it vibrates about the point of equilibrium, with longer or shorter times of vibration, according to distance of the motion and the mass of the vibrating body. If a weight be instantaneously left to act upon the lower end of a suspended iron rod, it will stretch the rod twice as far, abating what is due to atmospheric resistance and want of perfect elasticity, as it is capable of holding it at for any length of time. The elasticity of the rod will then preponderate, and will raise the weight nearly to its original position. The weight again will preponderate in turn, and thus the vibration will be kept up, till the want of perfect elasticity in the iron, and the resistance of the air, shall finally induce a state of rest. Now, we know that these vibrations are extremely short, as to duration of time, as well as extent of motion; quite inappreciable to the senses, unless the rod be very long; and if the weight be applied so gradually that a space of time equal to several of these vibrations, elapses from the incipiency to the end of the application, the vibration must be reduced to almost nothing, if not entirely destroyed. With regard, then, to the diagonal of a bridge, the weight has to traverse a space of 10 or 12 feet from the time it begins to act, until it comes to produce its full action, requiring, at a velocity of 60 ft. in a second, or 3 of a mile in a minute, 4 part of a second of time; a space greater than many of the vibrations above spoken of.

I conclude then, that theoretically, no allowance need be made for the rapidity of the passage of rail road trains, and, that if the rail be perfectly straight and even, and the motion true and equable, there is no more danger to a bridge from a rapid than a moderate transit.

But practically, this perfection in the adjustment of the rail and the movement, can not be secured; and consequently it is reasonable to suppose there is, in reality some more liability to failure by the quick passage of a rail road train, than by the same load at rest on the bridge.