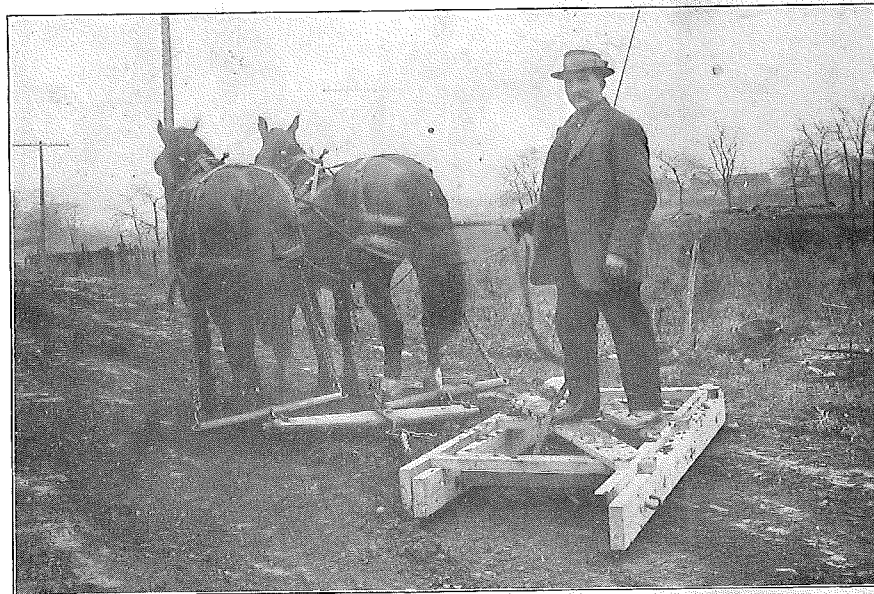


STATE OF OHIO
HIGHWAY DEPARTMENT

JAMES R. MARKER
STATE HIGHWAY COMMISSIONER

BULLETIN No. 20



**INSTRUCTIONS FOR DRAGGING ROADS
AND THE ROAD DRAGGING LAW**

COLUMBUS, OHIO, JANUARY, 1914

INTRODUCTION.

This bulletin is published for the benefit of officials and others having the maintenance of roads under their care. Primarily it is intended as an assistance to township trustees in carrying out the provisions of the new law passed April 17th, 1913, which requires that all the earth and gravel roads of the state shall be dragged.

An aroused public sentiment is demanding better care of our roads, and is focusing attention on the need of methods that give good results. Wide awake road officials naturally want to keep in touch with what the public is demanding of them.

The public is also interested in seeing that the mandatory provisions of the dragging law are carried into effect, and that benefits accrue from the expenditure of public money.

This bulletin offers practical and valuable information on the dragging of roads, and is presented with the hope that the reader will cooperate with local officials and his neighbors in making his community noted for good roads.

Take pride in better roads for Ohio.

FUNDAMENTALS.

GRADING.

Public sentiment is rapidly condemning antiquated practices of "fixing the roads." Road officials should discourage the practice of heaping loose earth, sod and other material scraped from the ditches and sides of the road, into the center as shown in Figure 1. The traffic, in order to avoid this objectionable material, will go to the sides of the road as shown in the figure. This will cut up the edges of the roadbed and allow the loose material to remain in the center uncompacted, which will absorb and hold water. The result is that the road surface is kept saturated, and while in this condition traffic will form ruts and soon ruin it.

The roadbed should be graded and the cross section constructed of good, sound material, as indicated by the dotted line.

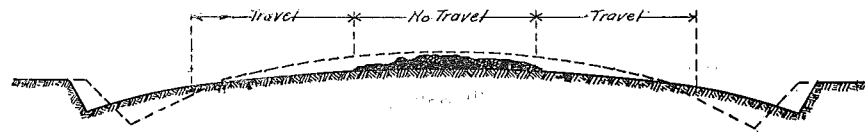


FIGURE 1.— Cross section of a road graded too wide, with a pile of loose dirt and sod in the center. The travel naturally takes the sides of the roadway where it has been scraped by the grader.

If the surface is properly harrowed and dragged, it will be kept smooth and free from ruts, and traffic in passing will soon compact it and put it in good condition.

Earth road grading should be done with the object in view of obtaining a more permanent roadway. Grade properly a portion of the road each year, rather than skimp over all of it in such a manner that no permanent good will come therefrom. Repair the worst and most traveled portions first.

DRAINAGE.

Drainage is very important. Provide ample culverts and ditches to take care of flood water.

See that the culverts are kept clean and unobstructed.

Surface drainage is secured by a proper cross-section of the road and ditches, and culverts.

Water falling on the road should be carried to the side ditches by giving a proper crown or cross slope to the road. This slope should vary considered proper; on a clay soil $1\frac{1}{2}$ " per foot. Side slopes of ditches

should be much greater. Figs. 3 to 6 inclusive shows various cross-sections of roads with proper and improper crown. The longitudinal with different soils. For a loamy soil, a crown of about 1" per foot is

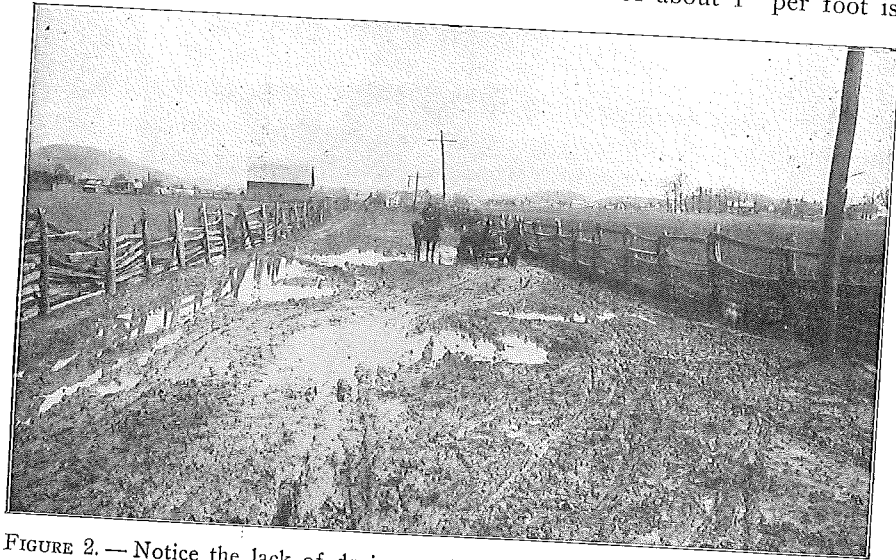


FIGURE 2. — Notice the lack of drainage. This road needs grading first, and then dragging.

slope or grade, will also determine the crown to be given to a road. On a steep grade, it is necessary to give the road a greater crown to keep the water from running down the traveled roadway and washing gullies.

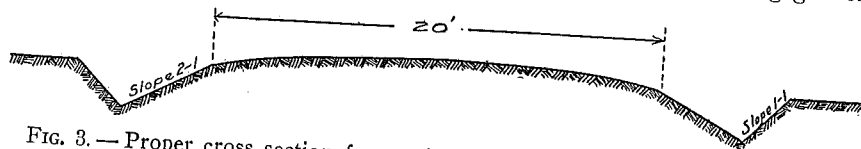


FIG. 3. — Proper cross section for road in loamy soil. Crown 1 inch per foot.

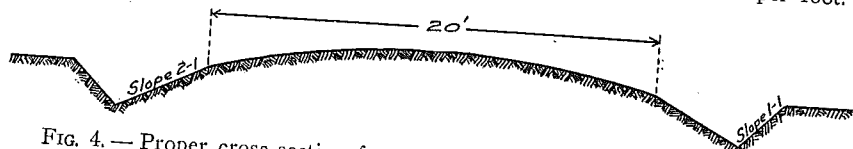


FIG. 4. — Proper cross-section for a clay road. Crown 1½ inches per foot.

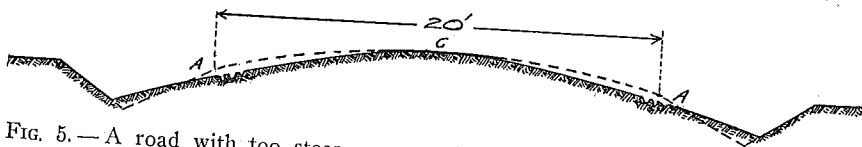


FIG. 5. — A road with too steep a cross slope. When the wheels get out to A, the weight is mostly on the outside wheels which causes deep ruts to form. The dotted line shows the proper cross-section.

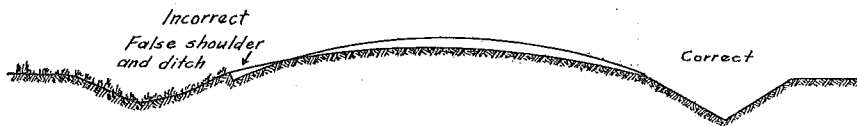


FIG. 6.— Showing an error commonly made in re-grading an old road. The false shoulder acts as a dam to hold water which softens the road surface.

Prevent hillside water from reaching the road by constructing a catch drain above the edge of the cuts. Treat slips in the same way. Drain springs and miry places by tiling.

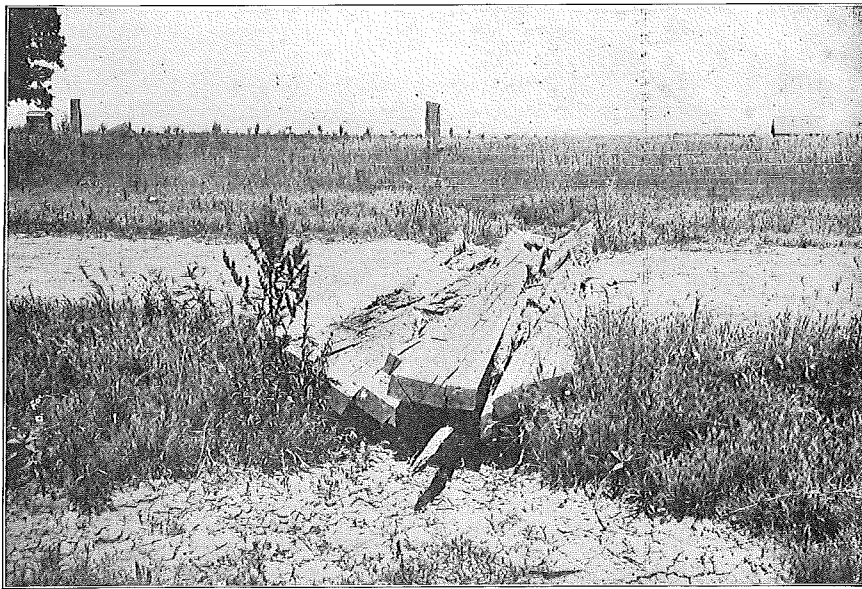


FIG. 7.— A type of culvert that is dangerous to travel, expensive to maintain, and a nuisance to a community.

DITCHES.

Be sure that the water is kept off the road by sufficient crown and properly constructed side ditches.

Broad and shallow ditches with flat slopes constructed with a uniform grade are better than deep, narrow ditches constructed with steep banks.

Ditches and slopes of cuts and fills should be seeded to prevent washing.

Give attention to keeping the ditches open.

READ THIS BEFORE DRAGGING.

The irregular course of wagon tracks is a sure sign of a poorly maintained earth road. For illustration see Fig. 2. The road surface should be so maintained that a straight line of travel is possible.

Loose stone, sod and other vegetable matter should not be placed or allowed to accumulate on the road surface.

Sand and clay together make a much better road surface than either material alone.

Never disturb a government or other land monument, stake or stone. If necessary to remove or relocate the same, see that it is done under the direction of an authorized surveyor and with the knowledge of the property owners who are interested.

ROAD DRAGS.

There are many types of road drags in use.

There is no one drag superior to all others.

Some of the manufactured types are good and serviceable. Others are too heavy to be serviceable under all conditions. Those with movable parts require care when not in use. If such parts, especially springs, are exposed to the weather, they soon rust and render a drag unserviceable.

Wooden drags have the advantage of having no parts to rust. They can be exposed to the weather with less injury than most patented types.

No drag will last forever. Any drag will in time need some repairs.

Those who contemplate purchasing a drag should consider the care and attention it will be liable to receive.

The split log type is practical and well recommended. It is in general use in some localities. Where logs are cheaper and more convenient to procure than planks, its use is advised. Red elm, cedar and willow are the best woods to use for a log drag.

A plank drag is strong and durable and gives as good service as any type of drag. It will usually cost less than other types. Red elm, burr or white oak or cedar make the best plank drags. Plank drags of white oak have been used by this Department on Experimental Earth Roads with highly satisfactory results.

Avoid drags that are too heavy.

Accompanying this bulletin is a design for an earth road drag, which can be used as a working plan. This design is the same as that shown in Fig. 8, excepting it is printed to a larger scale. This drag can be pulled endwise by shifting the free end of the chain to the rear hook, which is desirable in moving a drag to or from where it is to be used on the road. For illustration see Fig. 9. Special sized end links on the chain provide for long and short length of hitch. Figures 10 and 11 and the cut on cover page show a drag in operation, which is made after the design shown in Fig. 8.

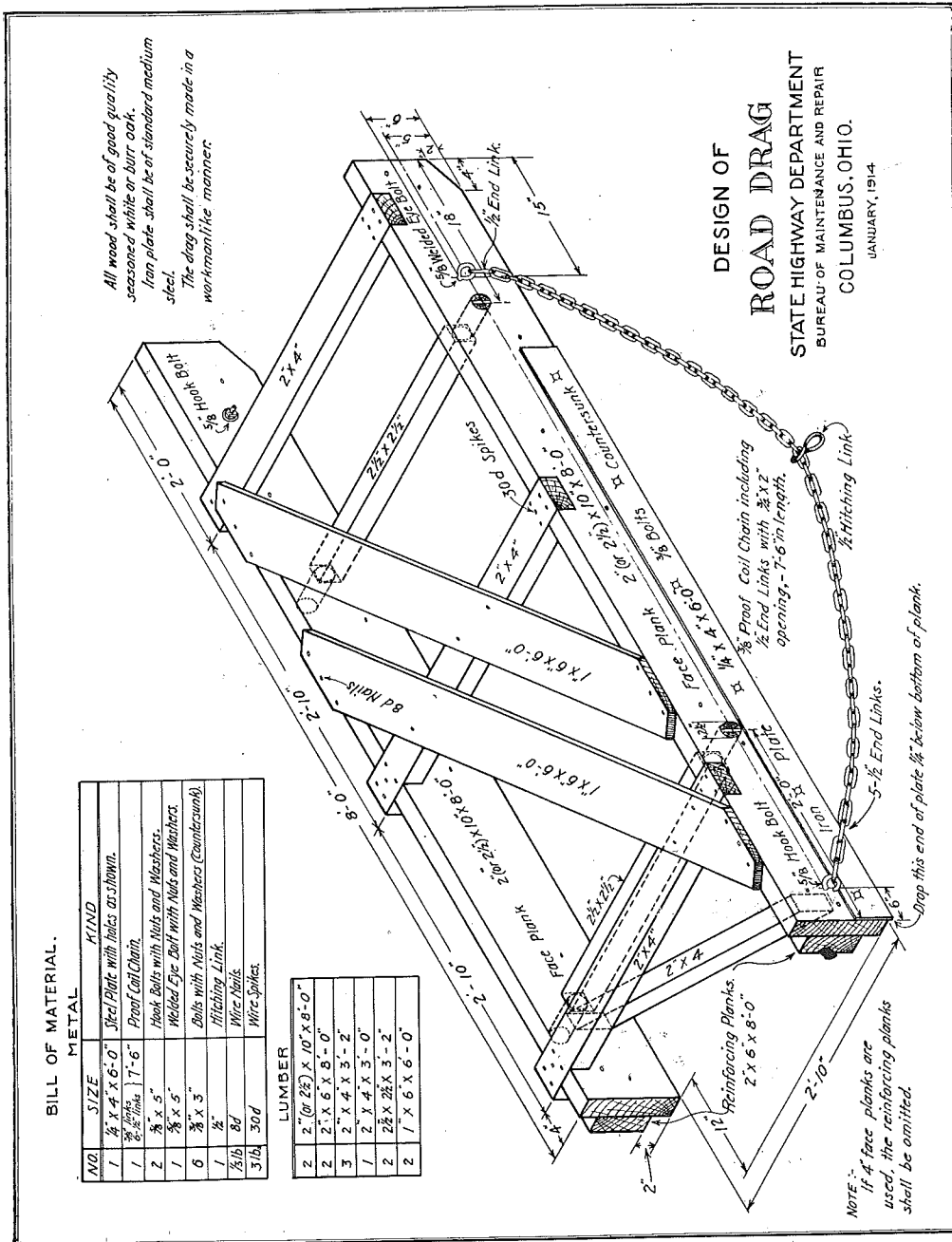


FIG. 8.



FIG. 9. — Method of hitching to drag in moving the same to or from where it is to be used on the road.

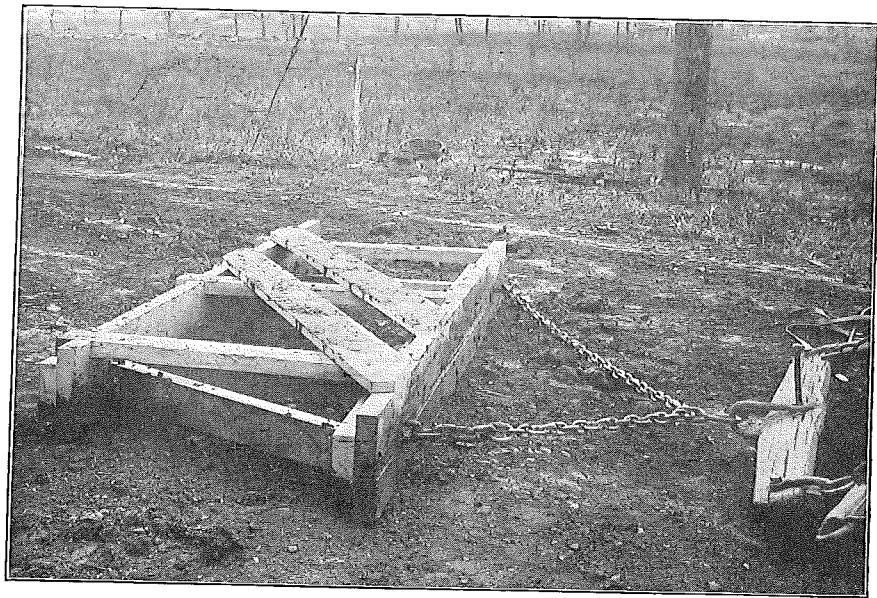


FIG. 10. — End view of plank drag in operation, made after the design shown in Fig. 8.

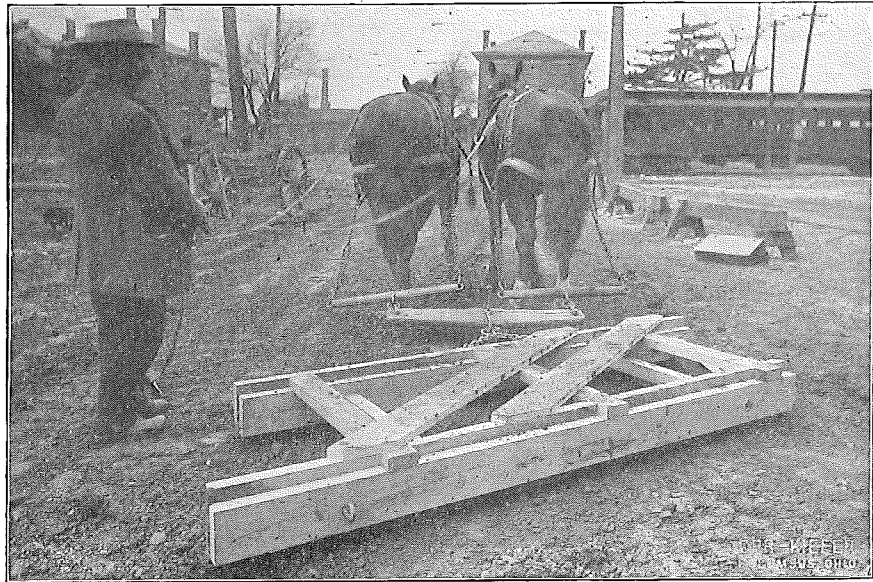


FIG. 11. — Rear view of plank drag in operation, made after the design shown in Fig. 8.

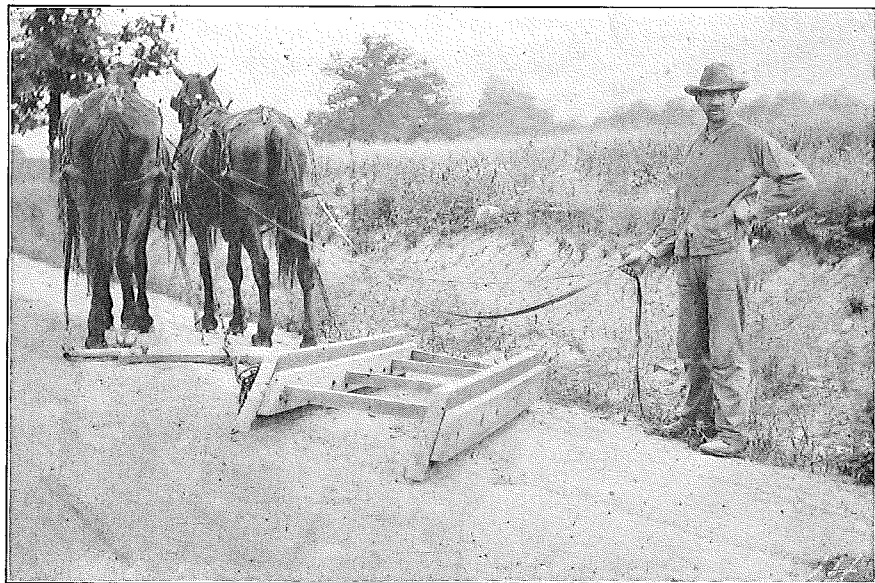


FIG. 12. — Oak plank drag used on Experimental Earth Road west of Ravenna, Ohio.

The cost of a drag like the one shown in Figure 8 should be from \$7.00 to \$12.00; when purchased in lots of twelve or more, from \$6.00 to \$8.00 each. In localities where lumber is plentiful a lower price than this may be secured by ordering a greater number. The chain, including the eye bolt which is fastened on the end of it, costs from 45 cents to 95 cents each. The iron plate, punched, costs from 50 cents to \$1.00 each, depending on the quantity purchased. If the price bid on a completed drag is unreasonable, the parts can be bought separately and assembled by any person of ordinary ability.

Township trustees can usually secure drags at a satisfactory price by submitting a design of the drag to be used to various firms, and



FIG. 13. — The split log type of drag after the "King" design, showing removable platform.

asking for bids on the same. Inasmuch as a drag will be necessary for every dragging district, township trustees can order drags in quantity. Two or more boards of trustees could cooperate in purchasing drags, thus having the advantage of securing a lower cost.

HOW TO DRAG.

Drive the team in a walk.

Under ordinary conditions two horses are sufficient to pull a drag on an earth road. When necessary to use four horses, they should be hitched to the drag by using a four horse double-tree.

Ordinarily the team should be driven with one horse on either side of the right hand wheel track, or rut, the full length of the part to

be dragged, and the return trip made over the other half of the roadway. The number of trips to be made will depend on the width of the road and the condition of the surface. The first trip should be made along the outer edge of the roadway, working toward the center; the object being to move earth toward the center of the roadway, which will gradually fill all mudholes and ruts, into which traffic will pack the new earth. Care should be taken not to move too much loose earth toward the center of the road. It should always be remembered that it is important to keep the road surface as hard as possible, and in order that this result be secured only loose earth sufficient to even the surface should be moved. An excess of loose earth will make dust in dry weather and mud in wet weather.



FIG. 14. — A well maintained earth road. The above results are secured by proper drainage and by dragging with a cheap road drag.

The driver should stand on the drag, and ordinarily in the line of draft. However, the driver should never sit on a box or seat on the drag, but should keep awake and observe the inequalities of the road surface, shifting his weight to vary the depth of cutting, and dealing with particular conditions as they are met with. When an unusually smooth or soft portion of the road is encountered it is often advisable for the driver to walk.

The depth of cutting may be regulated by varying the length of the chain. Shortening the chain will cause an upward lift on the front plank, hence lighter dragging. A longer hitch will cause a downward pull and hence the blade will cut more deeply.

The depth of cutting may also be varied by the driver shifting his weight forward and backward on the drag.

By attaching the double-tree close to the ditch end of the drag, the blade will cut as a plow. This will be convenient for cutting weeds or removing a furrow of earth. This method of hitching necessitates slow and careful driving in order to avoid tipping the drag forward. With this hitch the driver should stand near the extreme forward end of the drag, throwing his weight forward or backward, depending on the hardness or softness of the surface. A load of earth may be deposited in a low place by the driver stepping quickly away from the ditch end. Similarly, when weeds and straw clog the blade, they can be removed by the driver shifting his weight as far from the blade end as possible.

WHEN TO DRAG.

An earth road is in the best shape to drag when it is well graded and drained. Dragging is not a cure all.

Remove all loose stones from the road before dragging.

Drag the road when the soil is moist and mellow, or slushy, but not when it is dry or sticky. The earth should move freely along the face of the planks or slabs.

If the roadway is extremely full of ruts and holes it is best to drag the road when the surface is slushy. It is also advisable to drag the road when it is slushy just previous to freezing weather, that the surface may freeze smooth. Clay and water, when puddled in an intimate mixture, becomes tough and impervious to water, and will gradually get very hard if compacted in this condition.

Proper dragging causes a reduction of dust, for there is the least wear where the surface is smooth. Dust is mostly due to the wearing and crumbling, under traffic, of the irregularities in the surface caused by ruts and hoof marks. By smoothing the surface after each rain the road surface dries hard and uniformly, no roughness of the surface is exposed to the wear of traffic, and the least amount of dust will form, due to actual wear of the road surface only.

A stiff clay soil will resist the action of traffic for a longer time than a loamy soil, other conditions being equal. The same is true of a tough, sandy clay.

On account of steep grades, hillside wash, seepage, shade, etc., certain stretches of a roadway will require more care and attention than others. Experience is the best guide in these matters.

Frequent dragging will occasionally make the road too high in the center. This is liable to occur on a narrow road and in sticky soils, and more particularly on a hill. The best correction for this condition is to drag a part of the earth away from the center of the road toward the ditches.

Never drag a perfectly dry road.

Drag in the spring when the road is beginning to dry, after the frost has left the ground.

Drag the road after every wet period throughout the season.

It is very important to drag the road when it is in the proper condition to drag. Arrangements should be made to avoid delays.

USE OF DRAG ON GRAVEL ROADS.

On roads constructed of loose gravel the road drag can be used with even more beneficial results than on an earth road. This is particularly true of newly constructed gravel roads. Instead of allowing the loose gravel to be formed into trenches and ridges by the wheel tracks and center horse path, the drag should be used frequently to keep the surface smooth while the gravel is being compacted by traffic.

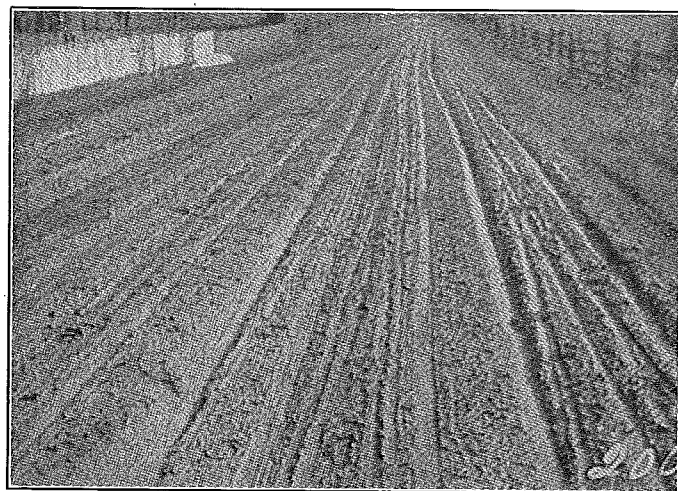


FIG. 15.—This gravel road needs dragging.

On old gravel roads all holes, ruts and depressions should be filled with new gravel to a level slightly above the road surface. This can be done to the best advantage after a rain, when standing water shows all the inequalities of the surface. The drag should then be used after a rain, when the old portion of the surface will yield to scraping.

In the spring when the frost is out of the ground, is the best time to dress and drag gravel roads.

DRAGGING DISTRICTS.

Frequently a section of a road will dry out in warm weather, while another section of the same road is being dragged. It is advisable for this reason to avoid too many miles to a dragging district.

Superintendents having charge of dragging districts should arrange to give immediate notice to those dragging the roads. Often after a day, or even a half day, a road dries out so much that it is unfit to drag. Valuable time is often lost by depending on a notice through the mails.

From three to six miles of road makes a convenient dragging district. Three to four miles of earth road, or five to six miles of gravel road, is sufficient for the care of one man.

General Code, Sections 7060-1, 7060-2, 7060-3 and 7060-4.

(House Bill No. 467.)

AN ACT

To provide for dragging the public roads of the state.

Be it enacted by the General Assembly of the State of Ohio:

SECTION 1. The trustees of each township, shall at the first meeting in January of each year, designate one of their number who shall be known as dragging superintendent. He shall have the powers and perform the duties hereinafter set forth and shall receive as compensation for his services as dragging superintendent such sum as may be agreed upon by himself and the other township trustees. The amount so paid shall not exceed fifty dollars in any one year and shall be in addition to the compensation allowed him as township trustee.

SECTION 2. The dragging superintendent shall divide the graveled or the unimproved public roads of the township into road dragging districts, which must include all mail routes and main traveled roads within the township which are graveled or unimproved, but he shall not put more than six miles of road in any one dragging district. He shall designate each dragging district by a separate number and shall file a description of said districts and the number of each with the township clerk who shall record the same in the records of the township trustees. He shall from time to time designate what districts shall be dragged. Suitable road drags shall be furnished by the township trustees, which shall be paid for out of the township road fund. The dragging superintendent shall adopt a suitable form of notice to be given each person contracted with to drag roads and shall provide return cards, which shall be substantially in the following form:

“To , dragging superintendent for Township.”

“I received your notice to drag district No. on the day of, 19....., and did on

the day of, 19....., comply with same and have charged said district for said dragging.

“If not dragged, why not?”

“(Signed)”

The township trustees shall provide a suitable book in which the dragging superintendent shall record the names of all persons who are entitled to compensation for dragging roads, said book to be known as the dragging record of the township, and shall be substantially in the following form:

County of, State of Ohio.

Dragging District No., Township of

Dragged by Whom.	Date.	Date Notified.	Date of Return Card	Amount Charged.	Amount Allowed.	Remarks.
.....

The dragging superintendent shall report all claims for dragging recorded therein that are in accordance with the provisions of this act, to the township trustees who shall, at their regular meetings in June and December of each year pay all claims for dragging that have the approval of the dragging superintendent and that are not inconsistent with this act, out of the funds of the township, the sum to be paid for such dragging not to exceed the sum of fifty cents per mile for each mile traveled while dragging the road. They shall not allow any claim for dragging, unless a return card has been duly returned to the dragging superintendent, showing said work to have been done by his order and within twenty-four hours after the receipt of notice to perform such service. They shall, each year during the month of January, fix the price to be paid for dragging during that year.

SECTION 3. It shall be the duty of the dragging superintendent to keep the dragging records of the township, recording therein the names of all persons entitled to compensation for dragging, the date of such service, date of giving notice for such service, date of return card, the amount allowed for such service, but no person's name shall be recorded therein as being entitled to compensation for dragging, unless his return card has been filed with the dragging superintendent, showing said service as having been performed by order of such dragging superintendent and within the time required for such service. It shall be the duty of

the dragging superintendent, to cause all roads to be dragged that the township trustees may from time to time direct, at such time as in his judgment is most beneficial. He shall cause the work to be done by giving the parties contracted with for the performance of such service such notice as he may deem sufficient; he shall, on or before the 15th day of February in each year, contract with one suitable person in each dragging district to drag the roads in that district for that year; but if no suitable person in the district will contract to drag the roads of the district, the dragging superintendent shall contract with any suitable person in the township. The dragging superintendent may at any time cancel such contract, or contracts, for dragging the roads, when the stipulations therein contained have not been properly complied with, or when the work is not done in a suitable manner.

SECTION 4. Any violation of any of the provisions of this act by the dragging superintendent, or any person or persons, who may be required under contract to drag township roads, or neglect on the part of any township trustees to set aside the funds required by this act, shall, on conviction thereof, be fined not less than ten dollars nor more than twenty-five dollars for the first offense, and, for each subsequent offense, shall be fined not less than twenty-five dollars.

C. L. SWAIN,
Speaker of the House of Representatives.

HUGH L. NICHOLS,
President of the Senate.

Passed April 17, 1913.
Approved May 3, 1913.

JAMES M. COX, *Governor.*
Filed in office of Secretary of State May 7, 1913.