Country Roads of Illinois

Introduction

It is a well known fact that the degree of civilization of a country is known by its roads. It improves with them, and begins to decline as soon as the roads decrease in quality. The railroads act as the larger arteries of the country, while the common roads take the place of the smaller veins, connecting the whole country in one grand system of communication. One part of the system is dependent on the other, to a greater or less extent, but, the common roads are the more independent. The railroads, although they extend all over our country, must depend on the common roads, as a means of getting the freight to and from their stations.

The railroads have been the great help in settling and improving our country, but the common roads are of as much importance to the community. For transportation of long distances, the railroads are generally used, and hence some have come to look upon the
Common roads as of less importance than formerly. This is not the case by any means. Increased facilities for transportation cause very much more grain and other produce to be raised, and this must be hauled to the railroad stations. This brings into use the common roads to a much greater extent, and therefore makes them more important.

The less the cost of transportation, the greater will be the profit to the producer, as he has eventually to pay it. It is readily seen by this, that the farmer derives the most benefit from good roads. Their improvement also benefits the farmer alongside of the road, in securing better drainage. Although all classes are benefited by good roads, the farmer is by far the most.

By improving the roads, so that time is saved in passing from one place to another, the same effect is produced as moving these places nearer together. For example, a farmer lives four miles from the rail road station, and it takes him one hour to go there. Now if the roads were improved, so that
It only takes him half an hour to go, he is in effect only two miles from the station, taking the old road as a standard. Time is money, and hence there is a saving from this source. Still our common country roads belong to that class of blessings that are unappreciated. The people seem to look upon them as a matter of fact, and hence little is thought of their importance. As a result they are neglected, and allowed to run, or at best but very little improved.

I have mostly spoken from the commercial point of view. The social side of the question is of equal importance. One of the main objections to living in the country is the necessarily poor roads. As a result the cities are crowded, while there is room for many more on the farms. The better class of people, as a class, those who tend to build up society, live in the cities principally for this reason. If the roads were better, the people would mingle more with one another, and consequently be benefited much more.
Great difference exists between the roads which are now in use, as to economy, ease and speed of transportation. This depends on the grades and road surface principally, and will be treated of in the body of this work. To treat of the roads of all countries and localities would make too lengthy an article for this purpose, as in this thesis we will take for our principal subject, the roads of Illinois, and try to point out some of the defects, and suggest some of the better ways of making and repaving them. Some kinds of roads which are practicable in other localities, may not be so here. These will not be treated of to any great length, but most of the kinds will be mentioned. In this thesis we will treat of them under the following heads:

1. As to their System of Repairs.
2. As to Alignment.
3. As to their Grades.
4. As to their Drainage.
5. As to the Shade and Fences along sides.
6. As to the Road Surface.
1. System of Repair.

About the most detrimental effect to the improvement of our roads, is caused by the present system of repair. There are several defects in it, but they can be classed under two heads. First, is the incompetent supervision and, second, the system of working out the road tax. The office of road supervisor is made such a small thing that competent men will surely have the place. As a consequence, incompetent men are usually chosen and poor results result. There is no certainty of one man remaining in office any great length of time, and if he does take an interest in his work, and try to improve the roads, his successor's views may not agree with his own, and the two plans will not accomplish the good result that either one alone would.

The next is the system of working out the road tax. Mr. Flint, formerly Sec. of Mass. State Board of Agriculture, says, that, "the system for working out road tax, is a plan most skillfully devised to accomplish nothing." This seems to be true to a
great extent. It was originally intended to benefit
the farmers, in allowing them to work instead
of paying money, but it is a detriment instead.
They could make more money, than they save, at
their own employment. The work should be done
in the spring and summer, so as to allow the
loose earth to get thoroughly packed down before
winter. This would require the farmers to quit
their own work, in the most pressing season. This
they will not do, and therefore they are worked
in the fall and there is mud all the following
winter and spring. When they do work, they don't
seem to care, as a usual thing, how the work is done,
only that their time is put in; and quite often
the roads would have been better if they had stayed
at home. It is not the amount of work done
that counts, but the manner in which it is done.
There should be a general reform in the sys-
tem of repairs of our roads. The old one, I think, has
been shown to be inadequate. As another system
I would suggest, first an overseer for each
county, to be elected for a term of several years. He should be a practical road-builder and a good engineer. If the county has too many roads for him to oversee personally, he may have one or more deputies. The people should pay their road-tax in money. The overseer should have the power to make contracts with other parties, for repairing certain roads, but, before the money is paid, the work should be found entirely satisfactory. The farmers might occasionally be allowed to work out their tax under the direct supervision of the contractor. This may be desirable at times but must not be carried too far.

By using this system, the road would derive the benefit of experienced labor much more than at present. This is what they need. Half the money that is now spent on the roads, if used judiciously would give us better roads. It has been said by good authority, that "to make a good road, no
quire a good judgment, knowledge of the materials
and practical experience no applying there. What farmer, who only works two or three days or even a week on the roads in a year, will acquire these? It requires much study and long experience. The man who makes road making his business, will become proficient in it as well as in any other business. If one man had the management of large tracts, the roads would become more nearly uniformly good than if managed by several. This is not of any great importance in local affairs, but for long distances, it is of great importance as the bad roads rule the load. It has been found, in Maine, that the counties, that have adopted a similar system to this, have better roads and pay less for it, than those that stick to the old way of working out the taxes.

It has been argued, that by adopting this proposed contractor system, that it would not beat the poorer classes right. This however is not the case. Men who are industrious can find
work elsewhere, or they could take contracts themselves, or work under the contractors. The only ones that would be inconvenienced, in the least, are the indolent class, which make these claims they put on the roads, a regular holiday.

The more expensive the roads, the more is the need of this contractors or a similar system. A common farmer would know nothing about building or repairing a stone road. He knows little enough about earth roads; let alone the higher kinds.

2. Alignment.

There is too great a tendency, in our country, especially in the west, to make the roads run by sectional lines. A straight line is better than a crooked one, other things being equal, but it is quite often the case that the crooked route is the more economical. When they are confined to straight lines, it is quite often the case that many hills and low marshy places are to be passed over. These must
either be brought to approximately the same level, or a great deal of power will be wasted in passing over them. This reducing the grade would cause considerable outlay of money, where usually there is some way in which the alignment might be varied, and so to make the road but very little if any longer, and much expense. Another very common case is that of a road lying on two sides of a section, upon poor ground, while diagonally across the section, the land is far more suitable. It is said, that it cuts the farmers land into an awkward shape. True it does, but what is one man's interest to that of a whole community. All the traffic need go less than one mile and a half, instead of two miles as formerly. This amounts to a large sum, but to it is added the diminished cost of building and repairing the road.

Straightness should always be sacrificed to get the road level. It is a general rule among engineers, that it is cheaper to go 2000 feet
around a hill, than 100 feet over it. In most cases it is not necessary to go so far, hence it is cheaper to go around.

A practical engineer should be employed to lay out all important roads, and those that are likely to become important in the future. He should proceed as in laying out a railroad, only he need not pay so much attention to the curves. It seems to be the general opinion, that anybody can lay out a common road. It should be done so as to pave as much for the community as possible, but the spending of a few dollars to secure a good engineer, will in the end, result in better roads and therefore be beneficial to the people.

Old roads, once well made, should never be changed. It is not often done except to straighten the road, and even then it is usually a bad practice. When the country was new, the travel took its own way, and this usually is the best route as it is decided upon by all who
pass over it. Combined,

Then a competent engineer cannot be had, others are obliged to do the work. They should however consider at least two general principles: First, take the most level route and; Second, take the route of the shortest distance. Thence, it will be seen, will quite often work against each other, but a compromise should be made. By taking the most level route, much may be saved in cutting down the hills, and filling up low places, but this may add too much to the length. Likewise, the straight line may be very uneven and thus cost too much to bring it to the proper grade. It may cost something, for the "right of way," for the crooked line, and this should also be considered. To decide on the route take much study, and a good judgment. Personal interests should be considered, as subordinate to those of the whole community, al- though they are not always so considered.
3. Grades

The best condition of a road, for economical transportation, with regard to grades, is perfectly level. This however can rarely be realized. It is better, for drainage purposes, that there should be some incline. The theory that undulatory roads are easier on horses than level ones, is denied by most of our best authorities on the subject. Nothing is accomplished by the horse using extra efforts in the ascent, for the sake of a little gain in the descent. Every foot of unnecessary rise and fall, adds to the power required to move the load. The expense of reducing the road to a level, in Illinois, will usually overbalance the benefits derived.

The ruling gradient should be made as low as possible. Most authors give 1 in 20 for hard-pike roads, while some give as high as 1 in 20 for earth roads. For descent it should not be more than about that at which the gravity of the load would overcome the friction. The following
We some relations between the grades, and what a horse can draw up each. If he can draw on a level 2000 pounds, he can draw on a grade of 1/10 100 - 1800 pounds,

1 to 50 - 1620
1 to 40 - 1440
1 to 30 - 1000
1 to 20 - 800
1 to 10 - 500

From this we see, that 1 to 20, should be about the ruling grade, as a horse can exert twice his usual effort, for a short time.

As before spoken of, there should be a minimum, as well as a maximum gradient, so as to secure good drainage. This is usually given as 1 to 120, to 1 to 140. This is below what it is sometimes given, but 1 to 125 is usually sufficient. We therefore conclude that our roads should not have a slope of more than 1 in 25, nor less than 1 in 125. It is a rare thing, in our state, that we find a road of any great length, that does not
violates this rule. In the first place, the grades are too steep, and to add to their steepness, the water runs down the middle of the road and washes it out into gullies. These grades should be cut down, for one short steep grade limits the load drawn over the entire road. It will cost some money to do this, but usually nothing to compare with what it would save. Even if the interest on the money expended is less than the annual saving, it is a paying thing to the community.

It is very often the case that the saving in one year would pay for the work. The grades are reduced once for all, but the saving thereby increases with the traffic.

The road-surface should be kept in the best of order, on the inclines, as the grades are bad enough as it is. To ascend the grade requires all the extra exertion of the horses, while on the level road, the road-surface may be in poorer condition, but the surplus energy of the horses is enough to overcome it.
4. Drainage.

About the most important requisite of a good road, is good drainage. In this particular our roads are far from the best. To have a solid surface, the water below must be taken away, as well as that on top. The people seem to think that if no water stands on the road, that the drainage is complete. The earth should be dry for some distance below the surface, as well as on the surface itself. Poor roads are often transformed to good ones, simply by appropriate drainage. In a properly drained road there are two systems; first the transverse, and second the longitudinal.

The transverse drainage depends on the cross-section of the road, which should be slightly higher in the center, and slope gently to the edges. When this is attempted, it is usually carried to an extreme. A very common way is to make the cross-section a flat segment of a circle or ellipse. As a result the road is very flat
in the center, and too steep near the edges. The travel is concentrated more and the already too flat center is worn down into holes and ruts. When the carriages approach the edge they tend to slide off and the grade is worn down badly. The best form is that of two inclined planes, joined by a short curve. This gives a uniform slope all over the road, and distributes the travel more evenly. The inclination of these planes should be about 1 in 20, for broken stone roads, and on the rougher earth roads, it should not be more than 1 in 20.

On steep slopes, there are usually broad shallow ditches, called catch waters, put across the road diagonally to prevent the water from running great distances on the road, and washing it out into gullies. If there is only one side ditch, the catch waters run clear across the road, but if there is a ditch on each side, they are in the form of a letter V, with the angle uphill. They are made very shallow and broad is
prevent sudden shocks to the passing vehicles. Underground, transverse drains are sometimes used, but these are too elaborate and expensive, to be adopted in our roads at present.

Equally important is the longitudinal drainage. The water should never be allowed to stand by the roadside, as the capillary attraction will draw it up into the soil. There should be a good open ditch on each side of the road, to carry off the surface water at time of heavy rainfall etc. Besides this, there should be tile drains on each side, to draw the water from the substratum. They should be put three or four feet deep, so that the frost will never injure them. Sometimes, only one is used and this is put in under the center of the road. This is not as good, however, as two smaller ones on the sides. The size of these tiles depends on the length of the drain, and the fall. With a good fall, a 3 inch or 4 inch tile is usually
large enough where the length is not more than a quarter of a mile. In some few places the open ditches are sufficient, but soft springy ground cannot be made passable without the tile. This tile does not cost a very large amount, and when once well put in, will last for many years. They may be made of great use to the farmers, by having the openings in their pastures; as the tile furnishes the best of stock water, the greater part of the year. They are as good as openings.

Although, not pertaining directly to the drainage of the roads, the manner of putting in culverts and bridges is a very important item. Usually, the best method is to let the water have its own way, as much as possible. Put the bridge opposite the inlet of the stream into the road, rather than the outlet. If it must run alongside of the road, let it do so after going through, rather than before, as there is then much less danger of
washing the road away. Make the openings large enough to carry off the largest amounts of water without forming any great ob-
deration. If it does, the embankment acts as a dam, and there is much danger of its being washed away. Small culverts should at all times be kept free from drift.

In putting in these culverts and bridges, they should always be put on a level with the surface of the road. If not they are either above or below, it is very unpleasant riding as well as there being much power lost.

5. Shade and Fences

Shade is very injurious to the roads. They cannot be kept dry, unless the sun and wind have a chance to act upon them. High hedges and shade trees, should never be permitted to grow alongside of the roads. Although the shade is very pleasant to ride
under in the warm summer days, it is greatly overbalanced by the improvement in the roads, in the spring and winter.

The fences should be set on the outside of the ditches, unless the ditches are so deep as to be unsafe. The more open the fence is, the better for the road, as the wind can have free access to the surface. When hedges are used, they should be kept low. This is greatly overlooked by our Western farmers. Some places one can travel for miles with hedges 8, 10, and even 15 feet high on each side. The wind cannot have any action on the road, and the sun very little. Aside from this, it is very unpleasant riding on such a road, especially in warm weather. It makes it warm and close, and one cannot get much of a view of the country. They should be cut down to not higher than 5 feet. There is a law in this state that places that limit, and why not enforce it?
6. **Road Surface.**

The main qualities for a good road surface, are smoothness and firmness. Smoothness is desirable for easy riding, for the reduced exertion required, and the saving in the wear of the vehicles, and the road itself. A road may be smooth, both before and after the passage of the vehicle, but on account of the elasticity, sinks under the wheels. This causes a great loss of power, as the effect is to require the wheels to continually roll up a small hill. The less a road gives the better.

It is must first, get a firm base upon which to build the road; this requires good drainage. Next we must have a good solid covering, free from organic matter.

We will consider the various kinds of roads, as to their surface, principally as to their practicability in Illinois. The following order will be observed:

1. Earth Roads.
2. Corduroy Roads.
7. Charcoal Roads.
8. Roads of Cinder.

1. Earth Roads. These are the most elementary of all roads. They are formed by using the common earth. There is a great difference, in those in use, as to the material and manner of building, and maintaining them. The most common practice is to scrape the material washed from the road surface, upon the road again. This is a very injurious practice, as this wash is in a large part composed of organic matter, which makes dust and mud very readily. Sods and weeds act in the same manner. Soil, with gravel in it, is most preferable; in fact, the more gravel the better. Some places
where there is a soft mucky soil, it may be improved by putting on a covering of clay. A clayey soil is improved by the addition of sand in the same manner. The main object is to get a material that will form a hard surface, and not absorb water easily..Rule should be filled as soon as formed. If they are not, each wheel that drops into them makes them a little deeper, and thus adds to the force of the blows of the next wheel. Stones and sticks should never be used, as is quite often the case. The same kind of material, as that of thick the road is formed, should always be used.

In repairing the road, it is not best to use a scoop scraper. It draws this trash and other organic matter from the ditches. They are, however, so handy and expeditions that they will still be used to a great extent.

One of the best instruments for leveling the road, consists of a stick of timber, or several of them framed together, shot with iron. This
is drawn obliquely along the road, so as to crown the earth toward the center. It costs very little to make these, and two men and four horses can help the roads a great deal in a short time. They should be used a great deal more than they now are.

2. Corduroy Roads. In swampy land, where timber is plentiful and cheap, corduroy roads are sometimes made. They consist of a layer of logs, either round or split, laid crosswise of the road and then brush and earth put on top. The logs should be laid as close together as they well can be. They do not make, by any means, a good road but are better than soft mud. They are never smooth on account of uneven wear.

3. Plank Roads. Plank roads came into use as an improvement on the corduroy roads. They are made by laying two or more sleepers longitudinally, and flooring with 3-inch or 4-inch boards. The boards should not come out even at the ends, but have small offsets. This
is to make it easier to get onto them, from the sides. When new, they make a very good road, but they wear out very quickly. The boards soon wear so that they begin to break out, and then it is very disagreeable, if not dangerous traveling over them. One might be put alongside of our common earth roads, to be used when the latter are muddy.

4 Sand and Gravel Roads. This makes a much better road covering than has been before spoken of. It is probably the most economical material for our western roads. Gravel can usually be found in large quantities, at no great distance, and the main cost is the transportation. There are instances of the railroads offering to haul it for nothing, just for the benefit of making the roads leading to their stations better, during the winter and spring. As it is, there is a rush when the roads are good, and the railroads cannot blame cars to carry on their business. When the roads are bad, it is the worse
and they have plenty of cars lying idle.

In making these roads, the first thing is to get the earth-bed in the same shape as the road is to be when finished. Then the first layer of gravel and sand is applied. It should contain enough clayey or earthy matter to secure a solid binding under travel. Pit gravel usually contains too much of this, and seaside gravel too little. Their layers should be 4 or 5 inches thick, and each should be consolidated by travel or otherwise before the next is applied. When finished, the gravel should be from 10 to 12 inches in thickness. Coarse gravel should be used, but no stones more than two or three inches in diameter should be allowed to go onto the road. The gravel should be screened, and the finest part put in the bottom, and the coarsest on top.

There are too many poor gravel roads. This is due to their manner of construction. First gravel is hauled to fill up a rut, and then
another. At last there is a layer of gravel over the whole road. This is put on unevenly, and therefore wears more in one place than another. It is very seldom that a good road is formed in this way.

5. Broken Stone Roads. These roads are usually one of two kinds. One kind is made by applying the broken stone similarly to the gravel, and the other by first laying a sub-pavement by hand. Of the first, the MacAdam is the type form, and the Telford is the type form of the latter. The Telford roads are usually better but not so cheap as the MacAdam. The best kinds of stone are the basaltic and trap rocks. compact limestone is pretty good, but sandstone should never be used. Although these roads are very good, and in common use in the Eastern States and Europe, they cannot be made practicable in Illinois, on account of the scarcity of stone which would be good for the purpose.
6. Burned Clay Roads. Clay, burned in a similar manner to brick, makes a very good road material. It has been tried in England, but was found to flake in course of time. This is not thought to be the case with American clay. It is not in common use, but the C. B. & Q. R. R. have adopted it as a ballasting material. It may be burned in regular shape, similar to brick, but is much cheaper turned in irregular pieces. The clay can be found, quite abundantly, in almost any section of the country, and thus would save a large amount for transportation.

1. Charcoal Roads. In heavily timbered countries, quantities charcoal has been sometimes used as a road covering. The earth bed is first prepared, and then logs piled up in the middle and covered with earth from the side ditches. It is then charred and the earth drawn off, and the charcoal leveled down. It has been found to pack well, not to wear
into nite, nor get spongy in wet weather, thus making a good road. Where the timber is handy, it costs only from $400. to $800 per mile. This can never come into general use in our state, on account of not having enough cheap timber.

8. Roads of Cinder. Near large factories and mills, where a large amount of coal is burned, the cinders may be utilized as a road covering. They make a very good road as long as the substructure is kept well drained, otherwise they absorb water too freely. This absorption is the worst when the frost is coming from the ground, in the spring. It would be impossible, even if they were the best materials, for them to come into general use, as the supply is limited. Although they are not so good at gravel or stone roads, they are a great improvement on earth roads.

9. Iron Roads. It has been tried to utilize iron as a road covering several times but it has been abandoned, for it is found to be so hard
that the horses slip very badly.

10. Roads with Trackways. These consist of narrow gauge railroads, etc., etc. Although they are strongly claimed by some to be the roads of the future, they can hardly become so. A different class of vehicles must be used, from those of the farms. This would require a transfer of all articles from one to the other, which would cost much time and labor. They would do very well for passenger traffic, but as general country roads, they cannot be made profitable.

**Conclusion**

In conclusion we will simply give a short summary of some of the principal points that must be observed to improve the roads of our state. First, we would suggest a change in the system of repairs, to the proposed contractor system, or a similar one. Second, improve as to the alignment. Make it more of an et
gleaning problem to decide on the location of the road. Third, cut down the ruling grade. Fourth, improve the system of drainage, by using tile to a greater extent. Fifth, Remove all shade trees, especially in low ground. Have the hedges trimmed down to not over five feet in height. Sixth, either improve our earth roads by means of better drainage and the use of the leveling scraper, spoken of before, or make gravel or burned clay roads to take their places. Take more interest in the roads and let their improvement be one of your highest aims now and henceforth.

Finis.