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of a cross-tie track. I believe that a continuous bearing of timber (say eight by twelve inches) is much the safest, as well as cheapest in the end. I have scarcely taken up a newspaper within the past month that has not recorded a serious accident and loss of life occasioned by a broken rail. These accidents could not occur with a continuous bearing of longitudinal timber underneath the rail; if the rail should break it could not get out of place. Broken axles and wheels, as well as most other accidents to the running machinery, occur from the same cause, or from the shock occasioned by passing from a full bearing on a cross-tie, over the vacant space between the ties. The rail in time becomes disintegrated and weakened, and finally breaks. I would rather have a fortypound rail, laid on a continuous bearing of timber, than a fifty-pound rail laid on cross-ties two feet apart from centre to centre. The saving in the wear and tear of rolling stock and rails will be at least ten per cent. per annum.

4. The width of road-bed proper at grade, or bottom of tie, both in excavation and embankments, composed of material that does not wash or slide, should not be less, and need not be more, than twelve feet. The dimensions of sideditches should be governed by the probable amount of drainage and the width between bottom slopes of excavations, by the character of material and depth of eut.

5. I consider the "McCallum patent inflexible arched truss railroad bridge" to be the best in use. The "Howe truss" is the next best; either are good enough for any ordinary purpose. I have never been in favor of iron bridges for railroads.

6. A locomotive with five-feet drivers, cylinders sixteen by twenty-four inches, and weighing from twenty-eight to thirty tons, is the best for ordinary work on ordinary grades. If you wish to transport extraordinary loads on high grades, you must increase the power and weight or adhesion proportionately.

7. I think that, as a general rule, and with ordinary use, the rails and rolling stock of a railroad depreciate about fifteen per cent. per annum; and, with reference to different velocities, that they deteriorate in the ratio of the increase of speed—that is, the wear and tear is twice as great at a speed of twenty miles per hour than at ten, and so on to any reasonable limit.

The foregoing, I believe, covers substantially all the points specified in your letter. The views upon them are expressed hastily, and without resort to calculations or statistics.

In conclusion, I desire to express my entire confidence in the disinterestedness of the motives of yourself and the other officers who are associated with you on the part of the government in connexion with this great national enterprise, in whatever you may do to elevate and establish the standard of the work. In doing this within reasonable and proper limits, you will always have my hearty co-operation and support.

I desire also to express the hope that you will not lose sight of the other great idea, that all these things are, or should be, subordinate to the vigorous prosecution and speedy completion of the road. Whatever you may do to facilitate this result will be regarded as a great public benefit.

I am, colonel, very respectfully, your obedient servant,

S. SEYMOUR.

Colonel J. H. SIMPSON,

U. S. Engineer, Washington, D. C.

## APPENDIX N.

PHILADELPHIA, January 20, 1866.

SIR : Referring to the late conversation between us in the office of the Pitts-

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