

THE HOOSAC TUNNEL.

I venture to say there are few, if any of your thousands of readers that have not heard of the Hoosac Tunnel, however, not many probably, have ever taken into consideration the magnitude of this great piece of engineering skill.

The Hoosac Mountain is a part of the Green Mountain range extending through the western part of Massachusetts, and until the opening of the tunnel had been a barrier between the States of Massachusetts and New York. As early as 1819 it was proposed to tunnel the mountain, but nothing of importance at the time was done. A board of commissioners was appointed by the Legislature in 1825 to select a route for a canal from Boston to the Hudson River. No unusual difficulties presented themselves to this undertaking except the tunneling of the mountain. But in 1835 the first railroad in American having been put in successful operation, the project of a canal was abandoned. The Boston & Albany Railroad was completed in 1842. This road ran over the mountains 20 miles south of the tunnel line and had grades unequaled in the history of railways, at that time; consequently the running expenses and charges were necessarily very high. In 1843 the Fitchburg Railroad was completed and that, in connection with the Vermont & Massachusetts, built three years later, formed a continuous line from Boston to Greenfield. But this did not seem to satisfy Boston capitalists, they wanted a more direct line to the West, and, to compete with the Boston & Albany, and in 1848, the Troy & Greenfield Railroad was incorporated; this was to run from Greenfield through the mountain to Williamstown, and there connect with a road for Troy, but the tunnel was the great obstacle to contend with; finally, in 1851, work was begun. It was the intention of the company at this time to cut or bore a hole through the mountain the full size of the tunnel, and a ponderous and costly boring machine was obtained for the purpose, this, with several other costly machines, was tried and proved failures. The company finding they had more of an undertaking on their hands than they had anticipated, ceased work; but in 1854 the State of Massachusetts came to their aid and voted a loan of \$2,000,000 taking a mortgage on the company's property, but in 1861 the funds gave out, the work thus far having progressed slowly, and in 1862 the State foreclosed its mortgage and appointed commissions to prosecute the work, and made appropriations for the same, but after six years management by commissioners the Legislature refused to make further appropriations, and authorized the Governor to make a contract for the completion of the work. The total amount of work done by the company and State to this time, January 1869, was, east and 5,282 feet, west end 4,055 feet; west shaft sunk to grade 318 feet, and central shaft sunk to a depth of 583 feet. To accomplish this over \$7,000,000 had been expended and less than one-third of the work necessary for the completion of the tunnel had been done.

A contract was made with Shauley & Co., of Montreal, to complete the work for \$4,594,268, and they took hold with energy, and although great obstacles presented themselves, they, with their perseverance, overcome them. They were obliged to put in a pumping system at any expense of \$30,000 to carry off the immense amount of water that flowed in. Hand drilling and the ordinary black powder was found to make slow headway with this giant; but this was the only means used prior to 1866; then drilling machines were put in operation, but they were more or less complicated, costly and proved failures. A short time afterwards the Burleigh Rock Drill Co., of Fitchburg, Mass., was organized. This company had perfected a machine which was less expensive, much lighter, easily repaired and far more effective than anything yet placed on the market. Eight of these drilling machines were kept at work constantly. With one of these machines a hole could be put down 5 feet deep in one hour. One of these machines was kept at work for a period of 90 days in the west heading, and during the time no repairs were required, and the holes drilled were equivalent to over one mile in length and two inches in diameter.

The rock through the tunnel was principally mica slate, with some veins of quartz—in some places a very hard flinty granite was found. Work was vigorously pushed at each, the west and east end openings, also the shafts, and on the afternoon of November 27, 1873, the final blast between the two headings was made, and long years of toil, untiring perseverance, with extraordinary engineering skill was crowned with success. The number of lives lost during the whole time was one hundred and thirty-six, which, when taken into consideration the

magnitude of the undertaking and the large number of men employed, was comparatively small, as during the construction of the Mount Ceniz Tunnel one thousand lives were lost.

To one not acquainted with the principal and details of engineering it will be difficult for them to understand how a tunnel five miles long could be worked from either end—also from two shafts—so accurately that the holes projected should meet with a deviation of only 9'16 of an inch in an advance into the mountain of 10,000 feet. This is less than 1-16 of an inch to the thousand. This has never been approached on similar works in a point of engineering accuracy. Some special and patented devices, entirely new, were used for this purpose.

The total cost of the tunnel was \$17,000,000, which is much more than a similar work would cost at this day, after years of engineering experience in tunneling, which was in its infancy when this work was begun. Above the tunnel are two summits with a wide valley between; the west summit is 1,718 ft. above the tunnel; the east summit is 1,429 ft. above the tunnel. Here we have a tunnel four and three-fourth miles in length through a solid mass of rock rising 1,718 feet. The reader may obtain a comprehensive idea of the immense amount of work necessary to accomplish this great undertaking, from the fact that over two million tons of rock was excavated and over 500,000 pound of nitro-glycerine used. Total length of tunnel 25,081 feet, or nearly five miles; width, 24 feet; height, 20 feet. There was 7,578 feet of brick arching required. The first train of cars that passed through the tunnel was on February 9, 1875. First through freight train from the West—24 cars—passed through April 3rd, 1875, over the Fitchburg Railroad. The first passenger train from Boston to Troy passed through October 13th, 1875.

The direct line East through the tunnel is the Fitchburg Railroad, known as the Hoosac Tunnel Line, and runs from Boston to North Adams. This road is equipped with steel rails, double track nearly the entire length of its line. The old wooden bridges have been replaced with iron structures and its passenger, drawing-room and sleeping coaches are built in a style of magnificence not excelled by any road in the country. These cars are run through between St. Louis, Chicago and Boston, over the West Shore and Hoosac Tunnel & Western. The traveling public will find the Hoosac Tunnel line well equipped with every convenience money can procure that will aid in the comfort and safety of its patrons. The Troy & Boston Railroad, running from Troy to North Adams, is the only line connecting with the New York Central Railroad in connection with the Hoosac Tunnel line. Niagara Falls is a wonder of nature; the Hoosac Tunnel is a wonder of engineering skill—both must be seen to be appreciated. Travelers wishing to avail themselves of the most picturesque scenery in New England and enjoy a ride through the world-renowned Hoosac Tunnel, will find tickets on sale at all stations reading *via* this line.—*Ex.*

SPLITTING A BANK NOTE.

The remarkable operation of splitting in two the paper on which a bank note was printed was accomplished by a Kentucky counterfeiter. The two sheets made were nearly transparent. He made a plate of copper and brass, a little larger than the bill, and spread one of the sheets on top of it. With a steel tracing pencil of his own manufacture he engraved through the sheet its exact counterpart on the plate. The other half was engraved on a different plate in a similar manner, and then he was ready for printing his spurious money. This method of workmanship looks very simple, but it is the first time it had been done by a counterfeiter, as it is said to be almost impossible to split the bill. However true this reported difficulty may be, it is generally an easy matter to split a sheet of paper. Paste a piece of strong cloth to each side of the paper to be split. When dry, violently pull the two pieces asunder, when part of the sheet will be found to have adhered to the one and part to the other. When the paste is softened in water the paper can be removed from the cloth.

The manufacture of artificial ivory from bones and scraps of sheepskin is a new industry.

Cryolite, a mineral which is of great value in the potash manufacture, has been discovered in the Yellowstone Park. Heretofore it has been obtained only in Greenland.