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EDITORIAL.

ROAD DRAINAGE.

Drainage is the fundamental principle of road-making. Without it good roads are impossible. The term drainage implies provision, either natural or artificial, for the rapid and thorough removal of both surface and subsoil moisture. Surface moisture must be removed in order to prevent it softening the surface, thus causing mud and afterwards ruts. Surface moisture must be removed, also, because, if allowed to lie on the road, a portion of it will soak down into the subsoil, thus softening it, unfitting it to bear the weight of traffic and causing it to yield in places, thereby disrupting the surface bond, whether this be earth or metal. The results are particularly disastrous to a metalled surface, and by far the greatest injury is done in spring when the frost is coming out.

To secure surface drainage, the roads should be graded to a reasonable crown, ditches provided with steady fall and free outlets, culverts made large enough to take care of the maximum flow of water, and no holes or blind furrows permitted anywhere, for these collect volumes of water that afterwards keeps the adjoining roadbed soft by seepage till the hole is dried. Having graded the road and opened all ditches, the next step is to keep the surface as smooth as possible at all times by means of the leveller or split-log drag. This operation is very important, but has been sadly neglected in many cases. Experience to date seems to favor the split-log drag as the best implement for this purpose, but the old-fashioned leveller is also good. Such an implement as the drag or leveller is especially needed on clay roads, but will do good work on any earth road, and even on gravel, tending to preserve a smooth surface that will shed water readily. Incidentally, it will tend to preserve the crown and obviate the necessity of such frequent grading or graveling as has been required in the past.

We come now to the subsoil. The subsoil of the roadbed bears the load, and no road can be good without a firm bottom. To be firm, it must be moderately dry—not powdery dry, but as dry as good tile drainage can make it. A sloppy or a miry roadbed can never support a good surface. It is true that a hard, compact earth or metal crown, by distributing the weight of a passing horse or vehicle over several square yards of the subsoil, enables it to support a weight that it could not bear up if confined to a narrow wheel track or hoof print. Nevertheless, the necessity for a firm road bottom cannot be overestimated. Why? Because it is impracticable on country roads to construct a metal or any other kind of surface that will carry a heavy traffic, unless itself supported by a firm foundation. Otherwise, it yields a little under each load, the bond is broken, and the work of disintegration begun. But the end is not yet. Fall rains come, and the earth is soaked to a depth of two or three feet. Some water percolates downward through the disrupted surface, and more soaks in from the brimming ditches and from adjoining roadsides and fields by lateral seepage, which occurs more or less wherever a waterlogged soil lies near a drier one. In some cases the roadbed actually contains springy places, which may or may not force water to the surface.

Winter frost finally seals up the outlets, and, working downward, congeals the pent-up moisture, with the consequent expansion that always occurs when water is converted into ice or frost. Spring comes and thaws out the frost, not uniformly, but sooner in some spots than in others. The sur-

face thaws first, and dries, perhaps, into a sort of crust. Underneath is a soupy, spongy bog that yields as you walk over it and allows horse hoofs and wagon wheels to press down, cutting deep ruts, completely destroying the once compact, bonded surface, in the case of macadamized roads, and playing havoc equally with the earth-surfaced highway, the difference in degree of injury being due to the fact that the former has cost more to construct. Before this road has dried out, it will, if the crown is clay, have been cut up into horrible ruts and hoof marks. If gravelled or macadamized, the ruts will not be quite so deep, but the bottom and sides of them will be rough with pebbles and pieces of stone, and travel and rain will combine to jar other stones loose, and to form mudholes. In one or two winters the gravel or crushed stone, no matter how well it was originally laid, is but a heap of loose metal mired into a mudhole. Then more metal is applied, and the thing goes on indefinitely. Conditions similar to the above obtain on every road where the subsoil is not well drained, either naturally or artificially. Artificial subsoil drainage is not always necessary, although in nearly all cases beneficial. There are some soils and some locations where good natural drainage obtains, and in such cases it is sufficient to grade, drag, ditch, and then promptly repair the little holes that are always liable to occur.

But there are other roads—thousands and thousands of miles of them—that will never be good till they are underdrained, and the sooner it is done the better. Underdrainage will do two things: It will greatly improve the road for immediate use, and prepare a foundation on which gravel or crushed stone can be applied at some future time with prospects of permanent results. On the method of underdraining roads, we have suggestions to offer at an early date. Meantime, correspondence is invited from readers who have had experience in the work.

FRESH AIR BETTER THAN TUBERCULIN.

The efforts which are being made in Wisconsin to legislate bovine tuberculosis out of the State by reliance mainly upon the tuberculin test, raises the question again of the ultimate or even temporary utility of this plan of campaign. Whether the identity of the human and bovine types of the disease be assumed or not, their analogy is sufficiently close to indicate the wisdom of giving cattle the benefit of the open-air treatment, now universally advised by the most successful physicians, both as a remedial and a preventive treatment. The success of fresh air, coupled with ample nutrition, in case of the human subject, is beyond any question, and Mr. H. F. Brown, the veteran Shorthorn breeder, of Minnesota, after an experience of over thirty years, is now able to bear emphatic testimony to the great advantage in promoting general vigor of health of keeping cattle in the open air both during summer and winter as much as possible. The climate of Minnesota is more rigorous than that of Ontario, and yet he is preparing to use open sheds in winter for the use of his stock, in preference to close barns. This policy is entirely in accord with the position on this subject taken by "The Farmer's Advocate," in calling attention to the degenerating tendencies involved in what was designated "The June Conditions Fad," whereby farmers have been ill-advised to house their cattle in an environment of summer throughout the long winter season, with its attendant evils of non-exercise and a vitiated atmosphere.

CORN - FIELD CULTIVATION.

In the May 2nd issue of "The Farmer's Advocate," the importance of early disking or cultivating of the land intended for corn was urged as a means of keeping the surface soil friable, preventing the escape of soil moisture by evaporation, and rendering the proper preparation of the seed-bed much less difficult. Now that in most cases this preparation and the planting has been completed, the importance of early and frequent stirring of the surface soil by means of the harrow, weeder or cultivator can hardly be too strongly advocated for the purposes of prevention of weed growth, the admission of air to the roots of the plants and the continued conservation of moisture in the land. Heat, moisture and air are cardinal requisites for rapid growth of most plants, but these agencies stimulate germination and growth of weeds as well as of useful crops, and as in this, as in most other matters, prevention is preferable to cure, the early stirring of the soil after planting prevents the weeds from securing a foothold and strangles them in their birth, thus saving much labor at a later stage, were they given a chance to take firm root and grow strong, robbing the crop of needed moisture and hindering its growth and development. An old-time doggerel says:

"A wife, a dog, and a walnut tree,
The more you beat 'em, the better they be.

While we should hesitate to endorse this doctrine in the case of "the party of the first part," experience has taught that in the treatment of the corn crop there is more than a modicum of sense in it. The mistake generally made, of sowing too much seed, is not observable till the crop is well advanced, when an excess of slim stalks, lacking in substance and feeding value, and yielding no ears, is then clearly noticeable. For the reasons above indicated, harrowing the ground or scratching it with the weeder after planting, both before and after the plants are up, while it may to some extent thin out the stand, will generally more than compensate for this by the prevention of weed growth, by conserving moisture in the land and promoting a rapid and vigorous growth of the crop.

Too many farmers have yet a wrong idea regarding cultivation. They wait till the weeds have started to grow before starting to kill them, beginning to cultivate at the wrong end of the week, and a week sometimes makes a great difference in the cost in time and labor of subduing a setting of weeds, while if a wet spell comes when the cultivator cannot be put to work, they make alarming headway, and seriously handicap the crop for the entire season. One cultivation at the right time is often better than two or three later on; and any time, when the ground is not too wet, is a right time to cultivate corn, no matter how dry or hot the weather may be. The blanket or mulch of fine loose soil on top, created by frequent cultivation, has the double effect of preventing evaporation, while aerating the underlying stratas of soil.

The doctrine of frequent cultivation of the corn crop is undoubtedly sound, and the cultivation in the early stages of its growth may be fairly deep, but should be shallower at the later stage when the rootlets spread over the spaces between the rows, and should not be cut off by deep cultivation. Within reasonable limits, in regard to corn and root culture, it is therefore safe to repeat the admonition, Cultivate, Cultivate, Cultivate, especially soon after a rain, to prevent a crust forming, and to retain moisture for a possible dry time.