. T. E. Stanton, then head of the laboratory in Sacramento, wrote me as follows:

"Your pioneering a quarter of a century ago in the road or plant mix type of construction in which local granular material is uniformly mixed with asphaltic road oils and thereafter consolidated to form an excellent uniform compact and dustless surface for traffic over hundreds of miles of roads where the cost of the more expensive type surfaces would be prohibitive, at least with the funds available, merits special commendation. I refer particularly to the hundreds of miles of roadway on the main route in your

district from Victorville and Indio, especially to the Nevada and Arizona State lines.

"I find that in October, 1927, in reporting to the annual meeting of the American Association of State Highway Officials held in Denver, Colorado, that year, I recorded that to California went the credit for the most of the progress which has been made to date in the so-called oil mix method and that by far the best results have been secured in District VIII *where the process had been developed*, and the excellent results secured were a direct evidence of the skill developed there in construction methods.

"It is relatively unimportant whether or not the development of the general theoretical principles involved in the above constructions originated with you alone or jointly with others. The credit for aggressively putting theory into practice and developing a practical working procedure goes to you. The state and nation owes you a great debt of gratitude for your outstanding contributions."

I was a very young District Engineer and nearly all of the employees in District VIII were much older than myself. Most of them have now passed away, but I do want to again pay tribute to the wonderful organization that made possible this success.

ROUTE THROUGH SAN BERNARDINO

Chapter XII

When District VIII was formed, there was only one east-west route through San Bernardino, namely, Foothill Boulevard. Neither Highland Avenue or U.S. 99 (between Los Angeles, and Colton) were in the highway system. The present controversy over one-way streets in San Bernardino brings to mind the worry and fear of San Bernardino merchants in 1924. Foothill Boulevard had been constructed to a width of 16 feet partly by the cities and counties and partly by the State. It was paved all the way from Los Angeles to San Bernardino.

In San Bernardino the route followed Fourth Street to the Santa Fe viaduct (which had been constructed by the Santa Fe Railroad). There was a right angle turn in the middle of the viaduct which landed traffic directly onto Third Street. My recollection is that the viaduct was only 20 feet wide. There were many cracks in the floor of the viaduct. Railroad locomotives blasted smoke, steam and sharp sand (when they cleaned their boiler tubes) up through these cracks. Since the railroad sand bins were on one side of the viaduct and the round-house was on the other side, many locomotives passed under the viaduct blasting up sand. The blasting from below made it impossible to successfully patch the cracks. There was a heavy 3-inch pipe rail about 5 feet high along the two edges of the viaduct. Even the most gentle old plug of a horse, hauling a farm wagon, would rise up on its hind

legs and walk erect when blasted from below. This was disconcerting to drivers of approaching cars; they had to back up. I remember having to back up several times in my beautiful new State 'Reo' car, to escape having Dobbin come down on me. I recall that at least once, and perhaps several times, when Dobbin 'cake-walked', he came down with his front legs over the pipe rail and the fire department had to be called to dislodge him.

A driver of an automobile even in those days of 35 miles per hour maximum speed limit had to be cold sober in order to make the right angle turn in the center of the viaduct. All too frequently, one who had imbibed would keep straight ahead at the turn and go through the pipe rail and fall down among the railroad cars below. Sometimes such a driver would crowd an innocent approaching driver through the pipe rail.

District VIII started a campaign to try to pacify the local merchants to the extent that a new viaduct could be built with a concrete deck and with no right angle turn in the center. It took a good many years of patient effort to convince the merchants that the viaduct must be built in a straight line right across the railroad yards, ending at Second Street instead of at Third Street. The merchants were afraid that if the traffic got as far as Second Street, cars and wagons would keep on going east on Second Street and thereby miss the Third Street merchants. I do not recall that we ever really convinced the majority of the merchants, but they finally gave up in the face of our persistence and the present viaduct was built.

MORE ON THE ROUTE THROUGH SAN BERNARDINO

Chapter XIII

There were three alternate ways to go through San Bernardino, Directional signs gave three choices with no indication of which of the three alternates was best. after crossing the viaduct, as described in Chapter XII, the signing directed traffic east on Third Street to 'E' Street. Here there was a choice allowed by the signs of continuing east on Third Street or turning south on 'E' Street.

The traveler turning south on 'E' Street came to Mill Street, at which point the road narrowed to 16 feet. From Mill Street south, there was a swamp and the pavement was in a deplorable condition. The swamp was caused partly by artesian water which seeped freely over the land on both sides of the highway, and partly by the outfall sewer of the City of San Bernardino. The outfall sewer followed along the edge of the pavement. It was a thin vitreous pipe, 3 or 4 feet in diameter, near the ground surface. It was overloaded and under pressure. There were countless breaks in this sewer and the raw sewage flowed out of these breaks and down the gutters. This sewer extended all the way from Mill Street to the Santa Ana River. The

artesian water and sewage resulted in a soft mud subgrade. The pavement was in its last stages of failure.

There was a ramshackle bridge across the Santa Ana River. Almost every time the river rose, the approaches to this bridge would wash out. The other two alternate routes will be described in Chapter XIV.

MORE ON THE ROUTE THROUGH SAN BERNARDINO

Chapter XIV

If the South 'E' Street route (described in Chapter XIII) was not chosen by traffic in passing through San Bernardino, the signs at Third and 'E' provided for the second alternate. Traffic was directed six blocks east along Third Street to Allen Street. Here the traffic was directed south on Allen Street to Mill Street. On Allen Street there were a good many places of business and these merchants and also the merchants on Third between 'E' Street and Allen Street, were pulling hard to have this route adopted as the State route. (At the corner of Allen Street and Mill Street there was a small wooden service station which survived until recent years. This service station was removed only a few months ago when a new storm drain crossed Mill at Allen Street. Some old business buildings on Allen Street between Third and Mill Streets still remain, though only one of them still contains a business.) Traffic was directed from the corner of Allen and Mill Streets east along Mill Street to the County road named Mt. View Avenue, thence south across the Santa Ana River on a concrete dip to present U.S. 99. The present bridges across the Santa Ana River at Waterman Avenue and at Tippecanoe Avenue had not been built at that time. Needless to say, this route could not be used when the Santa Ana River was flowing, because of the dip across the river on Mt. View Avenue.

The third alternate route directed traffic north from Third Street on Arrowhead Avenue. At the corner of Arrowhead Avenue and Base Line, traffic was directed east and proceeded on Base Line as far as a connection to Orange Street, thence south to Redlands.

The third route was two miles longer but was the only one of the three alternate routes that could surely be depended upon to be open when the Santa Ana River was flowing. It flowed most of the winter months. The bridge across the Santa Ana River on Orange Street had been built by the County at a later date than the county bridge across the Santa Ana River on South 'E' Street, and was of much better design. This bridge was taken over by the State and is still in use on Orange Street.

It can be well-imagined the conflict of interest of merchants along each of these three routes. There were about an equal number of merchants on each route. There was a grim struggle as to which would be named the State route. The present difference of opinion on the one-way street problem in

San Bernardino seems to me to be a Sunday school picnic compared to this struggle of the early days.

ROAD TO THE MOUNTAINS

Chapter XV

The Waterman Canyon Road to the mountains had been taken into the Highway System at the time District VIII was formed. No construction work had been done on this road by the State.

The Waterman Canyon Road was hard to find. It took a sharp eye to follow the signs.

Starting at the corner of Third Street and Arrowhead Avenue, a sign pointed north and the traveler proceeded north 3½ miles. The first mile to Base Line was built up rather thickly with residences. The next mile to Highland Avenue was about half vacant lots and half residences. Neither Base Line or Highland Avenue at that time could be classed as business streets. North of Highland Avenue the country was mostly subdivided into 10 or 20 acre ranches of grapes, citrus, and olive groves. Nearly half of the area was vacant. 1.6 miles north of Highland Avenue a sign directed the traveler to the right for 0.1 mile, where the road crossed the trolley line. This trolley line carried the 'Big Red' passenger cars between Arrowhead Hot Springs Hotel and Los Angeles. Arrowhead Hot Springs Hotel was a large wooden building and was famous as a spa for treatment of 'rheumatism', and as a vacation resort for wealthy people of Los Angeles.

After the road crossed the trolley tracks, it then turned to the left and followed the tracks for a distance of 0.1 mile. At a point known as Five Corners there was a double turn and soon, a diagonal road to the northeast. If the traveler had eyes sharp enough to find all the signs at the turns, he was then launched on the mountain highway known as the 'Waterman Canyon Road', or the 'Switchback Road.'

This road followed up the bottom of Waterman Canyon substantially as the county road which now passes Club Oaks.

Remnants of this unimproved old road can be seen from the present State Highway just before one crosses over the divide at the head of Waterman Canyon; the old road can be seen climbing up the side of the pass between Waterman Canyon and Devil's Canyon. Another remnant of the old road can be seen from the present State Highway after leaving Panorama Point by looking to the left soon after leaving Panorama Point. This portion of the old road was known as 'Switchbacks.'

This primitive old road was surfaced in the summertime with two or three inches of sooty black mountain loam. This black loam was ground up by traffic to the fineness of talcum powder. In the wintertime this black loam surfacing turned into black slickens.

The old road in the canyon did not follow the grade line of the present county road up the canyon. There were continuous changes of grade line with steep pitches up to 25 percent. On hot days black clouds of dust hung like fog and covered the ferns and trees as though they were painted black. This dust was choking to the traveler and in perspiring weather his face was soon covered with a black plaster. This road could not be negotiated in the winter without chains. This primitive old road crossed Waterman Creek several times. There were several very narrow bridges of inadequate capacity; there were no bridges where the tributary streams entered Waterman Canyon. Tributary creek crossings were made over boulders, placed for a base, to avoid sinking into the mud. There were three watering troughs to serve horsedrawn vehicles. These watering troughs were also used for the boiling radiators of autos. Needless to say there was outcry from the public to do something to reduce the dust. Also, the road was only ten feet wide in many places and on the steep grades, when cars met, it was very hard to hold one car with its brakes, while a second car backed up to a passing place; rules of the road required that the down-coming vehicle must back up to a passing place, to allow the up-coming vehicle to pass. When the present State Highway was built, the name was changed from the 'Switchbacks' to the "High Gear Road.

MORE ON THE ROAD TO THE MOUNTAINS

Chapter XVI

Our first efforts on the Waterman Canyon (Switchback) Road were directed to laying the black dust. I recall the praise we received from all sides when we put on the first water wagon and started laying the black dust. It was quite a tricky operation; if a little too much water went on, the dust surfacing became slick; if not enough water was put on, the watering of the road would not last out the day.

This first operation was not enough. It was evident that we could at a small expense reduce the grade to an average of less than 15 percent by taking out the irregular humps in the grade line. The survey party was headed by Howard Noble. The party was as follows:

Howard Noble, Chief of Party, \$200 a month and board.

Marie Noble, (Howard's wife), Cook, \$80 a month and board.

K. R. Peterson, Chainman, \$95 a month and board.

Roy G. Glover, Chainman, \$95 a month and board.

Burton E. Wilson, Chainman, \$95 a month and board.

The party had three tents, one tent was a cook and dining tent, one tent was for Mr. and Mrs. Noble, and the third tent housed the three chainmen. There

was a beautiful camp ground about one-half mile up from the mouth of the canyon and the survey party camped here.

A day labor improvement project was worked out; some of the 25-foot radius curves were changed to 50-foot radius curves. All of the 25 percent grades except one were eliminated. Except for this one 25 percent grade, the ruling grade was about 15 percent. Also, we "selected" some decomposed granite material from the cuts and covered the black dust as best we could with fine decomposed-granite-sandy material. We added more water troughs to help the up-coming boiling cars. We put some of the tributary side channels in wooden culverts.

This improvement did fairly well for a time. Our success in desert oiling made us think that we might ultimately oil this primitive old road and we started by putting on what we called "dust oil." We put on about half a gallon of fuel oil per square yard which was really a heavy grade of diesel oil. This fuel oil made the dust and sandy-decomposed-granite into a mealy texture and ultimately we added light road oil so that we had a dustless road. We did not do this until we had widened the road. As soon as the road was widened to a graded width of about 15 feet, (so that cars could pass at any point), it was considered safe to oil it full width. The curves were really angles in the road and were so sharp that it was impossible to see far ahead. Even in second or low gear, downgrade cars would collide with up-going cars unless there was room to pass at all points.

One interesting problem was in connection with the filling of boiling radiators at the water troughs. We tried to keep a tin can at each water trough but the motorist, when he filled his radiator, would take the can away with him because he rightly feared that when he stopped at the next water trough there might not be a can. We tried chaining the cans to the water troughs but this did not work because motorists would be too impatient to wait for horses to drink. It took a long time for horses to drink their fill and in the meantime the chain on the can could not be made long enough to reach around a horse and wagon to the boiling radiator. The motorist would therefore break the chain and carry off the can. We tried putting up signs "Can is State Property," followed by appropriate legal threats. This did no good. Some brilliant mind in the Maintenance Department conceived of a sign that worked. The expression "Be a Sport" in those days was understood to mean to be kind, courteous and generous (like a boy scout). With this in mind, the sign was changed to "Be a Sport and Leave the Can." It is now hard to believe, but this sign really worked.

MORE ON ROAD TO THE MOUNTAINS Chapter XVII

During the period described in Chapters XV and XVI, some work was being done on this mountain road near Big Bear. The Automobile Club of Southern California, the Los Angeles Chamber of Commerce, the San Bernardino Chamber of Commerce, had all gotten together and were urging that more 'Forest Money' of the Federal Government be spent in Southern California instead of most of the 'Forest Money' going to Northern California. A project had finally been approved from Big Bear Dam to Lakeview Point. This was known as the 'Deep Creek Cut-Off.' It was a substitute for the existing primitive road from Fawnskin to Green Valley, to Crestline, to the head of the Switchbacks above Waterman Canyon.

This 'Deep Creek Cut-Off' was already under construction by the Federal Government at this time. It was the most badly needed portion of the road. Many cars simply could *not* make it over the existing primitive road between Green Valley and Fawnskin. There was no road whatsoever along the present Deep Creek Cut-Off.

The County 'City Creek Road' was at that time incomparably the best road into the mountains and it was planned that the Federal Government would build with 'Forest Money' from Big Bear to Running Springs Park. The State of California started a day labor crew working west from Running Springs Park to eliminate a very bad section in that area. It was thought that the County City Creek Road could be used both as an entrance to Lake Arrowhead and to Big Bear areas.

Upon the completion of Deep Creek Cut-Off it became evident to the public that it was indeed possible to build mountain highways of 20 feet graded width, on alignment with no less than 50-foot radius curves and grades of not over 6 percent. The cry then went up to connect San Bernardino with the mountains by Waterman Canyon with a modern 20-foot wide 'High Gear' highway.

Old 'City Creek Road' was not in the State highway system at that time, and the pressure was overwhelming to make a good State highway from San Bernardino into the mountains. The Los Angeles groups were even willing to sacrifice some of their 'Forest Money' being spent on the Mt. Wilson road to help our highways. The rest is relatively modern history; the Waterman Canyon and Switchback road was eliminated with the 'High Gear Road.' This road was built thirty years ago and has never been materially changed since it was constructed.

I might make two other notes on this High Gear Road. The question is often asked about the beautiful stonework, the chain guard rails, the many beautiful plantings, and when it rains, the beautiful wild flowers along this route. San Bernardino was suffering from the great depression and the first

unemployment relief programs were by State employing of a very large number of San Bernardino men on a work relief project on the 'High Gear Road.' The State paid for this work prior to the Federal Government relief projects. The stonework was all done at this time. Two large crews were used. Regular State laborer wages were paid.

One crew worked Monday, Tuesday and Wednesday and was paid off. A second crew worked Thursday, Friday and Saturday and was in turn paid. This work continued until the Federal Government started the Federal unemployment relief programs. Don Wieman had charge of some of these men and it was his schooling that resulted in the beautiful stone work still seen along the 'High Gear Road.'

We had such a large number of people to take care of, that it occurred to us that we could use some of them to plant roadsides. Plantings were frowned on as a State Highway policy at that time, but finally some small amount of money was allotted. We sought and received donations of trees. Also, we replanted small trees, gathered from the adjoining forests. I recall that I bought \$30 worth of wild flower seed with my own funds. I tried to get the State to reimburse me; no dice. Seeds were not broadcast but were actually planted and covered with suitable earth. They grew well. These wild flowers have re-seeded themselves along many miles, and even after all these years, when we have good rains, the cut and fill slopes are clothed with wild flowers of varieties not usually found in these mountains.

A few years later, the policy of the State changed and erosion control plantings were promoted. Also, several landscaping projects were approved. The many unusual trees, the beautiful flowers of yellow 'Broom' and the vivid blue of 'Purple Sage' are the result of these plantings. This route is the unchallenged show place of State highway landscaping in Southern California. The later plantings were by skilled State landscape engineers, but the early plantings of the San Bernardino unemployment relief program laid the foundation and gave a head start of many years.

SAND TROUBLE

Chapter XVIII

Southern California has been in a "Dry Cycle" for almost 20 years, but when District VIII was formed we were in the midst of a wet cycle. Sand trouble is caused primarily by heavy winds due to the exchange of hot dry desert air and the cool moist marine air from the coast. In a wet cycle this exchange is more violent and prolonged and occurs more frequently than during a dry cycle.

Sand troubles were of two sorts; one was the engulfing of the highway by moving sand dunes, and the other was due to sandblasting of automobiles. Following a week or two of rain on the desert, winds blowing down through

the San Gorgonio Pass would be of such violence that they would carry pebbles up to one-eighth inch in size. The area between Garnet and Whitewater became impassable during wind storms because these pebbles would strip the paint off a car and would fret the windshield to such a degree that it would become opaque. Also, the pebbles would pack in around an automobile motor and fill in the space under the hood until the carburetor was covered. This situation was made worse by the completion of a 16-foot wide pavement between Whitewater and Garnet which loosened up the surface of the sand on each side of the pavement.

We had similar troubles near Desert Center and along stretches of the highway east of Yermo. The road from Barstow to Needles never did have much of this sort of trouble except for a short stretch west of Ludlow. The worst trouble of all was moving sand dunes. One large dune, three miles north of Kane Springs, had approached the highway and was engulfing it. The State had established a tent "Horse-Camp" at Kane Springs. This camp consisted of five men and ten horses. Eight horses were used on tow "Four-Horse Fresnos" and two horses were used during wind storms to drag cars through the moving sand. Between sand storms the same two horses were used to haul drinking water and supplies from Westmoreland to Kane Springs.

Driving past Kane Springs last week, I noticed that the spring is still functioning, but there seemed to be no inhabitants there at the present time. The State cleaned out the canes to increase the water supply but the canes have now come back and are flourishing again. Kane Springs is a famous old water hole used by the pioneers and is praised highly in the diaries of all the old wagon trains of the early days. But, times change. Our men could not drink the water though the old timers thought it was wonderful. The water had a rich acrid-alkali taste that the delicate modern stomach could not tolerate. We, therefore, hauled water for the men. The horses seemed to thrive on this water but the fact is, new horses coming to the job, would snort and refuse to drink for the first three days, after which they seemed to really enjoy drinking this historic water.

Up until the formation of District VIII the five-man crew went back and forth from the tent camp at Kane Springs to the huge sand dune and worked each day bucking the sand dune across the highway. The cost of this operation was \$6,500 per year. This was considered an absolute impossible maintenance expenditure for that period.

MORE ON SAND TROUBLE

Chapter XIX

Just prior to the formation of District VIII a new Governor had been elected and the most violent criticism of the previous administration (prior to the election) had been directed at the Highway Department for not solving the highway problems of Southern California, particularly the problems of the interstate connections. I was told that in forming District VIII, the principal and immediate project must be the solving of these interstate problems of which the sand difficulty was the worst.

Before District VIII was actually formed, I had some time to study the sand problem. I attacked the problem by going to Berkeley where I made a thorough search of the University of California library, hoping to find the solution to this problem. Also, I wrote to the Secretary of the American Society of Civil Engineers in New York and secured a search of this large engineering library. I spent a month in Los Angeles just prior to the formation of District VIII going over the District VII records, covering the highways of the new District VIII, and during this month I spent evenings searching the Los Angeles Public Library for data on sand control.

All of this effort came to naught. I found reports of a good many of highways built across moving sand dune country. All of them were similar to the road the State had already built across the sand dunes near Yuma, namely, a movable plank road surface that could be raised or lowered as the sand dunes approached and crossed the roadway. The plank road the State had already built was over seven miles long. It was eight feet wide. This plank road was considered a failure because it was inadequate for the traffic. The traffic count was 246 cars on Sunday and 175 cars on Monday. Also, the plank road was considered a failure because of the excessive cost of raising and lowering the planks. It cost \$35,000 per year to carry out this operation and the State Highway Maintenance Department felt it could not continue this excessive cost.

Since we could find nothing to guide us in past engineering experience, we decided that we must make an original investigation of the actual movement of sand dunes to see if dunes could be stopped or slowed down. The final solution did not become evident until our investigation had continued for a period of nearly a year.

The investigation consisted of hauling a truckload of sand-dune sand to San Bernardino and constructing a wind tunnel. This was before the days of present airplane 'air stream' wind tunnel studies. We had never heard of a wind tunnel but we made one when we found that we must confine the air in order to direct it across our truckload of sand.

Our wind tunnel was about 30 feet long, two feet high and 5 feet wide. We constructed miniature sand dunes of various sizes in this wind tunnel and

blew wind through the tunnel with electric fans. The tunnel had a lid on it that we could take off. Small crescent-shaped dunes would form and we then manipulated these dunes by putting trenches across them, making pot holes in them, cutting off the crescent arms and performing many other experiments.

We found that cutting a windrow through the middle of a dune (which increased the velocity of the wind passing through the dune) tended to blow the dune away. We found that a pot hole constructed in a dune caused a partial vacuum and this also tended to blow the dune away.

The real solution to the problem finally came when we noticed that the dunes moved forward inversely in proportion to their height. A smaller dune would move many times faster than a large dune; this, with the same velocity of wind blowing for the same period of time. We also found that when a barrier was placed in front of one of our smaller miniature dunes, if the barrier was of the same height as the dune, the barrier was not engulfed by the dune. When the small dune approached such a barrier it would build up against it but not climb over it. The small dune would remain the same height as the barrier and each particle of sand would become airborne and go over the barrier.

I was much interested in mathematics at that time. I had, in fact, taught a night class in calculus to supplement my income during my first years as a young engineer. From our experiments with these miniature dunes in our wind tunnel, I was able to write a formula describing dune movement that indicated dunes at the Sand Hills of 35-foot height would probably move only about ten feet per year, though dunes of 100-foot height would move only one inch per year, while dunes 10 feet high might move as much as 15 feet in one wind storm.

Armed with this theoretical data, we started experimenting with the sand dune near Kane Springs and with the many sand dunes where our highway crossed the 'Sand Hills' near Yuma.

MORE ON SAND TROUBLE

Chapter XX

Testing out the theoretical data we had accumulated from our miniature sand dunes in our sand tunnel experiments, we started digging pot holes in the big dune near Kane Springs. This worked quite well and greatly reduced the work necessary to keep this dune off the highway. The pot holes excavated by our horse-powered equipment, involved relatively little yardage movement of sand but we wanted to try excavating a trench through this large dune, parallel to the direction of the wind, to see if our theoretical experiments would work on a really large dune. Finally, we had the extraordinary good fortune to have a period of calm weather long

enough to dig a considerable trench across this dune followed by a very heavy wind that lasted for a long period without letup. This one wind blew the Kane Springs dune almost completely away and we were able to move the rest of this sand dune across the highway in a period of the next few weeks.

We tried out pot holes and channels across the dunes near Yuma, where the old plank road crossed the Sand Hills, and these were quite successful in reducing the raising and lowering of the plank road but did not really solve the problem. The plank road had to be closed for hours at a time as we raised or lowered the planks.

Since our experiments with miniature dunes indicated that the big dunes moved slowly and the small ones were the only ones that moved fast, we staked out the approaching dunes along the Sand Hills plank road to see if our calculations based on miniature dunes were borne out by actual behavior of the full-sized dunes. After one blowing season we were convinced that we were correct in believing that we could build a highway across the sand hills in the form of a fill (corresponding to the barrier of our wind tunnel experiments). The fill was made higher than fast moving dunes. We placed the highway alignment location to avoid the large slow moving dunes. For the past 33 years, our calculations have proven to be correct. There has never been serious trouble from moving dunes on our permanent fill crossing the Sand Hills.

The crossing of this sand dune area by our permanent road is past history. It was written up in engineering journals around the world at the time and we had engineers coming from all over the world to review our work for many years. Our success exceeded our most sanguine expectations.

INDIANS

Chapter XXI

When District VIII was formed, the counties furnished all of the right-of-way. The counties had no Right-of-Way Departments and each supervisor attended to the purchase of right-of-way where a State Highway crossed his supervisorial district. Supervisors were elected for short periods of time (not long enough to acquire skill in right-of-way negotiations.)

The most difficult right-of-way negotiations were with Indians. Since Indians had no vote at that time, the supervisors seldom personally knew the Indians. I recall that when we took over the 'Palms to Pines' highway (from Hemet to Palm Springs) that no right-of-way had been secured across the Santa Rosa Indian Reservation.

The Santa Rosa Indians had started a campaign of putting up barricades across this State Highway. The Riverside newspapers were full of sensational

stories; travelers were afraid to use this highway. Something had to be done at once.

In general, the Indians representing the Indian tribes had excellent educations (in English), some being graduates of Carlyle University, but I found that usually they would not acknowledge they could even understand English. At a tribal meeting there would be a group of 8 or 10 Indians. The Indians would have their long hair falling over their shoulders or done up in huge buns on their heads and the conversation would usually be in grunts or in the tribal language, interpreted by an inadequate interpreter. I finally grasped what the trouble was, that any money paid for the right-of-way did not go to the local Indians but went to a fund administered in Washington which was supposed to be used for the general betterment of all Indians. In those days, the State had no District Right-of-Way Department and the District Engineer or one of his assistants tried to negotiate, when a County Supervisor failed. I recall having a good many tribal meetings and we finally hit on a plan so the Indians could get a little money. One of the principal complaints of the Indians was that they feared if they took down their barricades and cars went over the highway at 25 to 35 miles per hour, that their ponies would be killed. Each Indian's wealth was measured by the number of ponies he possessed.

The plan that was finally worked out was paying the government for the land but hiring the Indians to put up fences. We paid the Indians a small sum for each fence post and we bought barbed wire at State expense. The Indians cut the posts from their own land and put the fences up.

This was one of the happiest right-of-way solutions of that troublesome time. The Indians benefited by receiving small sums of money and the ponies were saved from the 'dangerous' cars. Everyone was happy.

Years later, another fence deal based on this original success was worked out by Charles Mackey, who is now District VIII's Right-of-Way Clearance Agent. At that time, Charlie was a young right-of-way agent in the recently-formed District Right-of-Way Department. Charlie discovered that the Morongo Indians were much embarrassed because they had no uniforms for their baseball team. They had to play in old blue-jeans against the 'rich' Palm Springs Indians attired in fancy uniforms. We were widening the right-of-way through the Morongo Indian Reservation and had to get additional land from the Indians. Charlie had the usual tribal council meetings and finally settled on the basis of the Morongo Indians putting up a fence and being paid for the work; the Federal Government receiving the money for the right-of-way. The results were equally happy. The Morongo Indian baseball team went down to Palm Springs with their resplendent new uniforms and were able to play the 'rich' Palm Springs Indians without embarrassment. Charlie tells me he still has pictures of that baseball game, though sad to relate, the Morongo Indians were beaten in spite of their beautiful new uniforms.

**MORE RIGHT OF WAY TROUBLE---MINING CLAIMS
(HONEST PROSPECTORS)
Chapter XXIII**

At the beginning of the highway location period in District VIII about the only person one would meet on the desert, (away from the old county-road trails), would be a prospector of the old school, walking along with his burros. We would often find one camping at a spring. There were many living springs on the desert at that time because we were in a wet cycle. Sometimes our location would cross a prospector's mining claim. If he were working the claim, we would, of course, deal with him as a property owner. There was often a difficulty in tying in a prospector's claim, even though it was staked out on the ground. If there was no nearby section corner, the prospector would often dig up a distant section 'corner-post', hence the difficulty in correctly tying in the mining claim.

I recall one sharp old prospector. We paid him a small sum for right-of-way across his claim. This old boy was really *sharp*. Our location went down a gravel slope for a long distance. After our location stakes were all in, this sharp old prospector followed our stakes down the slope for a long distance of several miles, filing placer claims right down the middle of our proposed right-of-way.

Fortunately, we had about six months to acquire right-of-way on this particular project and this situation was taken care of by putting his placer claims under condemnation. He never answered our condemnation suite and we acquired title for a dollar or two a claim, this being the amount we had deposited in court.

This did not end trouble with 'honest' prospectors placing claims along our rights-of-way. Something had to be done about it. I conceived the idea of the State filing mining claims along new rights-of-way at the time of the original location. State attorneys thought it was useless for the State to file such claims, since the State would not really have found any gold and, therefore, had no color of reason for filing such mining claims.

With this decision in mind, I felt that, as an individual, I had just as much right to file claims as an old prospector and I started the practice of filing mining claims along all of our new desert locations in my own name. This stopped sharp old prospectors. I recall that the filing fee was perhaps only a dollar or two, but the plan required filing on a good many claims, to entirely cover our new rights of way across the deserts. My own pocket was not too well-lined. The pay of the District Engineer was exceedingly modest at that time, and I was raising a family. In no time at all, I had made a donation to the State of several hundred dollars.

I recall I tried to put these filing fees on my expense account, no soap. I tried to get our comptroller to find some way to reimburse me. He called for a ruling from our attorney and got this final result: The State would *not* pay. Someone in Headquarters Office suggested that I get my local State Senator to introduce a bill in the Legislature to reimburse me. He tired, but without success.

I am still looking for reimbursement.

MORE RIGHT-OF-WAY TROUBLE---MINING CLAIMS

Chapter XXIV

I recall one instance where our new location missed a small service station and motel. This was in a Government land area but not in an area where prospectors were active. It did not occur to me that anyone would file a mining claim on this new location.

I suddenly found I had made a mistake in not filing my usual mining claims along the new right-of-way. The service station-motel operator filed a mining claim square across our new location.

This man was not a prospector. He was highly intelligent and he hired an attorney. There seemed no choice but to take him into court. He had a mining engineer assay the gravel and there was a tiny trace of gold. The amount of gold was perhaps about the same as the trace always found in sea water; such a trace of gold can be found in almost any gravel anywhere. We were very reluctant to go to a local Superior Court with this man because we feared that a credulous jury might believe he had actually found gold and give him a large settlement.

I had heard that it was possible to induce the Federal inspector, assigned to the examination of placer claims, to hurry up his inspection and to pass on whether a federal title should be issued for a claim.

We took the case into a Los Angeles Federal Court. The Federal inspector testified that the trace of gold was so slight that it was not a practical mining claim. The service station operator testified that he had invented a machine and that this machine could profitably extract even the trace of gold. The machine was not brought into evidence; it appeared to the court that the machine was a nebulous dream and the court decision was that the mining claim was invalid and the Federal Government donated the right-of-way to the State instead of donating it to the owner of the mining claim.

LOCATION Chapter XXV

The location of most of the old county roads was from water well to water well or from natural spring to natural spring. Good direct locations almost never went by one of these wells or springs. Wells or springs were always out on some "dog leg" and the final location had to cut across these "dog legs".

I recall one such well. It was known for its bountiful water supply. An elderly woman, thin and dried up from desert living, had a small shack alongside her well. Our locating engineer proposed to miss her by several miles, instead of detouring around a "dog leg" by her well.

This woman was determined that we make the detour by her well and started a campaign of letters to the State Senator, to the State Assemblyman and to the Board of County Supervisors. I was finally instructed by Headquarters Office to go out and to see her, to personally make sure we *positively* had to miss her in order to achieve good alignment. I was "desert-wise" and always carried a bountiful supply of water in my car. I was skeptical of most local water and I had, therefore, never sampled her water (which was supposed to be so very good). She greeted me with great joy and started to tell me about the virtues of her water. She said that it not only was very fine drinking water but that it had medicinal qualities. She said that there was an unlimited volume in her well. The well was shallow; she had an old-fashioned cast-iron hand pump. I asked her why she didn't plant a garden. She said she had tried to, but while the water was fine for drinking it killed plants.

She assured me that the water was wonderful to drink and would cure all the ills of man.

She also assured me that when you put her water in a car radiator (this being the largest use for water on the desert) you could then flush the radiator and that the most amazing amount of dirt and of rust deposits would come out of the radiator. She said she never advised putting it in *old* radiators.

It finally came time to sample the water. She poured me a bounteous glassful. I accepted it in good faith. It was sparkling clear and slightly effervescent. She fixed me with expectant eyes; before I could stop, I had drunk half a glass. I quickly discovered that this water had exactly the same effect on the human system that it had on a car radiator. I realized at once why she did not advocate it for old radiators; it probably would have completely dissolved an old radiator. For a time I thought I was dissolving, but I was young and vigorous and in a few days I was back to normal.

I sent a sample of this water to the testing laboratory and the laboratory reported that it was very close to a saturate solution of epsom salts plus other equally potent medicinal salts.

TURTLE JUICE

Chapter XXVI

In the early period of District VIII, there were a number of moonshine stills throughout the desert region. The product was usually referred to as "turtle juice."

The "turtle juice" was said to be made from cactus. It would be distilled in a hidden canyon, at a considerable distance from the shack of a moonshiner. The moonshiner's shack would be near a natural spring or well and it was always alongside of the desert trail that passed for a road. The moonshiner's dwelling would consist of perhaps to a lean-to shack but sometimes only a tent.

Soon after the formation of District VIII, headquarters office sent me an engineer (from out of State) to go over my District with me. I was trained as a child and as a young man, in the moral theory that strong drink was sinful, so I was well-fortified to claim I was "on the wagon." However, this out-of-State engineer had no such scruples. He sampled the wares of the several moonshiners we passed. He enjoyed the "turtle juice" and partook generously. I recall that by the end of the trip, when we got back to San Bernardino, he was still on his feet, but I questioned his insistence that he could get into bed without help. I left him in bed in his room at a hotel in San Bernardino. The next morning about 10 a.m., he telephoned me and said that he had gone blind and wanted me to come and help him.

I got this young man dressed and into a hospital; his blindness was common complaint in those days. With a few weeks of intense medical attention, his eyesight came back (that is, fairly well).

In the early days there were some "Road Associations." These "Road Associations" were promoting different routes with the idea of benefiting their communities. These "Road Associations" had picturesque names. The adventures and efforts of these "Road Associations" would make a long story in itself. In later years, these "Road Associations" developed into substantial organizations, but at first, they were casual groups with a backbone of young and vigorous men in the automobile industry. At frequent intervals these groups would want to make a trip over some desert trail to promote a particular route which they felt would benefit their communities. Usually all the younger, more vigorous and adventurous of the group would go on the more dangerous trips, but there were sometimes a few mature men who went.

The Automobile Club would cooperate with these groups and helped on these trips. I would always go. Before the group got to the first moonshiner's shack, I made it a point to tell about the incident of the young engineer who was temporarily blinded by "turtle juice." This would warn more mature men, but the story only served to whet the thirst and add spice and excitement to the desire of the more adventurous young men in longing to try out the "turtle juice."

I recall on one memorable occasion that one of the leaders of the group said that if you really wanted to enjoy "turtle juice" you should not drink it from a glass, because if you did, you might look through the glass and see the blue "fusel oil" floating around in the "turtle juice." On the other hand, he said you should not drink it out of a tin cup because if you did this and it tasted tinny, it was hard to tell whether the tinny taste was from the moonshiner's still or from the tin cup. In view of this, he said he always carried along a supply of paper cups for the group to drink from. On this particular memorable occasion nearly all of the more rugged members of the party, (but not me) joyously accepted a sample of "turtle juice." It was served up in the paper cups.

The group undertook to wait until everyone was served, before drinking to the success of the expedition. Suddenly, one of those first served noticed that his paper cup was leaking. He called for a new cup, but then everyone else also noticed their respective paper cups were leaking.

The "turtle juice" had eaten holes right through the paper cups. This was the end of the joyous sampling of this particular "turtle juice."

MORE ON INDIANS **Chapter XXVII**

About 37 years ago I made a trip down the Colorado River from a point opposite Parker to Blythe. We started out early in the morning. There was no road or even trail along the river. I had some husky surveyors with me. We planned to fight our way through to Blythe. Blythe was about 30 miles distant. As far as we knew, there were no habitations.

We had shovels, pieces of canvas, to help get us out of sand traps, together with short pieces of planks, and the rest of the usual paraphernalia of early day pioneer desert traveling. After proceeding down the river for about 10 miles, we came upon the tracks of another car ahead of us. Cross washes had banks a few feet high and the car preceding us had dug nice trenches down the banks allowing the car to get down into the washes and out the other side. Since the tracks were going in our direction, we followed them. After a few miles, we came upon the car preceding us. It was a Model T Ford with a family of Indians. The car was parked on a high spot on hard ground and the fine looking man of the family stood to one side with his arms folded

in great dignity. Sitting on the ground was the mother of a brood of three children. The mother was young and smiling. She was a little on the plump side but with the very attractive features of a young Navajo squaw. The children were charming and full of smiles and giggles.

The mother was sitting cross-legged on the ground with her wide squaw skirt spread out around her. In her lap she had an innertube and I then noticed that one of the tires of the Model T was off, with a large hole through it. A tire 'boot' was in evidence.

It was the unwritten law of desert travelers that one never left a stalled car without offering aid. We stopped and asked what we could do. The man of the family looked right over our heads without answering. The mother smiled but said nothing. The children all giggled.

This family being so well dressed and in the possession of a Model T Ford convinced me that they must be Mojave Indians from the Yuma Indian Reservation with an allotment of land in the Yuma irrigation Project. Indians in the Yuma Irrigation Project usually rented their little farms to white people and lived in the luxury of good clothes and broken down Model T Fords.

Since they did not answer my questions, I realized they were pretending they could not understand us. I had already had enough dealing with the Mojave group to realize that they were probably at least Sherman Institute graduates, and that the father was perhaps a Carlyle University graduate, was sure they spoke English, but I respected their desire for privacy.

After watching the mother for a few minutes I noticed that the innertube had a long tear. She had a piece of old rubber and was carefully sewing a patch over this tear. This was too much for me and I went over to her and told her she could not keep the air in the tube by sewing on a patch. Her husband did not look at me. He continued to gaze over my head.

After a time I gave up, due to their unwillingness to admit they understood, and we went on our way.

This incident bothered me a good deal. I never forgot it and for many years I wondered what happened to this family group. Only a few years ago, it finally occurred to me that they may have had a tube of rubber patching cement and that perhaps they could slip the patching cement under the sewed-on patch and at the same time seal the needle holes of the sewing. I am still wondering.

PICNICS

Chapter XXVIII

At the period of the formation of District VIII, it was quite the thing to have picnics. District VIII had many such picnics. I recall one of the early picnics on March 2, 1924, in the town of Palm Springs.

We were in a wet cycle and decided to have the picnic where we were certain it would not rain. Palm Springs also was chosen because we knew it would be quiet and in the country. The picnic was held on what is now the main business street of Palm Springs. There were some shade trees and a small service station that provided water and restroom facilities. We had a baseball game. We held foot races for men, for stenographers and for the children. This was followed by a bounteous feast.

Picture No. 1 shows the stenographers' foot race. I am seen standing on the right side of the picture; I was the 'starter.' My little daughter is seen running along, pacing the racing stenographers. There are five stenographers in the race.

This street is not the heavily traveled State Highway through Palm Springs, but I do not recall that any traffic interfered with our foot races or our baseball game.

We held the picnic at Palm Springs to avoid rain but in a wet cycle it even rains in Palm Springs. Notice the puddles of water on the oiled road in Picture No. 2.

There were only six girls in the District Office at that time. They all had lots of pep. I am unable to distinguish one from the other from the group picture, but the list of girls is as follows: Verna Neville, Allis Cane, Eleanor Lyons, Della Bittke, Verna Peake, and Edith Miller. Three of these girls were in the Accounting Department. Verna Neville is now Mrs. Russell Lawrence. I was able to identify only a few of those in Picture No. 2; thanks to Ralph Wright, we were able to identify almost everyone. I have a good set of pictures of this picnic and of other picnics and intend to use them later in an illustrated reminiscence.

Nearly all of these State employees have either passed away or are in retirement. I think that Wally Ford and Ralph Wright are the only ones left in service, who were probably at this picnic.

GOVERNORS Chapter XXIX

In the early days of the State Highway Department, the Governor of California nearly always made it a point to be present at the opening of newly completed highway contracts. In those days, the State Highway Department was by far the most publicized and popular operation of the State of California. Successful building of highways was of the greatest political value to a Governor. Governors were properly intensely interested in highway work since public acceptance of State highways was a considerable measure of public approval of the Governor's administration.

As years have gone by, other phases of State Government have become much more politically important to a Governor, for example, State Aid to

schools, to Veterans, to the Unemployed, State Pensioners, Water Development, etc., have far over-balanced the political importance of highway development.

I vividly recall my first contact with a Governor of California. I was Resident Engineer in Tehama County when we opened a completed new highway. I was introduced to the Governor and sat on the reviewing stand. The reviewing stand was gaily decorated with red, white and blue bunting. I have been the Resident Engineer on the project.

The pavement was of standard narrow 4-inch thick Portland Cement concrete. The plans did not call for the curves to be superelevated (that is, banked). As Resident Engineer, without authority from Sacramento or from the District Office, I had gone ahead and banked all the curves.

Our State Highway Engineer was A. B. Fletcher. He came to the grand opening from Sacramento with the Governor.

I recall my dismay when A. B. Fletcher took me to one side and questioned me in tight-lip anger, as to why I had banked the curves. I was very young, hardly dry behind the ears. I was unable to explain why I have committed the terrible blunder of banking the curves. I was told to forward a written explanation. I expected to be fired.

In those days, the Resident Engineer was informed that he not only represented the State of California in dealing with a contractor, but that he was also the personal representative of the District Engineer and the State Highway Engineer. All correspondence between the Resident Engineer and the District Engineer was required in duplicate, the duplicate being sent directly to the State Highway Engineer in Sacramento so that the Sacramento office could be instantly in touch with what was going on at all times on all contracts. I had never mentioned in any of my correspondence that I was banking curves on this contract. I had not intended to hide anything, I was simply too young and inexperienced to know I was committing an inexcusable deviation from policy. I thought I was improving the job at no extra cost, and that everyone would be happy.

I sat on the platform and listened to the speeches of the local dignitaries. I recall that my chest swelled with pride when they all praised me to the skies for banking the curves. The banking of the curves was hailed as a wonderful innovation never before seen by them. The speed limit was 25 miles an hour, and, unknown to me, Chief Engineer A. B. Fletcher had taken the stand that there was no sense in banking curves.

I followed instructions and wrote a most difficult letter about my banking of the curves. To my surprise, I was not discharged or even officially reprimanded. I never heard anything at all from my letter.

I would like to emphasize that I was very young at the time. I tried to imagine that the Governor, having listened to the praise of the local dignitaries, had instructed the Highway Department to start banking curves.

In any event, within a few months, word came from Sacramento and from the District Office to bank all curves.

MORE ON GOVERNORS

Chapter XXX

In my last reminiscence I tell about my first contact with a Governor of California. When District VIII was formed, I soon found that I would have many contacts with Governors. Except for Governor Richardson, a Governor would arrive in San Bernardino or perhaps enter District VIII at El Centro or Pomona and I would be instructed to meet him. There would be a cavalcade of State cars and I would be assigned to ride in the car with the Governor. I would act as guide for the party. The Governor would always have a chauffeur and sometimes there would be someone from our Sacramento office.

Other cars in the cavalcade would be driven by the head of the State Department of Agriculture, the head of the State Department of Corrections, and perhaps the head of the State Hospital complex. The object of the trip would be for the governor to see all the new highway projects and examine other State Department activities. In the early days such trips by the Governor came once or twice each year. In riding in the Governor's car, (sometimes for several days) and talking over highway matters with him, I felt that I became quite well acquainted with each Governor.

Not all Governors followed this pattern. Governor Friend Richardson was a notable exception. He was the first Governor who contacted me in District VIII. He came to San Bernardino without previous notice and telephoned me in San Bernardino from the Sunset Hotel at Third and 'F' Streets. He said he wanted me to pick him up and take him for a trip.

The Sunset Hotel was at that time about the same class of hotel in appearance as at the present time. It was respectable, neat and clean, but not in the same class as the Arrowhead Springs Hotel or the Mission Inn. All other Governors who followed Governor Richardson, if they did not make an appointment to have me meet a cavalcade, would telephone me to pick them up the Ambassador Hotel in Los Angeles or if they stopped at a local hotel, it would be the Arrowhead Springs Hotel or the Mission Inn in Riverside.

After receiving the call from Governor Richardson, I went to the Sunset Hotel and found him sitting in the lobby chatting with the hotel clerk. I had never met him before, but he introduced himself and also introduced the hotel clerk. If you are over 60 years of age, you will remember the old-time "style" pictures in barber shops, showing various styles of men's haircuts. One would be entitled "New York Haircut." Another might have the title "For a Formal Dance." Another might be entitled "Professional Man," "Musician,"

"College Professor." But the haircut I saw on Governor Richardson was known as a "Statesman Haircut." I will leave to your imagination Governor Richardson's "Statesman Haircut."

I was struck by Governor Richardson's clothes. They were neat as a pin but reflected the style of that day as to what a "Statesman" should wear. His suit was made of beautiful textured dark cloth. The sleeves were rather long, the coat-tails instead of curving in the style of a formal business suit of that day, were of a "Statesman" cut - several inches longer than normal and extending around on the same level to the front.

I made several trips with Governor Richardson. I admired him very much. He was a great talker. He was a student and a person of wide and vast knowledge. He was an authority on California history and talked well on the subject. He knew every corner of the State of California. I remember that he once mentioned to me that he had asked the State Librarian to lay out for him a reading course on world history. He talked well and with authority on this subject. One impressive comment that I remember vividly, was a statement that he never, under any circumstances, read newspaper criticism of himself or his administration. He said he read all the newspapers carefully, but skipped all unfavorable articles and editorials. Another comment I remember was that he said his first name of "Friend" was a great political asset and he added the comment that my middle initial "Q" would be a political asset sufficient for me to aspire to political office (this last comment was no doubt in a humorous vein).

Governor Richardson was the last of the Governors to wear "Statesman" style haircuts and clothes. All of the subsequent Governors dressed in ordinary business clothes of correct businessman style of the day. I think Governor Richardson's haircuts and his clothes fitted his character perfectly. In my opinion, he *was* a Statesman of the first order.

MORE ON GOVERNOR RICHARDSON

Chapter XXXI

Governor Richardson had been a newspaper man. He knew something about every subject under the sun, and he greatly enjoyed swapping gems of information with his friends. When we made a trip we would stop at every little town and he would greet the local newspaper editor as an old friend. I greatly enjoyed hearing the talk and reminiscences between them. He would introduce me to the local editor in the most flattering terms and this proved a great help to me in my press relations, in the early days of District VIII. On my first meeting with Governor Richardson at the Sunset Hotel, he said he wanted me to take him to Niland. Niland was a small town at the northeast corner of the irrigated portion of Imperial County. We started out

at once, stopping at each little town to talk to the editor of the local newspaper. We arrived at Niland in the late afternoon.

The proposed trip from Niland to Blythe was a 70-mile desert trail, little more than two ruts in the sand. There were no habitations. This was a very dangerous road in the summer, and it was summer. Several persons had recently perished, after becoming stuck in the sand. I tried to talk the Governor out of this trip but without success. He said we would start early the next morning.

I telephoned our maintenance foreman in El Centro about our trip and told him I would telegraph him from Blythe if we arrived safely and instructed him to come after us with two cars if he did not get my wire.

The trip was to start after breakfast next morning but along about 3 o'clock in the morning the Governor came pounding on my door. I opened my door and found the Governor with his long hair in disarray, barefooted and with the upper part of his night clothes stuffed in his trousers. He wore extra wide strong looking gallses and these were hanging down behind. He said, "Let's get dressed and strike out for Blythe. Without argument we got ready.

I told the Governor that we would have to get breakfast and have a lunch put up. We went over to a little restaurant in town and rounded up the lady cook. She cooked us ham and eggs and put us up a bounteous lunch in a huge paper sack. I always carried several large canteens of water in the back of my car.

We struggled up through "Surveyor's Pass" and before long we were facing the brilliant desert morning sun. Needless to say, we met no one. Our average speed was less than ten miles per hour, due to deep sand and continuous chuck holes. After about 40 miles of struggle and getting temporarily stuck a few times the Governor said, "I've had enough. This route is no good." We had to go perhaps another mile before we could get out of the sandy ruts and find hard ground to turn around on. We finally got turned around and back to Niland about the middle of the afternoon. I telephoned our maintenance foreman that we were safe back in Niland.

Niland was a whistle stop on the Southern Pacific. The station agent flagged down a passenger train and the Governor was off for Sacramento.

This was one of several trips I made alone with Governor Richardson.

MORE ON GOVERNORS

Chapter XXXI I

My last chapter spoke of Governor Richardson. I will now speak of Governor Rolph. Of all of our Governors, Governor Richardson really had "the common touch." He had been a newspaper man and talked like a newspaper reporter getting a story.

Governor Rolph was the exact opposite. Governor Rolph had great dignity, but he radiated of personal interest and regard for everyone he met. But with all this he had an aristocratic bearing.

Governor Rolph always appeared in District VIII with a retinue, including a hugh police officer, secretary, and others from his office in Sacramento. My imagination balks at the thought of seeing him at the Sunset Hotel, introducing me to the hotel clerk.

I had known Governor Rolph when I was a boy in college. He was said by a friend of mine to be the owner of the largest building in San Francisco, the Merchants Exchange Building. My friend said that he also owned a steamship line and other great properties. This friend was working his way through college and got a job in the Merchants Exchange Building. His job was night fireman on the large power plant three stories below the street level under the Merchants Building. This power plant furnished the electricity to the hugh building and pumped the hot water heating system throughout the building. My friend's job was to sit at a desk in front of the boilers and watch the gauges. He sat at this desk from four in the afternoon until midnight. He had on his desk, books and papers and could study his college assignments; he would look up from time to time and adjust the oil and the air controls to keep the boilers on the beam.

I believe that Rolph was Mayor of San Francisco at this time but, in any event, he had a suite of offices at some lofty height up in the building. He would work nights and just before going home he would come down the elevator to the boiler room to look the power plant over. He would then visit with my friend.

One of the joys for an undergraduate at the University of California at Berkeley was to go over to San Francisco to take in a show. After a show, I would often go down to the boiler room of the Merchants Exchange Building and chat with my friend. I recall that on several occasions, Rolph came down in the elevator and joined us in gay talk and laughter.

Many years later, when I was District Engineer and he came to San Bernardino as Governor, I mentioned I had met him as a college boy in the boiler room of the Merchants Exchange Building. I told him I remembered his as a kind and generous aristocrat who came down the elevator to the power plant to chat and laugh with his fireman. He was gracious and kind enough to insist he perfectly remembered me as a friend of his fireman.

RIGHT-OF-WAY TROUBLE

Chapter XXXIII

When we built the first north and south route through Colton (Route 43) we had great difficulty in dealing with the Colton City Council. The old County Road and City streets made four right angle turns and passed under the

Santa Fe Railroad through a one-lane wide bridge. The project was to widen Eighth Street as it now exists, south from the Southern Pacific Railroad, (which we crossed at grade), and the construction of a new grade separation under the Santa Fe Railroad and to eliminate the four right angle turns. There was a good deal of opposition to this project because of wayside stands along the old routing. Also, there was a large school a block away from the new routing and some children lived on the opposite side of the proposed new routing. The school teachers entered the picture and insisted that a grade separation be built for the children.

We conceded that a pedestrian grade separation should be built for the school children but we had great difficulty in satisfying the school teachers as to the design. An underpass for the children was thought to be unsatisfactory because of the danger to the children from possible molestation in a pedestrian underpass. The design finally picked was the present pedestrian overpass with a wire cage to keep the children from walking on the bridge railings or climbing over bridge railings and falling onto the highway.

After the children's overpass was completed, it was found absolutely necessary, by the school authorities, to apply discipline to the children. One of the teachers would stand at the foot of the stairs and require the children to go up over the grade separation instead of dashing across the highway. Also, it was necessary to have a teacher in this location to keep the children from climbing to the top of the wire cage and skylarking, trampoline fashion, on the top of the wire cage. They would bounce high, in constant danger of bouncing off down onto the highway. They must have had quite good discipline in this Colton school since in time the children took to the overpass; perhaps normal use waited for the novelty to wear off.

MORE ON RIGHT-OF-WAY TROUBLE

Chapter XXXIV

I recall one particularly distressing right-of-way transaction. When the Department required an additional width of widening from 60 feet to 80 feet we trimmed off a piece of desert property that took in a dug well. It was impossible to widen on the opposite side because we were up against a railroad right-of-way. A rigid rule had been laid down that no further improvements could be made on 60 foot right-of-way. We had to get the additional 20 feet.

The Right-of-Way Department contacted the elderly couple that were digging the well. The material through which they were digging contained rocks up to 8 to 10 inches in diameter. It was what appeared to be loose gravel. The old couple had erected an old-fashioned winch geared down to about 100 to 1 and the loving old wife would let her husband down in a bucket. They had

been working for over 10 years on this well and had reached a depth of over 60 feet. She would let the old husband down and he would pull up the material, grinding on the winch. The well was not timbered; the sides were not secured in any way. The bottom of the well was dry as dust and the State Geologist reported that there was no possibility of their ever striking water in this location. A "Water Witch" had told them different.

They had a few cabins and hauled water to supply their guests. This was the way they made their living.

Anyone can imagine the human situation this transaction entailed. This old couple were convinced they would strike water. They were both small, in fact, no more than little wisps of individuals; they had put their life's blood into this well. The Right-of-Way Department could not give any value to the well and their property was nearly worthless at the time.

We tried to think of some legal way to reimburse them (perhaps not wholly but in part) but no one could think of anything to legally help them out. We finally went into condemnation as the only solution. A jury was chosen. The old couple had dozen of witnesses telling about the old lady lowering her husband into the well and pulling him up. Ninety percent of the testimony was along this line.

I do not recall the exact outcome of the case but I do recall the jury made an emotional award to this poor old couple.

DETERMINATION OF ROUTE LOCATIONS BETWEEN SOUTHERN CALIFORNIA AND ARIZONA Chapter XXXV

There is a book on the desert just out that is delightful reading. "The Desert was Home" by Elizabeth W. Crozer, Campbell Westernlore Press, 1961, Los Angeles 41. It is in the San Bernardino Public Library.

The author, Elizabeth, and her husband were banished by their doctor to the desert because her husband, Bill, had returned from World War I with lungs burned by mustard gas. They moved to 29 Palms in 1924 and camped at the oasis.

1924 was the year District VIII started a massive study of possible State Highway Routes across the desert from Southern California to Arizona. We crossed every mountain pass between Yuma and Las Vegas. The distance between Yuma and Las Vegas is about 250 miles. We found about ten possible crossings of the desert mountains.

Elizabeth describes the 29 Palms oasis in beautiful language just as I remember it. I remember this oasis as the largest and most attractive of all the springs and waterholes in all this vast desert country.

There was a two-rut road, very rough, all the way from Whitewater to 29 Palms. There were perhaps 5 or 10 cars per day on this road driven by cattlemen and homesteaders.

We were passing through to Arizona in our stripped-down Model T Ford and camped at the 29 Palms springs one night. There were one or two tents at the springs, several prospectors, and I think that night several cowboys stopped to water their horses.

1924 was in a wet cycle and open-range cattle were in evidence. They came to the springs to drink. U. S. "Water Supply Paper" published in 1921, had maps which were inaccurate in location of mountains but showed quite accurate waterhole locations. Most of the waterholes shown were springs but a few were wells. We learned to depend on this Water Supply Paper and made camp at many lonely springs and wells. At rare intervals we would find a prospector at a waterhole and just as Elizabeth describes, how he would like to talk.

At one particularly inviting waterhole after our long hot dusty days, our boys built a dam of sorts, large enough to get a good bath. The water was clear and the bathing pool had a white sandy bottom.

In the midst of the festivities, suddenly and quietly, a grizzly old prospector and his burro were standing and looking on. The boys, feeling a bit guilty, expected a torrent of abuse from the prospector for fouling up his drinking place. Our boys began to apologize. "Well," said the prospector, "I've drunk out of waterholes with dead rabbits and lizards, and once with a dead sheep, and I guess I can drink out of this hole. It ain't spoiled by nice clean live boys." Whereupon he lay prone and dipped his tobacco-stained whiskers into the edge of the pool and drank his fill. His burro moved up alongside and drank with him.

MORE ON LOCATION OF ROUTES BETWEEN SOUTHERN CALIFORNIA AND ARIZONA Chapter XXXVI

In the last chapter I mentioned that we found about ten physically possible crossings of the desert mountains separating Southern California and Arizona. This was the fundamental information needed on which to base political road location agreements between Arizona and California. California passed laws requiring the Southern California-Arizona routes to end at points "near Needles, California," "near Blythe, California" and near "Yuma, Arizona."

A trip to Phoenix was made by our State Highway Engineer and his Sacramento staff accompanied by myself and State Highway Commissioner, Nelson Edwards, to confer on the problem of Arizona meeting our routing terminals at the Colorado River.

At a formal meeting in the State Capitol, I explained that we had found at least one crossing and in some cases, several crossings of our desert mountains that would meet the California legal requirements.

Arizona had even more primitive desert trails than California and had the advantage of the Arizona Legislature not having as yet frozen into law, highway routing terminals. The meeting was most cordial. Our Chief Engineer, R. M. Morton, handled the California case in a skilled and friendly manner.

No final agreements were reached between the two State Highway groups at this first meeting, but the groundwork was laid for future agreements. The State Highway Engineer of Arizona expressed the desire to study Arizona's possible routes and agreed to keep in touch with me as his studies progressed. He made several trips to our District VIII office and I reciprocated by going over to Arizona to discuss his problems with him. Within a few years all problems of these interstate connections were worked out.

The locating engineer who fought his way across all the mountain passes in the stripped-down model T Fords was Howard Noble with his husky crew. When he would find a new possible routing he would telegraph me and I would take the next train out to the nearest point. Here he would pick me up and take me through the pass he had found so I could see the new possible route at first hand.

I count Howard Noble as one of the finest locating engineers and one of the finest men in his character and personal life in my memory. He passed away many years ago, a greatly beloved employee of District VIII.

MORE ON LOCATIONS OF ROUTES BETWEEN SOUTHERN CALIFORNIA AND ARIZONA Chapter XXXVII

There has been an impressive change in the waterholes, springs and use of the desert since our route studies in 1924. I mentioned in a previous chapter that we found most of the springs, waterholes and wells listed in the U.S. In 1924 this vast desert area was in a wet cycle and the high desert country was open range land that supported prosperous cattle ranches. For a number of years after 1924 there were good rains on the desert and this made for good cattle feed. However, as in the case of Elizabeth and her lung-crippled husband, Bill, veterans with lung trouble were being advised to go to the desert. Bill was allotted a \$90 per month disability pension, and with this help they were able to homestead. To prove up on a homestead, one had to fence a certain number of acres, develop water and grow a crop. This, Elizabeth and Bill did by digging a well on good fertile land.

The case of Elizabeth and Bill was not an average case. Homesteaders, when they could, would include an existing waterhole or spring in their homestead. For a homesteader to fence off natural waterholes was death to the open range cattle industry and Federal rules and laws were passed to prevent this. But this took time, and homesteaders would "develop" springs and waterholes to irrigate and thus prove up on their homesteads. This "development" too often cut through the underground impervious soil or rock dike that brought the spring water to the surface. The underground reservoir supporting the spring would then all flow out and the spring would be destroyed forever. Many of the springs existing in 1921 were destroyed in this way. How the cattlemen hated the homesteaders! However, the day of profitable cattle range ended a few years later with the approach of the dry cycle that has lasted so many years. I think it is generally felt that the long continued dry cycle has probably ended forever the use of this great desert area as profitable cattle range, so perhaps the outpouring of homesteaders, 5-acre allotments and the destruction of springs and waterholes, are after all only a secondary reason for the decline of the desert as profitable cattle range. Probably the basic reason for cattle range decline is that the long dry cycle prevented the growth of cattle feed and caused the drying up of the other springs and waterholes that were not destroyed by "development." In camping by a remote desert spring I recall how fearless wild life seemed to be. I remember one evening at dusk a covey of desert quail came to the spring to drink. They paid no attention at all to us. We came across several bands of Bighorn sheep. I recall on one occasion a band of about 20 Bighorns followed our three Model T Fords for several miles. They trotted along a few hundred feet to the left of us, parallel to our progress. They showed no fear at all. They were evidently consumed by curiosity at our noisy progress. If we camped a short distance from a spring, nocturnal creatures would come all night long to drink, seemingly without any fear of us.

MORE ON LOCATION OF ROUTES BETWEEN SOUTHERN CALIFORNIA AND ARIZONA Chapter XXXVIII

The most pressing of all improvements on interstate routes was the crossing between El Centro and Yuma. The traffic count on August 17, 1924, Sunday, had reached 139 cars and on Monday, August 18, 1924, the count was 104 cars. *

The east edge of the irrigated land in Imperial Valley was at "East Highline Canal." From El Centro to "East Highline Canal," a distance of nearly 20 miles, was a dirt road of Colorado River silt that had been maintained by Imperial County by flooding it with water and dragging the soft wet silt with

horse-drawn drags to reduce ruts and chuck holes. The flooded road was then allowed to dry out and the surface would then be smooth riding but unbelievably dusty.

The irrigated portion of the valley was laid out in a square grid of such roads and nearby parallel roads would be used while the regular interstate road was being flooded and dried out. The dust thrown up by traffic on any of these dry silt roads cut visibility down to a greater degree than a "tuley fog." The dust made it next to impossible to travel these roads at night.

This was the best part of the road between El Centro and Yuma.

District VIII was ordered to take over this road for maintenance as well as all of the rest of the route to Yuma.

We immediately took over this unbelievable flooding method of maintenance from the County and continued it several months until we could import gravel to relieve the situation. There was no local source, so gravel had to be brought in by railroad from Frink 60 miles away.

This gravel-surfaced road was lower than the parallel irrigation ditches and we were continually troubled by the ditches which broke and flooded the road. The flooding of the gravel surface caused it to fail and it then had to be repaired with more gravel at great cost. However, the public was delighted with the improved gravel road and our maintenance department was given great praise.

EDITOR'S NOTE

*The latest average daily traffic count on this same stretch of road was 3,500 vehicles.

Chapter XXXIX

Extending on from the irrigated portion of Imperial Valley to the "Plank Road", at the Sand Hills, was a so-called road about 20 miles in length. There was a County well, known as "New County Well" about 12 miles from the last water at East Highland Canal. "Old County Well" was 8 miles further east at the beginning of the "Plank Road." These wells had been kept in repair by the County. The traveler used a long iron-handled hand pump to pump up water to fill his exhausted radiator.

This 20-mile distance was over a flat sandy plain. The traveler could not get lost because a little over 100 cars per day were crossing the plain leaving many tracks on the sandy surface. The cars of that day carried 50 to 60 pounds of air in their tires. If the air was let out to about 40 pounds the tires would still not blow out and a car would not sink into the sand quite so deep; a car might keep going for many miles before miring down. There might be as many as ten or fifteen pairs of tracks in the sand and the driver would try to choose the pair of tracks that seemed to be less deep. Each car over a

tract made the ruts deeper. I drove across this 20 miles many times in my State car and I think I never failed to mire down at least two or three times. The County had never done any maintenance on this portion of the interstate connection. It was impossible to think of anything that could be done short of paving. However, District VIII was ordered to take this over for maintenance at once and we had to do something to help traffic. A contract was let for paving but traffic had to get through for the six or eight months it took to pave.

The way to get a car started after it had mired down was to jack up each wheel, fill the ruts with sand, and make a mat of creosote or mesquite branches under each wheel. The car could then be backed up and a new pair of ruts chosen to continue the trip. There were plenty of parallel ruts.

A novice would not know of this method of getting out of trouble and he would often shovel and sand away from in front of each wheel and try to keep on in his chosen ruts. He would soon be mired down to his axles.

We had a wonderful foreman named Bill Magee located at the plank road. (More of Bill Magee in later reminiscences.)

To help out cars, hopelessly mired down, we instructed Bill Magee to send a two-horse wagon over this 20 miles each day. It took all day each way but it assured the public that help would arrive sometime during each day. This method of maintenance was greatly appreciated by the public.

Bill Magee often said that the fellow who carried a shovel should be in jail. Only a fool would dig his car in when it should be jacked up.

A further precaution in sandy country was to carry along on desert trips, blocks of wood on which to place the jack to lift up the cars; otherwise, when a jack was used it would not lift the car but the weight of the car would push the jack down into the sand when attempting to jack the car up. Desert travel in those days was not simple