

SENATE No. 164.

Commonwealth of Massachusetts.

STATE BOARD OF AGRICULTURE,
STATE HOUSE, BOSTON, April 22, 1875. }

HON. GEORGE B. LORING, *President of the Senate.*

DEAR SIR:—I have the honor to transmit through you to the legislature, the Report of the State Board of Agriculture upon the "most suitable width of rims to wheels of loaded wagons, with reference to draught, and wear and tear of highways," in accordance with a Resolve of the last legislature, chapter 59.

Very respectfully, etc.,

CHARLES L. FLINT,
Secretary.

R E P O R T .

The State Board of Agriculture has called my attention to the following Resolution, passed by the legislature in May, 1874 :—

“ *Resolved*, That the state board of agriculture is hereby instructed to institute investigations, with the aid of the professor of physics and civil engineering of the agricultural college, into the most suitable width of rims of wheels of loaded wagons, with reference to draught, and wear and tear of highways, and report to the next general court.”

The time allowed has precluded the possibility of an experimental investigation, even if the season of the year were favorable, and the appropriate means were at my command. Fortunately the researches of others render such an investigation unnecessary.

In the years 1835 to 1841, Morin, under the auspices of the French government, performed a series of experiments which cover the points contained in the Resolution. The eminent ability of the engineer who conducted the experiments, the great scale on which they were executed, and the pains taken to secure accurate results, put the conclusions arrived at beyond all reasonable doubt. An account of his experiments was published by Morin in 1842, in a work entitled “*Experiences sur le Tirage des Voitures.*” A summary is also given in Morin’s “*Mechanics,*” N. Y., 1860. From the latter work I quote the following laws respecting the draught of vehicles.

1st. The resistance opposed to the rolling of wagons by solid metalled roads or pavements, and referred to the axis of the axle, in a direction parallel to the ground, is sensibly proportional to the pressure, or total weight of the vehicle, and inversely proportional to the diameter of the wheels.

2d. Upon paved or metalled causeways, the resistance is very nearly independent of the width of the tires.

3d. Upon compressible bottoms, such as earths, sands, gravel, etc., the resistance decreases with the increase of the width of the tire, and for farming purposes, tire of about four four inches in width should be used.

4th. Upon soft earth, such as loam, sand, earth drift-ways, etc., the resistance is independent of the velocity.

5th. Upon metalled roads, and upon pavements, the resistance increases with the velocity. The increase is so much less as the wagon is better hung and the road more smooth.

6th. The inclination of draught should approach the horizontal for all roads and for common wagons, as far as the construction will admit.

Respecting the destructive effects of vehicles upon roads, experiments gave the following results:—

1st. When carriages, alike in all respects save the breadth of the wheels, are loaded in proportion to the width of the tire, broad wheels are more destructive to roads than narrow wheels.

2d. When carriages, alike in all respects save the breadth of the wheels, are loaded *equally*, narrow wheels are more injurious than broad ones. But there is no considerable advantage in wheels of a greater width than about four and one-half inches.

3d. The disintegration produced by large wheels, is less than that produced by small ones, and in proportion to their diameters.

4th. A wagon hung upon springs, going at a trot, is no more injurious to roads, than the same wagon, with the same load, without springs, going at a walk.

5th. Under the same circumstances, wagons with four wheels produce less wear than carts.

Whether any legislation upon the subject is needed, may be an open question. If it should be thought advisable to make a law regulating the width of rims of wheels, the bill introduced into the last general court, seems to embrace the principles stated above, and perhaps is as good as can be devised.

Respectfully submitted.

WM. B. GRAVES.