

slanting trace OF is better than if it were horizontal along OB; in the latter case part of the force would be exerted to drive the wheel against the grade, while with the trace OF all the pull is exerted along the grade.

Now let us consider the question of the traces in connection with the horse (see Fig. 19).

The horse makes use of its weight in pulling a load. Consider that the centre of gravity of the horse is at B; i.e., B is the point at which all the weight of the horse may be considered to act. The hoof at A is the fulcrum; the weight of the horse acts along the line BC, and the weight arm is AC. If the trace is horizontal the pull is along

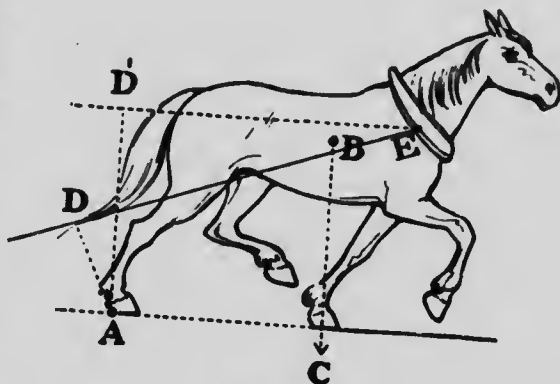


Fig. 19.

the trace ED' and the pulling arm is AD'. Notice that if the trace is slanting as in ED the pulling arm is AD, and is shorter than AD'. If we are considering the effect of the weight of the horse on the pull, the shorter AD is the greater will be the pull, because according to the lever law: weight of horse $\times$ AC = pull $\times$ AD, as AD decreases the pull increases.

When one of the forefeet of the horse is on the ground as at C, Fig. 19, only part of the weight of the horse is used in pulling. You have probably noticed, however, that when a horse is exerting its greatest pull it lifts both forefeet off the ground and throws its head and body forward, so as to give the greatest effect to its weight.