crease or diminish the pressure on the men passing through the air locks. A gang of men, or a car, would be admitted to the air chamber, the iron door closed, the air valve opened into the chamber, and the pressure regulated to that of the section inside or outside. Then the other doors could be opened without difficulty. Unless great care was used the men were attacked with the "benders," the symptoms being bleeding at the nose, mouth, and ears, and knees wabbling. Two ventilating tubes, each twenty inches in diameter, supplied pure air to the tunnel.

The tunnel walls are dry, and look like a ship's ribs. Pipes and wires are swung overhead. Safety platforms and ladders have been erected for the tunnel workmen and inspectors. Long lines of incandescent electric lights glimmer as far as can be seen. Brick and concrete walls were built in the lower third of the tunnel to prevent the brine from meat cars leaking on them and rusting. The brick work was plastered over. Nearly a million of steel bolts were tightened up and creosoted pine timbers were laid in the bottom of the tunnel. Beneath them are the three spaces for drainage, while above them is the railway track of standard gauge—4 feet 8½ inches. Extra heavy steel rails, 100 pounds to the yard, are used. The tunnel will drain itself into a pump shaft on the Canadian side. This shaft is 112 feet deep, 15 feet in diameter, and down to the rock. The water does not flow more than fifteen gallons per minute in the entire 6,000 feet of the tunnel. Rain and surface water is caught at the portals and pumped out.

The tunnel approaches have the same general appearance of solidity as the tunnel itself. On each side of the great cuttings are high and deep stone retaining walls. Each portal is 36 feet high and 148 feet wide, about 10 feet thick over the entrance of the tunnel, and about half that width at each end. Like the retaining walls the portals are made of rough, heavy limestone blocks. Over the entrance of each portal is inscribed "St. Clair, 1890." The diameter of the circle is 20 feet, and flush with the tunnel.

The average number of men employed was 700. In the tunnel eight hours made a day's work. The tunnel was estimated to cost $3,500,000, including plants, materials, and labor, and it required about that sum. It is likely that a second tunnel will be built near this. The present plants and experience will then be of additional value. The second tunnel will be of cast iron, as it is superior to brick and cement for similar tunnels.

DIMENSIONS, ETC., OF THE TUNNEL.

The St. Clair tunnel is 6,000 feet long. To the river's edge on the American side it is 1,716 feet ; on the Canadian, 1,994 feet ; under the river, 2,290 feet. The outside diameter of the tunnel is 21 feet, the inside 19 feet 10 inches. The tunnel nearest the river is 8.43 feet from the river. At its lowest point the top of the tunnel is 56.83 feet below the level of the river. From each portal to the river the grade is 1 foot down for every 50 feet ; under the river, 1 foot down in every 1,000 feet toward the Canadian side to that drainage shaft. Over 2,000,000 cubic feet of soil were taken from the tunnel itself. The cast iron lining of the tunnel weighed 54,000,000 pounds. To fasten this lining 828,150 steel bolts seven-eighths of an inch in diameter were used. The Canadian open cutting is 3,193 feet long ; the American, 2,532 feet long. The total length of the tunnel and its approaches is 11,725 feet.

The best kind of locomotive for this tunnel's use was discussed for some time. Coke engines were finally adopted. Three were built at the Grand Trunk shops of the "consolidated" pattern. Each engine can draw twenty-five loaded cars. One engine will be reserved for any possible accident, and one engine will be used on each side of the river. The car ferries will be discontinued.

In Port Huron August 20th, 1890, was recorded one of the largest mortgages ever given in Michigan. It was for $2,500,000. The St. Clair Tunnel Company gave it to secure bonds running fifty years and bearing 5 per cent annual interest, covering all the present property of the company. Rent and tolls can be collected for allowing other railways than the Grand Trunk system to use the tunnel.

Joseph Hobson, chief engineer of the company and builder of the tunnel, was born in Canada. From 1870 he was for three years the resident engineer of the International bridge at Buffalo over the Niagara River. Since 1875 he has been a chief engineer of the Great Western Railway of Canada and of the Grand Trunk Railway of Canada. In the St. Clair Tunnel works his able assistants have been : First assistant engineer in charge, Thomas E. Hillman ; second assistant engineer, M. S. Blaiklock ; mechanical superintendent, J. T. Eames ; superintendent of excavation, Thomas J. Murphy.

It is believed that the Grand Trunk route, as thus improved, will offer facilities for through communication between Chicago and all points in the East which will be appreciated by passengers and shippers. There will be no more trouble from ice blocks or other obstruction in the river, and the best time will be made for traffic of all kinds.—*American Engineer.*

TRAINED AND EXPERIENCED ENGINEERS.

Every now and then some young man seeking a vocation in life asks us whether or not we would recommend a thorough training at a technical school as a necessary preliminary to entering some one of the many branches of engineering, says *Engineering News*, which goes on to say :

Many ingenious arguments are advanced in favor of combining study with practice in the field or work shop, and many names famous in the annals of engineering are quoted as belonging to men who have literally risen from the ranks, men like the elder Stephenson, Telford and Smeaton and the bulk of American civil engineers connected with the infancy of engineering in the United States. It is argued that study combined with experience is more efficient, and that facts gathered in practice teach more than dull books conned in a school-room.

In answer to the query above, we most emphatically recommend the most thorough scientific and general education at the best technical school available as an absolutely necessay preliminary step to successful practice in any branch of engineering. The time has passed for self-teaching and Stephensons, Telfords and Smeatons are rare in this day. Some young men, by reason of natural qualifications, untiring labor and personal chance or opportunity, may succeed in spite of the lacking early technical training. But these same men would have advanced more rapidly and risen higher had they had the opportunities referred to. The modern science of engineering is too broad, its detail too intricate and its progress too rapid for the untrained mind to keep pace with it ; and education in those who adopt engineering as a profession is so general and the schools are so well equipped in teachers and apparatus, that even a phenomenally bright young man who starts out without these advantages will find himself sorely handicapped in the race for preferment. He may succeed, and some do succeed, but it is uphill work and a waste of useful energy.