

TABLE I.

Force of Traction required on various inclinations of Road—load 25 cwt, velocity two and a half miles per hour.

<i>Rate of Inclination.</i>	<i>Force required.</i>
Level.....	115 lbs.
1 in 600.....	120 "
1 in 57.....	140 "
1 in 40.....	164 "
1 in 29.....	200 "
1 in 26.....	218 "
1 in 19.....	300 "
1 in 14½.....	400 "
1 in 11½.....	500 "
1 in 8½.....	700 "
1 in 7½ ultimum of Traction.....	800 "

TABLE II.

A Horse can exert the following moving forces at different velocities for six hours per day.

<i>Miles per hour.</i>	<i>Strong Horse.</i>	<i>Ordinary Horse.</i>
2.....	169 lbs.	100 lbs.
2½.....	156 "	90 "
3.....	144 "	81 "
3½.....	132 "	72 "
4.....	121 "	64 "
5.....	100 "	49 "
6.....	81 "	36 "
7.....	64 "	25 "
8.....	49 "	16 "
9.....	36 "	9 "

By the Woburn experiments the mean force exerted by 144 horses in 52 teams, was 163 lbs each horse—inclination and velocity not given, force exerted by a strong horse, at a dead pull, 480 lbs.

From the above tables it is manifest, that a moderately strong horse can draw 25 cwt. on a nearly level road, but upon inclinations exceeding 1 in 40, such a load is beyond his strength for any considerable distance. However, if the inclination is short, he will be able by considerable exertion to draw this load on an inclination of 1 in 26—but upon an inclination of 1 in 14½, it is beyond the strength of an ordinary horse at a dead pull. These deductions assume the road to be firm and wrought into true inclinations; where the roads are loose and ill-formed, the required force of traction is greatly increased.

Proper form of a Road.

After a proper location for the road has been established, the ground should be carefully levelled and levelling stakes placed at every hundred feet distance. Sections of it should be made, and the whole laid out into true levels or inclinations as the case may be. This will

not only facilitate the future operations, but will also tend to lessen the expense; for it will prevent all improper excavations or embankments from being done. The metal bed is then to be formed, and the soil to be carefully drained, which is an operation of great consequence and requires much skill to execute it properly. The metal bed should be levelled transversely, and made as firm as possible. The metal should be so laid as to render it impervious to water. This can only be effected by laying it on in thin layers and giving each layer time to be settled by the action of the wheels before the next in succession is laid on. The first layer should be about five inches thick, quite level, and be well pressed down upon the metal bed, and consolidated before the next layer is put on, so as to form a species of concrete bottoming for the road. Should the road be narrow and the traffic light, another layer of five inches average thickness will form a good road; but if the road is wide and the traffic heavy, it will require two more layers of four inches each, which form a road strong enough for any situation. The form of the surface of the road when finished, ought to be the segment of a circle, radius eight hundred feet. If the width of the metal or the chord be 16 feet,