

Stone 1868



The Hoosac Tunnel.

The Troy and Greenfield Railroad ascends the narrow valley of the Deerfield river to a point some thirty miles above Greenfield. Here it is stopped by the Hoosac Mountain, a continuation of the Green Mountain range, which rises abruptly in its path to a height of 2500 ft., the river valley making a quick turn towards the north. Here also is situated the eastern portal of the tunnel while the western, five miles distant, opens upon the broad valley of the Hoosic, about two and a half miles from the village of North Adams.

The part of the mountain which is to be pierced has two summits with a wide valley between them. The eastern summit, 6,100 ft from the east portal, is 1415 feet above the grade of the road and 2210 feet above tide

water; the western summit, 6,700 feet from the west-portal, is 1704 feet above grade and 2508 feet above tide water. The summits are nearly $2\frac{1}{2}$ miles apart and the valley at its greatest depression is 800 feet above grade.

The mountain consists wholly of talcose slate thickly interspersed with veins and irregular masses of quartz. The dip, according to the report of James Laurie, C. E., at the east side of the mountain, is easterly at an angle of from 60° to 80° ; two miles from the east end it is only 22° or 30° which continues for about half a mile. Beyond this the dip changes to the westward at an angle of 20° to 32° , the anticlinal axis occurring about $2\frac{7}{10}$ miles from the east end. The dip is indicated on the plan by the blue lines.

The hardness appears to be uniform throughout except at the west end,

where for about 2000 feet, the water from two small streams above has infiltrated and decomposed the rock, probably by the forming of Sesquioxide of Iron from the Protoxide, as frequently occurs when rocks containing the latter salt, are exposed to the action of air or water. This rotten rock is ^{is} thoroughly saturated with water that it runs, having the consistency of a semi fluid, as tar, and if its angle of repose, for computation, were taken at 0. it would not be far from the truth. There is also at the west end a layer of limestone through which there will be an open cut, the tunnel not extending quite so far.

Tunnelling was commenced in 1855 and has been prosecuted with more or less interruption up to the present time. It is not intended to give here its past history but rather an account

of the work as now in progress.

The two portals having been previously fixed, the line, as now worked, which varies from the one first decided upon, was run several times over the mountain and continued beyond to the summits of the mountains opposite each portal. At these four points suitable stone houses were built, sheltering the instrument when in use there, and each being provided with an iron pole about 20 feet long, which is attached to the roof in such a manner that it may be moved laterally in order to correct any deviation from the line which might be found. There are also prominent marks at each entrance, that at the east end being a house and pole similar to those on the summits while that at the west end ~~is~~^{is} a bold led into a solid stone pier. The line is intended to be straight and

although there may be some slight variation, yet as it would be very small it would cause no difficulty in the future junction of the several headings.

The points at which the work is carried on ^{are} as follows East End, Central Shaft, West ^{Shaft} and West End. There are also four wells and a small shaft between the West Shaft and West end which have been sunk.

The whole length of the tunnel is to be 25,601 feet or about 5 miles.

The Central Shaft is situated 12,837 feet from the East end and consequently is not in the centre of the tunnel but 73 ft. nearer the ^{West} ~~East~~ End. The West Shaft is 3,017 feet from the west end. The centre lines of all these shafts and wells are in the line of the tunnel.

The grade as at present decided

upon is ^{21 feet to 26} from, feet to the mile; the two portals are nearly the same level, the summit being at the foot of the Central Shaft. The cross section to be when finished 24 feet high by 24 feet wide, sufficient for two tracks.

East End.

The work has here been carried on with greater success than at any other point and up to the first day of January they had penetrated to a distance of 4708 feet. Of this, 0 ft has been enlarged to the full cross section, 2000 feet is of feet by 24 feet section, the heading being of 8 1/2 feet by 24 feet section. With the exception of a slight dripping at the entrance ~~xxxx~~, there has been no water found. It is at this end that the experiment of machine drilling is being made. About one mile above the entrance of the tunnel a costly dam has been

placed across the river and a race constructed along the right bank of the stream down to the workshop which is a substantial stone building standing opposite the entrance. The river furnishes a constant supply of water to 4 turbine wheels, equivalent to 100 horse power in the dried season.

The upper floor of the shop contains the machinery for the repair of the drilling machines, the lower floor the two compressors, each consisting of four single acting cylinders, radiating from one shaft and having one crank pin in common; the plane of the cylinders is horizontal. The air is used at a pressure of about 40 pounds per square inch and its temperature is about 90° as it issues from the compressors where it is prevented from being higher by a stream of cold water forced into each cylinder.

The air is conducted into the tunnel nearly to the heading, in cast iron pipes of 8 inches in diameter. Two tracks of 2½ feet gauge run from the entrance to the heading which being 24 feet in width allows the tracks to be laid near the sides leaving a considerable space between them. The drilling machines are supported on iron carriages, one on each track and are attached to them in such a manner that the drills can be pointed in any direction over the face of the heading. The carriages are fixed firmly in their places by means of screws set against the rock at the top, bottom and sides.

The compressed air is brought from the end of the iron pipe to the heading, to admit of removal when blasting, in large rubber hose which is connected to a pipe on the carriage provided with nozzles and stop-cocks from which smaller rubber pipes run to each machine. These cocks are all

under the control of one man.

Water is also brought into the heading from a brook up the side of the mountain under 150 feet head; this is directed into each hole, when the machines are at work, in a small stream to wash out the dust produced by the drills.

When the holes have ~~been~~ been drilled to a sufficient depth, from 24 to 30 inches, the carriages are run back on the tracks, the rubber hose being coiled as they recede; a heavy wooden gate is swung in front of them, as a protection from the flying fragments of stone; and the holes are then charged and fired.

Immediately after the blast, air is allowed to escape from the pipes to clear the heading of smoke and the men clear the tracks of stone by piling the pieces in the space between the tracks; the carriages are run forward and the machines again set to work after a delay.

of not more than 15 minutes. Afterwards the rock is loaded upon small cars, run out and dumped along the bank of the river.

The greatest advance ever made in one month was 131 feet, 100 feet being about the average. The enlarging is done by hand labor and is comparatively easy work.

Central Shaft.

At the Central Shaft, which is nearly midway between the two portals, work has been stopped by the destructive fire of last October. The shaft soon filled with water and up to the present time the machinery for pumping and hoisting is not in place.

The form of this Shaft is elliptical, the axis being 27 feet in the line of the tunnel and 15 feet at right angles. Upon the top of the rock and through

the surface material has been built a cement wall 30 ft. high also elliptical in form with axes 47 feet and 35 feet.

This serves as a retaining wall for the earth and keeps out the surface water from the shaft.

Up to the time of the accident a depth of 583 feet had been reached, all done by hand labor and during the last few months of its progress, at a rate of nearly 20 feet per month.

When completed the shaft will be 1030 feet deep and will be used as a ventilator to the tunnel, intersecting it at the point where the two grades meet and therefore at the highest point of the line.

West Shaft.

The West Shaft is situated 3017 feet from the West End and 22584 feet from the East End. It is nearly square

in form, about 9 feet by 9 feet and has been sunk ³¹⁸ feet, to grade. There are two cages in the shaft running in guides the whole of the distance and provided with safety clutches to prevent falling to the bottom in case of the breaking of the rope. The ropes are of iron wire, $1\frac{1}{4}$ inches in diameter and are wound in opposite directions on the drum which is connected with the engine by friction wheels.

At the bottom of the shaft headings have been driven by hand labor both east and west. The east heading 1294 feet and the west 611 feet; the latter being stopped by the softness of the rock requiring it to be timbered.

The headings are first driven 6 feet high by 10 feet wide and then increased to 10 feet high. The rock is loaded on small cars, run to the cages, hoisted to the surface and dumped, while at

the same time an empty car is returned below in the other cage.

A great deal of water is found in these headings. The boiler and pumps are placed at the bottom of what is called the "New West Shaft", a small shaft 264 feet west of the West Shaft and sunk to fix more accurately the line. The smoke and waste steam is conducted up to the surface in a wooden chimney.

Although the compressors are all in place yet no trials with the drilling machines have been made. The average monthly rate of advancement in the East Heading is about 30 feet.

Between the New West Shaft and the West End, four artesian wells have been sunk to various depths. These were made in order to ascertain the position of the solid rock above the grade. These are shown in the profile.

First End.

This is the most difficult part of the whole work owing to the water and nature of the rock. After many experiments it was found that by driving one heading 6ft by 6ft in the line of the tunnel and one on each side, just outside the limits of the masonry (which latter ones are afterwards filled up) and heavily timbering these that the material was so far drained in the neighborhood of these headings as to have some little stability and to admit of the middle one being enlarged to the required size.

The form of the masonry used here is shown in the section. It consists of eight courses of brick, the bottom arch of a radius of 26 feet being laid on 3 inch plank placed directly on the mud; the ~~arches~~ sides are also arches of 26 feet radius while the top is an arch of 13 feet radius. The centres are placed every 4 feet. Outside the brick work is about 3 feet

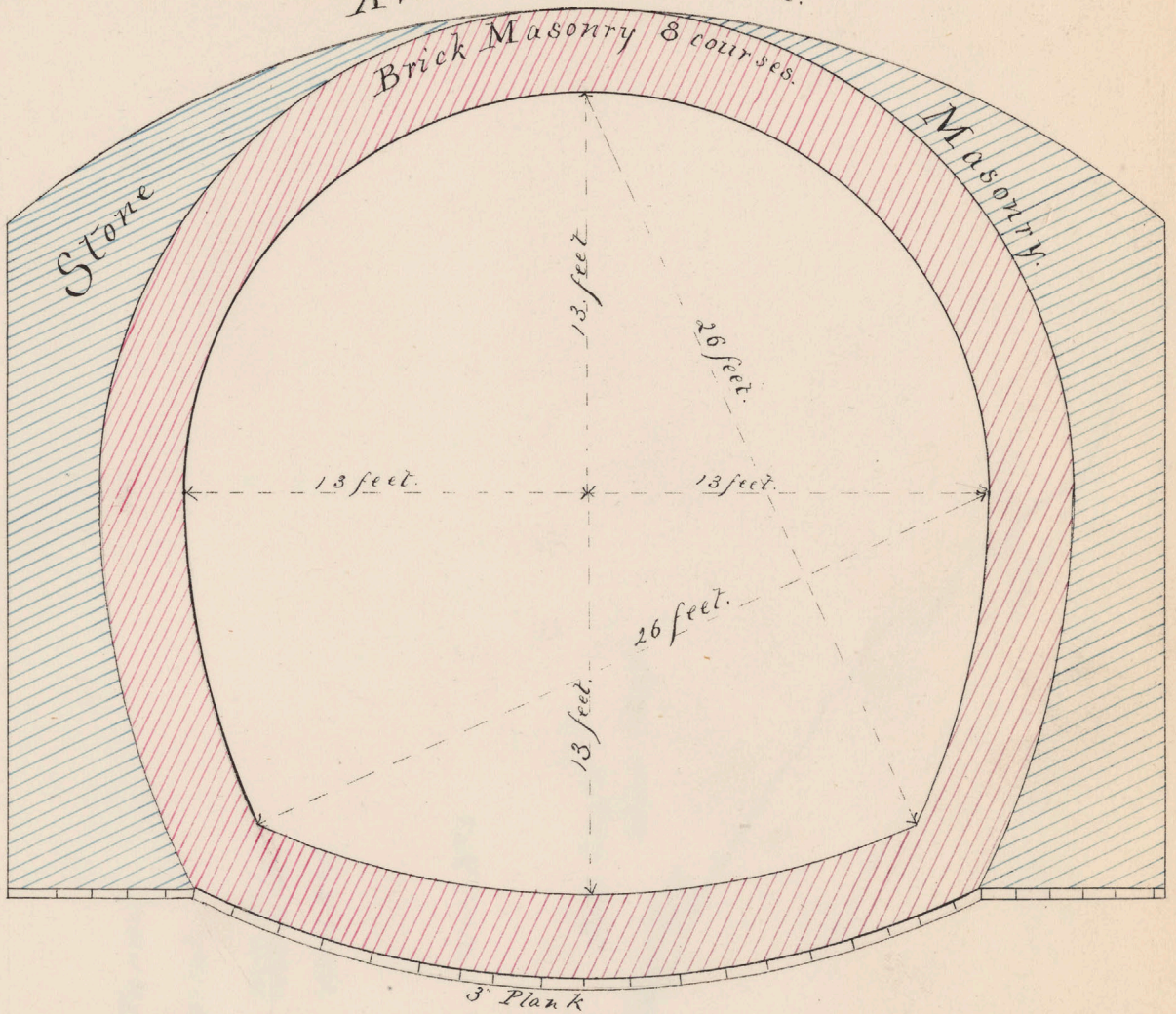
of stone masonry placed as represented in the drawing. The timbering which is not removed, is so placed as not to encroach at all on the above masonry and all spaces between it and the stone work must be filled with masonry.

Keeping holes are occasionally made along the sides near the bottom and there is already a small river running through the finished portion of the tunnel. This work is now completed for 600 feet and there will be about 1000 feet more to be lined. The bricks are all made upon the ground, the cement is brought from New York.

Annexed is a section of the masonry and a profile of the mountain, showing the position of the various shafts and headings and the progress of the tunnel up to January 1, 1868.

Joseph Stone.

Arch at West End.



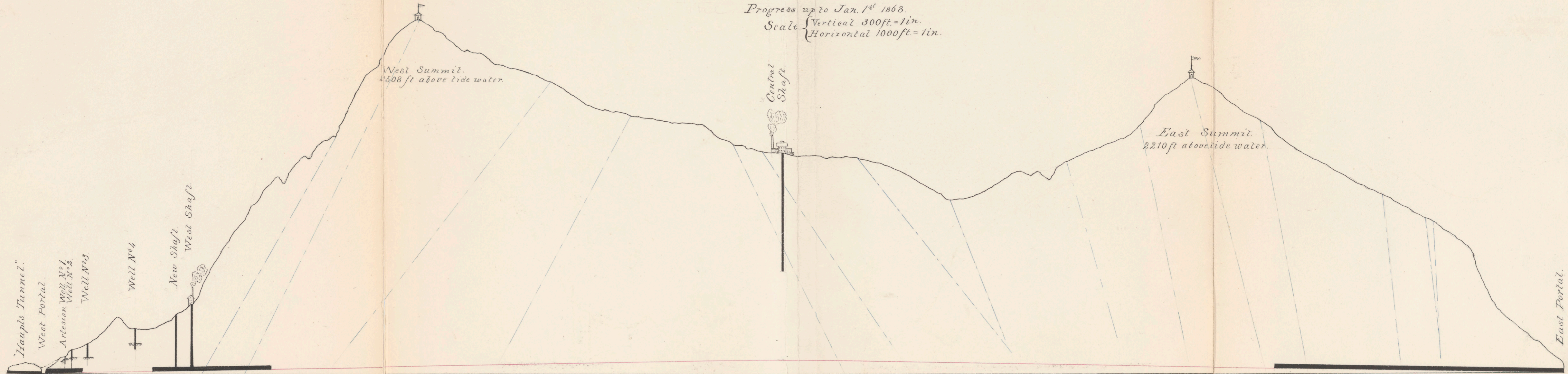
Scale 6ft. = 1 in.

PROFILE OF HOOSAC MOUNTAIN

showing

Progress up to Jan. 1st 1868.

Scale { Vertical 300ft. = 1in.
Horizontal 1000ft. = 1in.



"Haupt's Tunnel."

West Portal.

Artesian Well No. 1.

Well No. 2.

Well No. 4.

New Shaft.

West Shaft.

West Summit.
2508 ft above tide water.

Central Shaft.

East Summit.
2210 ft above tide water.

East Portal.

264

2152

1848