REPORT ON RAIL-ROADS AND LOCOMOTIVE ENGINES, ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE OF THE LIVERPOOL AND MANCHESTER PROJECTED RAIL-ROAD, PP. 5-36 (NOT COMPLETE)

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CHARLES SYLVESTER

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REPORT

ON

RAIL ROADS

AND

LOCOMOTIVE ENGINES,

ADDRESSED TO

THE CHAIRMAN OF THE COMMITTEE OF THE LIVERPOOL AND MANCHESTER PROJECTED RAIL-ROAD.

By CHARLES SYLVESTER,
CIVIL ENGINEER.

SECOND EDITION.

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1825.

Liverpool, December 15, 1824.

Sir,

HAVING been requested by a friend, a Member of your Committee, to inspect the Locomotive Engines and the Rail-roads near Newcastle and Sunderland, I have prepared the following Report, which he has desired me to publish and address to you. With my best wishes for the success of your most important and valuable undertaking,

I have the honour to be,

Sir,

Your most obedient Servant,

CHARLES SYLVESTER.

To Charles Lawrence, Esq.,
Chairman of the Liverpool and Manchester Rail-road Committee.

REPORT ON RAIL-WAYS.

Liverpool, 30th November, 1824.

IN every mechanical operation, whatever may be its nature, a certain effect or work has to be performed by some effort, called FORCE or POWER, which is intended to overcome other forces, or resistances, opposed to the existing causes. If the whole of these causes are properly estimated before they are put into operation, the result will be exactly foreseen; if, on the contrary, any of these causes, whether impelling or resisting, have not been properly estimated, the result will be different from that which has been foretold. This previous estimation of effects has been vaguely called *theory*, and there is a generally prevailing opinion, that theory and practice are oftentimes at variance; for we frequently hear such language as, "things being good in theory and bad in practice." Nothing can be more absurd. Every thing attempted to be practised has been the result of preconceived notions of the causes which would

interfere in favour of or against the result; but if the result be not what was expected, some of the causes have been wrongly estimated, or, perhaps, omitted altogether. Whichever of these may have been the case, we cannot call such a thing correct in theory, nor can any thing be correct in theory which does not hold good in practice.

Although, in this investigation, I have taken great pains to introduce all the circumstances for and against the accomplishment of rail-ways, I am well aware, that many have yet to be considered which must remain to be developed by experience.

We have long been acquainted with the effects and advantages of rail-ways in lessening the friction and the consequent saving of horse power. These have undergone various improvements in their means of lessening the friction. My object, in this report, is to explain the principles of moving wheel carriages along rail-ways, whatever may be the power employed. The force applied I consider as a certain pressure, which I call the moving force, and which I shall, in my calculations, express in pounds: the weight to be moved along the plane I shall also express in pounds.

With a view to make these principles better understood, I will propose an hypothetical plane, or rail-way, destitute of friction, to go quite round the earth, keeping every portion of the surface of the rail the same distance from its centre. These would be the precise data to constitute a level plane. It will be clear to all who are acquainted with central motion, that, if a carriage or other body be put in motion upon this hypothetical plane with

any given velocity, it will continue to revolve round the earth with the same velocity, supposing it to have no friction, nor to be otherwise resisted.

This hypothesis being admitted, I will now suppose, what we shall all readily allow, that this plane has a certain, but uniform, friction throughout, and that, in order to overcome this friction, we will suppose it to have some power travelling with it for that purpose. This being effected, it will, I think, be granted, that, whatever force we add to that which overcomes the friction, the carriage will be put in motion, and its velocity will increase, equally in equal times, as long as this extra force is continued. If, at any period of its motion, this extra force be withdrawn, leaving that still in action which balances the friction, the body will go on with the velocity it had acquired, and, if the path reached round the earth, it would continue to revolve for ever.

In order to apply this principle to practice, I have been anxious to get all the information I could on the subject of friction. For these valuable facts, I have been under much obligation to Mr. Stephenson, your engineer, and his friend, Mr. Wood, of the Killingworth Colliery.

They have ascertained, by experiment, that an empty coal waggon, which weighs 23.25 cwt., requires a force equal to about 14lbs. to keep it in motion, and they did not find, on varying the velocity, that this force was altered. When the waggons are loaded, the weight becomes 76.25 cwt., or 8,540lbs. If the axletrees of the waggon had been changed, according to the weight upon them, we should, doubtless, find that the friction would increase as the