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The Matter of Gauge

Speeding across the prairies of Iowa aboard any of the palatial transcontinental trains operating upon the railroads that converge at the eastern terminus of the Union Pacific in Council Bluffs, probably not a single passenger gives even a transitory thought to the gauge of the tracks over which he is riding. Yet it was in connection with this junction that one of the most basic problems confronting railroad builders was definitely settled — the width of the track which was eventually to become "standard".

While essentially a construction problem, the origin of the present "standard gauge" of four feet eight and one-half inches is not without historical significance. Introduced from England, through the early importation of British locomotives, this "standard" wheel span corresponded to the width of the early English road cart, meas-

ured from inside rim to inside rim. More than forty years elapsed, however, from the date of the earliest railroad construction in America, until the time when this gauge came into almost universal use in the United States.

In 1860 there were "seven widths of gauge in the United States, (in addition to the horse railroad gauge of 5 feet 2½ inches)". In New Eng-

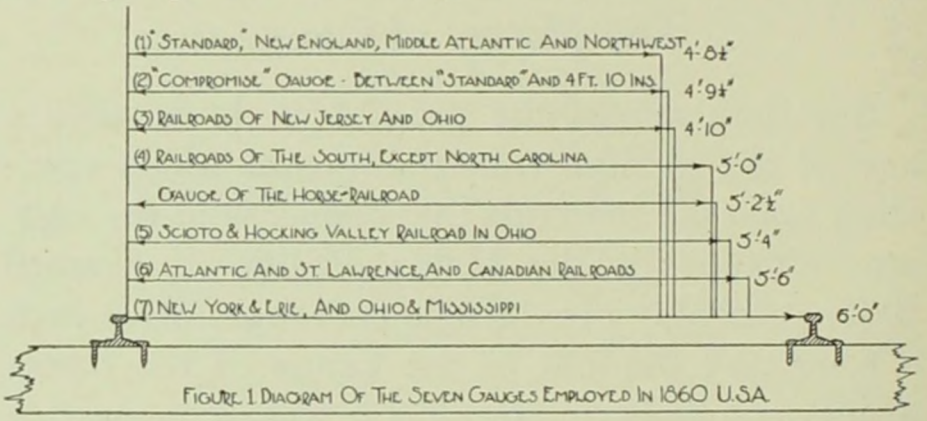

FIGURE 1. DIAGRAM OF THE SEVEN GAUGES EMPLOYED IN 1860 U.S.A.

land and the Middle States (with the exception of New Jersey) and in North Carolina and the Northwest, the 4 foot 8½ inch gauge was prevalent. The 4 foot 10 inch gauge was most common in New Jersey, Ohio, and on the extension of the Pittsburgh, Fort Wayne and Chicago line to Chicago. The 5 foot gauge was usual in the South, although several of the older lines were of the 4 foot 8½ inch gauge. The Scioto and Hocking Valley Railroad in Ohio used the unmatchable gauge of 5 feet 4 inches. Corresponding to

the Canadian gauge of 5 feet 6 inches were the Atlantic and St. Lawrence road and lines in Louisiana and Missouri. Next in width came the New York and Erie, with its tributaries, and the Ohio and Mississippi gauge of 6 feet. The Chicago and North Western was also begun on the 6 foot gauge but afterward changed to 4 feet 8½ inches. The seventh gauge was the "compromise" of 4 feet 9¼ inches on the Cleveland and Toledo Railroad, laid between Toledo and the junction of the northern and southern division which were respectively of the 4 foot 8½ inch and the 4 foot 10 inch gauge.

Thus, by the time railroad construction was getting under way in Iowa, there was throughout the country wide divergence of opinion and practice in respect to this all-important matter. Perhaps this may be accounted for by the fact that there existed, at that time, no transcontinental east and west lines. Inasmuch as most freight business was purely "local" in character, rather than "through", it was cheaper and easier to suffer the inconvenience of transfer of such long-haul traffic as developed on a line than to rebuild the roads and consequently the rolling stock of the entire system.

The problem provoked heated controversy, and the adoption of a uniform gauge was stubbornly

resisted as long as possible by the adherents of the various gauges in the futile hope that their own gauge might ultimately be adopted by the other roads and they would be spared the enormous expense of making the change. Furthermore, engineers were not agreed as to the proper width of the most economical and practicable gauge, and there was then no national authority, such as the Interstate Commerce Commission, to force the issue. While the disadvantages of these frequent changes in gauge at junctions were apparent to all, the public was utterly powerless to remedy the situation.

At such points, on interline shipments, all freight had to be transferred to cars of the other gauge. Passengers were likewise discommoded. Various devices were employed to obviate these difficulties, though none with very marked success. Where the difference in the gauge was not too great, narrower wheel trucks were fitted with wide-flange wheels and run over slightly wider tracks. Thus, cars made for the 4 foot 8½ inch gauge were used from St. Louis to Philadelphia, although for a "considerable part of the distance" they traveled over tracks of 4 foot 10 inch gauge. On the latter gauge there was a play of 1½ inches between the flanges and rail, which was certainly not desirable.

The Delaware, Lackawanna and Western Railroad was extended by means of a third rail over the New Jersey Central to tide-water, an arrangement which was also commonly practiced elsewhere throughout the country, especially in city terminals. Later, cars were built with exchangeable wheel trucks in order that they might be adapted to different gauges without transfer of freight. A German device enabled temporary trucks to be installed on freight cars by allowing the axle of the permanent truck to rest upon a saddle above the temporary truck. Thereby cars of different gauges could be transferred short distances at city terminals for the purpose of loading and unloading.

This annoying and perplexing matter of the diversity of gauge of American railroads was finally settled by President Lincoln. When the Union Pacific was built, he was called upon to locate the eastern terminus and to establish the official gauge of this road. Inasmuch as the railroads already building westward from Chicago, which were to form immediate connections with the new transcontinental line, were all of the standard 4 foot 8½ inch gauge, he very wisely designated this as the width of the Union Pacific. Roads of any other gauge, expecting eventually to share in the great east and west flow of commerce, were, there-

by, compelled to adopt this gauge as their own and remodel their lines accordingly.

During the halcyon days of railroad supremacy in transportation, there were occasional rumors concerning the construction of a super-railroad from the Atlantic to the Pacific, employing a gauge of six or seven feet. These projects were sometimes "promoted" as investment schemes to swindle gullible stockholders. One such road was to have crossed Iowa from east to west on a "bee line" regardless of cities, entering the State at the mythical town of Burris City on the Mississippi in Louisa County and emerging at Council Bluffs on the western border. Considerable grading and other work was actually done on this line, but no wide gauge track was laid.

After the main railroad systems had been built, a demand developed, on the part of isolated communities which had previously been left without adequate transportation facilities, for a cheaper form of railroad construction, whereby their needs might be satisfied without the almost prohibitory cost of building standard gauge track. A narrower gauge promised most of the advantages of the wider track without excessive financial burden, for narrower gauge meant less grading, smaller bridges, less expensive equipment, and many other savings. The cost of such a line, in

some instances, was less than forty per cent of the cost of a standard railroad. This seems to have been the prototype of the industrial railroads used in mines and large construction projects, where the gauge is as narrow as sixteen inches.

In general throughout the United States, only two gauges are now employed by railroads, for experience has proven that the "standard" 4 foot 8½ inch and the "narrow" gauge of three feet

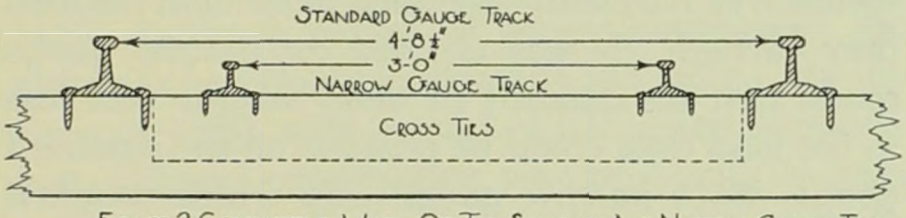

Figure 2. Comparative Width Of The Standard And Narrow Gauge Track

exemplify the maximum and the minimum width of track which may be efficiently operated as common carriers. Although there are a few short lines, mostly in Maine, employing a gauge of two feet, it is too narrow to be used extensively. A track less than three feet wide is impracticable, due to instability and lack of carrying capacity; while on tracks above standard the ratio between the weight of the car and the weight of the freight increases adversely to the gauge. This relation of the "dead load" to the "pay load" spells profit or loss in railroading.

The narrow gauge railroads, besides providing

transportation service which otherwise might never have been obtained, performed the no less important function of stimulating the management of standard gauge roads toward increased efficiency. At the time of the introduction of the narrow gauge, standard roads were not permitted to carry more than ten tons of freight per car, and any excess of this amount was charged double rates as a penalty for overloading. The cars themselves frequently weighed more than the load they carried. It was claimed for narrow gauge roads that the amount of dead weight was less to the load than could be possible on the standard gauge, since narrow gauge cars which weighed only about five tons were rated for loads of seven and one-half tons.

This officially advantageous ratio of "pay load" to "dead load" on narrow gauge lines compelled the standard roads to increase their freight-car loads. As a result, within ten years after the introduction of a competitive gauge, their carrying capacity was doubled and maximum loads of from thirty to fifty tons are now carried, depending upon the nature of the commodity handled. Locomotives have likewise become comparatively so much more efficient that modern railroading scarcely resembles that of fifty years ago.

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