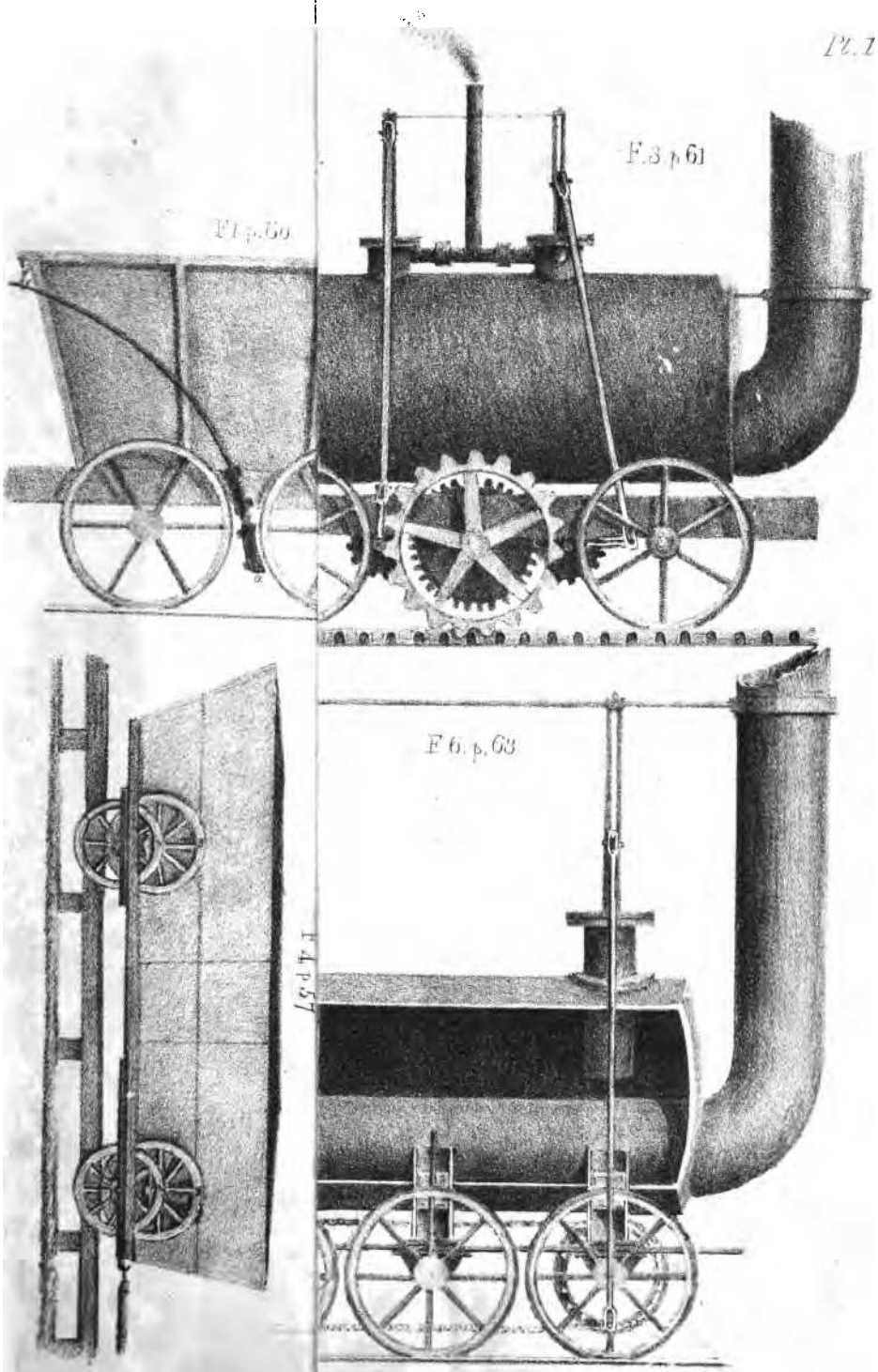
Treatise On Rail-Roads and Internal Communications

Earle Thomas

Title: Treatise On Rail-Roads and Internal Communications

Author: Earle Thomas



A

TREATISE

ON

RAIL-ROADS

AND

INTERNAL COMMUNICATIONS.

COMPILED FROM THE

BEST AND LATEST AUTHORITIES.

WITH

ORIGINAL SUGGESTIONS AND REMARKS.

BY

THOMAS EARLE.

PHILADELPHIA:

SOLD BY JOHN GRIGG, No. 9 NORTH FOURTH STREET;
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Eastern District of Pennsylvania, to wit:

BE IT REMEMBERED, that on the eleventh day of May, in the fifty-fourth year of the Independence of the United States of America, A. D. 1830, Thomas Earle, of the said district, hath deposited in this office the title of a book, the right whereof he claims as author, in the words following, to wit:

"A Treatise on Rail-Roads and Internal Communications, compiled from the best and latest authorities. With Original Suggestions and Remarks. By Thomas Earle."

In conformity to the Act of Congress of the United States, entitled, "An Act for the encouragement of Learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies, during the time therein mentioned;" and also to an Act entitled, "An Act, supplementary to an Act, entitled, 'An Act for the encouragement of Learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies, during the time therein mentioned,' and extending the benefits thereof to the arts of designing, engraving, and etching historical and other prints."

D. CALDWELL,
Clerk of the Eastern District of Pennsylvania.

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EXPLANATION OF MAPS.

The *deep blue lines* show Canals in operation: the *light blue*, Canals in progress: the *green*, contemplated Canals. The *red lines* show Rail-ways made or making: the *orange*, Rail-ways undertaken, and the *yellow*, proposed Rail-ways.

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ERRATA.

Page 101, for 85, read 25, in the expense of transportation on turnpikes.
Page 37, at top, for fig. 7, read fig. 12.

A TREATISE

ON

Rail-Roads & Internal Communications.

CHAP. I.

Of the plan and formation of a Rail-Road for the use of Horse Power.

The first thing to be determined in the formation of a Rail-road is the kind of power that is to be employed on it, whether horses, or steam engines. It is desirable not to use both kinds of power on the same road; because the graduation for each should be different, as will hereafter appear;—because the slow travelling of horses will present a serious obstruction to the free operations of locomotive steam engines, compelling them frequently to turn out, and occasioning delay and inconvenience; because a road for horses may be made of less strength and expensiveness than for steam carriages; and because the action of the horses' feet will throw dust and gravel on the rails, which it will be desirable to avoid on roads for engines, inasmuch as it increases the resistance, and the power required to move the wagons.* A further reason is, that the dust thrown on the rails, will be converted into mud, in wet weather, and will materially diminish the adhesion of the wheels of the locomotive engine to the rails.†

If the rail-road be intended for horses, it will then be proper to consider the choice of a route, between the two places to be connected by the road, and the mode of graduation which will be adapted to the most advantageous use of horse power.

* Wood on Rail-roads, p. 74. † Ib. p. 241.

In relation to this subject, I shall propose a method, which it appears to me, may prove highly beneficial.

We are without as accurate experiments on the power of a horse, and the most advantageous mode of its application, as are desirable.

A horse's power is estimated by the weight which he can draw perpendicularly upwards out of a well, by a cord suspended over a pulley. Dr. Desaguliers estimates his power at 200lbs. at 2½ miles an hour, for 8 hours in a day: making 200lbs. 20 miles in a day.

Mr. Watt estimates it at 150lbs. moving 2½ miles an hour. Mr. Wood states it at 112lbs. 20 miles in a day.* On the Backworth Rail-Road, the horses exert a power, in ascending a plane of 2½ miles, varying from 113lbs. to 314lbs. The average power is 189lbs.; or it equals the power of a weight of 189lbs, suspended over a pulley. But in returning, less power is exerted.

It may, on the whole, be fair to take Mr. Watt's estimate of 150lbs. as the average performance of a horse, travelling 20 miles in a day, and working every day, with an exertion varying from 50 to 300lbs, but averaging 150lbs. If his exertion were constantly equal, his power would probably approach near the estimate of Dr. Desaguliers.

Having ascertained the average power which a horse can exert through the day, or for a certain number of hours, it is yet desirable to know what is the greatest force which he may occasionally exert for a short distance, without danger of injury, so that we may fix the greatest declivity allowable, on a rail-road, upon which certain weights are to be drawn. A horse, in England, carried on his back 1232lbs. eight miles without stopping. But, he cannot, by drawing, raise as great a weight perpendicularly, when suspended

* *Wood on Rail-Roads*, p. 236.—There is an evident error in Mr. Wood's calculation; as he has taken the average draught for about 20 miles; in about 5 of which the horse drew no load at all, but, if no brake were used, must have exerted as great a force in holding back the load, as in drawing it forward in other parts of the road. He takes the performance of a horse on a hilly road as the same with that upon a level road. If this were correct, a level road would have no advantage over a hilly one.

over a pulley, as he can carry on his back. From some trials of the strength of a horse, against that of men, I should suppose the extreme weight a horse could raise by drawing (without the aid of any lever or other mechanical power), would be between 600 and 900lbs. The power generally exerted by dray and cart horses, on the steepest declivities in our cities, is probably at least 400lbs. The horses on the Team Colliery Rail Road in England, exert a power of 342lbs. regularly, on a plane of 500 feet in length. On the whole we may presume that 400lbs. is the greatest exertion that should be required of a horse, in extreme cases, and on short distances.

It is further desirable to know the rate of speed at which a horse can work most advantageously, in other words, whether it is easier for him to travel two miles an hour, exerting a force of 200lbs. on the load, or four miles an hour, exerting a force of but 100lbs.—Professor Leslie supposes the greatest effect to be produced at four miles an hour, or that a horse can draw more than half as much at that rate, as he can at two miles an hour. Mr. Wood supposes that the greatest effect is at the slowest rate of travelling. The latter supposition is probably the correct one. General experience seems to have proved that the most profitable horses for draught are those which travel slow. It is reasonable to suppose that the fewer times a horse travels over a piece of ground, to convey a certain quantity of goods, the better, provided the draught is not so great as to strain him: because the power exerted to transport his own body, is greater than that which he exerts on the load.

We will suppose then, that a horse's greatest effect can be produced in drawing at a speed of two miles an hour, or that he will draw more than double the weight at that speed, which he will do at four miles an hour, working an equal number of hours in a day.

A still further question remains, as to the number of hours in a day which a horse can work with most advantage. Can he work 8 hours per day exerting a force equal to 200lbs., with more, or with less ease, than he can work ten