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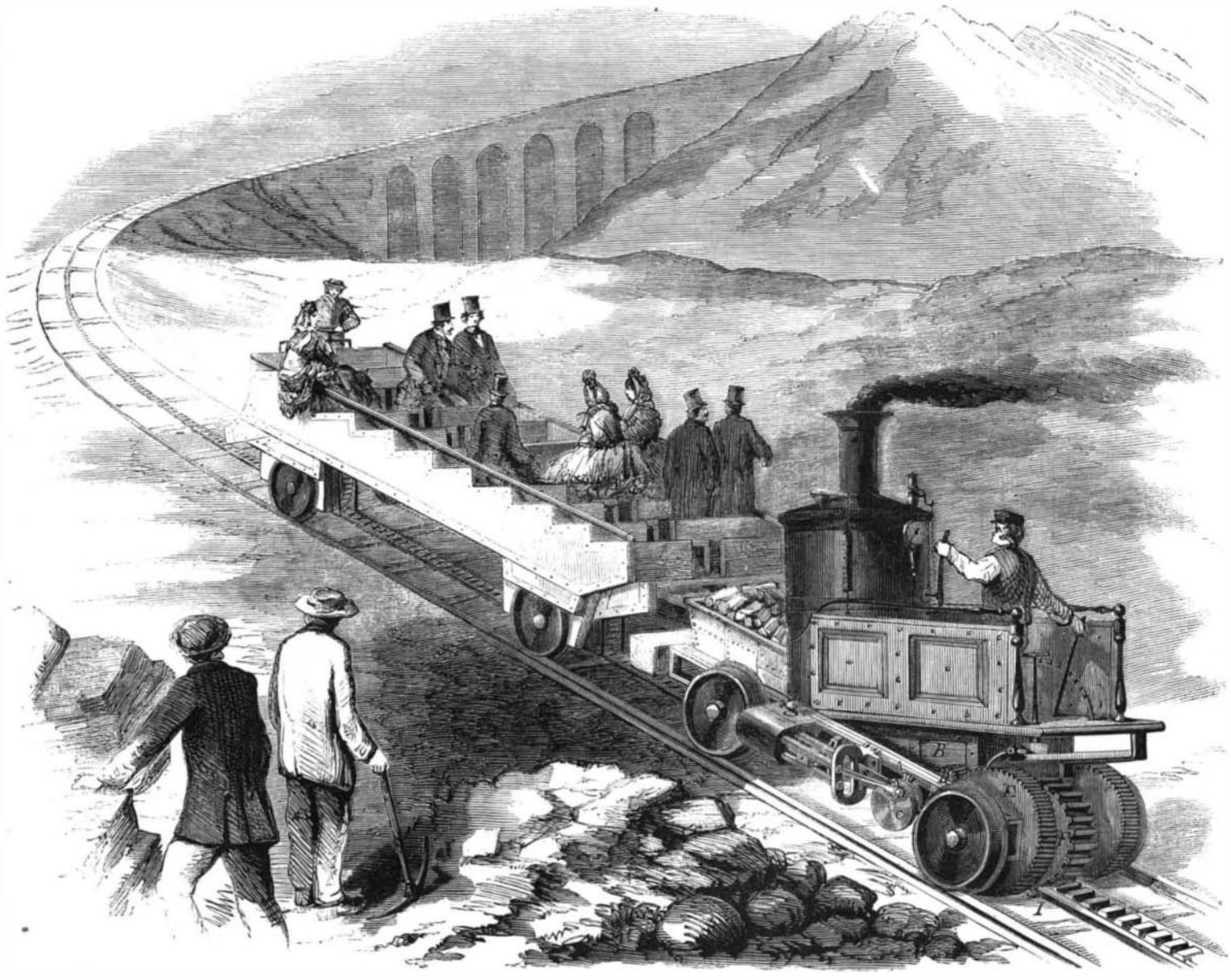



## MARSH'S PLAN FOR ASCENDING THE WHITE MOUNTAINS BY STEAM.

As the cost of building railroads is very much increased by the natural inequalities of the country through which the line runs, it is apparent to the most superficial thinker that if engines could be made to disregard those inequalities and ascend or descend steep grades with as much facility as ordinary engines run over levels, one great expense in the construction of railroads would be very much reduced. The subject of ascending heavy grades by loaded cars has long attracted much attention among railroad authorities and those concerned in such enterprises, and many lines are now working wherein trains are daily drawn up acclivities of very sharp angles with the ordinary surface of the earth. These lines, however, dodge the question, so to speak, as they do not accomplish the object by the direct application of the engine to the train, but through the agency of stationary engines and wire ropes wound on windlasses. In this manner a very steep incline at Mauch Chunk, Pa., is worked. On the Baltimore and Ohio Railroad, the trains run over the Alleghany Mountains by winding along the sides in a zig-zag manner, or as a sailor would say by tacking back and forth until the summit is passed. This plan increases the distance enormously, although the object is attained.

In England this subject is attracting considerable attention at the present time, in consequence of experiments recently made by an inventor named "Fell," who, on a certain occasion, ascended a very steep incline of 1 foot in 12, distance=200 yards, and another of 1 foot rise in 13, length=500 feet, with a 16-tun locomotive and four cars loaded with 26 tuns of ballast. He ascended and descended this grade with the utmost facility; the principle he adopted being a central track between the two others, said track being gripped by two strong wheels worked horizontally, or with their axes vertical. This English plan is nothing new, as we ourselves rode on an engine (in this city) which ran in a vacant lot in 22d street, some 18 years ago, the track and engine being constructed the same as Mr. Fell's. We may add that it was the invention of an American mechanic, named "Sees," and the experiment was successful.

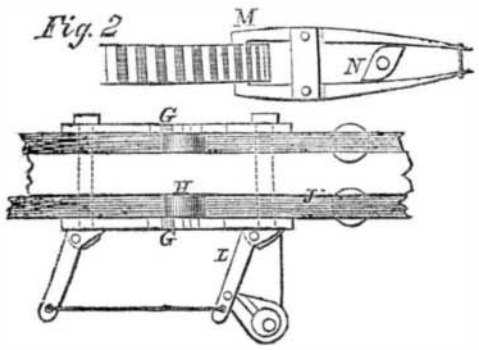
The engraving herewith presented represents a new plan for a "mountain" locomotive; it is the invention of Sylvester Marsh, of this city, and is intended to overcome the steepest gradients and turn the sharpest curves with facility and safety. The engine is a "pusher" and has a vertical boiler, as shown; this plan being preferable, and indeed indispensable on account of the nature of grades, or the difference which exists between them. This boiler sets in the frame, A, which also sustains the engine, the fuel, and the water tank. The fuel is carried forward and requires the services of an additional hand, or it may be carried on the foot-board of the engine if desired; the water tank is directly under the foot-board at B; it is between the frame and so constructed as to be out of the way of the machinery. The engines are of the usual locomotive pattern, outside, connected and

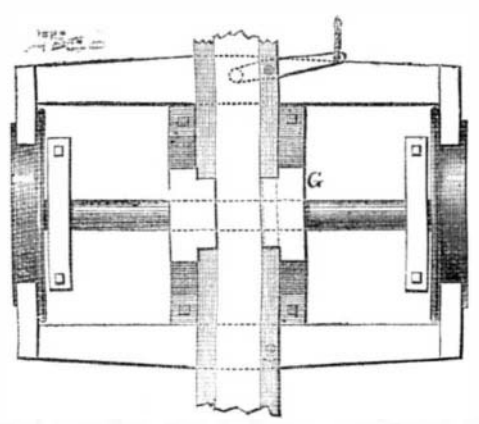
geared. As the machine is shown in the engraving it would make very slow progress, and the idea of the inventor is merely illustrated and not the actual plan of construction. The truck wheels behind will be replaced by small drivers, and the forward truck made with the usual arrangements, four wheeled, springs, &c., as in all the modern locomotives.

The gear which assists the locomotive in ascending the grade is thus arranged:—

The engines are connected to a shaft and crank at C, and upon this shaft there is a pinion, D, which meshes into the large gear, E, one of which is provided for each engine, upon this latter gear-shaft there is a large spur wheel, F, working in a rack laid between tracks. Of course when the engines are started the force exerted by them is communicated to the hind axle through the pinion, D, and thus the engine ascends. To aid the adhesion of the engine to the rails and prevent any liability of upsetting, there are two stout arms, G, underneath the engine (shown in detail at Fig. 2), which have rollers, H, on their extremities, and said rollers run on the under side of the rack-rail as at I, in the large engraving. There are also two side plates, J, having four or more wheels set in them, which grip the central track so that in

Fig. 2




addition to the mechanical power afforded by the gears mentioned previously, this central or roller frame adds very greatly to the ascensive power of the machine. This roller frame may be worked by separate engines if it is found necessary, though it is preferred to simplify the engine as much as possible by having a superabundance of piston area in the large cylinders, which can be used for the purposes set forth. This roller frame moves sideways and is thrown in and out of connection with the track at pleasure from the foot-board by the levers, L, and suitable apparatus above.

For descending heavy grades the hold-back gear, independent of the reversing or back pressure afforded by the cylinders, is thus arranged. The main spur wheel is gripped by a set of brakes as at M, Fig. 2, which are worked by a cam, N, from the foot-board of the engine; these brakes have friction rollers, and a heavy strain can be thrown on the wheel so as to retard its velocity. There are also preventer pawls as at O, Fig. 1, which must be thrown out when backing down, their principal use is to act as a safeguard in ascending. The wheels of the truck carriage under the passenger car are also rigged with the same friction gear and brakes as those described on the engine, and as the power and the strength of these parts can be increased indefinitely, they furnish efficient preventives against disaster, should the rack give way or other accident happen to the engines. There are also the usual block or wooden brakes applied to the periphery of the truck wheels.

The State of New Hampshire has granted Mr. Marsh an exclusive charter for twenty years to ascend the White Mountains by steam. The invention examined by many of the first railroad men and others of scientific reputation; these gentlemen have considered it both possible and feasible. The distance up the mountain is not over three miles, and it is intended to ascend very slowly, say in an hour. There is any quantity of timber at the foot of the mountain, and one great advantage of this enterprise would be to afford a means of taking lumber and other materials to the top of Mount Washington, for the purpose of erecting a large hotel on its summit; this hotel could be kept without the difficulties now in the way, if this road was in operation. If those who would be benefited by such an enterprise will lend their aid, it can be completed in two years. The cost will not be great, as no uniform grade is required according to this plan; thus avoiding all expense of blasting and grading for the superstructure. Letters of inquiry must be addressed to Sylvester Marsh, Esq., Box 3,047, New York City, by whom this invention has been patented.

## THE MOST IMPORTANT AMERICAN DISCOVERIES AND INVENTIONS.

### No. 2.

### THE COTTON GIN.

### Whitney.—1792.

Eli Whitney was born in Westborough, Mass., on Dec. 8, 1765. His father was a respectable farmer who worked on his own farm and had his sons work with him, but Eli always showed more fondness for mechanical employment than for labor on the farm. At the age of 12 years he made a very good violin. The most complicated piece of mechanism that had ever come under his notice was his father's watch, and he had great curiosity to see the inside of it. Buthis father would not trust him with it. One Sunday, however, he pretended to be sick, and after his father had gone to church, he went to the room where the watch was kept, and soon had the wonderful instrument all in pieces. He was a little afraid that he should not be able to put it together again, but finally succeeded so completely that his father never suspected what had been done till long afterwards, when Eli told him.

When 23 years of age, Mr. Whitney entered the "freshman" class of Yale College, and graduated in 1792. Soon after he took his degree, he made an engagement with a gentleman of Georgia as a private tutor in his family. Among his fellow-passengers on his way to Savannah was Mrs. Greene, the widow of Gen. Greene. When he arrived in Savannah, Mr. Whitney found that the gentleman who had engaged him had employed another tutor in his place. In this emergency Mrs. Greene invited him to make her house his home until he had completed the study of the law. He accepted the invitation and accordingly took up his residence at the house of Mrs. Greene, at Mulberry Grove, near Savannah. Here he soon had an occasion for his mechanical skill. Mrs. Greene was at work upon a piece of embroidery, and complained that the tambour caught her thread Mr. Whitney made a new tambour, which greatly pleased Mrs. Greene, and was regarded by all who saw it as a triumph of ingenuity.

Soon after this a party of gentlemen, some of whom had been officers under command of Gen. Greene, came to Mulberry Grove to pay a visit to Mrs. Greene, and while there the conversation turned on the recent introduction of the green-seed cotton. It was remarked that if some machine could be produced that would clean the cotton from the seed with facility, the cultivation of this cotton would be of great value to the country.

Mrs. Greene remarked that if they wanted any machine invented they had better call on Mr. Whitney, for he could make anything. Mr. Whitney was accordingly sent for, and introduced to the company; but he disclaimed any pretensions to mechanical genius, and said that he had never seen any cotton in the seed in his life.

The idea having been suggested, however, in a few days he went to Savannah, and, after a considerable search, succeeded in finding a small quantity of cotton which had not been separated from the seed. He carried this home and in the course of two or three weeks he finished the small model of a "gin." A temporary building was then erected, and with such tools as he could find on the plantation he began the construction of a working model.

His plan was to insert a number of wire hooks in the periphery of a wooden disk, and to allow these hooks, as the disk was rapidly revolved, to enter a narrow slit in the side of a hopper near its bottom; the hooks catching the fiber and pulling it through the slit, while the seed was retained in the hopper by the narrowness of the opening. The cotton was then swept from the hooks by a rapidly revolving brush. A series of the disks were placed on the same shaft, and provided with corresponding slits in the hopper. He contemplated also forming the hooks upon the edge of a circular iron plate, and this modification was afterwards adopted.

It is remarkable that no time was wasted in unsuccessful experiments. The first simple idea conceived by Mr. Whitney has never been superseded. For 70 years his machine has been in operation. It has determined the pursuits and affected the condition of millions of persons—building up hundreds of villages, towns and cities, and changing the face of a considerable portion of the civilized world.

At Mulberry Grove was a Mr. Miller, a graduate of Yale College, a man of some means, who afterwards married Mrs. Greene. He proposed to furnish Mr. Whitney with funds to take out a patent, and build machines, for half interest in the invention. Mr. Whitney accepted the proposal, and a written agreement to this affect was signed on May 27, 1793.

Mrs. Greene had shown the gin to a few gentlemen, and as a knowledge of its existence spread in the community, the greatest curiosity concerning it was excited. Persons came from long distances to see it, but it was not thought best to show it till the patent was secured. The excitement, however, in regard to it increased, and finally, before the patent was secured, some persons broke open the building in the night, and carried the machine away. From this model numerous gins were constructed, and the machinery passed into very extensive use before the patent was granted.

Miller and Whitney committed an error quite common among inventors—that of being too greedy for enormous profits. Instead of manufacturing and selling gins, they attempted to monopolize the whole business of ginning cotton, and not having capital sufficient for this, they strengthened very much the temptation to infringe their patent rights. They became involved in debt, and finally in bankruptcy, and Mr. Miller soon died.

On the 19th of Dec., 1801, the Legislature of South Carolina passed a law appropriating $50,000 for the purchase of Whitney's patent right for that State. In December, 1802, the Legislature of North Carolina levied a tax of two shillings and sixpence on every saw in the gins in use in that State, for the benefit of the inventor; and this tax was faithfully collected and paid over, giving Mr. Whitney the principal revenue, which he received from his invention. In 1803, the State of Tennessee passed a similar law, assessing a tax of 37 cents per annum, on each saw for four years.

These sums enabled Mr. Whitney to pay his debts, and to carry on his law-suits in Georgia, where he continued to prosecute the infringers for eleven years. Though he at last obtained decisions in his favor, he never realized any income in that State from his invention.

In the United States Court, held in Georgia in December, 1807, in a suit against Arthur Fort, Mr. Whitney obtained a decision granting a perpetual injunction to prevent the use of his invention without his consent. In giving his decision, Judge Johnson remarked:—

"With regard to the utility of this discovery, the Court would deem it a waste of time to dwell long upon this topic. Is there a man who hears us who has not experienced its utility? The whole interior of the Southern States was languishing, and its inhabitants emigrating for want of some object to engage their attention, and employ their industry, when the invention of this machine at once opened views to them which at once set the whole country in active motion. From childhood to age it has presented to us a lucrative employment. Individuals who were depressed with poverty and sunk in idleness have suddenly risen to wealth and respectability. Our debts have been paid off. Our capitals have increased, and