

# Arizona Highways



*Making Arizona Highways Dustless*

**Volume 7  
Number 4**

**April**

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Yearly One Dollar**

# Armco Corrugated Culverts Are Strong, Tough and Durable



Under a wide variety of conditions—under high or shallow fills, under heavily-traveled concrete or paved highways, and under the less used rural roads, these pure iron culverts have proved themselves the most satisfactory. When old dirt roads are being made a part of the state or county paved system, Armco Culverts, even though they have seen service for a long time, are usually left in their places and the road paved over them. That is reliance in Armco durability.

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At present constructing Arizona F. A. P. 604-95B, which consists of grading and drainage of forty miles of U. S. Highway 89. Beginning at the suspension bridge across the Little Colorado River at Cameron and extending northward toward the Lee's Ferry Bridge on the Flagstaff-Fredonia Highway.

# Arizona Highways

April, 1931

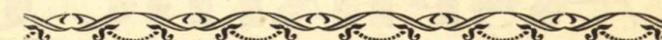


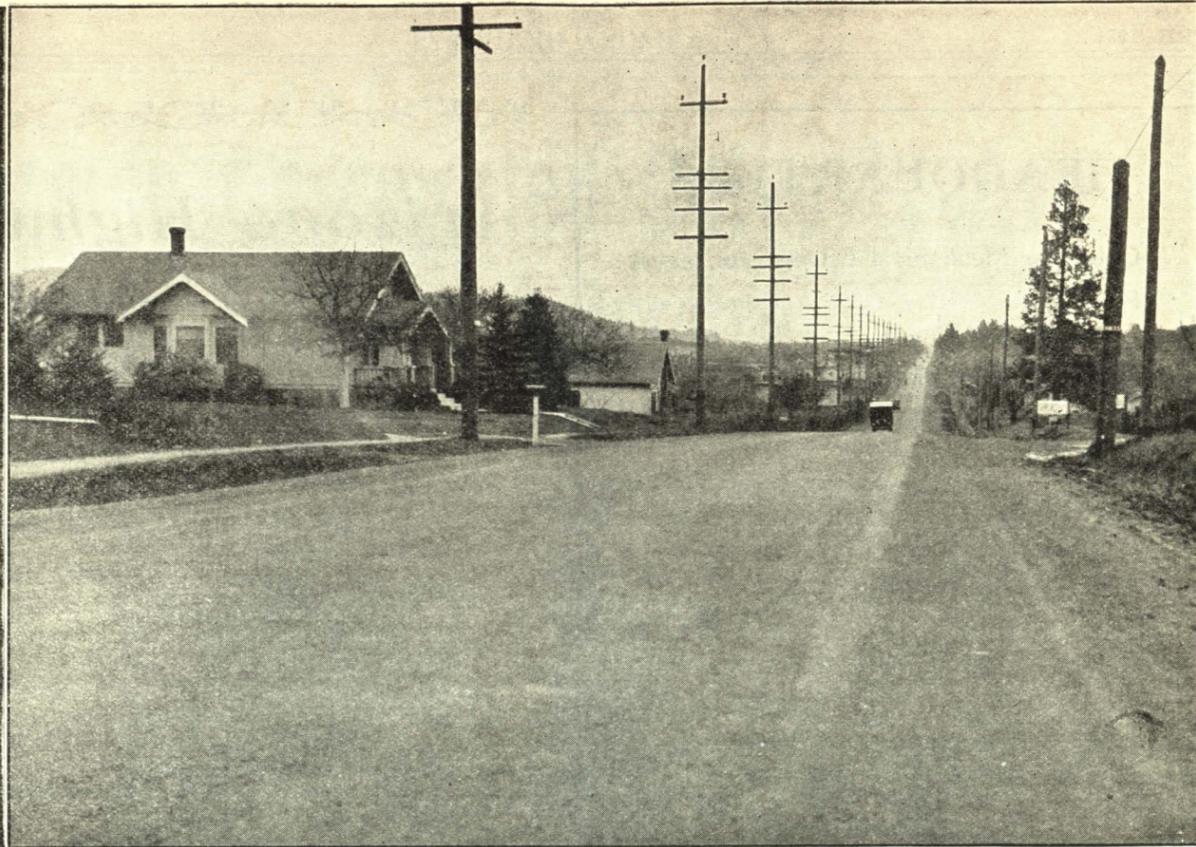
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**Non-skid  
ASPHALTIC CONCRETE  
for 1,000,000 cars only  
“two-bits” a yard!**

On Multnomah County's 82nd Street Road— Nothing but a non-skid surface needed after Asphaltic Concrete had carried thousands of cars a day for twelve straight years. So the Warren Construction Company laid Non-Skid Asphaltic Concrete right over the old road for only 25¢ per square yard!

To build any other comparable non-skid highway from subgrade up would have cost Multnomah County around \$30,000 a mile. But she beat that price by about \$27,000! She used her twelve-year-old Asphaltic Concrete as a base and got a non-skid top coat for only \$2,640 a mile.

Widen—resurface your old roads and save money with the longest lasting, safest pavement—Non-Skid Asphaltic Concrete.

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**CALOL  
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**ASPHALTIC CONCRETE** NON-SKID PAVEMENT  
WEARS LONGEST AT LEAST COST

# ARIZONA HIGHWAYS

CIVILIZATION FOLLOWS THE IMPROVED HIGHWAY

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Volume VII.

April, 1931

Number 4

## DESIGNING ARIZONA'S HIGHWAYS

By E. V. MILLER, Engineer of Plans.

MANY eminent engineers have expressed their ideas and opinions on the subject of location and design of the modern highway. Many of the theories so expressed are in use today and many of the thoughts are still theoretical. However, we are building new roads every day, and it is the present problems that confront us who are trying to match the people's funds with the elements which constitutes the engineering problem of building a road from here to there.

In the preparation of the plans for federal aid highway construction in Arizona there are many details beyond the location for grade and alignment to be considered. Of course the location is the all-important and except in general I am not going to touch on that. After a route has been determined upon by the state engineer and accepted by the Bureau of Public Roads, our locating engineer makes his detailed examination for location. The location is made and where the cost or desirability may determine the use of one or another line, the alternate lines are run and the data submitted on each. The location data which is thus sent in to the office consists of the line, level and cross section notes, with section and other land ties; a thousand foot to the inch map of the line showing, alternate locations, section lines and drainage areas; a 100 foot to the inch map showing all details of topography in and adjacent to the right of way and the profile upon which is shown the recommended position of all drainage structures, grade line, classification of material, ditching, clearing, etc.

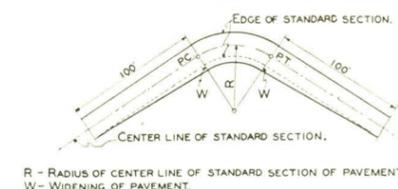
### First Steps in Plans

With this data in hand we then determine from costs and inspection the acceptable line or alternate and work up the plans accordingly. The first work to be done in the preparation of the plans is to plot the cross sections, lay out the templates and figure the earth work quantities. In mountainous country we try for a balanced grade line wherever it is practicable. That is, we endeavor to make the cuts balance off the fills, and

in order to do this we often have to go back and change our first or trial grade line. Seldom do we have to change the same grade twice for an experienced eye can lay a fairly close grade, when the side slopes and amount of swell, over-breakage, etc. are in hand.

During this process of computing the quantities, the draftsmen plot or trace the alignment on tracing cloth sheets.

### PAVEMENT WIDENING ON CURVES



R	W
FEET	FEET
100	4.5
200	4.0
300	3.0
400	2.5
500	2.5
600	2.0
700	2.0
800	1.5
900	1.5
1000	1.5
1100	1.0
1200	1.0

NOTE:— THE TAPER WILL NOT STRICTLY BE TANGENT TO THE WIDENED PORTION OF THE CURVE AT THE P.C. THE POINT OF TANGENCY IS SO NEAR THE P.C. HOWEVER, THAT A SLIGHT SHIFTING OF THE FORMS AT THIS POINT DURING THE SETTING WILL CONNECT THE TAPER WITH THE CURVE WITHOUT ANY NOTICEABLE BREAK. IN NO CASE WILL THE FORMS AT THE P.C. HAVE TO BE MOVED MORE THAN 15 FT.

This is the plan of the road and upon the plan is shown the right of way required and all topographical features of the country adjacent to the line such as buildings, existing roads, culverts and bridges, railroads, fences, etc. The profile of the center line is then plotted on this same sheet below the plan and shows all bench marks, drainage areas, etc.

### Plans Checked on Route

The design is then worked out on these sheets in pencil, giving all data as to structure openings, ditching, channel changes, grade line, fencing, guard rails, dips, cattle guards, etc. These

sheets are then blue-printed and the preliminary inspection of the proposed work is gone over on the ground by a state district engineer and a Bureau of Public Roads engineer. Any criticisms or suggestions on the design are noted on these blue prints and returned to the office.

The finished design is then made and the plans inked in. A finished set of plans will show, besides the data shown on the preliminary plans, the amount of cut, fill, borrow or waste between each balance point; the estimated yardage in each ditch, dyke or channel change; the size, length and amount of concrete, steel and structural excavation for each culvert or bridge; the yardage in each toe or retaining wall, amount of rip rap or bank protection required; the length of new fence or amount of fence to be moved, lengths of guard rail; the disposition of all buildings, telephone or telegraph lines or other encroachments is also given. The completed plans, in other words, give all the information as to desired results as well as a complete estimate of all quantities required in the execution thereof.

### Location Most Important

As previously stated the all-important part of any road design is the location, for without the proper thought given to the location the very essence of the design is destroyed and that is the safety factor. It is the wrong theory to build a road and then legislate the speed of cars to fit the conditions.

Except in rare cases, a well designed highway needs no warning signs to caution the driver of approaching danger from curvature or grade. Even in mountainous country where sharp curvature is used, the approaching curves may be so placed as to create a transition from the long radius curves to the short radius curves in a distance sufficient to slow down the traffic without the driver realizing any potential danger from the short radius curves. Super-elevation and curve widening are two essential features of the design and in most cases are more important as a safety factor than the best guard rail

built, for after all the road should be so designed as to assist a car from leaving its natural course. The super-elevation we use as a standard is a simple conclusion arrived at from plotting several existing formulae. In substance it is .01 per foot width of roadway per degree of curve up to and including a 7-degree curve. A 6-degree curve, for an example, has a super-elevation of .06 per foot of roadway width. The maximum safe speed for any curve is reached when  $12 e + 12 k f = 0.8 S^2$

R

where k is assumed as .6  
 f is co-efficient of friction  
 e is amount of super per foot.  
 s is speed in m.p.h.  
 r is radius of curve.

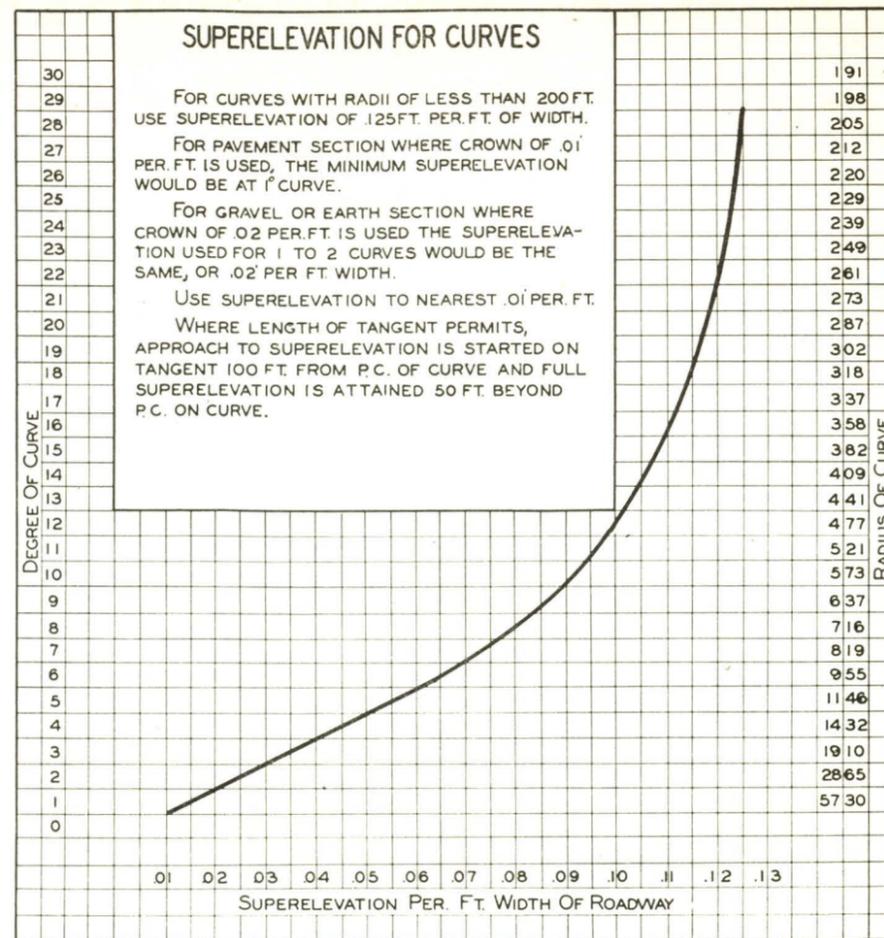
Using the above with .2 as the co-efficient for friction and we have a safe maximum speed of 51 miles per hour on a properly banked 6° degree curve or 59 miles per hour on a 4 degree.

**Curves Widened Inside**

All curves over 6 degrees are widened on the inside to give an added safety factor. Curve widening is important not only for the easement it creates in negotiating the curve but for the added sight distance it may create when in through cuts or "blind" curves. A 6 degree blind curve with no widening has a sight distance on center line of about 350 feet for a 28 foot roadbed.

Assuming that two cars were approaching each other on this 6 degree curve at 40 miles per hour, their speed per second would be 58.7 feet each or in other words the space between the two cars would be reduced 117.4 feet each second and in three seconds they would be passing each other. It is apparent from the above example that maximum sight distance by curve widening or other means is an important safety factor. On paved roads the center strip or traffic lane should be used at all curves both horizontal and vertical where the sight distance is less than 500 feet.

Guard rail as a safety feature is also important, not only as a guard against cars leaving the road when beyond control of their drivers, but from the psychological effect on the average driver. The fact that the guard is there makes a timid driver feel more secure in mountainous country and he will have the tendency to stay near the rail, while without it he will crowd to the center of the road. This has proven itself, for we have in some instances erected only a line of white posts set at 20 feet inter-



vals, or placed large white stones at ten foot intervals. Although this practice might be questioned from a safety viewpoint the psychological effect has proven the theory.

**Must Consider Maintenance**

The maintenance problem must also be considered in the design, for maintenance costs can mount to large proportions due to inadequate design. Deep ditches or borrow pits adjacent to the road are a source of much worry to the maintenance engineer and a minimum berm of 10 feet is hardly sufficient, for in case of future widening these borrow pits must be filled again. Culverts are placed full width of roadbed and sufficient material placed over them to enable the maintenance blade to pass over without lifting.

In the northern part of the state where we have snow the grade line is laid to anticipate the snow removal problem and to provide widened sections for snow storage.

All through the design the matter of cost enters into each problem for after all the engineers' job is to build the most he can with the funds available.

**Agreement To Purchase Blythe Bridge Hastens Arizona Road Program**

With all agreements signed between Arizona, California and the owners, for the purchase of the toll bridge across the Colorado river at Ehrenberg, approval of the transaction by the United States Bureau of Public Roads only is needed to start the improvement of the highway from Wickenburg to the bridge.

The entire highway has been divided into ten projects by the Arizona highway department. The department contemplates the construction of seven of these projects this year. Of the three remaining projects two now are under state maintenance and the third was constructed in 1927, extending approximately ten miles from the bridge eastward. This section may be oiled during the present year providing funds remain after the improvement of the other sections is made.

The improvement of two of the projects is provided for in the funds of the  
 (Continued on page 14)

**Oil Surfaced Roads Test Subgrade for Future Surfaces**

By GEO. B. SHAFFER, District Engineer.

How good is an oil road? Has it a distinct value? What is its economical life? When acid, what should be the next step?

Arizona now has many miles of oil roads. The traveling public thinks they are wonderful. The ease with which traffic whisks over them establishes a mental inclination which causes the people to urge the continuation of their construction. Once a rough dusty highway is made smooth and clean by oil surfacing, there is little wonder why

fail because of faulty drainage, faulty sub-grade or faulty material. In either case the failure should be corrected if traffic is to continue uninterrupted. Up to date forces have been able to handle this situation successfully in nearly all cases. The placing of oil surfacing on a road under ordinary traffic is a fair, but not an absolute proof of the value of the subgrade upon which it is placed even though we know that the oil surfacing is of good quality and properly constructed otherwise. During the life of the oil

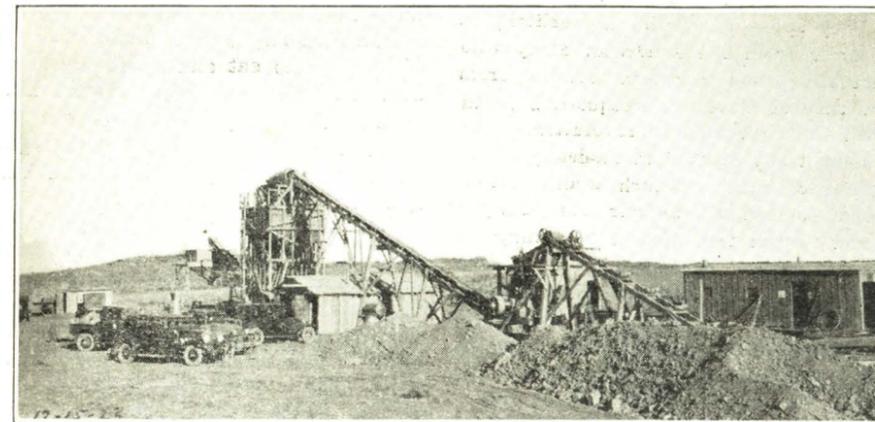
of traffic and if properly maintained proven the quality of the subgrade. It has forced certain requirements necessary to modern traffic, but the time of its usefulness is but a few years and from an economical standpoint, it is doomed to give way to a replacement or added waering surface as a public demand.

It is not the intention at this time to go into the details of comparison of the different types of road surfacing and pavements. In fact it matters but little to the traveling public just what the highway is surfaced with so long as it is an all-season, smooth-riding roadway and if maintained properly the cost of construction is merely a matter of record.

An oil surfaced road like other smooth types of surfacing and pavements invites traffic when placed on our main highways and it is not long until maintenance costs of the oil road begin indicating that the original construction is the first stage of a more permanent type of road.

**Reflects Quality of Subgrade**

A road is no better than the subgrade, but the subgrade is not the only part of a road which can cause success or failure. Surface failures originating from causes other than poor subgrade are numerous and steps should be taken to prevent them. Subgrade failures are often times latent in character and yield stubbornly to corrections and the opinion here is that an oil surfacing placed upon any roadway will reflect the good and bad qualities of the subgrade more quickly than any other types of surfacing. This fact is one of the distinct values of an oil surfaced road and  
 (Continued on page 8)



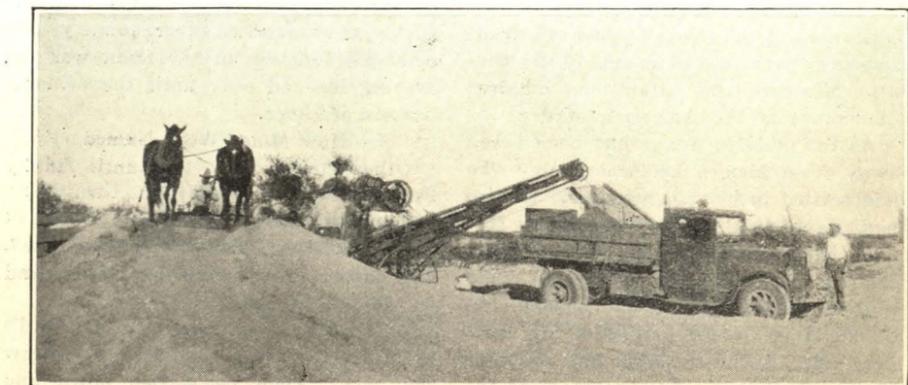
Plant for Obtaining Mineral Aggregate for Surfacing an Oil Surfaced Highway.

the public craves for more of the same kind of improvement.

Dusty roads are dangerous and expensive in many ways. Old surfaced roads take out many hazards, but in turn add others. A clean smooth surface naturally superinduces faster and less careful driving. This obviates the necessity of safe widths, profiles and curvatures along with ample caution signs and guard fencing. In other words the use of a road after being oil surfaced will point out to the engineers certain advisable requirements before the adoption of a more expensive type of construction. An oil surfaced highway is a vast improvement over the ordinary surfaced highway, and while it is serving a wonderful purpose in regards to transportation, it is in fact the pioneering forerunner of a higher type hard surface pavement which is sure to follow.

**Faults in Grade are Detected**

With the hard surface pavement in mind the oil surfacing has a distinct value. Traffic is increasing each year and the weaker parts of the road get no favors except from the maintenance department. The weaker portions might



Developing "Squeegee" for Seal Coat on an Oil Surfaced Highway.

## Early Mine Names Were Descriptive Of Events

By E. J. KELLEY, Pearce, Ariz.

PRACTICALLY every stranger arriving in Arizona becomes interested immediately in our system of names. They are all intrigued with the apparent oddity of them but they each applaud the appropriateness of the nomenclature.

Perhaps in no other state were names given that are so apt, terse, descriptive and even pretty,—not to say difficult. Can you pronounce and spell "Chiricahua" or "Huachuca" offhand for example?

Horse Thief Canyon, Funeral Mountains, Tombstone, Superstition Mountain, just to mention a few, easily suggest interesting stories. Very often the name alone tells a whole story in itself. A study of them often reveals the originality, sturdiness and intelligence of those pioneers who made our state great; therefore, their history is unusually interesting.

Upon looking at a map of the Tombstone mining district you note the names of the principal claims and immediately know there is a story somewhere. Their apparent absurdity, yet their clear sequence, arouses your curiosity, and you look further. There are the Grand Central, Lucky Cuss, Toughnut, Contention and Tranquility. The Lucky Cuss is the first mining claim ever recorded from the Tombstone Mining District. As this was a part of Pima county in 1877 before the formation of Cochise county, naturally the record is carried in the Pima books at Tucson.

In 1903 M. M. O'Gorman, the original owner of the Tombstone townsite, completed his sale of La Cananea to "Colonel" W. C. Greene. As Cananea was in Mexico it had been necessary for Mr. O'Gorman to take out Mexican naturalization papers in order legally to possess Mexican land within one hundred kilometers of the American border.

As the state of Texas had been taken away from Mexico by Americans who had settled inside the boundary, Mexico had passed this law to prevent any further encroachments on her domain. Shortly afterwards Mr. O'Gorman made a final accounting of the money received from Greene to two of his partners, Mr. Richard Gird and Senator George O. Perkins of California. At the conclusion of the business meeting the three men relaxed and reviewed old

times in Arizona and Mexico. That is, Senator Perkins asked questions and Gird or O'Gorman answered them. They spoke of old Governor Pesquiera of Sonora, who reigned in lordly style; who always was escorted by a corps of battle-scarred fighting men with outriders and all the trappings that mark a king. He made all his own laws for the government of the state, dispensed with such trifles as legislatures and got away with it until the day he died.

### Might Made Right

They spoke of Emilio Kosterlitzky, a deserter from the American army who virtually ruled northern Sonora from the time of Governor Pesquiera's death until the first Madero revolution. This Kosterlitzky started in modestly as an officer of rurales, which would correspond somewhat to our old ranger force. From this modest beginning he rose to greater heights until he became a terror in all Sonora. Kosterlitzky, among other things, could never see why the state should be made to go to the expense of bringing in a criminal for trial. He considered the cost of apprehending a criminal, feeding him and prosecuting him was a total loss to the state. Hence, when he went after a man of bad reputation it became noticeable that the man of bad reputation never again appeared in Sonora or anywhere else.

They also told of the joy in western Sonora when the Santa Fe R. R. completed the railroad between Benson and Guaymas. At that time Silver was \$1.29 per ounce. At that high price one Mexican discovered he could afford the wonderful luxury of a cake of ice and a keg of beer delivered by express daily. Others caught on, and, as this was primarily a wonderful silver country, the principal function of the train was delivering ice and beer until the demonization of silver.

### How Mines Were Named

Other stories they told until finally Senator Perkins asked Mr. Gird "how in thunder" the early mining claims of the Tombstone district received such odd names. There must be a story and he wanted to hear it.

A far-away look came into Mr. Gird's eyes. It took him a minute to review the past. Then he settled down and told us all about it as follows:

"It was very early in 1877 when

Ed Schieffelin, Al Schieffelin and myself were camped at what is now Charleston on the San Pedro river. Ed Schieffelin had found a piece of wonderful ore while acting as scout for the army; but when we got down to the San Pedro he could not go directly to the ledge. We prospected for it and while so doing camped near the river to insure a supply of water.

"A few days later a stranger came into camp. He had a ranch near Fort Huachuca and was hunting for a pair of mules he claimed to have lost. None of us had seen any sign of mules, but we had to eat and spend the night with us. He had breakfast the next morning and then resumed his search for the mules. He came back the same night unsuccessful and again we invited him to share our grub and camp.

"This kept up for several days. Each morning he started out to look around and returned each night empty-handed. He was somewhat of a joke to us as we figured any man should be able to trail a pair of mules in very short order, unless they were killed or run off by Indians. Even that we could find out in quick time. We thought him a little queer, but kept inviting him to share with us, lest we be accused of inhospitality, which was a serious thing in those days.

"However, he surprised us. One night he came into camp with several pieces of rock in his hands, saying, "Aha, I have found that ore you fellows are looking for." Sure enough he had wonderful specimens of the real thing. Furthermore, he had a map drawn on old wrapping paper, showing where he had located all of the country around the place of his rich discovery. Everyone else, we included, were completely shut out. And what is more, he intended to hold on to all his locations.

"In those days everyone, as a matter of course, carried a rifle and pistol with plenty of ammunition, so he felt able to keep what he had.

### Taming a Tightwad

"The next day all of us went up to view the discovery. It was the identical ledge from which Ed Schieffelin had knocked off the original piece of ore. It looked bad for us, but we could take things philosophically when we had to. Nevertheless, we did a lot of thinking

(Continued on page 7)

## Highway Laboratory Tests Keep Arizona's Roads Up to High Standards

By J. W. POWERS,  
Engineer of Materials

Last month I stated that future articles would give data on tests and the reasons for conducting them—with the application to their use in field work. However, before going into tests it seems to me it would be advisable to know why the tests are made, methods of testing, and where the methods are gotten for making determinations.

All work contracted by this department is done under specifications which have been approved by the United States Bureau of Public Roads. Certain portions of these specifications are for the guidance of the resident engineer during construction. Other portions cover the grade of construction materials which shall be used and it is on these materials that the materials division is called to pass judgment. Uniform methods of submitting samples are set up in a materials division manual giving size of sample, the necessary data to accompany it, and the number of samples to send in from time to time for analysis—the latter statement in reference particularly to sand, gravel and concrete test cylinders.

The basis for the above referred to specifications in both method of testing and materials specified is usually the standards set up by the American Society for Testing Materials. The American Society for Testing Materials is a society composed of producers, consumers, highway departments and others who are interested in uniform materials and uniform methods of testing them.

The Materials Division of the Arizona highway department has been a member of this Society since 1922. In addition to the above society, this division is a member of The American Concrete Institute, The National Research Council and Committee on Materials of The American Association of State Highway Officials. With this background and applying the data which they publish from time to time to local conditions we are able to keep our materials specifications and tests up to date, which assures the Arizona highway construction is kept on a par with the best highway practices in the country.

### THE PSALM OF THE ROAD SIGN

By IRA L. WOOD

Give ear unto my speech  
And eye unto my writing,  
For, verily, I am the Road Sign,  
Thy guide and counselor.  
He that heedeth my words liveth,  
But for him that disobeyeth is destruction.  
Yea, verily, will I scatter his chassis upon the highway  
And pieces of his body shall lie in the morgue.  
When I say SLOW!  
Put the foot that is thine upon the brake,  
For it is better to take thy time  
Than for time to take thee.  
When I say CURVE!  
Approach it carefully,  
For verily many a fool driveth,  
And if thou art another,  
Then woe be unto thee.  
When I say SPEED LIMIT! obey it,  
Or suffer in a foul dungeon,  
Or pay money that is thine unto the judge.  
Yea, verily, I am the Road Sign,  
The Guardian Angel that protecteth thee  
And guideth thee upon the highway.  
He that heedeth, liveth,  
But if thou but disobey me,  
Then the days that are thine are numbered.

## Early Mine Names Were Descriptive of Events

(Continued from page 6)

that evening as we prepared supper. It would not have been so bad except that our mulish friend developed a disposition to 'rub it in'. He was naturally somewhat of a loud talker, but this evening he went strong. I finally asked him if he were going to 'share up' at all. This provoked quite an outburst from him. 'He'd be blankety blanked if he'd let loose a cent's worth.' Then I gently reminded him that as he had been eating our food and sharing our camp all the time he was prospecting and locating these claims, we were entitled to a division. We had grubstaked him and so by law could claim a share. At this he flew into a rage. He told us over and over it was all his, and by the eternal, he was going to keep it. He repeatedly swore by all the gods he would keep everything. He continued swearing to this effect, occasionally varying by telling us what he would do to anyone who tried to prevent him.

"We saw it would do no good to argue with him any further. Ed Schieffelin unrolled his blankets preparatory to turning in for the night. When our hoggish friend was at the height of his

denunciation Ed turned his back, saying significantly, 'It's a long road to Tucson,' and went to bed. The effect of these words on Mr. Muleman was instantaneous. He stopped in the middle of a sentence. His lower jaw dropped and his eyes went glassy. He say the point right away. Indians or roving bandits could easily account for a man disappearing between our camp and Tucson, where it was necessary to record the filing of the mining notices to make them effective. For a full minute absolute silence reigned. Then seizing the rough map he had made of the claims in dispute he drew a pencil mark through it, saying, 'I will keep these claims and you can have the rest.'

"We studied it for a while and after a few alterations agreed. The first claim near his pencil mark was called the 'Grand Central.' The next we called the 'Lucky Cuss,' for he was fortunate in finding the ledge. The next claim we named 'Toughnut,' for we so considered the muleman. In view of our disagreement and quarreling we named the next one 'Contention,' and after peace and quiet settled down we named the last one 'Tranquility.'"

All of these claims produced fortunes and became world famous.

### Oil Surfaced Roads Test Subgrade for Future Surfaces

(Continued from page 5)

as soon as the subgrade condition which is made so apparent by this type of construction is mastered, it is then time to start the determinations of the length of its useful and economical life. Assuming that the oil-cake is properly constructed and maintained as to materials and operations and subgrade corrections etc. respectively; the oil cake should not, and the opinion here is that it will not, deteriorate under ordinary heavy traffic. The life of it will vary directly with the amount of traffic and if reconstruction is not well timed, the oiled road will give way to wear and tear. This should not be allowed to happen for this reason—an oil surfaced road, although having served the greater part of its usefulness as a splendid traffic-way, still possesses a great value as a thoroughly tested base for the next stage of construction. The timing of this next stage of construction is very important for this reason. If the proper timing of the next stage of construction is not made, it will result in much waste to the tax-payer and unlimited inconvenience to the traveling public. It can be stated with confidence that an oil surfaced road, not completely worn out, if topped with a high grade wearing surface will last as long as and at half the cost of a reconstruction job

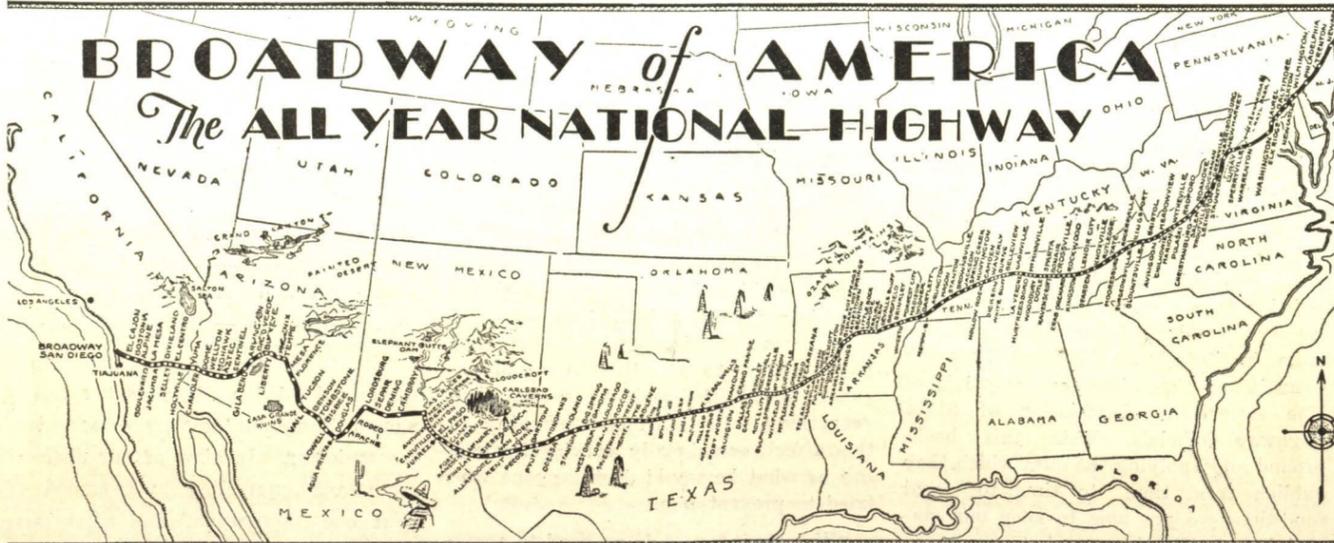
### Calendar of Civic Celebrations

The following celebrations and conventions to be held in Arizona in the near future were compiled from reports to the Arizona Industrial Congress:

- April 16-18—Douglas. Arizona Federation of Music Clubs Convention.
- April 17-18—Tucson. Statewide "Buyers and Sellers" Convention.
- April 18—Tucson. "Romance of the Old Pueblo" Pageant.
- April 20-22—Douglas. I. O. O. F. State Convention.
- April 24—Safford. Red Knolls Pageant.
- April 24-25—Safford. State Convention Lions' Club.
- April 24-25—Douglas. Arizona Postmasters' Association Convention.
- April 25-26—Nogales. Arizona Association of Optometrists' Convention.
- April 27-May 2—Phoenix. 14th Biennial (National) Council Meeting, General Federation of Women's Clubs.
- April —Nogales. Arizona Social Workers Convention.
- April 28-May 2—Phoenix. National Conference, General Federation of Women's Clubs.
- April 30—Phoenix. Masque of the Yellow Moon.
- May 5-6—Nogales. Arizona Public Health Association Convention.
- May 7-9—Nogales. 40th Annual Convention Arizona State Medical Association.
- May 9-10—Prescott. Federal Employes Convention.
- May 22-23—Douglas. Elks State Convention.
- May—Douglas. Knight's of Columbus State Convention.
- June 14—Prescott. Smoki Ceremonials.
- June 15—Grand Canyon. Arizona Association of Commercial Secretaries Meeting.
- June 18-19—Prescott. National meeting Alpha Gamma chapter of Sigma Phi Gamma. (Includes one-day trip to Nogales.)
- July 2-5—Prescott. Prescott Frontier Days.
- July 2-5—Prescott. Northern Arizona State Fair.
- July 3-5—Winslow. "Meteor City Roundup."
- October 29-30—Glendale. Glendale District Fair.
- October—Yuma. "49 Camp" and Rodeo.
- November 9-14—Phoenix. Arizona State Fair.
- November 11—Yuma. Pecan Day Celebration.
- December 21—Yuma. Sunshine Congress.

made necessary if the same oil surfaced road is allowed to give way to wear and tear, to say nothing about the inconvenience to the traveling public. In the foregoing article, the writer refers to oil surfaced roads as those

constructed in Arizona. They have been constructed by both the Road and Plant Mix Methods and the same conclusions go for both types. (This is the third of a series of articles by Mr. Shaffer.)



Broadway of America, Inc., chamber of commerce building, El Paso, Texas, the association that is sponsoring the improvement and advertising of this transcontinental route from New York City to San Diego, Calif., is celebrating the fact that this route is now 82 per cent paved and improved its entire length by holding a convention of members and good roads enthusiasts in Hot Springs, Ark., on April 25th. This route, which traverses Arizona over U. S. highway 80, is declared to be the best all year road across the continent. A motorcade starting at San Diego on April 12, and gathering cars in each city along the route, is due to arrive in Hot Springs before the convention date.

### Phoenix To Yuma Highway Now Completely Surfaced

WITH the publishing of this issue of Arizona Highways, one of the greatest road building projects in the state will be completed. The highway between Phoenix and Yuma, approximately 200 miles, a part of U. S. Highway 80 and one of the main east and west transcontinental and state routes will be completely hard surfaced or oiled.

It is less than 10 years ago that this important road was only a desert trail often requiring two days to negotiate it. Then the highway department started its improvement, and a gravel surfaced highway was built connecting the Arizona metropolis and the important Yuma valley and city in the Southwest corner of the state. This highway for several years was regarded as an excellent highway and many travellers from other sections of the nation thought it was a marvelous road cutting across the wide expanses of desert. But the life of a gravel road under the traffic conditions this important highway sustains is short lived. It was necessary that the highway department sur-

face it to keep from either losing it or running maintenance costs to a prohibitive figure.

Regrading the weak spots in the old road, building up the levels, placing of adequate drainage structures to take the place of the old dips, building overpasses at railroad crossings, and surfacing and oiling the entire distance that was not hard surfaced, and without any special financing, was the problem which the department had to face. The job was completed on April 15th.

From January 7, 1930, to March 4, 1931, approximately 117 miles of the highway were completed. Over 11,048,478 square feet of prepared subgrade was made in that time; 133,000 cubic yards of crushed rock spread on the surfacing and over 2,572,000 gallons of road oil mixed and placed. The work went ahead with approximately 8 miles a month being finished.

Today, 1,200 to 1,500 cars per day pass over this highway between Yuma and Phoenix and four and one-half hours is about the usual running time.

### Smith Lauds Safety Teaching in Schools

CHICAGO—Organized safety effort of the type which has come to the relief of the child en route to school will succeed in cutting down our accident toll in all walks of life, according to ex-Governor Alfred E. Smith, who recently addressed delegates to the Greater New York Safety Conference.

"While it would naturally be imagined that the greatest hazard to child safety is traveling the streets back and forth between the home and the school, the fact is that organized effort has cut these accidents to one-third the number happening in the home," said Governor Smith. "Inasmuch as the home is not organized for safety, accidents continue to happen frequently."

Judge—"What is the charge, officer?"  
Officer—"Driving while in a state of extreme infatuation."—Ex.



Traffic problems of trunk highways are becoming as great a problem in the eastern states as in congested cities. New Jersey, situated as it is between New York and Philadelphia, has developed a situation calling for the most advanced methods of moving traffic, resorting to viaducts and subways through and under cities in the path of its trunkline highways. Some of this state's main highways run as high as 50,000 vehicles per day. Separation of highway grades and of traffic lanes and the construction of traffic circles, by which traffic always enters the lanes by turning right, have become necessary. Above is one of the latest devices for the control of traffic at the junction of two important highways. Crossing is effected by an overpass of one highway over the other and lanes from one highway for traffic to enter the other are afforded so that change can be made in any direction by always making a right turn. This is called a "clover leaf" because of its resemblance.

# ARIZONA HIGHWAYS

Published in the Interest of Good Roads by the  
ARIZONA HIGHWAY DEPARTMENT

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No. 4

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## Step Lightly on the Accelerator

Arizona's death toll from traffic accidents is mounting daily, keeping apace with the record established last year. We had hoped this state would show a marked improvement in 1931.

The touring season is at hand. While we are thinking of it we should seriously consider whether we want to come home in a box, or go through life crippled, or whether we want to tour this great state of ours, seeing the wonders the Creator has placed here for us to enjoy and come home healthy and happy.

Millions of dollars have been spent on Arizona's highway system making a vast network of boulevards. We can ride hundreds of miles in a day through desert, plain, forests and mountains in safety as far as the condition of the highways are concerned. But, we must keep in mind one thing, don't let our foot get too heavy on the throttle. Thirty-five to forty miles an hour, with proper caution observed on hills and curves is a safe speed in these modern days. If maintained steadily it will get one over many miles during a day, as far as the average person would have to travel. Speeds above that are a gamble. If you read the accidents that are occurring daily you can see how many are losing, and no matter how lucky you

may have been up to now, IT WILL TURN, and it may be tomorrow.

## No Mind Reader

"The Man Behind Can't Read Your Mind—Signal."

This terse, punchy slogan is the suggestion for motorists to keep in mind during the all-year safety in traffic campaign.

Failure to give the required arm signals is a prolific cause of accidents on the highway. Motorists who do not keep in the proper lane when turning, or who give no signals at all are not only a menace to themselves, but to other drivers.

Carelessly given signals also lead to accidents. The state law demands that a motorist indicate by a proper, continuous signal at least 50 feet in advance of where a turn or stop is to be made.

Likewise, the man that dashes through the arterial highways without regard of the stop signs, is a menace to society and such violations should be met by revoking the driver's driving permit. Many of the fatalities that have occurred in the state have come through such violations. Motor vehicle operators should be taught that stop signs are posted to guard intersections and they should be given as much respect as if they were traffic policemen.

## What Price Motoring?

What does an automobile tour of the eastern states cost?

Many motorists in Arizona have speculated on how big a dent would be placed in the pocketbook if a family motor tour were taken to the old home back east. Few persons keep an accurate count of cost so that information is somewhat difficult to obtain. Much depends on the country traversed, type of automobile used, class of hotels patronized, and the "incidentals" that are purchased.

What is believed to be a fairly accurate and representative average is found in a typical trip recently made from Los Angeles. This indicates a daily cost per person of \$7.71. In this cost incidentals are included so that a more economical traveler doubtless could make some reduction.

Total time gone from Los Angeles on this trip, 45 days; actual traveling time, 30 days. Average mileage per day 303 miles, the entire trip being made during daylight driving. Exactly 700 gallons of gasoline were consumed, getting an average mileage of 13.1 miles per gallon. The total cost of trip, including gasoline, oil, accommodations, meals and incidentals was \$1,041, or an average of \$23.13 per day for the trip for each of the three travelers.

# Three Members Take Office As Highway Commissioners

Arizona's State Highway Commission underwent the greatest reorganization of that body since its inception on March 16th, when three new members, C. E. Addams, Phoenix, John B. Hart, Douglas, and Jacob Barth, St. Johns, took their places on the commission through appointment by Governor Geo. W. P. Hunt. They were welcomed into office by I. Perle McBride, W. R. Wayland



C. E. Addams, Chairman

and James F. McDonald, retiring commissioners and Monte Mansfield and Samuel T. Trengrove, holdover commissioners.

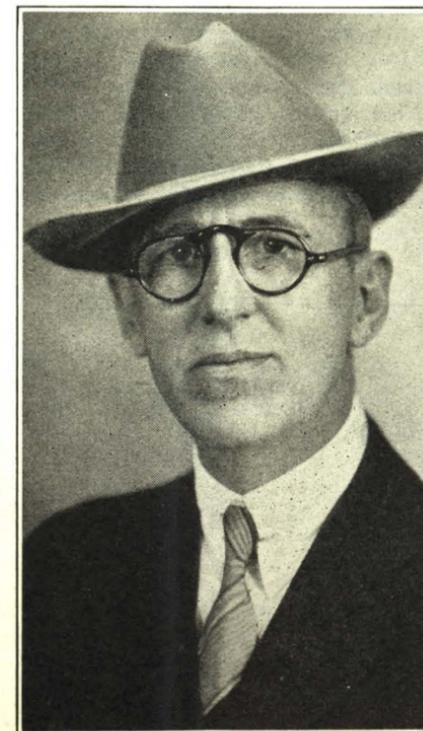
In the organization of the new commission Mr. Addams was elected chairman and Mr. Hart vice-chairman. The appointments of Mr. Addams and Mr. Barth expire January 31, 1937 and that of Mr. Hart, who was named to fill the vacancy caused by the resignation of Mr. McDonald, expires January 31, 1933.

Mr. Addams has been a resident of Phoenix since 1917. He was born in Pennsylvania and started his engineering career as mining engineer for the Lehi, Wilkes Barre Coal company of that state, leaving for the diamond fields of South Africa where he held the positions of Chief Engineer for the De Beers Consolidated Mines of Kimberly and was manager of four of

the largest diamond mines in the Kimberly district, the Wesselton, Dutoitspan, De Beers and Kimberly mines. He also held the position of general manager of the Voorspoed Diamond mines in Transvaal, South Africa.

In 1913 Mr. Addams came to Arizona as the assistant superintendent of the Ray Consolidated Copper company and then became general manager of the Ray Hercules mine at Ray. He left his mining position in 1917 to come to Phoenix and do war work serving in the capacities of chairman and director of the Arizona State Council of Defense, a member of District Draft Board No. 1, and later was in charge of the entire relief work in the state during the Flu epidemic.

Since the war Mr. Addams has largely devoted his time to looking after his



John B. Hart, Vice-Chairman

personal interests and has taken an active part in civic and state affairs. He was chosen chairman of the Democratic State Central Committee last fall and so conducted the state campaign that the state committee was put and kept on a cash basis.

Mr. Hart came to Arizona in 1901 with his parents and three brothers, locating in Bisbee. He was born and educated in Sandusky, Ohio, removing

from his birthplace to Marion, O. where he was engaged in business for four years previous to his coming to Arizona. He entered the restaurant business in Bisbee and in 1903 expanded by opening additional restaurants in Lowell and Douglas, moving his residence from Bisbee to Douglas in 1915.

In 1920 Mr. Hart was elected a member of the board of supervisors in Cochise county and served through four terms. In 1930 Mr. Hart disposed of his restaurants and has served as assistant chief of police of Douglas since that time.

Mr. Barth, a son of a pioneer family in Arizona, was born in St. Johns and educated in Albuquerque, New Mexico, high school and university. His father, Sol Barth, came to Arizona in 1861, stopping first in Tucson. Later the family moved to Prescott and finally located in St. Johns in 1874.

Mr. Barth has been engaged in many enterprises about St. Johns, besides being interested in several mercantile businesses, he has also engaged in stock and cattle raising. He saw service in the Navy during the World War.

While always active in the civic and political affairs of his community and state he never before has held a public office or appointment.



Jacob Barth, Commissioner

# New Commissioners Take Up Duties

By M. C. HANKINS, Commission Secretary.

The Arizona State Highway Commission met in special session on March 16, 1931, with the three newly appointed members present. Messrs. C. E. Addams, Phoenix, John B. Hart of Douglas, and Jacob Barth of St. Johns.

Organization was effected by the election of C. E. Addams as chairman and John B. Hart as vice-chairman. The length of term of Commissioners C. E. Addams and Jacob Barth is to January 31, 1937. John B. Hart was appointed as commissioner in lieu of James F. McDonald, resigned, term expiring January 31, 1933.

Contract was awarded on the Tucson-Nogales Highway, F. A. P. No. 86-C and 86-E to Heitsch and Bitten, Nogales, Arizona, low bidder. This construction involves approximately 17 miles of oil processing by the road mix method from the end of the pavement North of Nogales extending North on U. S. 89. Date of completion is June 30, 1931.

This contract awarded on the basis of the employment of Arizona citizens at a minimum wage of \$4.00 per day.

The governor transmitted a letter to

the highway commission relative to the flooding of the highways by irrigators, particularly, near Chandler and Buckeye. The matter was deferred until information is secured from the Salt River Valley Water Users' association as to their cooperation and advice on the proper method of procedure to eliminate the nuisance.

### Ask for New State Roads

A letter was presented from Mr. Harry O. Parks, president of the Sulphur Springs Valley chamber of commerce at Willcox, transmitted to the commissioners' office by the governor, requesting the establishment and location of a highway from Willcox through Aravapai Canyon to Winkelman. No action can be taken at this time.

A letter from the chamber of commerce of Florence was presented requesting the commission to take over the Hunt highway as part of the state system. The chamber of commerce was notified that no action would be taken at this time.

A letter was received from Mr. Wm. Allen Nickerson, Humboldt, together

with a petition transmitted from the governor's office, requesting the commission to take over the Black Canyon road to the state system. Petitioners were notified that no action could be taken at this time.

The commission awarded the contract on the Winslow-Holbrook highway, F. A. P. No. 40-C, Schedule 2, to the low bidder, McGinty Construction company, Phoenix. This work involves 1600 feet of grading, draining, and paving out of Winslow east, and the draining and placing of surfacing on approximately three-fourths mile. To be completed by April 30, 1931. Requirements are that Arizona citizens be employed and that a minimum wage be paid in the amount of \$4.00 per day.

The commission authorized the transfer of sufficient funds to seal coat the Douglas-Rodeo highway.

State engineer advised that the oil surfacing and widening of the culvert and structures on the Casa Grande-Picacho highway would be ready for construction in about three weeks.

### Special Session

The commission met in special session on March 23, 24 and 25, 1931, with all members present except Commissioner Mansfield.

A delegation from Greenlee and Gra-

ham counties appeared before the commission requesting that additional funds be set up in the ensuing budget for the continuation of the widening of the Coronado Trail and also that a survey be made on a new alignment of State Highway No. 71 from the Junction of U. S. 180 east of Solomonville to Clifton. The Commission instructed the state engineer to make a reconnaissance of the proposed new alignment with a view of setting up in the ensuing budget sufficient money for a complete survey and estimate, also consideration will be given for additional money for the widening of the Coronado Trail.

A delegation headed by Mr. John Dobson, President of the Water Users' association, appeared before the commission with reference to a new alignment of U. S. 80 from the Palm Service station, west of Mesa, straight through to Mill avenue at Tempe. State Engineer was instructed to make a preliminary survey on the proposed change so that it may be given consideration in the ensuing budget.

Mr. H. D. Lore of Apache county appeared before the Commission with reference to a proposed road from the bridge site over Puerco to U. S. Highway 66, which is a distance of approximately 5 1/2 miles. This road is through

the Petrified Forest and Adamana in Apache county. The matter to be fully investigated by the commission on their trip to Northern Arizona.

The right-of-way situation at Aguilla on the Wickenburg-Ehrenberg highway was settled by the commission for the alignment to run on the south side of the Santa Fe Railroad tracks, thereby eliminating two overpasses.

### Approve Bridge Purchase

The commission approved the tentative agreement for the purchase of the Blythe bridge between California and Arizona in which the agreement will be forwarded immediately to the California commission for their approval in order that immediate construction can start on the Wickneburg-Ehrenberg highway with the release of Federal Aid funds.

A letter was presented from Miss Grace M. Sparkes, secretary of the Yavapai county chamber of commerce, with reference to Senate Bill No. 147 providing for the construction of a bridge across the Verde river or Beaver Creek near Camp Verde, in which the state highway commission is authorized and empowered to proceed with the erection of the bridge, provided that Yavapai county will agree to provide the connecting roadway between Clarkdale, Camp Verde and Fossil Creek. Further consideration to be given the matter in conference with the board of supervisors of Yavapai county and also to secure information from the Paradise Verde association as to probable time when construction will commence on the Verde River dam.

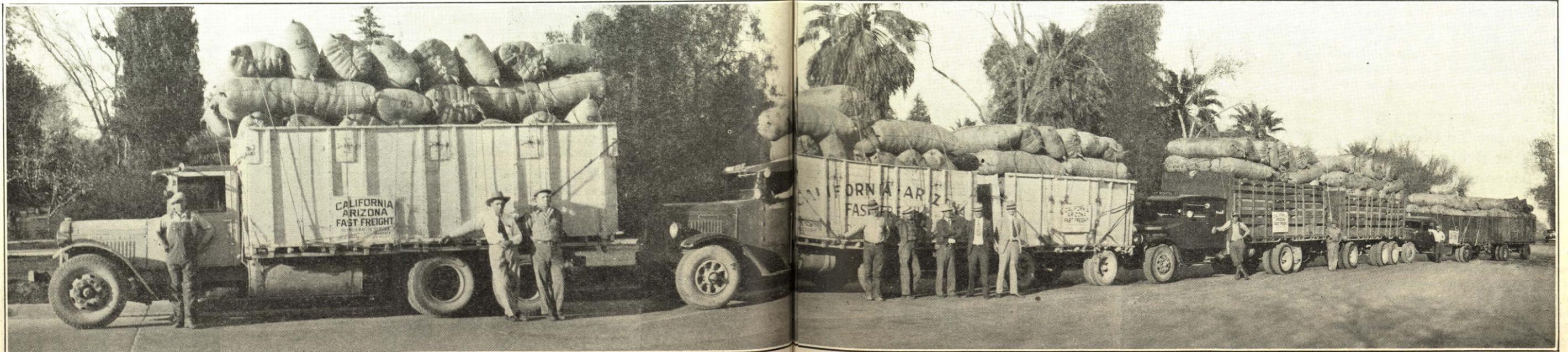
The state engineer was instructed by the commission to make a survey of the proposed road from Showlow to Concho.

Contract was awarded on the Phoenix-Tempe highway, F. A. P. No. 2-B, approaches to the Tempe bridge, to the low bidder R. H. Martin, Tucson. This work consists of grading, draining, and placing of subgrade stabilizer and is to be completed by June 30, 1931.

All bids on the Ash Fork-Kingman Highway, Ash Fork-Flagstaff, Ash Fork-Prescott, oil processing of approximately 22 miles were rejected on account of the bid on mineral aggregate being too high. A second call followed for new bids which are to be opened April 14, 1931.

Contract on the Holbrook-St. Johns Highway, F. A. P. No. 78-F, was awarded to the low bidder, H. L. Royden. Work consists of grading, draining, and placing of subgrade stabilizer from the town of Holbrook running easterly to

## Importance of Improved Highways in Transportation in Record Shipment of Arizona Wool to Coast



Most of the trucks we see about the city streets are owned by Arizona concerns for the transportation of their own commodities. Unless special attention is drawn to the fact the average person does not realize that the highways of Arizona have become arteries of transportation that are growing in importance each day and that the tonnage now coming into the state and going out of it in huge trucks that carry half a freight car load of merchandise is reaching a point

where it must be given serious consideration in the construction of highways and bridges. This is particularly true in the highway 80 between Phoenix and Yuma, where the newly oil surfaced highway is being given a severe test under this kind of traffic. This motor traffic is reflected in the registration fees of the Motor Vehicle department of the Arizona Highway department. The equipment in the above picture represents \$50 in registration fees to obtain

Arizona licenses, exclusive of the personal property tax on the trucks. Incidentally a motor vehicle inspector found two of the trailers in the picture were not registered in Arizona when this shipment started on its way to the coast and it cost \$67.00 for plates for them before the load could proceed. It keeps inspectors busy checking freighters into the state who attempt to use our highways with license plates of neighboring states.

ward St. Johns and is to be completed by July 31, 1931.

#### State Engineer Resigns

State engineer tentatively submitted his resignation effective April 15, 1931.

Mr. John C. Hall of Eagar and Mr. Gibbons appeared before the commission with reference to the controversy over the right-of-way on the Coronado Trail in Apache county, between the federal government and Apache county. State engineer advised that the highway department had nothing to do with the controversy as it is a matter entirely between the Forest Service through the Bureau of Public Roads and the County of Apache. This is not a part of the state highway system.

The letter of resignation of W. W. Lane, State Engineer, was read and accepted with regrets with date changed effective as of May 1, 1931.

On March 27, 1931, the Commission met in special session at 10:00 A. M. with all members present.

Thomas S. O'Connell, district engineer, was appointed as state engineer.

W. R. Hutchins, office engineer, was transferred to district engineer in the South district.

E. M. Whitworth, superintendent of the motor vehicle department, was given the added duties of Field Efficiency engineer.

The labor investigation was changed by turning over the duties of investigation and the inspection of all contracts regarding the employment of foreign labor to the four Motor Vehicle field inspectors.

Plans, specifications, and estimate were reported under way for the construction of the first section of the Bisbee Divide.

### Agreement To Purchase Blythe Bridge Hastens Arizona Road Program

(Continued from page 4)

Oddie-Colton bill with a possibility of a third being added. Relocation of the highway across one section is contemplated by the department and therefore is not included in this year's program.

California has appropriated a half million dollars for the improvement of the highway on the California side to Blythe, and early construction from that side is assured.

Following a conference between Governor Hunt and Governor Rolph of California, negotiations were entered into by State Engineer W. W. Lane and Col. Walter E. Garrison, director of the de-

partment of public works, C. H. Purcell, state highway engineer of California, and the owners of the Ehrenberg bridge for the joint purchase of the structure as the federal government would not approve the use of federal aid on the highway from Wickenburg unless the states owned the bridge. Agreement on the joint purchase of the bridge was reached on March 7. This agreement has now been approved by the commissions and legislatures of both states and only the sanction of the federal bureau is needed for Arizona to start the immediate improvement of the route.

Work will be expedited by the highway department so that all contracts may be let on the projects at the earliest possible moment. This improvement will shorten the distance between Los Angeles and Arizona points more than any other road in the state as it gives the most direct east and west connections and will save many thousands of dollars to motorists annually, that now are being paid in the form of tolls for crossing the Colorado river.

### Purchasing Department Adopts New Rules For Purchasing of Supplies

By W. C. JOYNER,  
Purchasing Agent

Effective April 1st the purchasing department notified all vendors whose solicitors regularly call at the department, that hereafter all purchases, unless emergency arises, will be made between the hours of 9:00 a. m. and 12 Noon. Due to the large amount of work necessary in getting out the myriad purchase orders it became absolutely necessary that some regulations be made to avoid the confusion of a large number of sales representatives who called each afternoon.

A new sign has been installed in the main entrance requesting salesmen to transact their business with the purchasing department rather than with the heads of different departments. Unfortunately, in many cases during past years salesmen have adopted rather high pressure methods, and this resulted in some cases at least in requisitions being written calling for the particular represented by this salesman.

As nearly as possible, every article bought by this department is purchased under competitive bidding, hence the necessity for the rule prohibiting salesmen from persuading supervising heads

to specify their particular brand of goods.

The purchasing agent's name is now followed by the legend "Purchases made from 9:00 a. m., to 12:00 Noon only." This is, however, not an arbitrary rule and applies to the salesmen who call every day for orders. Those who sell the department only occasionally, of course, may call and discuss their business at any time, but I believe that since the regular callers have become accustomed to the new rule that they are uniformly pleased with the present practice.

When competitive bids have been submitted by several firms we usually open these bids in the afternoon, at approximately 2:00 p. m., and the vendors are naturally expected to have a representative present to ascertain to whom the business was allotted.

This is a state institution, but I feel that it should be conducted along lines conducive to the best interests of all of the people of the state, and I am attempting to carry on the duties of this position in identically the same manner as I would were the business my own.

#### NORTH DAKOTA

The North Dakota legislature last month passed a bill increasing the gasoline tax from 3 to 4 cents. The bill will take effect July 1. The tax will be divided 2½ cents to the state highway fund and 1½ cents to the counties.

The Wisconsin state senate, by a vote of 22 to 10, passed a bill increasing the tax in that state from 2 to 4 cents. The same bill also repealed the personal property tax on automobiles, but increased the license fee or so called "weight tax."

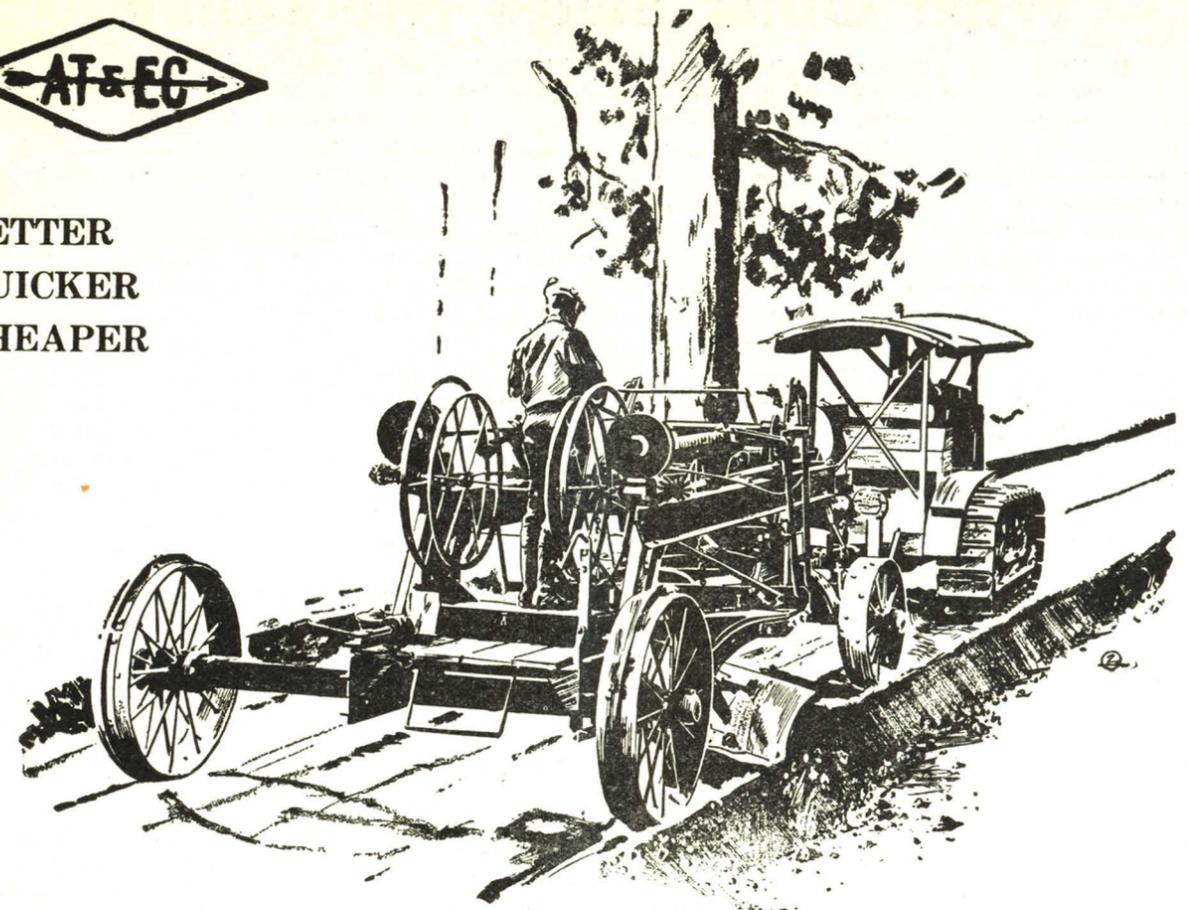
#### AUTO INCREASE SMALL

Last year marked the smallest annual gain in the number of automobiles in use in the United States since the invention of the "horseless carriage," it is noted in reports reaching the Automobile Club of Southern California. There were less than one per cent more machines on the highways than in 1929.

The actual increase in numbers was only 160,153, bringing the present total to 26,661,559. It is pointed out by manufacturers that there is every indication of an increase in the manufacture and sale of cars in 1931.



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"Caterpillar" Road Machinery

## ARIZONA TRACTOR & EQUIPMENT CO.

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## What Other States Are Doing

### ILLINOIS

Completion of the bond issue system of hard roads will require approximately \$110,000,000 and can be accomplished in the next three or four years providing present road revenues are continued.

That information was transmitted to Gov. Louis L. Emmerson by Director H. H. Cleveland of the department of public works and buildings.

With revenues continuing to come from motor license fees, Federal aid funds and from two-thirds of the state's three-cent gasoline tax, new pavement of standard width, and important widening and grade separation projects equivalent to a total of 800 miles can be completed each year, the highway officials said.

Any curtailment of the present road revenue would seriously delay completion of the bond issue system, as well as hamper the construction of grade separations and paving projects necessary to relieve traffic congestion in the metropolitan areas, they said.

"The principal interest of both bond issues are being paid from current motor license fee receipts, and the yearly surplus is used for construction and maintenance."

"To date 7,631 miles of bond issue roads have been paved, leaving approximately 2,200 of the 9,800 miles system to be slabbed."

Approximately \$285,774,000 have been spent up to November 1, 1930, in constructing bond issue roads, while outstanding obligations for roads in the process of construction total about \$14,250,000.

### CALIFORNIA

Abolition of the personal property tax on automobiles by the counties and substitution of a weight basis tax to be collected by the state at the time of registration is a new plan embodied in the proposed constitutional amendment which has been introduced in the California legislature by Assemblyman William B. Hornblower of San Francisco.

Under this arrangement, the bulk of the proceeds would be pro-rated back to the counties to be used for street and highway improvements. A state fund would be set up for participation with cities and counties and the railroads in the elimination of grade crossings on streets and roads off the state highway

system. Additional aid to joint highway districts would also be provided out of the tax revenues.

Under the proposed plan the counties would receive the same amounts now obtained from the personal property tax, while the additional revenue derived from those who evade the tax under the present method would be applied to grade crossing work and joint highway districts.

Endorsement of the measure has been voted by the directors of the Automobile Club of Southern California, the California State Automobile Association, the Motor Car Dealers' Association of San Francisco and of Los Angeles, and the Northern California Motor Car Dealers' Association.

Features which caused the Automobile Club of Southern California and the northern association to actively oppose Amendment 18, the state taxation proposal which was defeated at the election last November, are obviated by the Hornblower measure, it is stated.

### MINNESOTA

Bids on bituminous treatment of 630 miles of graveled trunk highways were received by the Minnesota Highway department March 17. Another 150 miles, more or less, may be added to the program later in the season, it is announced. Minnesota now has 1,150 miles of bituminous gravel in the trunk highway system and the 1931 program will bring the total close to 1,900.

The tentative schedule on which bids were received March 17 calls for figures on 12,700,000 gallons of material. Separate figures will be taken on material delivered at the nearest station to each project, and on application of the material. In addition to the new treatment, the schedule also includes 822 miles of retreatment of routes previously treated. Retreatments, on the average, are required two out of three years.

While bituminous materials come in three general classes, oil, tar and asphalt, there are several grades in each class. Before any gravel road is treated, there is a careful study of traffic conditions, sub-soil, cost of materials, and other factors, to determine the right grade and amount to apply. Using the wrong grade, too much or too little, or any error in the method of application, may result in a road surface worse than an untreated road.

### COLORADO

Colorado builds her mountain roads to connect her people of the mountain towns with the people of the cities of the plains, and in so doing builds for the use of the tourists.

Neither our mountains nor our plains roads are completed as through highways from east to west or from north to south.

The unimproved portion is our weak link in the chain.

To complete our system of state highways will cost about \$60,000,000. Our present highway program of construction is about \$4,000,000 a year.

### ARKANSAS

The Ninth Biennial report of the Arkansas highway commission forwarded to the governor and the state legislature contained 473 pages showing the detailed status of all contract work between January 1, 1927, and Nov. 30, 1930. The foreword of the report says:

"A perusal of the contents of this biennial report will give a very clear idea as to the magnitude of the construction program inaugurated by the State of Arkansas through the passage of the Martineau road law.

"Nearly four years have passed, each marked by a nearer approach to a parity of construction in each of the 75 counties of the State and by the completion of various inter-communicating highways throughout the State.

"As the provisions of the Martineau road law, providing for a parity of construction throughout the State, precluded the possibility of the completion of the through, or interstate highways, such highways have been completed only in part, but now that parity will be reached by the end of this fiscal year, the through highways should be completed as rapidly as possible.

"It is felt that the efforts of the State Highway Commission should be directed during the next biennial period toward the early completion of the interstate highways and toward higher type dustless surfaces on our heavier traveled roads, which will reduce maintenance costs, together with increased revenue due to the completion of our through highways, will be available for building other much needed roads in all parts of the State."

## "Caterpillar" Patrol Is Latest Addition In Maintenance Machines

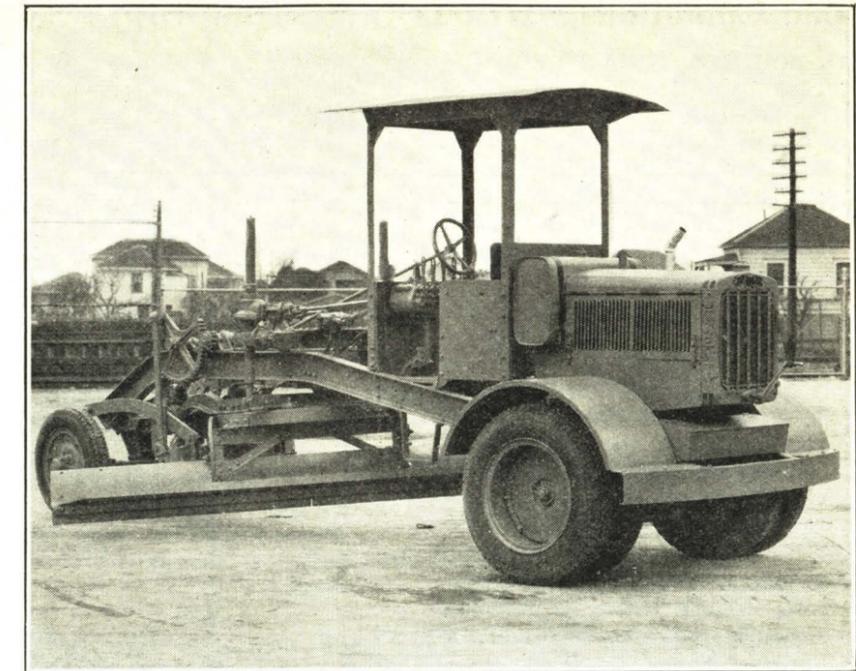
The "Caterpillar" Auto Patrol, latest addition to the "Caterpillar" line, is designed and engineered throughout as a heavy duty maintenance machine capable of doing all kinds of maintenance work according to "Caterpillar" standards. It has been placed on the market to do the work demanded by the leading maintenance engineers of the country.

They want a machine that has flexibility of speed. On first speed this machine will do an excellent job of scarifying, for it has the proper weight, power and traction. The scarifier has a double row of teeth which gives more clearance between the teeth for larger particles. First speed is also adapted to oil-mix work as well as extremely heavy blading work.

Second speed is an ideal rate for normal surface maintenance work.

Third speed is for lighter surface maintenance work and means many more miles of road work per day.

Fourth speed is a special high speed to get from one job to another in a hur-



CATERPILLAR "FAST PATROL"

ry and cushioning on six big pneumatic tires makes this possible without the usual vibration found in most big maintenance machines. Another demand in a machine of this type is simplicity and ease of control. The steering wheel is the only control operated manually.

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## Road Conditions, Arizona State Highway System

U. S. ROUTE 80, YUMA TO RODEO—518 Miles. All paved, oil surfaced or graveled. Condition good excepting 8 miles being oil surfaced west of Wellton; 2½ miles of detour around paving in Florence; 21 miles being oil surfaced Tucson to Vail Junction; 4 miles under construction west of Benson. Detour good; 7.6 miles under construction east of St. David, caution, no detour.

U. S. ROUTE 66, TOPOCK TO LUP-TON—396 miles. Gravel surface, oiled or paved. Condition good excepting 17 miles oil surfacing west of Oatman and 4½ miles under construction at Hackberry.

U. S. ROUTE 180, FLORENCE JCT. TO STATE LINE — 183 miles. Condition good. Observe caution in driving, 30 miles being oiled Coolidge Dam to Geronimo; 5 miles detour; condition fair; 13 miles under construction east of Geronimo, 2 mile detour, fair; 8 miles of oil surfacing, Solomonville to Duncan, caution.

STATE ROUTE 88, APACHE JCT. TO GLOBE—83 miles. Gravel surface. Condition good.

STATE ROUTE 73, CUTTER TO MC-NARY—104 miles. Gravel surface Cutter to Rice and White River to McNary, other unimproved. Condition good when open. Should enquire Globe Chamber of Commerce before making trip at this time of year as road is often closed because of snow.

STATE ROUTE 71, CLIFTON JCT. TO SPRINGVILLE — 157 miles. Gravel and partly surfaced. Condition good Clifton Jct. to 40 miles north of Clifton; closed for winter from that point to Alpine; Alpine to Springerville fair, partly under construction.

U. S. ROUTE 89, NOGALES TO FREDONIA—660 miles. Gravel, oil or paved surface to Flagstaff; graded and drained to Cameron; unimproved Cameron to Jacob's Lake; 40 miles under construction north of Cameron; gravel Jacob's Lake to Fredonia. Condition good

excepting 10 miles under construction between Nogales and Tucson, caution, Ash Fork to Flagstaff fair to good and Cameron to Jacob's Lake poor.

U. S. ROUTE 70, HOLBROOK TO STATE LINE—109 miles. Gravel surfaced. Condition good to excellent excepting 5 miles east from Holbrook, fair.

STATE ROUTE 79, PRESCOTT TO FLAGSTAFF—91 miles. Gravel or oil surfaced to Sedonia, graded and drained Sedonia to Flagstaff. Condition good excepting for construction in Oak Creek canyon. Sedonia to Flagstaff slow in wet weather.

STATE ROUTE 74, WICKENBURG TO EHRENBURG—74 miles. Surface, low type improved. Condition good, Wickenburg to Aguilla and Quartzsite to Ehrenberg, balance fair.

STATE ROUTE 81, DOUGLAS TO SAFFORD—128 miles. Gravel surfaced. Condition good.

STATE ROUTE 187, SACATON DAM TO CASA GRANDE—13 miles. Gravel surfaced. Condition good.

STATE ROUTE 83, VAIL TO SONOITA—28 miles. Gravel surfaced. Good.

STATE ROUTE 82, NOGALES TO TOMBSTONE JCT. 70 miles. Gravel surfaced. Good. Bridge under construction 8 miles north of Nogales.

STATE ROUTE 84, TUCSON TO GILABEND—124 miles. Gravel surfaced. Condition good excepting Tucson to Rillito being oil surfaced, 1 mile detour near Rillito; ten mile detour between Rillito and Red Rock. Detour fair. Observe caution in driving.

STATE ROUTE 87, MESA TO PICACHO—60 miles. Paved oiled or gravel surfaced. Condition good excepting 1800 ft. detour around overpass construction near Picacho.

## Watch Hand Signals

When a motorist is observed giving a signal, the best rule for drivers of approaching vehicles to adopt is one of caution. Records of traffic accidents show it is unsafe to take it for granted that the signalling operator is going to do just what his hand signal indicates. It frequently happens that a driver is confused and gives the wrong signal.

Many drivers, also, give signals which are so uncertain that they might mean anything, and in such cases other operators should use extreme care until it is definitely evident what the signalling driver really intends to do.

He: "My ancestors came over in the Mayflower."

She: "It's lucky they did. The immigration laws are much stricter now."

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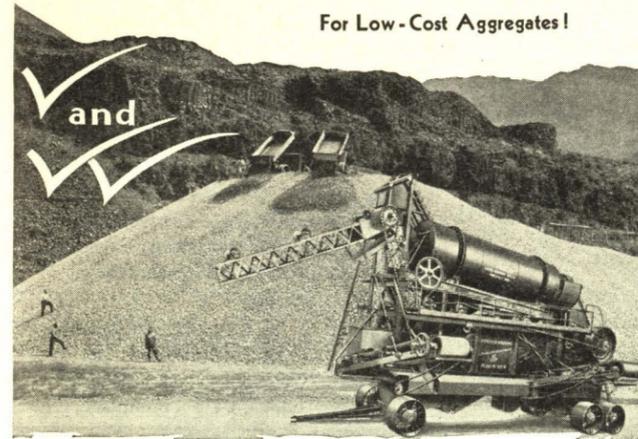
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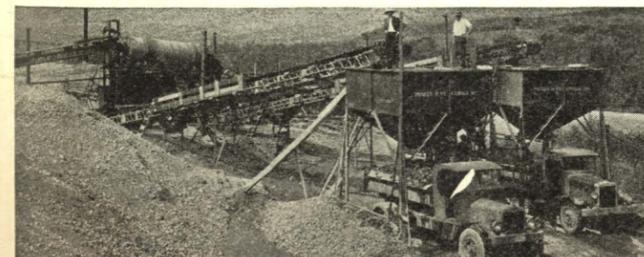
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Above is view of huge coarse aggregate stock pile on Stone & Webster \$25,000,000 Rock Island job. A similar stock pile of sand is close by. Aggregates produced by 300W Pioneer Plant shown above.

No. 300W **Pioneer Washing,**  
Screening, Crushing and  
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Here is the last word in mobile plants for producing required capacities of low-cost aggregates. This plant embodies in one compact unit the necessary feeding conveyors, screening, washing, crushing, dehydrating and delivery mechanism, all arranged in perfect balance to permit large input and output capacities.



This 300W Pioneer Washing Plant is producing 300,000 cubic yards of coarse aggregate on Stone & Webster \$25,000,000 Rock Island, Wash. Hydro-Electric Project. The Pioneer Plant has given complete satisfaction.

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# Projects Under Construction In Arizona

## District No. 1, Geo. B. Shaffer, District Engineer

Schmidt & Hitchcock have completed the oil surfacing of F. A. 55 Reo. beginning at Wellton and extending east 42½ miles. George Lang, Resident Engr.

Lee Moore Contracting Co. has completed the concrete dip four miles north of Gila Bend. F. A. P. 53-1 Reo., A. W. Newhall, Res. Engr.

M. H. Slocum has the grading, draining and gravel surfacing of 7.4 miles F.A. 80 D., (beginning at Seligman and extending west) 80% complete, Floyd J. Beeghly Res. Engr.

Canion, Francis & Royden has the grading, draining and gravel surfacing of 5.6 miles of the Phoenix-Yuma Highway (beginning at Ligurta and extending east) completed, James A. Parker, Res. Engr.

Skeels and Graham have the grading, draining and oil processing and construction of fifteen miles of road including two concrete bridges (beginning at Gila Bend and extending west), F. A. Reo., completed, A. W. Newhall, Res. Engr.

Gribble & Burke have the construction on oiling approximately 17 miles of the Topock-Oatman Highway 77% complete. H. O. Norville, Res. Engr.

The Western Gunite Co. has the contract for the oil surfacing of eight miles F.A. 26-D Reo. (beginning at Ligurta overpass and extending east), 50% complete, Geo. E. Lang, Res. Engr.

Yglesias Brothers have the construction of placing subgrade stabilizer on 9.3 miles of Ashfork-Seligman Highway (beginning at Pinevita and extending west), F. A. 57 Reo., 90% complete, Floyd J. Beeghly, Res. Engr.

H. L. Royden has the construction of two bridges and widening fill and

placing subgrade stabilizer, F.A. 55 Reo. (beginning ½ mile north of Stovall), 87% complete, Jas. H. Parker, Res. Engr.

Martter & Bock have the construction contract for the grading and draining of 4.5 miles (beginning 2 miles east of Hackberry and extending west) on F. A. Project 80-E 1% complete. H. O. Norville, Res. Engr.

## District No. 2, F. N. Grant, Dist. Engr.

Ben Pearce Construction Co. has the gravel surfacing of 22½ miles of U. S. 66 (beginning at Sanders and extending to the New Mexico state line), 68% complete, H. Pinney, Res. Engr.

Veater and Davis have the construction of 49 miles from Cameron to the Ridge Trading Post on U. S. 89 (F.A. 95-B) 8% complete, H. D. Alexander, Res. Engr.

McGinty Construction company has been awarded a contract for the construction of S. 20 & Non 40-C, Schedule No. 2 in the city of Winslow, J. P. Flynn, Res. Engr.

H. L. Royden has been awarded a contract for the construction of 5½ miles, beginning at Holbrook and extending east on Route 70, F. A. Project No. 78-F. J. P. Flynn, resident engineer.

## District No. 3, R. C. Perkins, Dist. Engr.

R. H. Martin has been awarded the contract for the construction of the approaches to the Tempe bridge, F. A. No. 2-B. Gus Rath, resident engineer.

Lynch-Canon Engineering Co. has the construction of the Tempe Bridge 80% complete, A. F. Rath, Res. Engr.

Martin Bros. have construction of the oil processing of 30½ miles of the Globe-Safford highway (beginning at Coolidge Dam and extending east), 28% complete, A. 87-B, M. Kisselburg, Res. Engr.

Lee Moore Contracting Co. has contract for the grade, drain and sub-grade surfacing of five miles of U. S. 180, (beginning at Geronimo and extending west, F. A. 15-D., 45% complete, L. C. Bolles, Res. Engr.

Lee Moore Contracting Co. has construction on F. A. Project 88-C, (beginning at Duncan and extending to the state line), 48% complete, H. B. Wright, Res. Engr.

Robert E. McKee has the grading and draining of 13.7 miles of U. S. 180, F. A. 87-E. (beginning at Geronimo and extending east), 4% complete, L. C. Bolles, Res. Engr.

Skeels & Graham have been awarded a contract for the surfacing and oiling of 11.6 miles (beginning at Duncan and extending west) on F.A. Project 88-B Reo., Daniel Thompson. Res. Engr.

Skeels & Graham have the surfacing and oiling of 8 miles (beginning at the east end of the pavement and extending east) F. A. Project 88-A Reo., 30% complete, Daniel Thompson, res. engr.

Stanley Jaicks Co. has the construction of the Florence paving 56% complete, Joe de Arozena, Res. Engr.

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## District No. 4, W. R. Hutchins, District Engineer.

Skeels & Graham have the grading, draining and surfacing of 8.7 miles of the Tucson-Nogales Highway, U. S. Route 89, (beginning at the end of the pavement 3 miles north of Tucson, and extending north) A. F. 86-E, complete, Sid Smythe, Res. Engr.

Hogger and Farmer have the construction of a R. R. Overpass and Approaches (between Rillito and Tucson) F. A. 94-G., 74% complete, J. R. Van Horn, Res. Engr.

Stanley Jaicks Co. has the construction of 8.3 miles of U. S. 84 (beginning at Rillito and extending west) F. A. 94-E, 78% complete, J. R. Van Horn, Res. Engr.

N. G. Hill Co. has the construction of a bridge and approaches, an overpass and grade, drain and surface, four miles west of Benson, F. A. 18, Sec. D. & E., 45% complete, W. J. Tavenor, Res. Engr.

The Imperial Trucking Corp. has the oil surfacing of 15½ miles F. A. 94-F. (beginning 1 mile north of Rillito and extending to the pavement three miles north of Tucson, 35% complete, J. R. Van Horn, Resident Engineer.

William Peper has the surfacing of

approximately ten miles of the Tucson-Nogales highway (beginning 22½ miles south of Tucson and extending to the Santa Cruz county line, also the construction of several concrete bridges, 45% complete, J. R. Van Horn, Resident Engineer.

Packard & Tanner have the construction of 7.6 miles (beginning 1 mile east of St. David extending east) F. A. Project 79 E, 5% complete, W. J. Tavenor, Res. Engr.

Hodgman & McVicar have the oil surfacing of 21 miles beginning 1 mile east of Tucson and extending toward Benson) on F. A. Project 90-A, 1st Reo., 7% complete. C. S. Benson, Res. Engr.

## WHERE TO SPEND HIGHWAY FUNDS

Washington, D. C.—An educational campaign on where to spend highway money rather than where to get it has been launched by the American Association of State Highway Officials.

This step, according to W. C. Markham, executive secretary of the Association, has been made advisable by the efforts of those who are clamoring for second and third class road improvement without realizing that our present policy of completing state systems first is

leading steadily and logically toward the goal they seek.

This is being done through two results which come from placing substantial surfaces on main routes first and where traffic is heaviest. The first result of this policy is to hold road repair costs down to a minimum, and the second result comes from lessened cost of fuel in automotive vehicle operation. Both of these results provide savings in main route operation which in turn may be applied to the improvement of secondary and third-class roads. While this statement may be a repetition of known facts, it cannot be repeated with too much emphasis.

"The plans under which we are working" Mr. Markham states, "did not just happen. It took exactly eighteen years of hard-fought legislation, beginning with the Post Road Inquiry of 1912, followed by long debates and the passage of amendments running through ten Congresses, to get where we are now."

Government experts say you can buy more with a dollar now than you could this time last year, and what we hope is that they are now at work on a bulletin telling where to get the dollar.

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**Apache Powder Company**  
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## Bureau Of Public Roads Projects In Arizona

### UNDER CONSTRUCTION

C. G. Willis & Sons have the grading of Forest Highway-Oak Creek Hill Section 7-C. The project begins at the top of the Oak Creek Canyon—13 miles south of Flagstaff—and extends to the bottom of the hill, a length of 2.8 miles. Estimated cost of construction is \$186,000 and project is now 12% complete. E. J. McCracken, Resident Engineer.

Skousen Brothers have the grading of the Picnic Mesa-Springerville Section 19-1, of the Clifton-Springerville Forest Highway. The project is 4.5 miles in length, beginning at Picnic Mesa and extending north to a connection with U. S. Route 70 at a point ½ mile East of Springerville. Estimated cost of this project is \$27,000 and is now 55% complete. C. R. Dalton, Resident Engineer.

O. F. Fisher has the contract for sub-grade reinforcement on Forest Highway 19-G 2 H1, two sections of the Clifton-Springerville road, 11.3 miles in length extending from a point one mile north of Nutrioso to Picnic Mesa. The estimated cost of this project is \$27,000 and is now 90% complete. C. R. Dalton, Resident Engineer.

Lord & Bishop have the contract for oil surfacing 18.5 miles of the Grand-Canyon National Park, Route 1, beginning at Grapevine Canyon, 10 miles east of Grand Canyon village, extending 152 miles east to Desert View and includ-

ing 3.3 miles of spurs. Estimated cost of this project is \$144,000 and was 60% completed when closed down in November for the winter season. It is expected that work will be resumed about April 15th. V. G. Watson, Resident Engineer.

Jasper-Stacy company has the contract for grading Houserock Canyon Section of the Houserock Canyon National Forest Highway, Project 28-A, Kaibab National Forest, Coconino County, at an estimated cost of \$275,000. Work on this project was begun in August 1930 and is now approximately 75% complete. W. Nelson, Resident Engineer.

Jasper Stacy company has the contract for grading the 8.4 miles of Section B, Houserock Canyon National Forest Highway, Kaibab National Forest, Coconino County, Arizona, at an estimated cost of \$162,000. Work on this project has not yet begun. W. J. Nelson, Resident Engineer.

Lord & Bishop have the contract for oil surfacing 26 miles of the Grand Canyon Route 3 from Bright Angel point to Cape Royal, at an estimated cost of \$285,000. This project is located on the North Rim of the Grand Canyon National Park and in Coconino county. Project when closed down October 29th for the winter was 40% complete. Work will probably be resumed in May or June. Rudolph Thirion, Resident Engineer.

Swift Trail Section 1 Improvement, a

portion of the Major Forest Development Road System, is being done by day labor and Station contract. This project is 4 miles in length beginning at a junction with State Route 81, seven miles south of Safford and extending in a southwesterly direction to the foot of the Graham Mountains. Estimated cost is \$12,000 and project is now 45% complete. E. V. Aldrich, Resident Engineer. Henry Galbraith has the contract for the grading of Project 7-D, Upper Canyon Section of the Oak Creek Forest Highway. The project begins at the foot of the Oak Creek Hill, adjoining the Willis contract, and extends down the Canyon to the "Call of the Canyon" resort. The length of the project is 2.9 miles and the total estimate of cost is \$73,000. Project is 3% completed. E. J. McCracken, Resident Engineer.

Harry Hagen was low bidder on April 3 for the grading of 4.3 miles of Section 2-D, Swift Trail Major Forest Development Road, in Crook National Forest, Graham county. The total estimated cost is \$57,000 and E. F. Strickler is the Resident Engineer. Award of the contract has been recommended but has not yet been made.

W. M. Tenny Jr., has the contract for grading and draining of 1 mile of the Heber Hill Section of the Payson-Holbrook Forest Highway, a portion of Project 11-A, in the Sitgreaves National Forest, Navajo county. Actual con-

struction work has not yet commenced. Estimated cost of construction \$2,800. L. C. Chadwick, Resident Engineer.

Jack Casson was low bidder on March 31, for the surfacing by the plant mix method of 28 miles, Section A and B, of the Grand Canyon-South Approach Road in Coconino County. Total estimated cost of construction is \$160,000. V. G. Watson, Resident Engineer.

### SURVEYS

Chiricahua National Monument Survey, Forest Highway Route 32, in Cochise County. Estimated length 12 miles. Survey began February 23. F. H. Horton, Locating Engineer.

Payson-Indian Garden-Colcord Survey, Forest Highway Route 11, beginning at Payson and extending eastward for an approximate distance of 40 miles, to a connection with the Young-Holbrook Highway near the Gila-Coconino County line. Survey began March 15th. J. H. Brannan, Locating Engineer.

### Auto Dollar Leads

Now is the time to buy an automobile, according to a recent statement regarding the value of the automobile dollar from the National Automobile Chamber of Commerce.

In terms of the 1914 dollar, the automobile "buck" today is worth 122 pre-war cents, while the cost of living dollar is worth only 66 cents. On this basis, nearly twice as much value is obtained from a dollar expended on automobile purchases, compared with expenditures for articles used in computing the average cost of living budget.

Widespread interest has been aroused in Mexico through the proposed International Pacific Highway construction from Nogales to Mexico City.

The tourist invasion as far as Guaymas started already, it is indicated, as

the number of motor touring parties passing into Mexico has increased from an average of two a week to 10 or 12 a day, or approximately 35 times as many as when the pathfinding party from the motoring organization went into Mexico last spring.

A curious feature of the increased travel is that the majority of the touring parties are honeymooners seeking the land of romance.

### NOTICE TO CONTRACTORS

FLORENCE-TUCSON HIGHWAY  
E. F. A. P. No. 94-E.

Bids to be opened April 21st, 1931.

Sealed bids for the Oil Processing of the above named project will be received until 2:00 P.M. on the above date, and then publicly opened and read at the office of the Arizona State Highway Commission, Phoenix, Arizona. No bids will be received after the time specified.

All bids must be marked upon the outside of the envelope "State Highway Contract, Florence-Tucson Highway, E. F. A. P. 94-E," and MUST CLEARLY SHOW THE NAME OF THE BIDDER ON THE OUTSIDE OF THE ENVELOPE.

The work, which begins at the Pinal-Pima County Line, extends eight and three-tenths (8.3) miles toward Tucson, consists of the Oil Processing by the Road Mix Method of the entire Project, and is to be completed on or before August 15th, 1931.

### APPROXIMATE QUANTITIES

96,400 Sq. Yd. Preparation Subgrade or Road Surface
12,000 C. Y. Mineral Aggregate
75,000 C. Y. Mi. Mineral Aggregate Haul
5,000 C. Y. Shoulder Material
18,700 C. Y. Mi. Shoulder Mat. Haul
192,000 Gals. Oil
8.2 Mi. Mix, Lay and Finish

No contractor shall be eligible to submit a bid until his attested statements, made on forms supplied by the Arizona Highway Department, of financial resources and construction experience and equipment has been approved. Bids will be made only upon the bidding form contained in the Pamphlet and supplied by the Department, and which form will be supplied only to contractors whose statements show sufficient financial resources and construction experience to properly construct the work.

All bids shall be accompanied by an unendorsed, certified or cashier's check only, of not less than five (5%) per cent of the gross amount of the bid payable to the State Treasurer of Arizona.

The right is reserved, as the interest of the State Highway Commission may require, to reject any and all bids, to waive any informalities in bids received and to accept or reject any items of any bid unless such bid is qualified by specific limitations.

STANDARD SPECIFICATIONS — Copies of the Standard Specifications, Issue of October, 1930, may be purchased for Three (\$3.00) Dollars the copy. Checks should be made payable to W. W. Lane, State Engineer.

PLANS & PAMPHLET (For Bidders ONLY)—Copies of the Plans and Pamphlet may be issued to qualified contractors having a copy of the Standard Specifications of above issue, and upon deposit of Ten (\$10.00) Dollars. Deposit will be refunded should Plans and Pamphlet be returned within ten (10) days after opening of bids.

PLANS & SPECIAL PROVISIONS (For Non-Bidders) — Copies of the Plans and Special Provisions, without Bidding Schedule, may be obtained upon deposit of Ten (\$10.00) Dollars. Deposit will be refunded should plans and Special Provisions be returned

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within ten (10) days after opening of bids.

The Standard Specifications of the Issue of October 1930, shall be used for all Projects until July 1931, or until notification that a new issue is ready for distribution.

The bidder will be required to comply with the provisions of the Specifications and Contract in bidding and the award and execution of the Contract.

W. W. LANE,  
State Engineer.

Phoenix, Arizona,  
April 7th, 1931.

**NOTICE TO CONTRACTORS  
FLORNC-SUPERIOR HIGHWAY  
F. A. P. 23-A & B, 23-C, D & F**

Bids to be opened April 17th, 1931. Sealed bids for the construction of the above named projects will be received until 2:00 P. M. on the above date, and then publicly opened and read at the office of the Arizona State Highway Commission, Phoenix, Arizona. No bids will be received after the time specified.

All bids must be marked upon the outside of the envelope "State Highway Contract, Florence-Superior Highway" F. A. P. 23-A & B, Florence-Superior Highway, F. A. P. 23-C, D & F (as the case may be)", and **MUST CLEARLY SHOW THE NAME OF THE BIDDER ON THE OUTSIDE OF THE ENVELOPE.**

The work, on 23-A & B begins at the Florence Bridge and extends north approximately fifteen (15) miles to Florence Junction, consists of the construction of approximately three (3) miles of new roadway, the oil processing by the Road Mix Method of the entire fifteen (15) miles, and is to be entirely completed on or before August 31st, 1931.

The work on 23-C, D & F begins at Florence Junction and extends easterly approximately sixteen (16) miles to Superior, consists of the oil processing by the Road Mix Method of the entire fifteen (15) miles, and is to be entirely completed on or before August 31st, 1931.

**APPROXIMATE QUANTITIES**

- F. A. P. 23-A & B
- 6,300 C. Y. Excav. Road
- 1,500 C. Y. Excav. Drain
- 830 C. Y. Excav. Struct.
- 9,750 C. Y. Excav. Borrow
- 11,400 C. Y. Sub. Stab.
- 59,500 C. Y. Mi. Sub. Stab. Haul
- 300 C. Y. Concrete
- 13,300 Lbs. Rein. Steel
- 136 Lin. Ft. 24" C. M. P.
- 144 Lin. Ft. 36" C. M. P.
- 32 Lin. Ft. 30" C. M. P.
- 75 Lin. Ft. Bank Prot.

- 150,000 Sq. Yd. Prep. Subgrade
- 18,800 C. Y. Mineral Aggreg.
- 84,500 C. Y. Mi. Mineral Aggreg. Haul
- 300,000 Gal. Oil
- 14.2 Mi. Mix, Lay & Finish
- 28.4 Mi. Reshape Shoulders
- F. A. P. 23-C, D & F
- 9,300 C. Y. Sub. Stab.
- 18,100 C. Y. Mi. Sub. Stab. Haul
- 20,700 C. Y. Mineral Aggreg.
- 58,600 C. Y. Mi. Mineral Aggreg. Haul
- 331,000 Gal. Oil
- 15.1 Mi. Mix, Lay & Finish
- 30.2 Mi. Reshape Shoulders
- 2,000 C. Y. Mi. Overhaul of Material to be Stockpiled.
- 2,000 C. Y. Mi. Ovehaul Material to be Stockpiled

No contractor shall be eligible to submit a bid until his attested statements, made on forms supplied by the Arizona Highway Department, of financial resources and construction experience and equipment have been approved. Bids will be made only upon the bidding form contained in the Pamphlet and supplied by the Department, and which form will be supplied only to contractors whose statements show sufficient financial resources and construction experience and equipment to properly construct the work.

All bids shall be accompanied by an unendorsed, certified, or cashier's check only, of not less than five (5%) per cent of the gross amount of the bid payable to the State Treasurer of Arizona.

The right is reserved as the interest of the State Highway Commission may require, to reject any and all bids, to waive any informalities in bids received, and to accept or reject any items of any bid unless such bid is qualified by specific limitations.

**STANDARD SPECIFICATIONS**—Copies of the Standard Specifications issue of October, 1930, may be purchased for Three (\$3.00) Dollars the copy. Checks should be made payable to W. W. Lane, State Engineer.

**PLANS & PAMPHLET** (For Bidders only)—Copies of the Plans and Pamphlet may be issued to qualified contractors having a copy of the Standard Specifications of above issue, and upon deposit of Ten (\$10.00) Dollars. Deposit will be refunded should Plans and Pamphlet be returned within ten (10) days after opening of bids.

**PLANS & SPECIAL PROVISIONS** (For Non-Bidders)—Copies of the Plans and Special Provisions, without Bidding Schedule, may be obtained upon deposit of Ten (\$10.00) Dollars. Deposit will be refunded should Plans and Special Provisions be returned within ten (10) days after opening of bids.

The Standard Specifications of the issue of October 1930, shall be used for all Projects until July 1931, or until notification that a new issue is ready for distribution.

The bidder will be required to comply with the provisions of the Specifications and Contract in bidding and the award and execution of the Contract.

W. W. LANE,  
State Engineer.

Phoenix, Arizona,  
April 4th, 1931.

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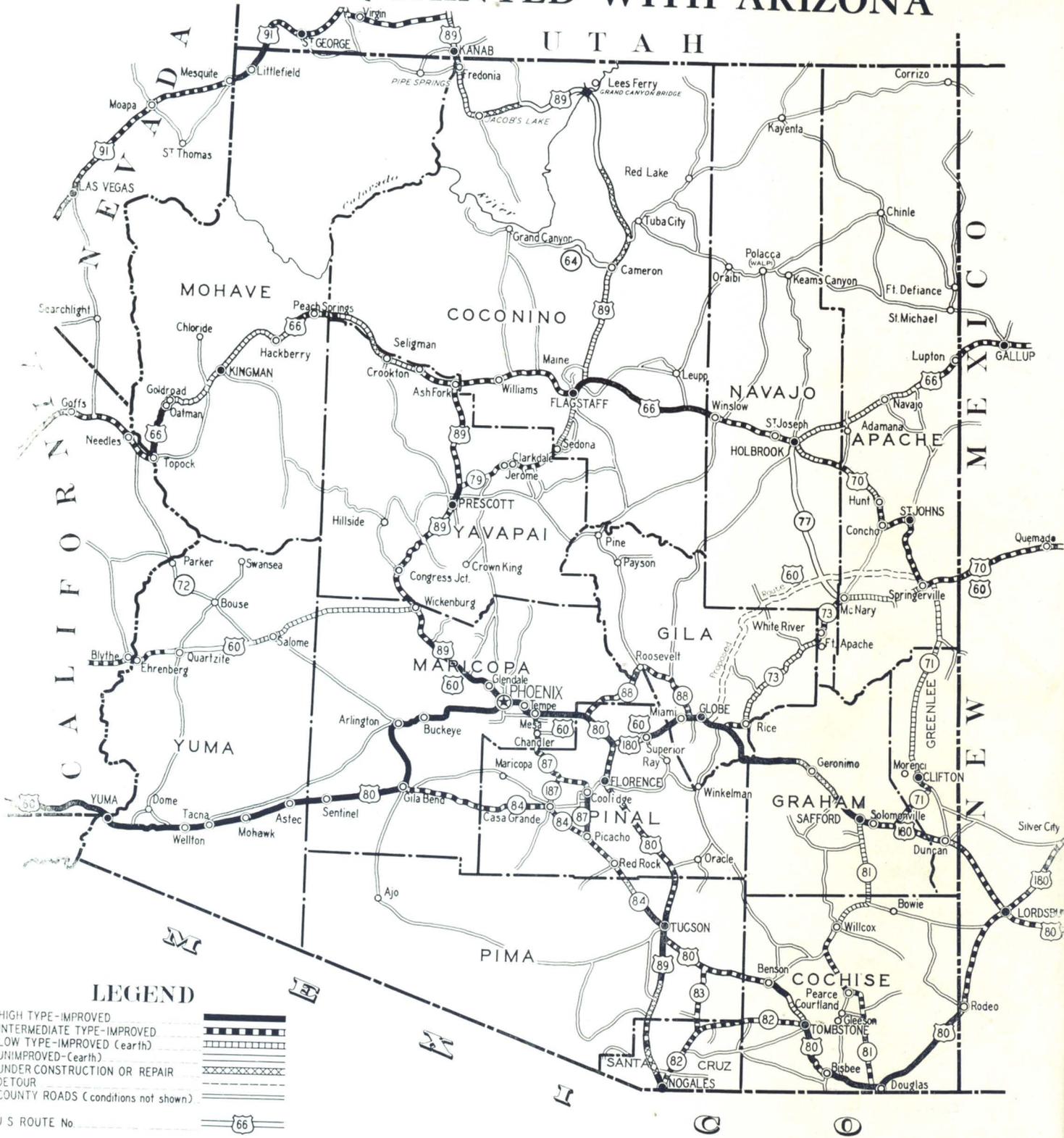


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## LEGEND

- HIGH TYPE-IMPROVED
- INTERMEDIATE TYPE-IMPROVED
- LOW TYPE-IMPROVED (earth)
- UNIMPROVED-(earth)
- UNDER CONSTRUCTION OR REPAIR
- DETOUR
- COUNTY ROADS (conditions not shown)

- U. S. ROUTE No.
- STATE ROUTE No.



STATE ROUTE MARKER

## ARIZONA HIGHWAY DEPARTMENT CONDITION MAP OF STATE HIGHWAY SYSTEM

Scale  
0 10 20 30 40 50 Miles

State Historian,  
State Capitol,



FEDERAL ROUTE MARKER