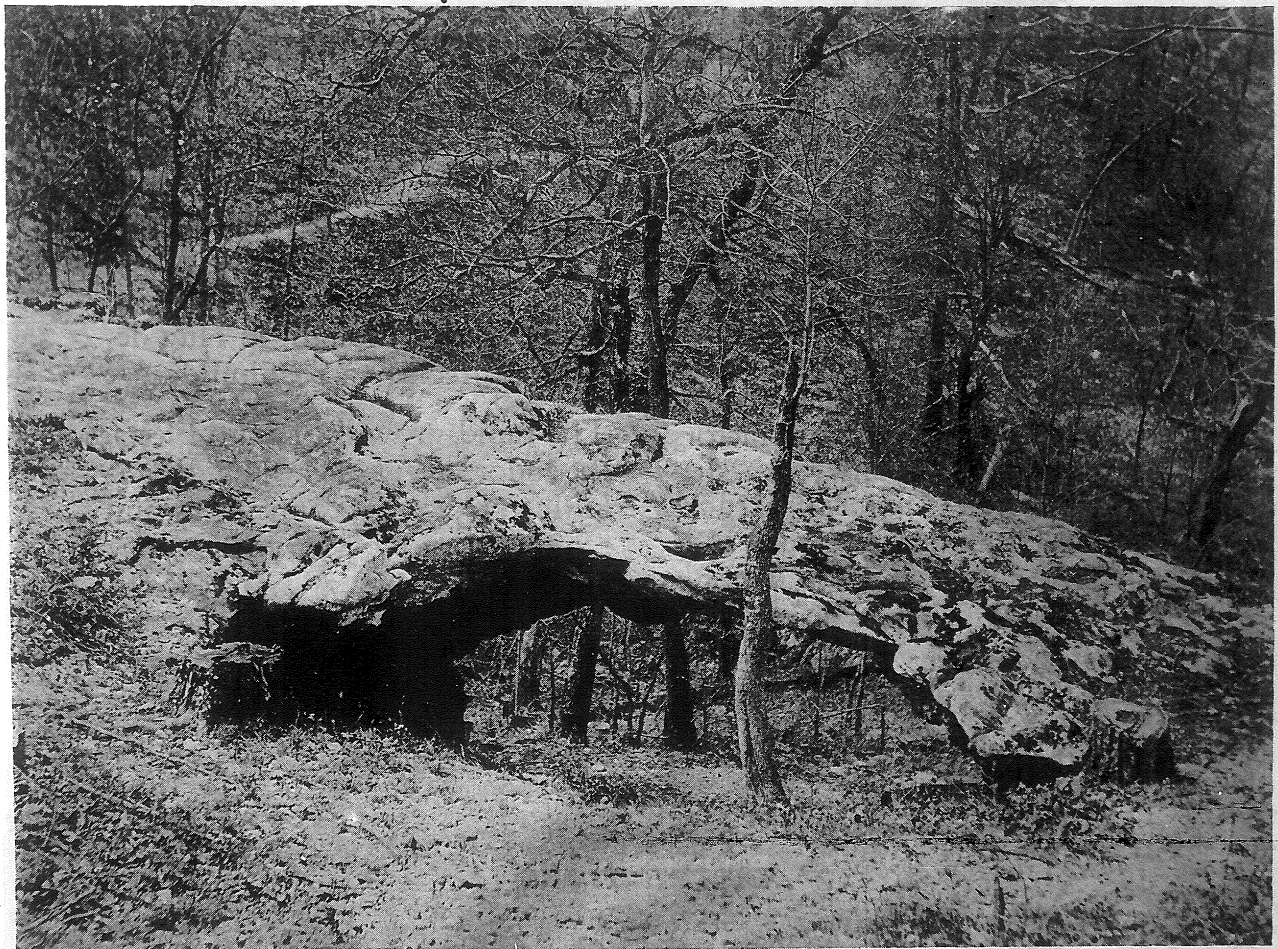


ARKANSAS HIGHWAYS

The Official Magazine of the Arkansas
State Highway Department, Little Rock



A SPOT OF RARE BEAUTY IN ARKANSAS

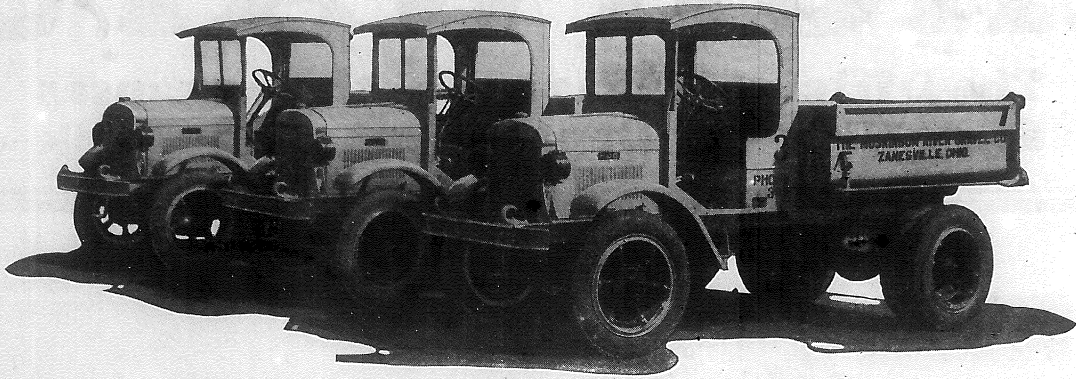
Vol. 4

OCT. 1927

No. 10

Hug Roadbuilding Trucks

Designed for Roadbuilding



(Fleet of Model "80" Hug Roadbuilders, equipped with Hug Open Roadbuilders cab and Presto-Lite equipment. Above fleet delivered to the Muskingum River Gravel Co. of Zanesville, Ohio. The performance of the first three trucks resulted in the purchase of three additional trucks.)

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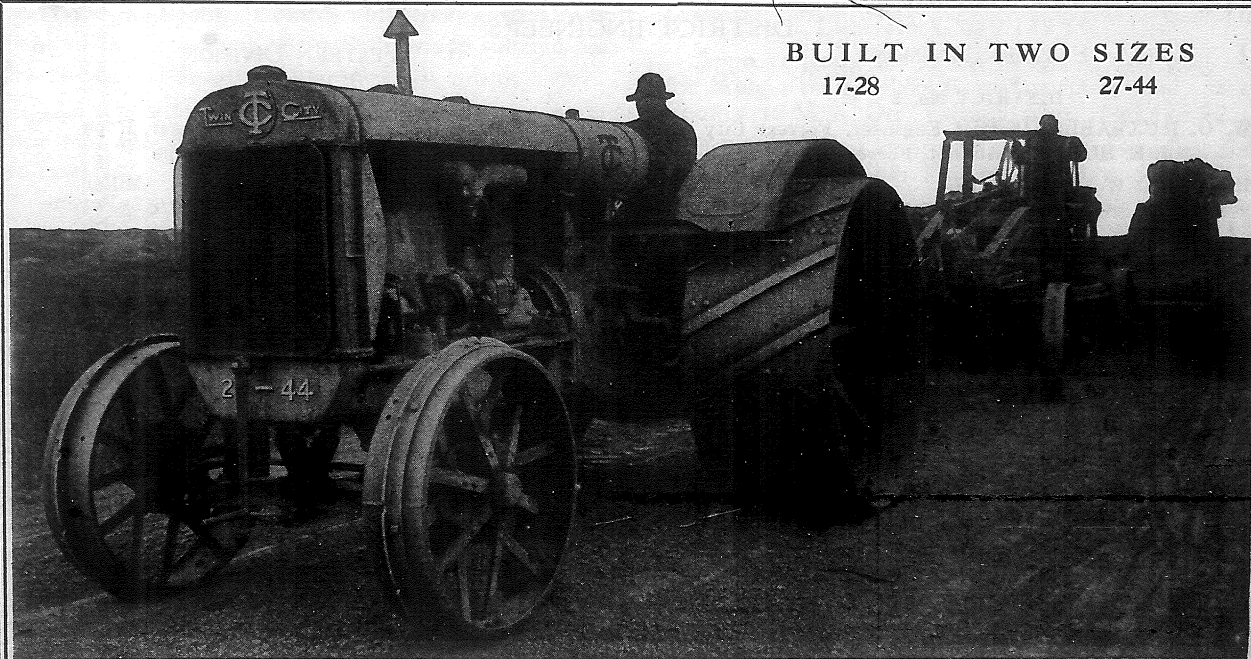
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ARKANSAS HIGHWAYS

*Official Monthly
Magazine*



*State Highway
Department*

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VOL. IV.

OCTOBER, 1927

No. 10

Contracts Let For Highways and Bridges

New Construction To Cost Approximately \$1,149,798.77

The State Highway Commission recently announced the successful bidders on \$1,149,798.77 new road construction in Arkansas, covering approximately 150 miles.

The bids were opened at a meeting of the commission in the chamber of the House of Representatives Monday and the tabulation was completed as rapidly as possible to prevent any delay in awarding the contracts.

The new construction includes 20 highway projects and five bridge jobs. Considerable repair work also will be done in the sections of the State which suffered heavily during the disastrous floods of last spring.

The contracts as awarded by the Highway Commission and announced by Engineer C. S. Christian are as follows:

Fair Oaks-Wynne road, 14 miles, Cross County, to E. E. Davis, Oklahoma City, Okla., on a bid of \$76,877.82.

Wheatley-Southwest road, eight miles, St. Francis County, to Mississippi-Arkansas Construction Company, \$72,053.42.

Pine Bluff-South road, 8.4 miles, Jefferson County, to Joe Selz, McGehee, \$42,604.33.

Nashville-Lockesburg road, 11 miles, Howard County, to Reynolds & Sutton, Tyler, Tex., \$79,030.37.

Kirby-Murfreesboro road, eight miles, Pike County, to W. P. McGeorge & Co., Pine Bluff, \$125,774.49.

Approximately 345 feet of reinforced concrete bridge on Ashdown-Ben Lomond road, Sevier county, to Richardson-Ayres, Hope, \$28,208.59.

Arkadelphia-Amity road, eight miles, Clark County, to C. H. Atkinson, Chillicothe, Mo., \$26,418.28.

Mountainburg-Fine Springs road, eight miles, Crawford County, to Hinson Brothers, Muskogee, Okla., \$93,089.29.

Ash Flat-Hardy road, five miles, Sharp County, to Williamson & Williams, Batesville, \$41,362.86.

Beedeville road, surfacing eight miles, Jackson County, to W. L. Davis, Kansas City, Mo., \$15,843.16.

Algoa-Beedeville road, surfacing six miles, Jackson County, to A. A. Davis, Kansas City, Mo., \$6,329.58.

Stegall road, surfacing four miles, Jackson County, to A. A. Davis, Kansas City, Mo., \$9,140.46.

Approximately 130 feet timber and steel beam bridge, Heber Springs-Edgemont road, Cleburne County, to B. H. Heard, Little Rock, \$10,149.83.

Approximately 1,520 feet of timber and steel beams for bridges on the Newport-Harrisburg road, Jackson County, to M. K. Orr, Tschula, Miss., \$40,496.82.

Benton-Grant County line road, eight miles, Saline County, to Bradley & Tolbert, Sheridan, \$54,983.68.

Malvern-Donaldson road, 10.7 miles, Hot Spring County, to Stanley-Fowler & Kennedy, Malvern, \$53,289.21.

Malvern-Grant County line road, six miles, Hot Spring County, to Stanley-Fowler & Kennedy, Malvern, \$29,134.10.

Warren-Banks road, 12.5 miles, Bradley County, to Browne & Ross, Arkadelphia, \$101,615.

Pansy-East road, two miles, Cleveland County, to R. J. Lynch, Little Rock, \$18,523.70.

Warren-Hermitage road, six miles, Bradley County, to J. A. Perdue & Co., Pine Bluff, \$9,302.64.

Dardanelle-South road, eight miles, Yell County, to J. N. George & Bro., Centerville, \$34,805.71.

Dardanelle-South road, six and one-half miles, Yell County, to J. N. George & Bro., Centerville, \$58,637.44.

Harrison-Omaha road, 11 miles, Boone County, to M. E. Gillioz, Monette, Mo., \$72,925.70.

Corning-Pocahontas road, 11.5 miles, Clay County, to A. A. Davis & Co., \$37,702.66.

State To Use Own Workers On Highways

Thirty-eight Projects On Which Bids Were Rejected To Be Completed

Thirty-eight highway projects in widely scattered portions of the State upon which all bids from contractors were rejected by the State Highway Commission, will be constructed by forces of the State Highway Department, according to announcement by officials of the department.

In many instances the work on these projects has already begun and others will be under way in a short time for completion by spring to take care of the heavy tourist travel. A majority of the projects are widening, improving grades and installing drainage structures, officials said, though there are several gravel surfacing jobs to be done by State crews. Bids submitted on each of the projects were rejected by the commission because of price or time required for completion.

The list of projects to be completed by the State Highway Department forces are as follows:

District No. 1—Moro-Wheatley, Lee County, concrete box culvert.

District No. 3—Kirby-Amity, Pike County, grade and drainage; Prescott-Rosston, Nevada County, grade and drainage; Lewisville-Bradley, Lafayette County, grade and drainage; Murfreesboro-Delight, Pike County, grade and drainage.

District No. 4—Fort Smith-Hartford, Sebastian County, grade and drainage; Van Buren-Evansville, Crawford County, grade and drainage; Seligman-Eureka Springs, Benton and Carroll counties, grade, drainage and gravel.

District No. 5—Batesville-East Independence County, gravel surface; Sulphur Rock-East Independence County, grade; Newark-Oil Trough, Independence County, gravel; across southeast corner of Independence County, gravel; El Paso-Beebe, White County, grade and drainage; Ash Flat-Highland, Sharp County, grade and drainage; Newport-South, Jackson County, grade and gravel surface; Independence County line east, Jackson County, gravel; Alicia-Northeast, Jackson County, grade, drainage and gravel; Jackson County line north, drainage and gravel; Beedeville road, Jackson County, grading; Salem-West, Fulton County, grade and drainage.

District No. 7—Sparkman-Dalark, Dallas County, grade, drainage and gravel; Manning-Princeton, Dallas County, grade and gravel; Holly Springs-Princeton, Dallas County, grade and drainage; Mt. Holly to El Dorado, Magnolia road, Columbia County, grade and drainage; Camden-Bearden, Ouachita County, grade and gravel; Stephens-Camden, Ouachita County, grade, drainage and gravel; Pansy-North and South, Cleveland County, gravel.

District No. 8—From Federal project No. 26 to Hartman, Johnson County, grade and surface; completion

of Federal Aid Project No. 26, Johnson County, grade and surface; Morrilton-South road, Conway County, grade, drainage and gravel, and repair to south approach of Arkansas river bridge.

District No. 9—Yellville-West, Marion County, grade and drainage; Flippin-South, Marion County, grade and drainage; Mountain Home-South, Baxter County, grade and drainage.

Enforced Exercise

"Yes," said the man, "I realize that motoring is a great thing. I used to be sluggish before the motoring craze, but now I'm spry and energetic."

"I didn't know you motored."

"You're right. I don't—I dodge."

Accident Insurance

"Say, Boss," cried a dark-skinned customer, rushing much perturbed into a store, "a no-count boy has threatened my life. Ah craves protection."

"How about a bullet-proof vest?" queried the man behind the counter.

"Wuthless, plumb wuthless. Ain't yo' got no razzer-proof collahs?"



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Beautification of Highways

Just as we were about ready to give a lot of thought and then some views on the important subject of planting along highways, we come across an interesting article by Prof. C. A. Keffer, in the Southern Agriculturist, which we pass along with our indorsement. More on this point will appear later.

"With the development of hard-surfaced roads throughout the country much thought has been given the planting of highways. Suggestions have been almost as various as numerous. A plan that has had many advocates involves the planting of one species of tree at regular intervals on both sides of the highway across an entire county. And one highway improver would have the same species planted the full length of the highway—from Memphis to Briston, Tenn., for example.

There are many things to be considered: The rights of the adjacent property owners, the privileges of power, light, telephone and telegraph companies, the regulations of the highway commission, the interests of travelers, the dictates of good taste, the lay of the land, the adaptability of tree species to the locality and the use intended, cost of material and planting, and after care. There may be other considerations, but these are important and should be carefully studied before any planting is done.

One has only to observe the effect of isolated trees to see what a draft they make on the land. Their roots feed far beyond the spread of their crowns, and a row of mature trees bordering the highway depletes the field adjoining of much of its fertility, so that the crops for two rods or more from the road are practically worthless. This is asking of the farmer more than the passing traveler realizes, and his farm operations are in no way benefited. In deed it is doubtful if the traveler gains more than he loses in traversing trees bordered highways. For any continuous highway planting program would place trees not more than 50 feet apart. This seems a wide interval while the trees are young, but with rapid growing species the crowns will touch in thirty years or less. Continuous shade is thus provided, but the view of the traveler is confined to the road-way. He cannot see the country through which the road leads. He gains little knowledge of the farms, or of the people as revealed by their farming.

And the community gains little from the traveler who journeys over such a tree-embowered road. He can

tell no one what the farms are like, he has not seen livestock or farms or farmsteads. He has only seen the trees along the road!

Unless roadside trees are protected from the encroachments of wire lines nothing larger than dogwood and redbud should be planted. Every highway affords awful examples of trees that have been mutilated by telegraph and telephone systems. And these mangled trees are anything but beautiful. The road commissioners do not want trees in the right-of-way because they interfere with the upkeep of the highway.

Indeed there are many arguments against continuous highway planting, and few in its favor.

Every man of every community wants the traveler to leave his neighborhood with a good impression. Can this be better accomplished than by making every farm look like it is a good place to live? Instead of cutting off views of the country by road-bordered trees, let us afford the passer-by every opportunity to enjoy every good thing the landscape contains. Well painted farm houses and barns, good lawns and shade trees, flowers, gardens and orchards, fine livestock on good pastures, wide tilled fields are what impressed the traveler.

To be well cared for it is not necessary that farms be large. One gets the strongest impression of fertile soil in a region of market gardens, which are usually of small area, but they are heavily fertilized and intensively cultivated, and the crops of cabbage and beans are vastly more vigorous than the extensive cotton fields. What splendid examples they are of intelligent constant care! And who that has motored through the country has failed to be impressed by the little farm home whose every detail suggests a well-cared-for farm and a contented family?

The community no less than the traveler wants good roads, and these roads should be comfortable to travel over and should reveal every good thing in the countryside. There are many unsightly spots along the highways. Let us confine our plantings to these places, and improve and beautify the farms and the farm homes through which the highway passes rather than attempt general road-side planting. The country school yard and the country church yard afford excellent opportunities for improvement. They are usually ugly. Let us beautify them, making attractive community centers of them.

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LITTLE ROCK, ARKANSAS

The Motor Bus—Our Youngest Industrial Giant

By A. J. Montgomery in September "Good Roads"

There are now 270,000 miles of route covered by common carrier bus lines as against 257,000 miles of rail line—a fact perhaps not very generally known—shows the extent to which the motor bus has entered into the transportation problems of the United States. The immense sums paid in taxes by the motor bus companies and the vast army of passengers and bulk of freight carried are testimonials to the fact that the motor bus has come to stay and if it has not revolutionized transportation problems, at least has given them a new twist which now is recognized by traffic men of every suasion—steam and electric.

These hitherto little known facts and a host of others which shed surprising light on the extent to which the motor bus has grown in importance are gleaned from a new publication of the Bus Division of the American Automobile Association, called "Bus Facts for 1927." In this little volume, for the first time in its history, salient facts about the motor bus industry are compiled in a graphic fashion that are readily understandable to the layman and expert alike.

THE BUS INDUSTRY

The Bus Division of the A. A. A. is the national organization of operators of motor buses and its membership in July, 1927, consisted of 22 State and District Motor Bus Associations and several individual member companies, representing in excess of 18,000 motor buses. The booklet just compiled contains practically all the statistics and facts obtainable from reliable sources which have any bearing on the industry and is presented in such manner that it may be grasped without tedious groping through columns of figures. Some of the facts portrayed are startling to those who have not kept in touch with the rapid progress made by the industry in the last six to ten years. Some of the outstanding points emphasized are:

There are 32,425 buses used in common carrier service.

There are 32,800 buses used in carrying school children back and forth from home to school.

Total passengers carried by all buses in 1926 were 2,395,000,000.

Of the total passengers, 2,100,000,000 were transported by common carriers.

Total investment in rolling stock, terminals, garages, etc., amounts to approximately \$455,000,000.

Total gross revenue of common carrier bus lines in 1926 was nearly \$300,000,000.

Taxes paid by motor vehicle operators in 1926 are estimated at \$712,000,000 out of a total bill of about one billion dollars.

Of the total of 80,000 motor buses in the United States on January 1, 1927, 42,040 were engaged in common carrier operations. These were divided into 31,500 intrastate carriers; 2,500 interstate carriers; 7,284 electric railways and subsidiaries; 756 steam railroads and subsidiaries. There were 38,000 non-common carrier operations, divided as follows: hotel buses, 1,050; sightseeing and tour companies, 2,650; industrial uses, 1,100; schools (public and private), 32,800; miscellaneous, including railroad terminal companies, 400.

THE MOTOR BUS AND EDUCATION

One of the most interesting features brought out in "Bus Facts" is the extent to which motor buses contribute to education. Gone are the days when the scholars in rural communities had to get up at break of dawn and trudge many miles to the schoolhouse. Now the pupils get up at the same time as the rest of the family, have time to eat a good breakfast and stroll down to the main highway where a comfortable bus picks them up and conveys them to school. After hours the bus deposits them at home. It is estimated that at the beginning of this year the 32,778 buses engaged in this transportation carried 875,462 children over 316,045 miles of road to 13,874 schools at a total cost of \$23,430,195.

Looking over the figures as related to school children by geographical divisions, the Southeast is shown to lead in this means of transportation with 299,161 children carried, while the Northeast was a close second with 284,593 transported. However, the Northeast spent the most money on this transportation, the total being \$8,169,079 as against \$5,659,139 spent by the Southeast.

For individual States, Indiana took the palm for the greatest number of buses operated, the greatest number of children carried, largest total mileage and greatest total expense. In this State 4,000 buses carried 100,000 children over 44,000 miles of route at a total expense of \$3,000,000.

The steam railroads, not long since scoffers at the utility of the motor bus as a common carrier, no longer see things in the same light. There are now 60 steam roads using 756 motor buses, either directly or through subsidiaries. Electric railways are using 7,284 buses, whereas in 1923 they only used 1,200. And there were many electric railway men who had little faith in the future of the bus.

One of the outstanding features of the motor bus industry, as brought out by "Bus Facts," is the mileage covered, which now is almost 2,000,000,000 miles. For common carrier buses the mileage has ascended steadily since 1923 when 1,350,000,000 miles were recorded. In 1924 the total was 1,534,000,000 miles and in 1925, 1,687,000,000 miles.

The number of buses covering this astonishing mileage have doubled since 1923, the booklet shows, there being in 1923 only 40,000 registered. A year later the registration had climbed to 52,225, touched 69,425 in 1925 and last year exceeded 80,000 units.

COMFORT AND SAFETY

In the matter of comfort for passengers, the motor bus industry has made constant improvements. The time when passengers making long trips at night were forced to huddle in their seats, suffering through the long watches from cold, aggravated by a cramped position or heat, made more irksome by dust filtering in from the roadside, is rapidly disappearing. Nine lines now operate sleeper service, where the passenger can enjoy all the comforts of a Pullman berth without the discomfort incidental to train berths resulting from cars being shunted from track to track at the terminals.

One argument advanced by opponents of buses for use as common carriers in the early days was that they would not provide the same margin of safety as other means of transportation. The fallacy of this contention is clearly demonstrated by "Bus Facts" by the presentation of a report of the Bureau of Motor Vehicles of the State of New York for 1926. This shows the total number of accidents in which buses were involved to be 699, of which only 24 were fatal. This compares with a total of 43,261 accidents to passenger cars in the same period, of which 1,291 were fatal; 11,915 to commercial cars, of which 562 were fatal; 14,479 to taxis, of which 209 were fatal, and 1,219 to motorcycles, of which 40 were fatal.

An interesting survey made in California, to show the class of bus riders and whether they ride for business or pleasure, is given in the booklet. This tabulation shows that the largest number of pleasure riders were among the unemployed, 147 of the jobless whiling away their time in this manner as against 94 of their brethren who used the buses to seek employment. The most numerous class of bus riders was found to be those engaged in specialized employment of major mental activity, of which 308 rode for business reasons as against 70 bent on pleasure. Business and professional men were next in number, there being 222 riding on business and 33 for pleasure.

The economic aspects of the motor vehicle industry assume an important proportion when compared with the investment in steam railroads, which it equals. For railways and equipment, these figures are given in the booklet: Miles, 251,000; locomotives, 70,000; freight cars, 2,440,000; passenger cars, 56,500; rail motor cars, 500; total units, 2,567,000, showing an investment of \$25,000,000 and an annual cost of \$6,310,000,000. Improved highways and motor vehicles tabulate as follows: Miles, 495,000; motor trucks, 2,500,000; automobiles, 17,430,000; motor buses, 70,000; total units, 20,000,000, showing an investment of \$25,000,000 and an annual cost of \$12,125,000,000.

While at one time general taxpayers contributed a large portion of the cost of highways, the proportion of such moneys going into highways has been decreasing rapidly, "Bus Facts" states. The nation's highway bill has averaged about one billion dollars annually for the past four or five years. Statistics given show that taxes paid by motor vehicle operators alone strictly in relation to their use of motor vehicles was in 1922, \$334,901,000; in 1923, \$471,548,000; in 1924, \$551,400,000; in 1925, \$667,000,000, and in 1926, \$712,000,000.

Of the balance of the annual highway taxation bill a large proportion is being raised by bond issues specifically payable from the proceeds of motor vehicle transportation.

From these facts it is apparent that the operators of motor vehicles—passenger cars, trucks and buses—are, at the present time, paying taxes equivalent to the total current charges for our highways, although the money so paid does not always go into road improvement as it should.

There is no more interesting data given in "Bus Facts" than the compilation of State taxes and fees on motor buses. These figures cover four pages, and the wide divergence in the fees assessed demonstrates the need, so often voiced by motor vehicle operators, for a better standard for taxes throughout the country. The best example of the disparity in fees is shown by the fact that the tax ranges from \$12 in the District of Columbia and Wyoming to \$1,428.59 in Maryland. The average tax in 1925 is given as \$431.01.

The motor bus as a utility, while still in its infancy, is each succeeding day making further progress in development and gaining increased popularity in the public mind. Even trained transportation experts of long experience now hesitate to say when or at what stage the maximum development of the industry will be reached.

Radio Stuff

A June bride asked her husband to copy a radio recipe one morning. The husband did his best, but got two stations at once. One was broadcasting the morning exercises and the other the recipe. This is what he got: Hands on hips, place one cup of flour on the shoulders, raise knees and depress toes and wash thoroughly in one-half cup of milk. In four counts raise and lower the legs and mash two hard-boiled eggs in a sieve. Repeat six times. Inhale one-half teaspoonful of baking powder and one cup of flour, breathe naturally and exhale and sift. Attention! Jump to a squatting position and bend white of egg backward and forward over head and in four counts make a stiff dough that will stretch at the waist. Lie flat on the floor and roll into a marble the size of a walnut. Hop to a standstill and boil in water, but do not boil into a gallop afterward. In ten minutes remove from the fire and dry with a towel. Breathe naturally and dress in warm flannels and serve with fish soup."—*Clift*.

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Road Development For National Defense

By Edward K. Smith, Captain, Corps of Engineers, Reserve
(From "The Military Engineer" for July-August, 1927)

An easy attitude regarding national defense is to rest in the sunshine of a rosy future and ignore the knowledge that was forced upon us ten years ago. To their credit, be it said, some men in civil life have not forgotten that experience. The American Legion, the Reserve Officers' Association, and other civilian organizations still urge the necessity of maintaining a suitable preparedness in organized man-power, capital, and industry to meet a national emergency efficiently and economically. True, it costs money, but organized preparation for national defense is no more than national fire insurance against an international conflagration.

Plans have been carefully prepared for the mobilization of men. Most Reserve Officers are familiar with them and have worked upon them. Other plans have been prepared for the emergency mobilization of industries and railroads, within the "procurement districts." These are largely the province of the Quartermaster Corps and of the Ordnance. A large part of the military engineer's duty deals with roads, and it is of special interest to him to know what provision is being made for the industrial mobilization of the highways of the United States. To quote Lieutenant-Colonel Marshall R. Pugh, "The highway is the fundamental avenue of army transportation, just as it is of transportation in civil life."

ROADS FROM A MILITARY POINT OF VIEW

From a military point of view, roads may be broadly divided into two classes, those in the zone of the advance which may be under enemy fire, and the roads in the zone of the interior, not subject to deliberate destruction. To lay out, reconstruct, and maintain the road system in the zone of the advance are major duties of engineer troops. They may be trained for this duty in time of peace, but the real work cannot come until the emergency arises, until the theater of operations is known, and until the zone of the advance is defined. Military engineers usually feel that their interest is limited to these roads; but the more permanent roads in the zones of supply and of the interior are also of great value and importance, and should be studied by the military engineer.

In time of national emergency, fire, tornado, earthquake, or war, all means of transportation are used to the utmost. Inability of either rail or road to function throws greater burden on the others. In military operations, men, equipment, and supplies are constantly moving forward toward the front. Back from the zone of advance come men to hospital and rest areas, and transport to refill at base supply points. In the zone of the interior, men are being concentrated by the hundred thousand in training areas. Raw materials are hurried to mills and factories; food, clothing, equipment, and munitions are being rushed out of industrial centers in enormous quantities. The railroads are best adapted to serve long hauls, motor trucks and buses on the highway serve for quick concentrations and short-haul traffic, up to 100 or 200 miles, and relieve the railroad main lines of the interference from this local traffic.

Men overseas in 1918 and 1919 will remember the highly developed and improved French road system and

the great use made of the highways by American transport. Engineers, in particular, will recall the great amount of work performed by labor battalions and prisoners of war in repairing the roads around the American camps and the main supply routes through the S. O. S. After the armistice, during the first five months in 1919, American troops repaired and maintained 10,000 kilometers of French roads, damaged by American traffic.

As one result of their war-time experience, the French realized the difficulty of maintaining a water-bound macadam surface under heavy traffic. Since the war several parties of French engineers have visited the United States to inspect and study our hard-surfaced roads.

The French roads, 420,000 miles, in a country only four-fifths as large as Texas, have been developed during hundreds of years. In the United States we have a country fourteen times the size of France, 3,000 miles across, with our industrial and food supply centers widely separated and with nearly three million miles of roads. Nearly all of our present-day system of improved roads has been improved since 1900, and a very great percentage during the last ten years. Today, in 1927, about 7 per cent of the total road mileage of the United States has been surfaced with macadam or higher types of surface.

WAR TRANSPORTATION EXPERIENCES

Our experiences with transportation in the United States during the World War were illuminating. We were 3,000 miles away from the theatre of operations, yet both rail and road in the United States were terribly congested. The national government, as a war-time necessity, took over the administration of all railroads.

In 1917, we had almost 100,000 miles of hard-surfaced road, as against 190,000 miles today. But, in 1917, we had only 5,000,000 motor vehicles operating on the roads, as against 20,300,000 in use today.

In 1917, it was at first felt that highway improvement was not a necessity and should be postponed. In a very few months, the improvement and maintenance of highways were found essential to the war industries themselves. All transportation facilities were strained. It was found that motor trucks operating over an 18-ft. road could handle a greater tonnage than a single track railway equipped with the usual siding capacity. The Highway Transport Committee of the Council of National Defense was organized, "to conserve and strengthen every element of highway transportation." In Indiana and other States, the councils of defense urged their citizens to use roads for short-haul transportation and relieve the railroads for long-haul traffic. Thousands of men were hurriedly building roads to contonments, camps, supply depots, and concentration points. All this to meet the necessities of a war 3,000 miles away. Trucks moving from Buffalo to Newport News for shipment overseas were lost for days, hub-deep in the mud of inadequate roads.

General Pershing, before the Senate Committee on Roads, stated in 1921, "The country road will be of

tremendous value in time of war * * * the roads must be relied upon to obtain the needed food supplies."

With our shortcoming fresh in mind, the National Defense Act was revised in 1920. This act did not provide in detail for emergency mobilization of railroads and industries. It provided, however, for co-ordination of all procurement work, including planning therefor. With the cheerful co-operation of the industries themselves, such plans have been made. They can best be explained by those who have worked on them. We have three million miles of roads, 7 per cent improved with hard surface. What provisions have been made to render of roads fit for service in a military emergency? The building of thousands of miles of roads cannot be taken up overnight. After years of preparation and building up the necessary organizations, we are placing hard surface on less than one-half of one per cent of our highway mileage each year.

Twenty years ago, our road-building was unsystematic. Most of the road improvement was carried on by the local authorities, town and county, on a small scale. Stretches of improved road were blocked by unimproved sections, often impassable. A few States, however, had laid out State trunk highway systems, and, through State aid and the supervision of State highway commissions, were encouraging systematic improvement. The recently organized United States Bureau of Public Roads was making some studies of highway improvement in behalf of the national interests.

THE FEDERAL AID ACT

The greatest single element in the real development of a serviceable road system for the United States was the Federal Aid Act of 1921, passed by the same Congress that gave us the National Defense Act. Under this act, a limited percentage of through routes might be approved as Federal Aid roads. If requested by the State, a limited amount of Federal aid money will be contributed to the cost of these roads if the Federal standards for construction are complied with. The maximum aid provided in the act of 1921 is one-half of the cost of the road and not over \$20,000 per mile. Not over 7 per cent of the total road mileage in any State may be included in the Federal aid system. The total Federal aid money spent on roads last year was only 7 per cent of the one billion dollars spent in the United States on road improvement. We still have in the United States 2,250,000 miles of roads with little or no improvement. How is road development for military use provided for?

We are proud of the constitution we have sworn to defend. We should also be proud of the National Defense Act of 1920. In future years it will be regarded as a most valuable piece of constructive legislation, providing for nationally organized defense, without militarism and not for aggression. It is not in accord with our policies, as expressed by this legislation, to appropriate money for a large military establishment. Our policy is rather to give every patriotic citizen, in his civilian pursuits, opportunities for elementary military training and organization, that all may be prepared to function efficiently, if the emergency arises.

Similarly, the spending of large amounts for the peacetime construction of military roads is not in line with our policies. But, in most cases, these roads which best serve our normal industrial development are the same roads that will be needed in time of emergency, military

or otherwise. The main highways join our industrial centers. Their feeders tap the sources of supply in mine, forest, and farm. This has been our development for a hundred years. John C. Calhoun, Secretary of War, reported to Congress in 1819, "The road * * * can scarcely be designated, which is highly useful for military operations, that is not equally required for the industry or political prosperity of the community." General Pershing's testimony, one hundred and two years later, has already been quoted.

RELATION OF BUREAU OF PUBLIC ROADS AND WAR DEPARTMENT

The vital factor, to secure the ready development of a road system, fit for use in a military emergency, is some central agency to assist in co-ordinating the scattered efforts of forty-eight States, to set minimum standards for economic, serviceable construction, and to give due consideration to the broader, national interests, outside the province of a single State.

Under our present law, the United States Bureau of Public Roads exercises this function. It is neither practical nor desirable for our over-burdened regular military establishment to attempt to work out details with forty-eight States and thousands of counties. The military value of a road is only one of many factors in its construction. The Bureau of Public Roads is furnished all necessary military information from the Office of the Chief of Engineers. The minimum width of 18 ft. for a Federal aid road is satisfactory for two lines of military traffic. Culverts and bridges are designed with a clearance of not less than 16 ft. between side walls and 14 ft. vertical. They are designed to carry, with the ordinary factor of safety, two 15-ton, or one 24-ton, truck. This gives clearance and strength sufficient for a 155-millimeter gun or a heavy tank. At the same time, these requirements are reasonable for civilian traffic. Paving is designed to carry as continuously heavy traffic as can be carried by the bridges. Grades are limited, whenever practicable to 7 per cent.

The War Department has prepared maps of the United States, indicating those points between which roads are of military importance. These maps do not attempt to define the route to be followed in connecting two points or two cities. Several routes may be available; which one will be followed is largely dependent upon local conditions.

Engineers will readily recognize the military values of the road systems shown diagrammatically on the War Department map. Naturally, these roads in most cases can follow normal industrial routes and were readily incorporated in the complete system of Federal aid road approved by Congress in 1921. These military maps also indicate the relative importance of the Army of the connections between cities as of first, second or third "priority." The roads corresponding to "first priority" connections should receive first attention, and, as occasion arises, this is being done. While progress is being made on the entire system, a special effort is usually made by the Federal authorities to persuade the States to fill in the gaps of the "first priority" system and make it fit for use. There are over 16,000 miles of so-called first priority roads between points whose connection is considered of first priority.) Only a small amount of this system is completed each year. It will be several years before even the first priority system is completed, but

steady progress is being made. Some of the priority roads are, of course, improved as parts of State or county systems.

Except in the case of Federal aid roads, the authority of the Bureau of Public Roads is purely advisory. Even in the case of Federal aid roads, the initiative rests with each State. But even the small amount of money which is appropriated as Federal aid in 1926, 7 per cent of the total expenditure in the United States for road improvements of \$1,000,000,000, enables the bureau to enforce to a considerable extent the use of their standards, and, in a general advisory capacity, to assist in the development of the lesser road systems for their national services, mail routes, interstate through traffic, and military use. It is also true that, in some Western States, with large areas of undeveloped, or government-owned land, through roads could not be built without this Federal assistance. The opening of the "Wendover Cut-off," across the State of Utah last summer, is an instance. It may be said that the adoption of these standards on Federal aid roads in every State in the Union has greatly encouraged the adoption of corresponding standards on other road work in the State.

DEVELOPMENT OF ARTERIES INTO CITIES

Another important feature of road development lies in the particular development of the streets and highways leading into large cities. Just as a railroad line must have proper terminal facilities in order to give adequate service, so our major highways cannot be used to their fullest extent without proper entrances and terminals at the large industrial centers. The great congestion and delay that occurs at the main highway entrances to a large city are well known to every driver.

In the last two years, cities have recognized that this problem concerned not the city alone, but also the surrounding suburbs and nearby centers tributary to the city. Plans for the development of the region tributary to the city are prepared or are in the process of preparation for such centers as Detroit, Boston, Los Angeles, and Chicago. Many other cities need them. This work is being handled by local authorities. The military engineer will readily see, however, that this "regional planning" around a city like Chicago may be of importance to the nations as well as the city.

ROADS A DEFENSE FACTOR

Recently, the Corps of Engineers has adopted a new system of indexing geographical information. The Harriman Index number exactly defines the geographic location of any area. It has been planned by the road authorities to place on certain cross-country routes Federal numbers and markers of special design, spaced at regular intervals. It has been suggested to the officials in charge of the design of these markers that, if provision were made for placing on each marker, in small, inconspicuous figures, the index number of that spot, it would be of great value in military operations. Even for touring, these numbers would be useful to the half million members of the regular Army, National Guard and Organized Reserve, as they become acquainted with these new maps.

Our scheme for national defense is still in the process of development. Without continued, vigorous support, to maintain public interest, it will fail, as have such movements in the past. The development of an ade-

quate national road system during the next ten years, to reach every city of five thousand population, will be one factor in our scheme of national preparedness.

The movement is under way, the machinery is functioning. After ten years' work, 19,000 miles of the Federal road system have "high type" surface, concrete, brick, sheet asphalt, and so on, completed or under contract with Federal aid. In addition, over 16,000 miles have received "high type" improvement without Federal aid. Of the remaining 148,000 miles, 50,000 miles, or one-third, have had no improvement, and 28,000 more are dirt roads, graded and drained. The remainder has various types of light and "medium type" surface, running from sand and gravel to 16,000 miles of water-bound and bituminous macadam. A large part of our military road system, of first, second and third priority, is included in the 148,000 miles only partially improved. The movement to improve any road must be started within a State and receive local support to secure the appropriation of State and local funds for their share of the construction cost. The military engineers are especially fitted to give the intelligent support to this program that is needed to carry on the work successfully. They, above all others, realize that the roads built during our years of peace and prosperity must serve as our military roads in time of emergency.

Local posts of the Society of American Military Engineers may perform a most valuable duty by appointing special committees, composed of men trained in highway development, to study the road problem in their vicinity. This study should consider the location and character of strategic roads, terminal facilities, and means of increasing capacities in event of an emergency.

Looking Ahead

In no country but the United States can such things as 500-foot highways, express roads, and two cars to a family be talked about.

No other country enjoys the unique advantages of the United States in expansive areas, great distances, and a comparatively small population.

Here are three million square miles of country, inhabited by 110,000,000 people—slightly over 35 to the square mile.

Compare this with England, with more than 700 inhabitants to the square mile. Or with Germany and Italy, with almost 330 to the square mile.

That leaves little room in those countries—and there are many more like them—for widening of roads, let alone the doubling of automobiles in use by the two-car-to-a-family method.

Here we have a country of distances, to which no other country of rank can be compared. We can afford wide roads and twice as many automobiles, where the others have to skimp on road space and frown on extra cars, in order first to take care of their own comparatively crowded populations.

Fortunately we are taking advantage of our present expansiveness and are building the roads that in the future will be more than welcome to our increasing population.

We can't afford to make the errors of our forefathers in designing streets and highways that would care only for our present needs.

Highway Building on a Larger Scale is One of the Supreme Needs of the Country

When the internal combustion engine came into being it marked a new epoch in human affairs. It revolutionized our means of transportation by land, by water and by the air. In all of this the change has been so rapid that we have hardly adjusted ourselves to the full realization of what it means in human activities.

The internal combustion engine brought into being the automobile, the motor truck, the motor bus, the motor boat, the motor ship, the airplane. All that has thus far been accomplished through the utilization of this new power is, we believe, small as compared with the progress of the coming years. Daring, indeed, must be the vision of a man who ventures to look into the future and attempts to draw aside the curtain which veils the future from our knowledge and tries to set forth some of the things he can thus visualize. We can, however, conjecture and draw a little upon our imagination based on what has already been done.

The automobile, once a toy, a plaything for the rich man, has become a prime factor in all the ramifications of life throughout the country. It has changed the face of the earth. It has changed all business methods. It has well-nigh wiped out distance. It has made suburban development on a large scale a possibility, and in so doing has created vast wealth and stopped the trend toward congestion of population and business in limited areas. It is helping to decentralize business to the good of the country. It has given longer life and greater health to millions of people. It has taught them to love nature. To a large extent it has taken the place of the saloon, and men now drive their families into the country and on picnics, where formerly they wasted their money in riotous living in corner saloons.

It has made us a nation of mechanics. It has taught the farmer boy, the educated white man, the uneducated negro, something of mechanics, and it has stimulated in them a desire to know more of electricity and of machinery, and in this respect the automobile becomes in reality technical schools for broadening the knowledge of tens of millions of people about machinery and how to utilize power.

Back of all material advancement; indeed, it might be said, in these days back of all the advancement in education and in science, in the maintenance of religious activities made possible by prosperity, is power. The cheaper the power that can be utilized the greater is the advancement of the country. The more abundant the power available on the farm and in the factory, and for all the business and pleasure activities of a nation, the greater will be the country's material advancement.

He who lessens the cost of power and gives to it a wider distribution is a benefactor of mankind. Whether consciously or unconsciously, he is hastening the day for more widespread prosperity and for the uplifting of millions of people who, without the use of power, would have continued through the coming generations and centuries to be denied the blessings which are now so common to us.

Prior to the coming of the automobile this country was sinking lower and lower in its highway work. Mud roads, impassable in winter and early spring, and

bottomless sand roads in some sections, were all uniting to lessen the religious and educational activities of the country. In vain were country churches built and country schools established where impassable roads made church and school attendance almost an impossibility. Millions of children were growing up with but little religious and few educational advantages. In the early days of motoring a foreign ambassador undertook to drive from Washington to Baltimore, a distance of 40 miles, and made the journey in five hours' time over a highway that was a disgrace to civilization. But that highway was merely typical of nearly all the so-called highways of the land.

We must now begin to realize that the amount of money expended in highway building must be doubled and trebled. Our highways must be wider, more solid, more permanent; built to stand any amount of traffic, for the traffic today by automobiles, motor buses and motor trucks is small as compared with the traffic of the next few years.

This country is growing with such amazing rapidity, increasing its population, at the rate of 2,000,000 a year, developing its industrial and business affairs of all kinds far more rapidly than its population is increasing, that we must plan great things for the future.

The Economy of Good Roads

The expense of operating automobiles over good roads is estimated at 4.22 cents per mile. H. F. Kingsley of Chicago, a traffic authority, says the expense for operating automobiles for the country is \$3,537,000,000 annually, and he thinks that good roads must have saved the people more than 50 per cent of that sum, or around \$1,500,000,000 annually.

That does not seem an extravagant estimate, as we all know how much faster tires wear out on bad roads than on good ones, and how much more gasoline it takes to push a car over bad roads, and how much oftener a car has to go to the repair shop if it is traveling in rough country. Also how much longer a car will wear if it is only run over smooth roads.

It takes much more time to do errands and to truck goods over a bad road. The farmer or manufacturer can deliver his goods with much less expenditure of time if he has a good road to do it on. All that additional cost of the bad road is charged up to merchandise and paid for by the consumer.

~~The old timers used to say that a workman was known by the condition of his tools. If his tools were rusty and out of order, he was regarded as a poor workman. The roads are one of the most important tools of our industrial system. If they are in bad order, it shows some lack of foresight, some failure of care, some lack of intelligent understanding of how work should be done.~~

Good roads are an essential part of efficient distribution. If the roads leading into a city are good, trade is encouraged to come in from a long distance, and the outlying people can get their marketing done with a minimum of expense, and business in the city prospers.

MUST ANTICIPATE FUTURE ROAD NEEDS

Competent engineers and experience have proved conclusively that it is not possible to anticipate conditions in regard to public improvements beyond a generation. Most of us are familiar with building construction five and ten years ago that are now inadequate.

We seem to be unable, or unwilling, to grasp the necessities of the future. We too frequently build for the immediate present. This is particularly true in highway construction, due, perhaps, to the desire to build as many miles of improved roads as the funds available will permit, thus accommodating a larger volume of traffic. The impetus that has been given highway building had its origin in the development of motor traffic, but this form of transportation is of comparatively recent development and certainly has not reached the peak.

Generally speaking, highway engineers and road builders five and ten years ago were more or less handicapped because of lack of funds, and were forced to do the best they could with the means available. For instance, the State of Georgia appropriated for highway improvements the sum of \$15,000 in 1918. Today the revenues for highways in that State total more than eleven million dollars. Of course it was impossible to accomplish very much in the way of highway improvements with \$15,000. The road builders did the best they could with the funds available, and cannot be censured for their short-sightedness.

Five years ago a sixteen to eighteen-foot roadway was considered the last word in highway requirements. Today this width of roadway is a menace to the trav-

eling public, and it seems that present traffic requires double this width in congested districts. Highways that might have been regarded as "boulevards" five years ago are not adequate for the traffic of today. We cannot build to meet future conditions of all times, because we are little better equipped now to judge of conditions ten years hence than we were five or ten years ago to foresee conditions of today.

Widening of highways and the use of more permanent materials in their construction is desirable. It necessarily follows that if highways are made wider and the roads built for traffic averaging from 1,000 to 3,000 cars daily, construction costs will mount higher and higher. But this is inevitable. Improvements cannot be secured otherwise. It takes real money to build and maintain adequate highways and they must be paid for in some way. There is no "magic" by which we can just "wish" these betterments on the traveling public. They must be paid for.—*Colorado Highways*.

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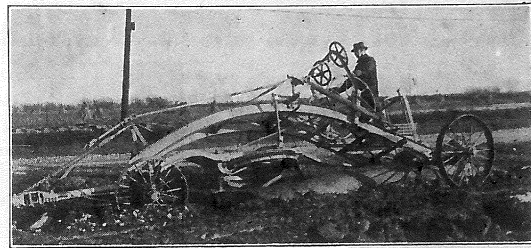
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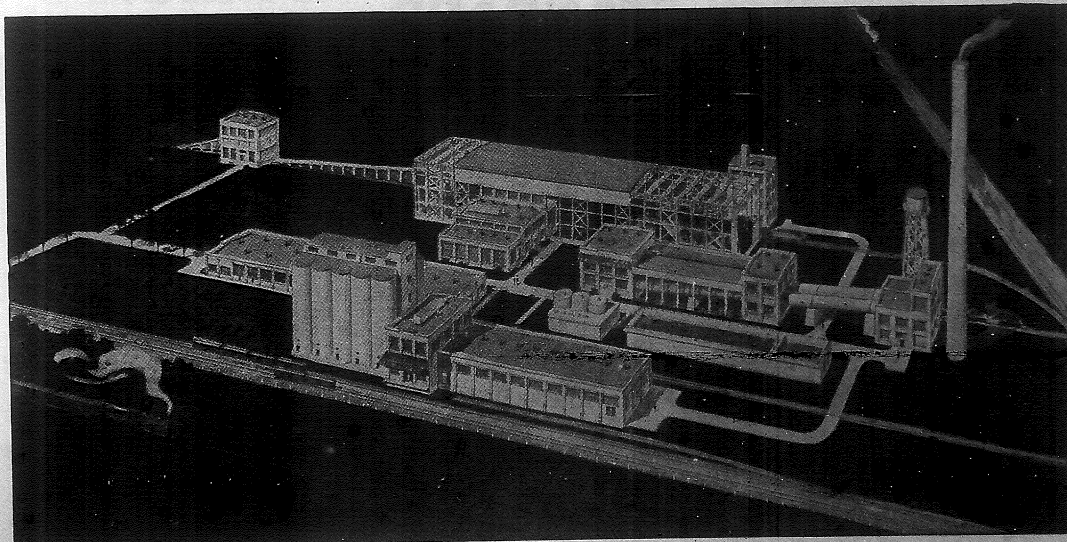
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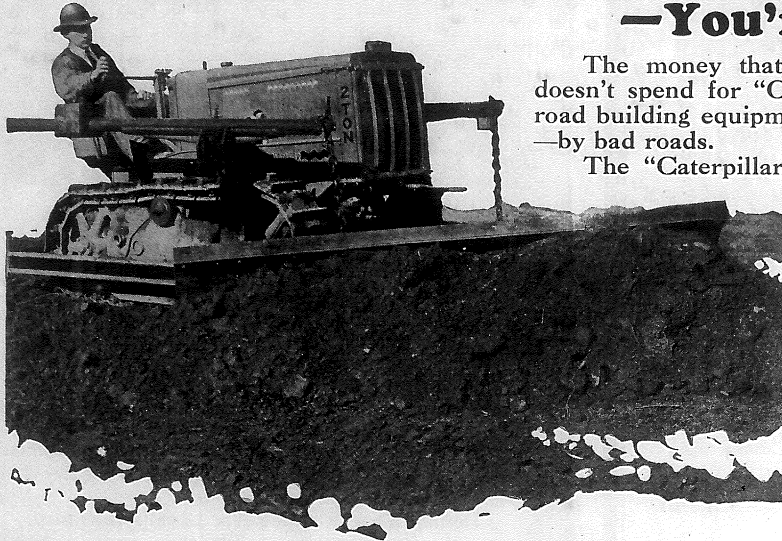
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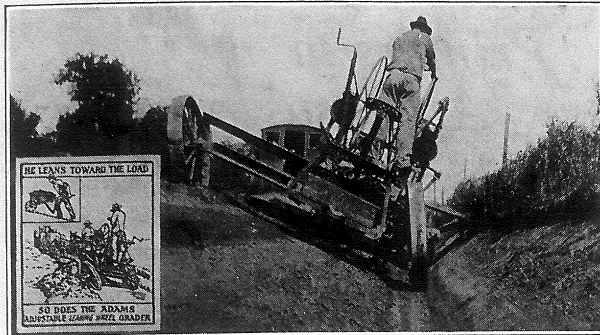
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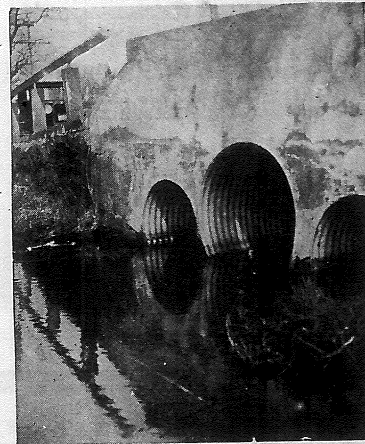
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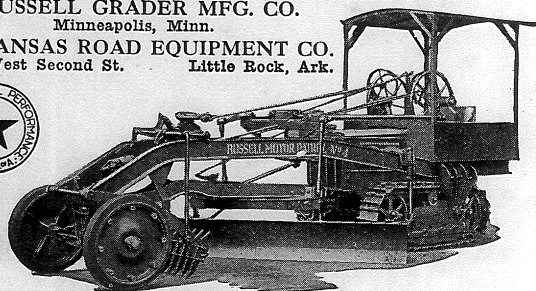
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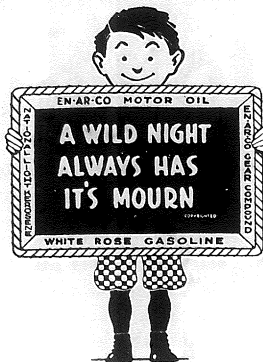
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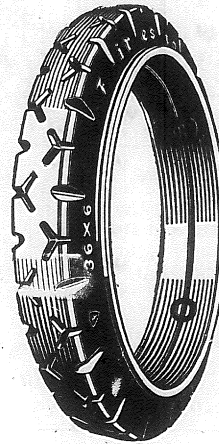
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Caused by lateral soil movements and poor foundations. Can be minimized by using culverts having a positive bond between adjoining sections.
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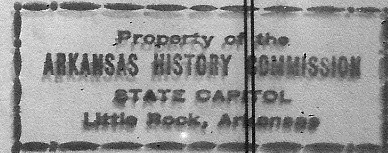
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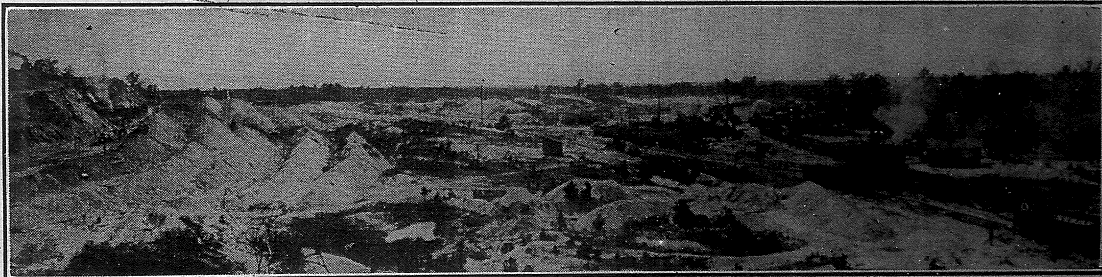
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