ROAD-BUILDING IN THE CAUCASUS.

The military engineers, who during our late war found themselves compelled at times to build roads over all but inaccessible localities in the mountainous regions of Virginia, Tennessee, and the Carolinas, will doubtless admit that, though arduous as their labors may have been, the exercise of no such consummate skill was required as was necessitated in the construction of a substantial way over such precipitous steeps as are represented in our full page illustration. In fact, if we may judge from the delineation presented, the threading of such mountain fastnesses seems impossible save to goats or chamois, and yet history tells us that the work was not only undertaken, but carried against every obstacle to successful completion.

The military path, represented as in course of construction, was projected by the Russians in order to carry their vast army, operating against Schamyl the famous Circassian chief, across the Caucasus Mountains. This range lies in the east of Russia, where the bleak, inhospitable climate added still further difficulties to the many already to be encountered by the engineers; but after a lavish expenditure of skill, money, and human life, the forces of the Czar succeeded in building a solid and enduring road, which, extending over crags and across crevasses, eventually afforded a means of cutting the enemy off from his base of supplies, and so victoriously ending the war.

Our engraving gives an excellent idea of the mountain declivities, into which the path had to be fairly carved or hewn, through the rock of summits elevated far above the plains below.

[From the New York World.]

PROFESSOR TYNDALL'S FIRST LECTURE IN AMERICA.

Professor Tyndall made his debut before an American audience on the evening of October 15th in the hall of the Lowell Institute, on Washington street, Boston. It was packed with people, and his reception was exceedingly warm and hearty. The tickets to the lectures, which will continue for six alternate nights, were given out the previous morning, and twenty minutes sufficed to dispose of them all, although but one ticket was allowed to each person. The lectures are free, and are the gift to the public of this splendid institution, which does in another way something of what the Cooper Institute does for New York. The front seat at these lectures is always for Mr. Lowell's friends, and among those who attended him to-night were Robert C. Winthrop, Josiah Quincy, Professor O. R. Gray, of Harvard College, Dr. A. P. Peabody, Professor John Fiske, Rev. Dr. Neale, and many other distinguished people. Otherwise it was a typical Boston audience. Though so exceedingly plain, the hall is well adapted for the purposes of a popular lecturer.

Professor Tyndall's apparatus was arranged chiefly upon a large table, arranged as three sides of a square, in the center of which he stood while speaking. A long, narrow bridge was built out from the front of the platform over the heads of his audience, and on this was placed the auxiliary instruments with which the professor produced his most brilliant effects, in analyzing a ray of light upon a canvas at the back of the platform. He was as prompt as his audience.

At half-past seven he emerged from the anteroom and began to talk in a rapid, unassuming, polished way of the circumstances of his coming to America.

In person, Professor Tyndall is a gentleman of medium hight and rather slight in build. His features are shrewd and kingly, and his manner betokens the accomplished and genial gentleman. He was clad in a full evening dress, and was followed by his two assistants, who were kept busy throughout the evening in preparing for his experiments. With that happy faculty of speech which is his most charming trait, the Professor settled down immediately into the good opinion of his hearers, who cheered him so warmly that he intimated at once that he felt quite at home.

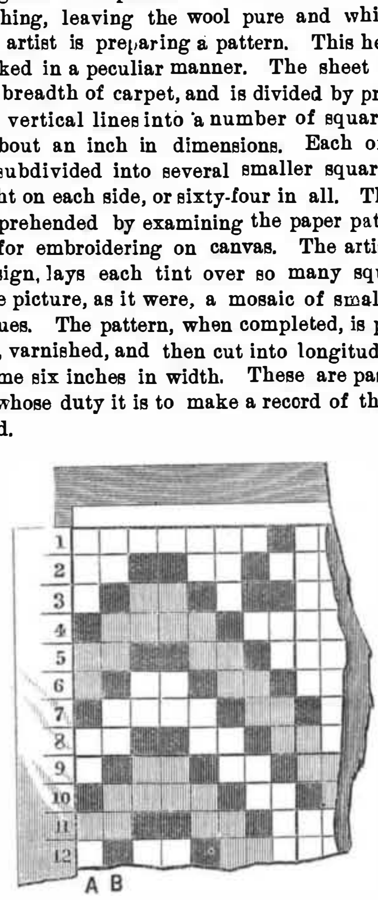
He told how, many years ago, he was besought by Mr. Lowell to come to America, and how last year the summons came with such a force from many distinguished men that he could not longer resist it. So here he was before a Boston audience. He spoke of his indebtedness to Mr. E. L. Youmans and Professor Henry; and, when the ice was fairly broken, he set his assistants to work, and, while they were preparing the batteries and wires and electrical lamps and prisms, he gave a little discourse on the pursuit of science for the truth's sake, vindicating the investigator and claiming for his apparently aimless labors an importance equally as great as the practical work of the worldly without the scientific experimentalism of 300 years ago. He showed there could be no industrial England or industrial America to-day without such labors. Next he spoke of the importance of the work of the scientific demonstrator, and then turned to his instruments. His lectures, he said, were to be confined to the exposition of the laws of heat and light.

By the aid of a platinum wire and battery, he explained the electrical light which he uses in all his experiments. Bidding the gas glare begone, he caused a platinum wire, stretched across the table in front of him and no thicker than a horse hair, to glow with an intense brightness and then melt by electricity, which sufficed to demonstrate the principles of electrical action. Then substituting his lamp for the circle of gas jets of the hall, he proceeded by a series of rapid and beautiful experiments to analyze a ray of light. Through a tiny aperture in a bit of tinfoil, he took the single ray and showed the process of combustion and the laws of refraction. Then with a prism he resolved the ray into its component fragments, and afterwards gave the synthesis of light, by those wonderfully brilliant and marvellously simple methods which have given him a world-wide reputation as the greatest living popular scientific demonstrator. His fascinated audience cheered him to the echo, and went away to hunt up new adjectives with which to praise him.

HOW PATTERNS IN CARPETS ARE MADE.

The following description, gleaned from notes made of an interesting visit to one of the largest carpet manufactories, that of the New Brunswick Carpet Company, in the vicinity of New York, is of course not applicable to all the different varieties of floor coverings found in our large warehouses. For the kinds known as tapestry Brussels, it is, however, in the main correct, while it will give a general idea of the ingenious processes in an industry which, in this country, is rapidly assuming extended proportions.

In carpet manufacture, two principal materials are employed: carpet worsted for the warp and a coarse cotton packthread for the woof. The latter, previous to being used in the loom, is starched by being conducted from its spools down into a starch trough, after its exit from which the superfluous mixture is removed by pressure of rollers, and the fibers laid by revolving brushes, after which the thread is allowed to dry. This portion of the fabric, however, plays no part in the formation of the pattern, so that our attention must be directed to the worsted and the different manipulations through which it passes. First in order is scouring and then bleaching, leaving the wool pure and white. Meanwhile, the artist is preparing a pattern. This he draws on paper, marked in a peculiar manner. The sheet is just the width of a breadth of carpet, and is divided by printed horizontal and vertical lines into a number of squares, each of which is about an inch in dimensions. Each of these divisions is subdivided into several smaller squares; for example, eight on each side, or sixty-four in all. This may be better comprehended by examining the paper patterns used as models for embroidering on canvas. The artist, in coloring his design, lays each tint over so many squares, thus making the picture, as it were, a mosaic of small blokcs of different hues. The pattern, when completed, is pasted on a thin board, varnished, and then cut into longitudinal strips, each of some six inches in width. These are passed to the workman whose duty it is to make a record of the colors on each thread.



A B

This operation is somewhat complex, so that, to make it clear, we must refer to the accompanying small engraving. A section of the pattern divided into squares, as above described, is represented. The first perpendicular line of small subdivisions, marked A, represents one thread of warp B, another and so on. Beside this first thread is placed a paper gage, as shown, numbered perpendicularly and divided off to correspond with the small squares. The workman now notes down the different tints on thread A, corresponding to the subdivisions of the gage. Thus, in our engraving, 1, 2, and 3 are white, 4 is black, 5 and 6, for example, red, 7 black, and so on in regular order throughout the whole length of the pattern. Then the gage is applied to thread B, a similar memorandum made, and this is repeated throughout the whole design. Consequently, when this work is completed, there are as many memoranda as threads of warp; as there are eight threads to a square, and, for instance, 27 squares is the breadth of the carpet, there will have to be made no less than 216 different records.

During the above operation, the worsted is being wound about a number of large wooden cylinders, each of which is some six feet in width and of a circumference equal in length to three times that of the design. Why this is the proportion we will shortly explain. The wool is laid on smoothly in a single layer over the whole periphery, but is divided into a number of skeins, each of which may be separately removed. All of the worsted on a single cylinder is dyed according to the memorandum of one thread; so that there are 216 windings of worsted, and consequently that number of repetitions of the dyeing process.

The pattern, as drawn by the artist, represents the finished carpet; therefore, in dyeing threads, allowance must be made for the extra amount doubled up, so to speak, in the finished fabric. In other words, space corresponding to one small square, as indicated by the paper gage, must be considered and allowed as three times the size, in the unwoven warp, and consequently on the cylinder. Around the edge of the latter is attached a series of teeth all numbered exactly similar to the gage. On the principle above stated, the distance between any two of these teeth is made three times that between any two numbers on the gage. These teeth engage in a ratchet which, worked by the operative, holds the cylinder at rest at any desired point. Under the cylinder is a track, on which is a carriage actuated by a belt moved by steam power. In the carriage is a pot of dye in which rotates a wheel which has a circumference of rubber or other suitable material. The wheel dipping in the dye also rubs against the worsted on the cylinder above it. The width of the edge of the wheel is exactly equal to the distance between two of the teeth on the edge of the cylinder.

In beginning the operation, the workman turns the cylinder until the tooth marked 1 is directly in line with the dye wheel—this is indicated by suitable means—so that the latter will, if set in motion, draw a line lengthwise the cylinder from that point. Let us suppose that the dye is red and the first thread, A, to be the one under operation. Referring to the engraving, we find that the first three divisions are white; they need no dye, so the cylinder is turned until the first red point (No. 5) is reached. Now the machinery underneath is started. The carriage runs along the track and the wheel leaves a red line across the worsted. The next space is also red; the workman rotates the cylinder ahead one tooth, and again sets the wheel in motion; the red line is now twice as wide as before. Then he goes on to the next red space, and so on until all are marked. A pot of black dye is substituted; the cylinder is turned back to tooth No. 1, thence on to No. 4—the first black space according to our memorandum; and thus the work continues until all the colors are printed. The skeins of worsted, between which and the surface of the cylinder is a sheet of oil cloth, are easily slipped off. They are then placed in a steam bath. Chemical decomposition ensues, the base or mordant is precipitated in the cells of the wool and becomes the chemical reagent for absorbing or reflecting the different quantities of rays of light according to the base and dye used; so that, when the worsted, emerges it is ready to be rewashed and, thus cleansed from the glutinous matter, employed to hold the base and dye in place during the printing and steaming processes.

The above operations are repeated, differing of course for every thread. Finally, when all is completed, the skeins are placed on an apparatus which winds the worsted on spools. This requires great care, because an exact point on every thread must be determined, which must correspond in all, so that when they are laid side by side the pattern will be plainly formed. This point is marked while the worsted is on the cylinders, in a manner which renders it easily detected.

Each thread is wound on a separate spool, which is numbered, that holding the thread furthest on the left of the pattern being No. 1, on the right No. 216; the others are intermediate. All the spools are placed upon spindles in regular order on a large movable table. The end of each thread in proper order is led through an orifice in a metal reed and fastened on a large beam. As the threads are side by side, the pattern is corrected by girls who, with the design before them and further assisted by the threads passing over a setting board corespondingly divided off into squares, readily place them in proper relative position. As fast as a certain length of pattern is arranged, it is wound on the beam, and this continues until all the threads are expended. The beam then is placed in the loom, where the worsted is arranged as the warp. The shuttles, carrying the woof of cotton and the filling, generally of jute, are in readiness, the almost magical machine is started, and, lastly, we see the material, that we have traced through its many processes, emerge in the shape of finished carpet.

THE MANCHESTER SCIENTIFIC AND MECHANICAL SOCIETY.

At the last meeting of the above society, held in Manchester, England, the subject discussed was the "steam jacket." The question at issue was whether the unavoidable liquefaction of steam, due to condensation from radiation, conduction and convection, as well as to work done, was to be allowed to take place in the cylinder itself, or whether it was more advantageous to employ a separate casing to supply heat to the steam inside the cylinder, and let the condensation take place in the casing, so that the propelling steam might be uninfluenced by loss of heat from convection.

During the argument, a speaker advocated the jacket because it was a safeguard against breakage, resulting so often from accumulated condensed water in the cylinder. This view was, however, strongly opposed. The result of the discussion was the general opinion of the members that no advantage could be gained from the steam jacket, nor did they object to its use, but they were convinced that efficient protection against radiation and conduction of heat from the cylinder was the best and only meaus to attain true economy.

The Good Butter of Philadelphia.

Many have been the attempts to account for the superior reputation of Philadelphia butter. Perhaps the most popular notion was that it was due to the prevalence in our pastures and hay-fields of the "sweet vernal grass," which often gives so peculiar a fragrance to meadow hay. But it needed very little reasoning to demolish such a theory as this. This grass is one of the poorest for hay or pasture purposes, and scarcely exists except on cold clay lands, in partially shady places near groves or low woods. We owe much more of the sweetness of our butter, suggests the *Germantown Telegraph*, to the abundance of springs and spring houses in our State, than to anything peculiar which grows in our pastures. Milk has a particular affinity for any odors in the atmosphere, and water has some; hence whatever impurities may get into the atmosphere of the spring-house are drawn out by running water, and the very best security is provided against their being absorbed by the cream.

SINCE the completion of the Mont Cenis tunnel, the quantity of wine imported into France from Italy, by that route has greatly increased.