



THE  
**GREAT INDUSTRIES**  
OF THE  
**UNITED STATES:**

BEING  
AN HISTORICAL SUMMARY OF THE ORIGIN, GROWTH, AND  
PERFECTION OF THE CHIEF INDUSTRIAL  
ARTS OF THIS COUNTRY:

BY  
HORACE GREELEY, LEON CASE, EDWARD HOWLAND, JOHN B. GOUGH,  
PHILIP RIPLEY, F. B. PERKINS, J. B. LYMAN, ALBERT BRISBANE, REV.  
E. E. HALL, AND OTHER EMINENT WRITERS UPON POLIT-  
ICAL AND SOCIAL ECONOMY, MECHANICS,  
MANUFACTURES, ETC., ETC.

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## NARROW GAUGE RAILROADS.

MODERN CHEAP TRANSPORTATION. — OUTLINE HISTORY OF RAILWAYS. — THE TRAMWAYS OF THE NORTH OF ENGLAND. — THE FESTINIOG RAILWAY. — EXCAVATION AND TRANSPORTATION WHERE PERMANENT RAILWAYS NOT WANTED. — THE PETELER PORTABLE RAILROAD PRECISELY ADAPTED FOR THIS BUSINESS. — MASS OF SUCH WORK IN ORDINARY RAILROAD BUILDING. — SAVING BY THE USE OF THE PETELER PORTABLE RAILWAY. — FACILITY OF HANDLING AND MOVING THIS RAILWAY. — SAVING IN TIME AND MONEY. — FACTS AND DETAILS IN ILLUSTRATION OF THIS ECONOMY. — ACCOUNT OF THE ORIGINAL INVENTION OF THE PORTABLE RAILWAY.

Cheap transportation is the instrument and the test of civilized progress. In proportion as men can travel quickly, and easily, and cheaply, and can carry goods and materials quickly, and easily, and cheaply, very nearly in that proportion do wealth, and intelligence, and happiness — that is, civilization — advance.

In this branch of improvement railroads are the most recent forward steps on land, as steam vessels are at sea. In railroad improvements, the latest step is the adoption of very narrow gauges; and, last of all, a recently organized American company — the Peteler Portable Railroad Company — have in one singularly ingenious step completed a circle of improvements by combining the vast economy of power which railways afford with a cheapness greatly beyond that of a horse and cart, and an ease and quickness of use which makes a railroad train almost as handy as a wheelbarrow.

A brief outline may be given of the course of this return to features of railway history nearly three hundred years old, while yet the modern improvements in railroad construction prevent this return from being a retrograde.

The first ancestor of the railway was the tramway, which, as its description will show, was a good deal more like the Portable Railroad of to-day than any of the intermediate generations. This

is according to that law which recent physiologists call "reversion," according to which, in any generation of men or animals, there may crop out, as it were, some trait which had been hidden perhaps for a century, but had been distinct in remote progenitors.

Tramways were first introduced in the coal mining districts of the north of England probably between the years 1602 and 1649, that is, under James I. or Charles I. They consisted of parallel lines of wooden *trams*, or beams, pinned down to the ground, and with flanges on these trams, not on the wheels. Coal wagons were drawn to and fro along these flanged trams from the coal pits to the shipping ports on the Rivers Tyne and Wear. Rent was paid to the owners of the lands over which these tramways were laid, and this rent was called *way-leave* — a term still used in that region for land damages for railroads. Roger North, writing in the year 1676, describes these tramways thus: "The manner of the carriage is by laying rails of timber from the colliery down to the river exactly straight and parallel; and bulky carts are made with four rowlets fitting these rails, whereby the carriage is so easy that one horse will draw down four or five chaldron of coal." Along one of these colliery tramways the English cannon were posted at the battle of Prestonpans, won by the Young Pretender and his Highlanders over Sir John Cope in the year 1745.

The first use of iron on these tramways was by nailing down iron plates on the timbers, to protect them where they wore out fastest. The first iron rails were cast at Coalbrookdale in 1767, to keep the furnaces going in a slack season. They were bars, five feet long, four inches wide, and an inch and a half thick, and whenever the price of iron should rise, they were to be taken up again and sold. All iron rails were cast until Birkenshaw introduced rolled wrought iron rails in 1820. Horse railroads were increasing in numbers in England — five having been chartered by Act of Parliament in 1805, sixteen in 1815, and thirty-two in 1825 — when the locomotive was first successfully constructed by Stephenson in 1829.

The width of the tramways was about 4 feet  $8\frac{1}{2}$  inches, because that happened to be the usual width of the wagon tracks in that region. The same width was naturally adopted for the first railroads, and has ever since been used on more roads than any other in most parts of the railroad world. Fourteen other widths are known to have been used, — from seven feet (on an English line, the Great Western) down to two feet (on the now famous

little Festiniog Railway in Wales). The Spanish roads have the elaborate fractional width of 5 feet  $5\frac{1}{8}$  inches.

The Festiniog Railway is that whose construction and operations are most nearly like the Portable Railroad of the Peteler Portable Railroad Company. It was built to haul slate from a Welsh quarry down to a seaport, and has been running for nearly forty years, by horse power until 1865, when locomotives were placed on the road, and with so much success, as to economy and efficiency, as to have of itself alone practically decided the narrow-gauge question.

Some occasional discussion of this comparatively new idea of very narrow railways has taken place during the last year or two in the United States; and here, as well as in Europe, a number of permanent steam railroads on a similar plan are in process of organization or construction. There is required, however, every year, an immense mass of transportation and excavation, for which a permanent railway is not wanted. This is at present executed by the old-fashioned means of wheelbarrows, carts, or wagging, and it is for the economical and rapid performance of this work in particular that the portable cars and track of the Peteler Portable Railroad Company are peculiarly adapted.

Such cases are — the transport of stone, brick, and timbers from a quarry or dock to a building; filling up low grounds; levelling and embanking for wagon roads and railroads; building mill-dams; working peat bogs; sanding cranberry meadows; building levees; running brick-yards; filling ice-houses; many portions of military transportation; for excavating and hauling at quarries, iron mines, coal mines, marl pits, gravel pits, etc.; for levelling and filling in the grading of public parks, cemeteries, and other large areas; for the heavy hauling at rolling-mills, foundries, boiler-shops, and other large iron works; at lime-kilns; in digging for large cellars, excavating for gas-holders, etc., etc.

The statistics do not exist for estimating the quantity of such work which is every year executed in the United States, either by number of men, or horses, or vehicles employed, or by number of cubic yards or tons' weight moved. But an estimate of what may be expected from one single item of the above list will sufficiently indicate the vastness of the total. Mr. H. V. Poor, a most experienced and sober statistician, and a first-class authority on the railroads of the United States, calculates that new railroads have been built, during the last twenty years, in this country, at the rate

of two thousand miles a year; that this is to be three thousand miles a year hereafter, and more too; that the whole length of railroads now in operation in the United States is (on January 1, 1870) forty-seven thousand miles; and that it will take at least two hundred and fifty thousand miles more of railways to supply even moderately the whole of the United States.

Now, if we imagine the quantity of hauling required for the deep cuts and high embankments that must be made, for the timber, stone, and iron that must be hauled for the superstructures, bridges, etc., for this distance of two hundred and fifty thousand miles, which is more than nine times the distance around the world, and if we add some imagination of the further mass of heavy excavating and hauling required in all the mining, banking, filling, and other earth work of the United States, — which will be far greater in the total than this railroad item, — although we shall have no arithmetical figures for a result, it is impossible not to be convinced that the whole work laid out is enormous to a degree even beyond the intelligent grasp of the mind. It follows, of course, that the invention which diminishes the labor and cost of all this drudgery, directly and very greatly increases the sum of human wealth and happiness.

An easy comparison will show how greatly the Portable Railroad does diminish this cost and labor. One horse and man on the Portable Railroad can move at least five cubic yards of earth. This would be from ten to fifteen ordinary cart loads, for in practice, one cubic yard makes about three horse-cart loads; the same quantity makes sixteen average wheelbarrow loads. One man alone, with one of the smaller sizes of portable cars and track, can move a half cubic yard of earth, equal to eight wheelbarrow loads. Therefore the Portable Railroad enables one man to do eight men's work, and enables one man and horse to do the work of at least ten men, ten horses, and ten carts. It is easy to compute the saving.

"Portable" is the most important idea in this latest of the railroads; for it can be carried hither and thither, laid down, used, picked up, and carried away again, almost as fast as the field telegraphs that have played so important a part in the military campaigns of the last twenty years. The track is manufactured in twenty-foot sections, hitching strongly and securely together at the end by means of a hook-and-eye contrivance. The necessary short lengths, turn-outs, single and double curves, frogs,





THE PORTABLE RAILROAD IN OPERATION.

cross-roads, turn-tables, etc., are all kept ready made and fitted with hooks and eyes in like manner. The rails are laid directly on the surface of the ground, without sleepers or any preparatory grading or digging. On level ground two men can lay down a thousand feet of the track in an hour, and can pick it up again in fifteen minutes. If there is a marsh or a bog, where an ordinary team could not pass, a "track-raft" has been contrived, which carries road, cars, and all, and a flying bridge is ready for canals and small rivers. A single railroad car, or three two-horse teams, can easily transport the whole track and fixtures of a Portable Railroad a thousand feet (about one fifth of a mile) long.

The patents which are owned by the Peteler Portable Railroad Company are two in number, one covering the track, and the other the peculiar dumping car which is used with the road, and which is of itself an ingenious and efficient contrivance for handling heavy materials. The car used for earth only requires that its load shall be lifted two feet eight inches from the ground, instead of five or five and a half feet, into an ordinary car or cart body. Any man who has ever shovelled one load of earth into a cart will readily see what a relief and saving it is to cut down by half the hoisting of the whole load. For materials like timber, brick, or stone, which will stack closely, this item of convenient handling becomes still more important, the platform for this purpose being only ten inches from the ground.

It is calculated from the results of the work thus far done by the Portable Railroad, that the saving it secures on heavy pieces of transportation is from half to three fourths of the time, and from one quarter to one half of the money, that would be required by the old methods. As in fixed railroads, these savings may become more or less, by virtue of some local peculiarity. Thus, if the ground traversed be of a suitable slope, the cars can be carried one way by gravity alone, and then, of course, so much of the work of transportation is saved.

A few specific details of work actually done will aptly illustrate these general statements.

In filling a wharf at the United States Light-house Depot, Staten Island, it turned out that, with the Peteler Portable Railroad track and cars, the quantity of earth moved was over twenty cubic yards per day per man, while with carts and horses, each man would have moved, on the most liberal estimate, not over  $11\frac{1}{2}$  cubic yards. In sanding some cranberry meadows at Franklin,



Mass., and at Westbrook, Conn., where the ground was so soft that the horse used had to wear what may be called mud snow-shoes, made of board, the Portable Railroad — with one horse and six cars — did the work with a speed sometimes thirty times, and never less than twenty times, as fast as a wheelbarrow force could have done it. A canal and railroad contractor in Indiana wrote that he was embanking and excavating at one third the cost of using horse-carts. Dacey & Co., contractors on the Cape Cod Railroad, upon a careful and extensive trial, moved a thousand cubic yards a month more with a portable track and cars than with an ordinary train and track of  $2\frac{1}{2}$  yard rotary cars, worked with an equal gang. Mr. Whyte, who hired twenty cars and fifteen hundred feet of track to make excavations for his great gas-tank for the New York Mutual Gas Company, reported that he had saved fifty per cent. on his contract in consequence. A Connecticut cranberry man, Mr. Bill, of Lyme, wrote that he had been sanding a cranberry meadow a mile long with the portable track, and that it enabled him to do the work for one third of what it must have cost in any other way, and that his saving on that one job would "pay for the cars and track twice over." Town Road Superintendent Seymour, of Hingham, Mass., found that, even at short distances, such as three hundred feet, he saved one fourth the cost of wheelbarrow hauling, and one third over that of carting.

A long list of similar statistics might be reported from documents on record, not to mention the numerous general statements of "saving both time and money," "having a decided advantage over horses and carts," and the like.

Perhaps the most interesting illustration of the flexibility of the Portable Track was shown in a job of city filling at Boston, where it was found that wheelbarrow work was slow and expensive beyond endurance, and where horse-carts could not go. The gravel used in this work was to be filled in from six to eighteen feet deep, in a low and ill-drained part of the city, built over, however, and where the houses were to be raised to the new level, and the filling dropped and packed in, as the case might be, in side streets, alleys, back yards, and cellars, at all sorts of depths. It was, however, found that the road was, one might almost say, as flexible as a string; it twisted and squirmed up and down, and in and out, round corners and through back gates and cellar doors, searching out one hollow after another, ever and anon being picked

up and carried in at a new place as they carry the hose at a fire, until the whole was successfully accomplished, and at the rate of three hundred cubic yards a day to twenty men, too ; being fifteen cubic yards, equal to thirty heavy cart loads, per man.

It is scarcely necessary to say that a mode of transporting which possesses at once more than the adaptability of a man with a wheelbarrow, at half the cost ; more than the wholesale economy of a railroad gravel train, without its burdensome permanency ; which can go where man and horse cannot ; which cannot be disabled by rain, flood, sand, or mud ; and which can be laid down in an hour and removed in fifteen minutes, without leaving a remnant or trace of its presence, is the very beau-ideal of a transportation system. The credit of the inventions which are united in the Portable Railroad enterprise is due to a Bavarian engineer officer, Herr Peteler. During the military operations of the famous campaign which was closed by the decisive defeat of the Austrian army at Sadowa, in 1866, there arose a necessity for quickly filling in an area of marshy ground. The means were not at first forthcoming, but Herr Peteler quickly conceived the idea of the movable narrow tramway, the light cars, and the track-raft which was to carry them over the morass. The necessary woodwork was extemporized, and the filling executed with unprecedented quickness. The efficiency of the plan was thus proved, and the inventor proceeded to develop and complete its adaptation to civil as well as military operations. When his inventions were complete, he went on to introduce them in Europe, and intrusted his brother, Mr. Alois Peteler, with the business of bringing them into use in America. The undertaking has already met with great success, the track and cars of the Company being now in use in more than half of the states, and in the British Provinces, Cuba, and South America. The office of the Peteler Portable Railroad Company is located at 42 Broadway, New York, where they keep samples of their cars and tracks, and where all business pertaining to the Company is transacted.

