THE RAILROAD ON MT. PILATUS.

If the Rigi railroad is worthy of being considered an extraordinary and wonderful piece of work, the latest undertaking of this kind—the building of the railroad on Mt. Pilatus—certainly ought to attract the attention of engineers and of the traveling public. This new road differs essentially from its older rivals in the construction of its roadbed, as well as of the rolling stock. The ruggedness and steepness of the mountain, together with its great height (6,882 feet, against 5,905 in the case of Rigi), offered much greater obstacles than the roads previously built, and required an entirely different system.

The restless spirit of man is always glad to set for itself some new task, and consequently men were found who, equipped with the necessary capital, were willing and able to carry out this tremendous undertaking. When a portion of the road had been completed, all fear in regard to strength and safety were removed, for it was thoroughly tested every day, the locomotives going as often as was necessary to that part of the road on which they were at work, carrying materials of all kinds, weighing from 20,000 to 22,000 pounds.

The southeastern side of the mountain was chosen for the road, which begins at Alpnach-Stad, between the Hotel Pilatus and the Eagle Hotel (1,448 feet above the level of the sea). From there it climbs in a northerly direction to the Aemsigenalp, then westward to the Mattalp (5,315 feet above the sea), and after much winding reaches the plateau of the Hotel Bellevue on Mt. Pilatus (6,811 feet above the sea).

The road is about 2¾ miles long, and the total height climbed from the shore of Alpnacht Bay to the Hotel Bellevue is 5,360 feet. The grade is from 18 to 48 per cent, which is scarcely exceeded by any rope road. In the middle of the line, at Alp Aemsigen, there is a switch. Seven thousand two hundred and sixty-seven feet of the entire road consists of straight stretches, curves, with radii of from 262 feet to 328 feet, constituting the remainder. The road includes a viaduct, three short tunnels and one long one. The width of the track is 2 feet 7 inches. The foundation consists of a wall covered with plates of granite and loose material, and on this the superstructure is firmly anchored.

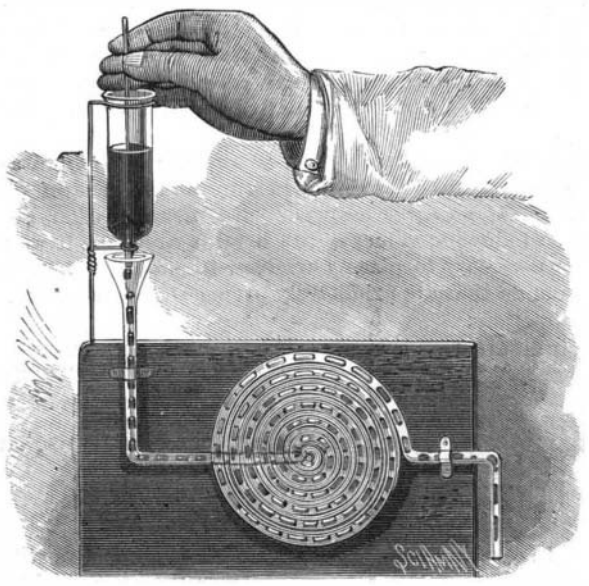
The toothed bar—which is placed midway between the rails and is somewhat higher than the latter—consists of soft steel, and is provided with a double row of vertical teeth, which are milled out of the bar. The cogged wheels on the cars, which engage the toothed bar, are arranged in pairs at the right and left of the same. The axles of these cog wheels are not horizontal with the level of the road, as in the Rigi system, but perpendicular to the same, this arrangement making it impossible for the cog wheels to become displaced.

The locomotive and cars form a train with two running axles and four cog wheels engaging the toothed bar. The boiler and engine are behind or below the cars, which latter accommodate thirty-two passengers. Brakes can be applied to all of the cog wheels, and besides this there are two clamps at the upper running axle which clutch the head of the rail, thus preventing the upsetting of the cars by the wind. The weight of the loaded cars is about 21,000 pounds, and one trip up or down can be made in about 80 minutes.

The idea of the Pilatus road originated with Edward Locher, of the firm of Locher & Co., in Zurich, under whose supervision and control the road has been built. The engine was invented by mechanical engineer Haas, and engineer Hensler, who has had much experience in the construction of railroads, undertook to act as the representative of Messrs. Locher.—*Illustrirte Zeitung.*

NOVEL LANTERN SLIDE.

The engraving shows an inexpensive and very simple and effective device for exhibiting the action of the circulating fountain upon a screen. It consists of a glass tube of small diameter bent into the form of a volute, with the inner end of the tube extended laterally, and



CIRCULATING FOUNTAIN FOR PROJECTION.

then bent vertically and provided with a funnel at the upper extremity. The tube at the outer end of the spiral is bent outward radially, then downward at right angles. The tube thus bent is mounted on a board having a circular aperture a little larger than the spiral, so that the entire spiral may be strongly illuminated while the ends of the tube leading to and from the spiral are concealed by the board.

Above the funnel is supported a reservoir with a fine ajutage, the reservoir being provided with a pointed wooden rod which extends down into tube at the lower end and forms a valve for regulating the flow of liquid.

The liquid employed is water to which has been added some coloring matter, such as aniline blue, red, or green. A few drops of aniline red ink answers for this purpose.

The flow of the liquid is started by loosening the valve, so that the water drops regularly into the funnel of the tube below. The drops should fall so as to include air spaces between them. The liquid, as it issues from the downwardly turned end of the spiral, is received in a cup, by which it may be returned to the reservoir to be used again.

When it is desired to accelerate the motion of the liquid in the tube, a short rubber pipe is connected with the downwardly turned end of the glass tube.

The glass tube is about one-sixteenth inch internal diameter, and the spiral is three and one-half inches in diameter.

When the fountain is in operation, the material of the spiral appears to revolve, but each convolution at a different rate of speed, owing to its increasing diameter. When projected with a good lantern and a strong light, it becomes a very interesting object.

G. M. H.

SUSPENSION FOOT BRIDGE.

An instance of the practical work done by amateurs in mechanics is furnished by the suspension bridge which has been erected at Oak Park, Ill., and which we illustrate in the accompanying engraving. The bridge is very light, and is intended solely for the use of foot passengers, and it is suspended from a large double elm tree on one side of the river, while a tower has been erected as a pier on the other bank, which is a rather high bluff. The cables at this end, however, are carried to an oak tree, where they are anchored at the ground.

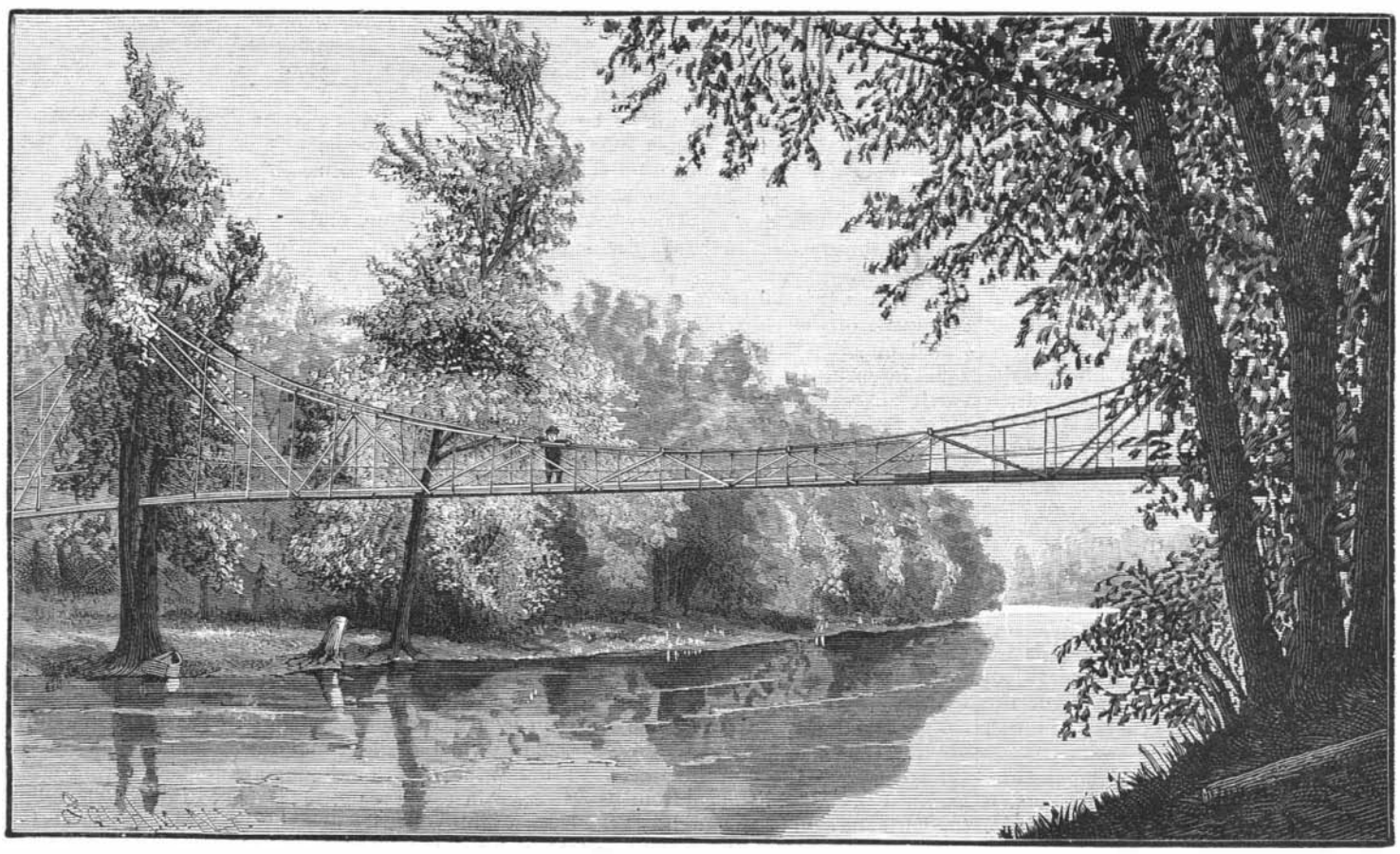
Mr. Leo G. Haase, who sent us the photograph, says in his letter that "the bridge was built by amateur mechanics, with no other knowledge of bridge building than that gained by observation and constant and thorough reading of the SCIENTIFIC AMERICAN. The builders were young men, just in their twenties."

The bridge extends over the river Displaines, with a span of 125 feet in the clear. The distance from the tree pier to the concrete anchorage is 75 feet clear, and the distance on the other bank between the tower and the tree anchor is 50 feet. The total length, therefore, is over 225 feet. It weighs but 2,750 pounds, and has been tested by placing fifteen men thereon. There are four five-eighths inch cables, but only two carry the load, the other two forming an auxiliary support in case of accident to the main cables.

The passenger way is narrow, the floor being about 3 or 4 feet wide, and passing directly between the two trunks of the tree through which the cables are passed. The height of the floor at the tree is about 10 feet. The flooring is built of planks 1 inch by 6 inches, laid 1 inch apart, on account of snow, on longitudinal stringers, 2 inches by 4 inches. These are supported by 1 inch gas pipe, hammered flat at the ends. One-half inch pipes are used at the middle of the bridge. The bottom ends are bolted to the stringers, and upper ends are provided with small wooden blocks clamped by two three-eighths inch bolts, and a space being left in the blocks for the passage of the cables. The bridge was built in the winter time, in order that a scaffolding could be erected on the ice on the river to facilitate the construction. The bridge is considered quite a curiosity, and many thousands cross it every year.

Brown Reins or Saddle Leather.

Unstained leather may be colored a fine chestnut brown by treating it daily for a week or more with a solution of pine and alder barks. The bark is leached with rain water, using, by bulk, ten times as much water as ground bark, returning the water to the leach until all the coloring matter is extracted from the bark. The leather is then laid into the water, and allowed to remain until wet, then hung up to dry. By repeating the process three or four times, a fine color is secured.



A CURIOUS SUSPENSION BRIDGE NEAR CHICAGO, ILL.