LOW GRADES ARE ESSENTIAL

Decrease of Grades Reduces Cost of Wagon Transportation.

MANY THINGS ARE CONSIDERED

Drainage, Material and Many Other Things Enter Into the Construction of Good Roads in This State.

If the construction of good roads meant nothing more than the mere reduction of grades it would be a proposition vastly worth while. Grades are of course more of a consideration in some parts of the state than in others, as there are sections of the country that are more hilly than others. Then there are places where the country is so level, as in parts of northeastern Colorado, for example, where in Phillips county and others in the neighborhood the farmers do not even have brakes on their wagons, as they are never needed. In the agricultural sections of Nebraska, however, there are very few localities where a brake could not be used to good advantage in traveling a distance of a dozen miles.

The cost of wagon transportation can be reduced by increasing the size of the load hauled. This can be done by decreasing the grades. It has been pointed out that if a horse can pull 1,000 pounds on a level surface, with the same kind of surface he can draw only 900 pounds up a 1 per cent grade, 800 pounds up a 2 per cent grade, 400 pounds up a 5 per cent grade and only 250 pounds up a 10 per cent grade. This is only one-half the load on a 5 per cent grade that he can pull up a 2 per cent grade, two and one-half times on the level what he can pull up a 5 per cent grade or four times the load on a 10 per cent grade. The railroads, who make a business exclusively of transportation, expend millions of dollars to reduce a grade in order to make a slight reduction in the cost of haul per ton mile. The beauty of cutting down a hill for road purposes is that once it is cut down the grade is reduced for all time to come and the facility of hauling in all the years to come will pay and repay the cost of the grading a countless number of times.

Two Important Things.

Among the many things to be considered in the construction of roads are the two prominent items, drainage and wearing surface—"a tight roof and a dry cellar," as this has been expressed. The more important of the two is the matter of drainage, surface drainage and under drainage. If there is not good, natural drainage it must be acquired artificially, as no road will ever be good until the drainage is good. The next is a thoroughly compacted wearing surface, a surface that will withstand the effects of travel and the weather. If the material of the surface is in a loose condition, not only will the wheels and hoofs cut it and destroy it, but water and frost will get in their work of destruction.

By surface drains is meant the crowning, ditching and culverting. The crown makes a drained roadway for travel. If it is too broad and flat it does not drain well. If it is too steep it makes travel hard. The road should be wide enough for two vehicles to pass conveniently. Where excessive travel demands it, of course, they can be widened. The ordinary farm wagon measures about five and a half feet out to out, and the automobile six feet. This then makes fifteen feet of passing roadway sufficient.

The crown of the road is expected to shed the water quickly off the surface into the ditches at the side. To provide means for these side ditches to drain themselves properly is now an important matter. The side ditches are constructed not only to carry the water off the road itself, but also to protect the roadbed from the water from adjoining fields. If the road is on a hillside it is necessary to have a ditch on the upper side of the road. The lack of proper ditching is often the cause of a bad road. Culverts and bridges are absolutely necessary in a good system of surface drainage.

Under drainage cuts off the underflow and is absolutely necessary for soils which cannot be dried out by the surface drainage. Any soil in which the ground water comes near the surface needs under drainage to lower the water level under the roadway. Roads which dry out slowly after a wet spell or in the spring of the year need under drainage to make them drain off or dry quickly. Roads can also be ruined by the water coming up from below as well as by the water falling upon them.

Effective Drains.

Effective drains are sometimes made of buried logs or stone, although drain tile is better, since they are less liable to get clogged and are not so expensive as to be prohibitive. The tile must be laid in line both horizontally and vertically, with as close joints as is practicable and a free outlet. If the tile is not in line and laid to a true grade there is danger of its clogging. The hoighway department of the Missouri State Board of Agriculture has found that best results are obtained where tile of not less than four inches in diameter is used with a fall of not less than four inches per 100 feet and buried not less than two feet in the center of the road. The department also recommends that the upper drains be laid either directly across the roadway or in a "V" shape with the point of the "V" upstream and under the center of the road, with the outlets in the side ditches if the tile is to drain a wet or boggy spot.

The whole of the road drainage question was summed up by the Missouri State Board of Agriculture as follows: "In order to have a good road the water must be got off and away—one of the road by means of the under drains, off the road by means of the crown and away from the road by means of the side ditches."

Concomitant with the problem of drainage comes the problem of bridges and bridge material. In Missouri the highway department has many years ago given up the idea of constructing bridges from any material except steel and masonry. Quoting from their bulletin No. 5, published in 1908: "How much better off would some of our counties be today could they have the annual repair expense for bridges, to be used toward building new bridges. How long does it take for the repair bill to amount to enough to pay for another bridge? It is an expense that will steadily increase as more wooden floors and light bridges are built. The wooden bridge is such an obsolete type that it is useless to discuss it. It does not belong to this age, and should be built as a temporary structure only."

Large Field to Select From.

In selecting culvert material one is confronted with quite a large field to select from, and naturally the normal life of the culverts of the various materials together with the cost and availability of the material are to be considered. One has the whole field of wood, steel, corrugated metal, cast iron, vitrified clay, brick masonry, stone masonry, and concrete to select from. It is well known to all farmers and road overseers that the wood culvert is a poor structure. The life of the wood culvert is short. The cost of repair is high, and loose planks in the structure are constantly dangerous to horses.

Nearly everyone is familiar with the culvert of steel put out by bridge shops. These steel pipe culverts can be put in place with the greatest ease and but very little care is require in the preparation of the bed. Steel under such conditions it is said can be depended upon for from fifteen to twenty years. The cost for one-half inch metal as quoted by the Highway department of Missouri is approximately $3.50 per lineal foot for pipe 3 feet in diameter, and $6.50 per lineal foot for pipe 5 feet in diameter.

Corrugated metal often gives good satisfaction. Road builders in Missouri have found it difficult to tell, however, when they were getting a good lasting corrugated pipe as the material does not all have the same lasting qualities. A good weight and quality of corrugated pipe has been found to last from fifteen to twenty years. A pipe sixty inches in diameter, weighing six pounds per foot, can be had for about $4 per lineal foot.

Cast iron is less destructible from rust than most any other metal from which culverts are manufactured. Its life is generally put at from fifty to 100 years. The approximate cost for a pipe four feet in diameter is $5.75 per lineal foot.

Vitrified Clay is Good.

Vitrified clay is good, but it is hard to determine the quality of any given piece of the pipe from appearances, because the glazing covers a great many defects. A well glazed pipe that rings sound under the hammer should be selected. The approximate cost of vitrified pipe thirty-six inches in diameter, weighing 385 pounds per lineal foot, is $5 per lineal foot.

Brick is recognized as very good for culvert material. Where the bricks are close at hand it is as cheap as stone masonry or concrete. Forms or molds for the arch work need not extend the entire length of the culvert as a form four feet in length can be moved forward as soon as the earth is rammed in around the haunches.

Little Trick that Does the Work

KING SPLIT-LOG DRAG.

J. A. FREELAND HAS GREAT AUTOMOBILE YEAR

Mason and Midland Cars Go Faster Than He Can Get Them

FEW PROMISED IMMEDIATELY

Will Not Arrive in Quantities Before September, Though Few Come Every Week

One of the firms doing the most satisfactory automobile business in this part of the country this season is the Freeland Automobile Co. at 1124 Farnam St. They are distributers for two well known, satisfaction giving cars, namely, the Midland and the Mason.

This concern has oversold its allotment so far as the original contract number with the factory is concerned, but they continue to get a few more cars every week or so which enables them to partly meet the demand for their lines.

The Mason car comes in both delivery and pleasure designs. The delivery car for instance is a large, roomy machine seling at $900.00. Many prizes have been won by the Mason car in hill climbing contests. During the Automobile Show last February the manufacturers of this excellent little car had a standing offer of a large sum of money for any one who could duplicate the hill climbing feats of the Mason car. On several occasions they loaded the little car with as many as a dozen persons and readily climbed a 45% grade—a thing that the owners of several other cars had the courage to attempt, but lacked the proper mechanism to accomplish. There were but few who succeeded in advancing more than one-third of the distance up the incline. The Mason, however, never faltered.

The Midland car comes in the five-passenger touring type and is in the popular priced class. It, too, has become famous through the place which it has won on the occasion of various contests in which it was entered along with other makes of cars.

It will be possible to get a few more cars of both these makes, but the factories do not promise them in satisfying numbers before September. Mr. Freeland is anxious to demonstrate one or both of these lines, particularly to those who have actually ridden in cars of other makes.