

1816
Nov 28

I have been informed that the State of Virginia is about to improve the facility of intercourse between its citizens, on this subject I have spent much thought, should give the preference to roads over canals. I do not mean to dogmatize, I know my name will give no sanction to my theory, if I do not give rational conclusions, from clear facts, I do not call for attention, the expence however of testing the experiment is trifling and I want nothing for it.

I find that many well informed persons are of opinion that double ^{force will give double} velocity through the water; I find it takes four times the force to give double the velocity, if the force of one pound propel a boat two yards in ten seconds it will require four pounds to propel a Boat 4 yards in the same time and so on in the same ratio, being 120 times more force to carry a Boat 5/6 miles p^r Hour, than it would have required if double force produced double velocity, this loss is so important that at the rate of 200 Miles p^r hour, land carriage is superior to water, through bad roads,

Under certain circumstances increas'd velocity on land requirs less force, as any person may know by drawing a jig by hand

The Boats in Holland are drawn by a Horse from Amsterdam to the Hague in 10 1/2 Hours, a distance of 30 miles, (being something less than 3 miles an hour), with 60 passengers, which at an average of 150^{lb} for each person will make for each boat load ^{9000^{lb}} so that if

1 Horse will carry 9000 ^{lb} 3 miles p ^r Hour	
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But it is probable the Horse would not stand the severe ^{exercise} of toking at the rate of twelve miles p^r Hour, (applying the same force as when he only traveled three), more than half an hour in forty eight,

Indeed it is believed no horse, or very few, could do as much, which would require 42 Horses to perform this service, but at the rate of 3 miles per Hour one Horse is sufficient, it therefore appears that the loss of force is great, and a rapid passage through the water unattainable but to a great disadvantage.

On turnpike roads four Horses will draw 4800 lb 20 Miles per day, load and unload, which is in favor of Boating say 10 to one, ^{overcome by a waggon at 3 miles per Hour,} it is believed that the sum of the actual resistance, and the resistance that a Boat meets with at the same rate, is not materially different, I say the sum, because the turnpike not being a plain, the resistance is unequal, if there were no hills I think there would be a practical equality, the however the result of our enquiries will not depend on this assumption.

On a fine surface of Iron it is beyond a doubt true that a Cylinder with a good Iron surface, with 40 Tons burden, can be propelled by one horse at the rate of 2 miles per Hour, I think I might say 500 Tons, for a loaded cylinder is not obstructed by friction, a cylinder sufficiently large to carry 40 Tons would ^{easily} soon make a turnpike road nearly if not quite ^{equal} to an Iron surface, for so large a surface to act on.

If one Horse give 2 miles, 4 Horses will give 8, & twelve 24 miles per Hour, for 40 tons, this will be equal to twenty tons, carried by 6 Horses, 24 miles per Hour,

A Horse cannot travel more than 6 miles per Hour without any Burthen, but 6 Horses can give velocity to machinery, walking at the rate of 2 miles per Hour, equal to 24 miles.

These observations are made on the supposition that the country is perfectly level, as this is out of the question, we must either make great allowance for unequal ground, or by other means cause the effect in another way, this effect may be nearly produced by either steam, or Horse power, if in either case, the force applied, shall operate descending, ascending, uneven ground, & the velocity gained in the descent, will be nearly ^{sufficient to gain} equal to the next ascent, it will be perceiv'd that the Horse traveling on the road could not give the necessary velocity, his force must be applied by means of cog wheels, to give 12 times his motion, which will be 24 miles per Hour, for 6 Horses, with 20 Tons,

A Cylinder is a bad form to pass rapidly through the Atmosphere, it must therefore have a light inclosure suspended on its axis, to which you may give the form best adapted to pass through the air, and a Wheel to direct its course,

Steam will be equally convenient for this purpose, and perhaps more so

A Horse can carry 4000 lb on a common road, what can he carry on smooth road, firm, & level, certainly the difference must be very great, on the proposed plan the effect is the same as if there were no hills,

To carry 9000 lb three miles an Hour, is equal only to the carriage of 1125 lb 2 1/4 miles an Hour, our calculation is more than three Times as Burdened, suppose we have not the practical result, and now can only carry 1000 lb

Pleasant James B. Brookeville Nov. 28. 16.
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24 miles per hour, the difference of cost between canals & roads, together with the many advantages attending quick conveyance, especially for persons, will make very decidedly in favour of roads

There is however another method, or rather an improvement on this method, that would be worth trying, and I ^{believe} would be found much superior, which I can on some future occasion explain,

If thou should think any thing useful to the community might be produced, thou art at liberty to use the above observations in any way thou may think most conducive to that end

Brookeville Nov 28
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James B Pleasants

I think that turnpike Roads may be made at one half the expence they are made by any method now in use and much better