



## Achieving the Impossible in the 1860s... ...Still on the Cutting Edge of Railway Technology 150 Years Later

When Sylvester Marsh declared that he would build a railroad up the side of Mount Washington, many people stated that it couldn't be done. Others chuckled and thought he was crazy. A New Hampshire legislator quipped that Marsh "might as well build a railway to the moon."

Sylvester Marsh was anything but crazy – he was an innovative, creative thinker who had made a fortune in Chicago's meatpacking industry. On a trip back to New Hampshire, after getting lost and surviving a storm on Mount Washington, Marsh decided there had to be a safer way to enjoy the mountain.

### What is a Cog Wheel and How Did It Solve a Problem?

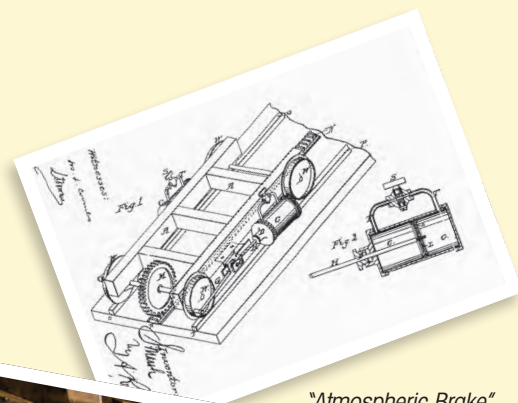
Mount Washington is steep and rocky. In fact, the steepest incline where the track runs is 37.4 percent. To put that in perspective, the heads of the passengers in the front of the coach are 13 feet higher than the heads of the passengers in the back.

Marsh invented a locomotive with cogwheels that have teeth around the edge to grip into a center rack rail and propel the train up the mountain. Once that problem was solved – and it was a challenge – the train could ascend the mountain safely.

Then the problem was getting the train back down. In 1864, Marsh designed and patented possibly his most important invention, the "atmospheric brake" or airbrakes. By the compression of air in the cylinders, the locomotive could descend the mountain. These brakes are still used today on many cog railways.

On July 3, 1869, after three years of construction, Peppersass (pronounced Pepper-Sass) became the first cog-driven locomotive in the world to climb a mountain – all the way to the 6,288-foot summit of Mount Washington.

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*"Atmospheric Brake" or airbrakes patented by The Cog in 1861.*



*Cog Wheel*

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Wayne and Susan Presby's biggest accomplishment was the development of an eco-friendly biodiesel locomotive.

For the first 40 years of The Cog's operation, wood-fired boilers powered the train. Around 1910, coal was introduced. For each trip to the summit, the coal-fired steam locomotives used one ton of coal, and 1,000 gallons of water. From the beginning, the inventions and construction of the locomotives were done on-site, in the workshop near Marshfield Station.

### Current Innovations

Since 1983, Wayne and Susan Presby along with Joel and Cathy Bedor have been stewards of The Cog Railway, working to bring the unique railroad into the 21st century. With an eye towards making repairs, enhancing visitor experience, and energy conservation, they have made numerous improvements.

Their biggest accomplishment was the development of an eco-friendly biodiesel locomotive. Biodiesel is a nontoxic renewable fuel created by the conversion of vegetable oils and animal fats. The advantages of biodiesel are that it reduces emissions by eighty percent from conventional diesel; it is biodegradable, nontoxic, and essentially free of sulfur and aromatics.

After much research, experimentation and construction, the first biodiesel locomotive, *Wajo Nanatasis*, (the Abenaki word for "Mountain Hummingbird") was put into operation on September 6, 2008. It was designed and built on-site by the dedicated crew. The biodiesel train burns only 16–18 gallons of fuel per round trip. Today, there are six biodiesel locomotives in operation as well as two coal-fired steam locomotives. The experience is the same as 150 years ago, however the new biodiesel locomotive offers visitors an environmentally friendly way to travel to the summit of Mount Washington.



Biodiesel locomotive designer Al LaPrade holds the flag over "M1", the first Cog Railway biodiesel locomotive, as the Presby and Bedor families (the owners of the Cog Railway) and then NH Governor John Lynch and his wife Doctor Susan Lynch look on.



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