Correspondence.

A Letter from the Garden of Eden.

To the Editor of the Scientific American:

Referring to the paragraph on the Seychelles Islands, printed in your monthly edition for May, I beg to correct the statement that there is a grove of palms here which grow in pairs, and which, if one is cut down, the other dies also. This is an error. A quintuple headed cocoanut tree, which has been sketched by that indefatigable *peintre et voyageuse* Miss Marianne North, is the nearest approach to the Siamese twin palms which the Seychelles can boast.

As regards the other assertion, viz., that General Charles G. Gordon had discovered here the site of the original Garden of Eden, I can affirm that I have heard from that brave and devoted soldier's own lips his theory and argument that the Garden was located at or near Seychelles, that the bread fruit represented the tree of life, and the coco-de-mer, which grows in no other part of the known world, was the undoubted tree of good and evil.

EVELYN P. MUSSEY.

United States Consulate, Port Victoria, Mabe,
Seychelles Islands, September 6, 1884.

[The Seychelles Islands, from which our correspondent writes, consist of a group of small islands in the Indian Ocean, situated 300 miles south of the equator and about 1,200 miles easterly from Zanzibar, east coast of Africa. Mahe, the principal of the islands, is from 3 to 5 miles wide and 16 miles long, very luxuriant in vegetation, tropical but delightful climate. Port Victoria, from which our correspondent writes, has a population of about eight thousand. It is a calling place for whaling vessels.—EDS.]

Underground Telephone Wires.—A Correction.

To the Editor of the Scientific American:

In the fifth paper upon "The International Electrical Exposition," published in your issue of October 11, 1884, certain statements are made which are at variance with the facts of the case. I am so accustomed to expect correctness in the columns of the SCIENTIFIC AMERICAN, that I am constrained to believe that your correspondent is for once not writing from his own knowledge, but has received a garbled report from interested parties, and I have therefore no hesitation in requesting the publication of this letter. The statements referred to are on page 332, and relate to a paper read by myself which was criticised by Mr. W. H. Preece.

The statement is made by your correspondent "that Prof. Preece believes that wires may be efficiently and economically buried.

That at a recent meeting of the telephone managers a paper was read by an employe of the American Bell Telephone Co., whose duty it is to keep the lines in running order.

That the object of the paper was to show that telephone lines could not be efficiently operated underground."

That at the conclusion of the reading Prof. Preece took the writer severely to task for the incorrectness of his conclusions, remarking that "if that was the result of his investigations, he must sadly have neglected his business."

And that results with underground telephone wires are more than encouraging, etc."

In the first place, Mr. Preece lays no claim to a professorship—he is chief engineer of the British telegraphs, and a Fellow of the Royal Society.

Second. The paper was not read at any meeting of the telephone managers, but at the afternoon session of the fourth day of the National Conference of Electricians.

Third. The duty of the employe of the American Bell Telephone Co. who read the paper (myself) is not to keep the lines in order.

Fourth. Not being actively engaged in the business of telephonic communication, the A. B. T. Co. has no lines.

Fifth. The object of the paper was not "to show that telephone lines at least could not be efficiently operated underground." The subject then under consideration by the conference was:

"Induction in telephone lines, long line telephony, and underground wires," and the paper related to the subject as a whole, was prepared by request of the U. S. Electrical Commission, and only incidentally touched on underground telephony.

Sixth. Prof. (?) Preece did not take the writer severely to task for the incorrectness of his conclusions, although he freely criticised his premises.

Seventh. Although Mr. Preece did make the remark cited, it was by no means with reference to underground wires, but merely referred to the omission from the paper of several methods for preventing induction which had gone into use in England.

Eighth. The inference that Mr. Preece held the opinion that telephones could be operated for considerable distances underground is not warranted by the facts. The paper stated that telephone wires could not be successfully and commercially operated underground for a greater distance than twelve miles, and Mr. Preece fully concurred in that statement both at the Montreal meeting and at the Philadelphia conference; while the remark that "even telegraph wires are constructed underground at four times the expense of overhead wires, while they are but one-fourth as efficient," was made by himself not over a year since in a lecture before the Society of Arts in England.

Ninth. It is not true that the results so far obtained with underground telephone wires have so far been encouraging. On the contrary, they have been discouraging.

The articulation invariably becomes sluggish when the underground conductor exceeds two miles in length, and this effect is greatly accentuated when an overhead line of several miles in length is connected with the underground line. Increasing the sectional area of the conductor aids materially in overcoming the sluggishness.

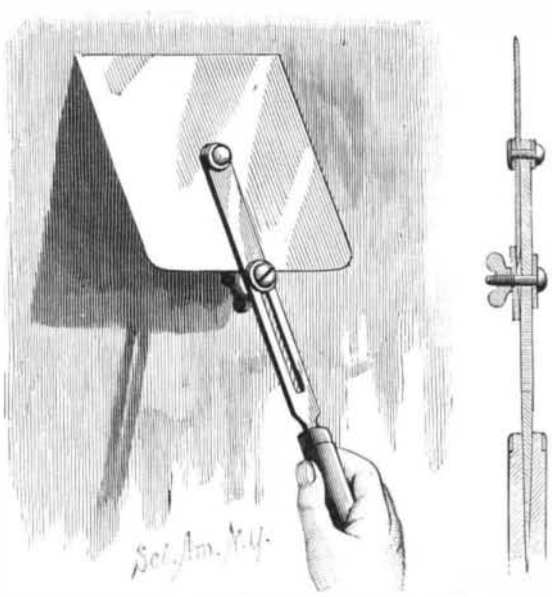
It is not necessary here, however, to enter into the question of the relative efficiency and economy of underground and overhead lines, as my only object in forwarding this communication is to give a correct statement of facts, which can readily, if necessary, be attested from the records of the conference.

THOS. D. LOCKWOOD.

Boston, October 11, 1884.

REVERSIBLE WALL SCRAPER

The end of the shank is pivoted to the center of the steel blade of the scraper. One edge of the blade may be firmly



COLEMAN'S REVERSIBLE WALL SCRAPER.

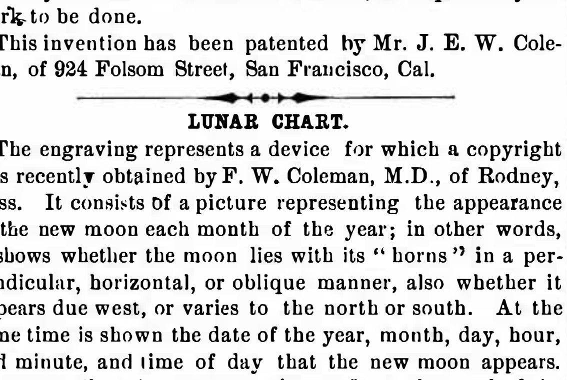
clamped to the shank by means of a thumbscrew that passes through a slot in the shank, as indicated in the sectional view, the nut bearing directly against the blade or against a plate interposed between the blade and nut. The blade is made about square in shape, with two corners rounded, with two opposite edges sharpened, and with the other edges finished square across the thickness of the blade. The sharp edges are specially intended to be used in removing accumulations of paper or calcimine from sound walls in preparing the surfaces to receive new work, and the square edges for like work upon unsound walls which might be further injured by the sharp edges of the blade. By loosening the nut the bolt may be moved along the slot to permit the blade to swing around. The handle may be of any suitable length, and may be made in extensible sections, as required by the work to be done.

This invention has been patented by Mr. J. E. W. Coleman, of 924 Folsom Street, San Francisco, Cal.

LUNAR CHART.

The engraving represents a device for which a copyright was recently obtained by F. W. Coleman, M.D., of Rodney, Miss. It consists of a picture representing the appearance of the new moon each month of the year; in other words, it shows whether the moon lies with its "horns" in a perpendicular, horizontal, or oblique manner, also whether it appears due west, or varies to the north or south. At the same time is shown the date of the year, month, day, hour, and minute, and time of day that the new moon appears. Of course, there is a separate picture for each month of the year and for each year.

A represents the new moon, B the arc of a great circle



COLEMAN'S LUNAR CHART.

with points upon which the degrees are marked, C is a base line whose ends are marked with the points of the compass —north and south. Within the arc is the date of the year, month, day, and time at which the new moon appears.

Such a series of pictures will be appreciated by that large class of people who firmly believe that the position of the horns of the moon indicates whether the weather during the ensuing month will be wet or dry.

Dr. Raymond on the Divining Rod.

An interesting feature of the Philadelphia Electrical Exhibition was a lecture given by Professor Rossiter W. Raymond, before a large audience of attentive hearers. The following extracts are from the *Progressive Age:* After an introductory allusion to the prevalence, even at the present day and in this country, of a belief in the divining rod as a means of discovering springs, mineral veins, hidden treasures, and oil deposits, the lecturer described its various forms, the commonest of which resembles a letter Y, and consists of a forked brance of witch-hazel having this form. The ordinary forked rod is held in the two hands, each grasping the extremity of a prong, with the fingers closed, and the palms upward, the shank or stem being horizontal, or vertical, or variously inclined, according to the preference of the operator. Carried in this manner over the surface, the rod is said to turn or dip over or near treasure, veins, springs, etc., and even to give more complicated information by means of its movements, which have been at different times elaborately codified.

The lecturer proceeded to trace the mythical origin of the divining rod and its use in ancient times—principally, if not wholly, for moral purposes, that is, for the discovery of guilty or the decision of important questions or the indication of future events. Its physical application for the discovery of hidden springs, metals, etc., seems to have been a later origin, and to have become general throughout Europe in the sixteenth century. During this period its action was either attributed to a mysterious natural affinity between the material of the rod and the material affecting it, or else to the agency of evil spirits, or to a divine gift bestowed on the operator.

In the seventeenth century numerous treatises were written, both as to the facts and as to the theory of the rod—the latter being referred, in accordance with the dominant Cartesian philosophy, to "corpuscular effluvia." According to the school, there were "corpuscles" of springs, minerals, thieves, assassins, lost landmarks, etc.—each kind exerting a different influence upon the sensitive expert, and possessed of extraordinary levity and permanence, so that they could be traced, suspended in the air, after the lapse of days or years. Many years later an electrical theory was popular. It, however, was thoroughly refuted in 1782, in the case of Blaton, by the simple expedient of making and destroying the insulation of the operator without his knowledge, and thus proving that such knowledge was an essential part of the so-called electrical action.

The lecturer adopted, with some modification, the theory of Chevreul, suggesting that, in the case of springs (and of mineral veins which are the conduits of springs), there are differences of temperature, heat conductivity, etc., which might affect sensitive persons so that the unconscious volition and minute muscular movements of Chevreul might be thus occasioned. In the main, however, he regarded the present theory and practice of divining with the rod as the small, lingering remnant of a once powerful superstition, and entitled to the same respect as "planchette"—the object of curiosity, or of study from the standpoint of psychology, but not worthy of the attention of geologists or prospectors.

A Destroyer in the Spruce Forests of Maine.

According to accounts of observations published in the third *Bulletin* of the Entomological Division of the Department of Agriculture, the ravages of the spruce bud worm (*Tortrix fumiferana*) have been extensive and destructive in the coast forests of Maine west of the Penobscot River. The damage appears to have reached only a few miles inland from the coast, but the belt in which it has prevailed is marked by extensive masses of dead woods. The trees are attacked in the terminal buds, which are eaten away, and when that is done, the case is hopeless. The fatal character of the attack is owing to the fact that the spruce puts forth but few buds, and those mostly at the end of the twigs, and, when these are destroyed, it has nothing on which to sustain the season's life. The attack is made in June, when the growth is most lively, and just at the time when the check upon it can produce the most serious results. The larches are also attacked by a saw fly, but with results that are not as necessarily fatal as in the case of the spruce. They are more liberally provided with buds, some of which may escape and afford a living provision of foliage. The larch, moreover, sheds its leaves in the fall, and is in full foliage before its enemies attack it. Hence, while the spruce and fir succumb to the first season's assaults, the larch can endure two years of them.—*Science Monthly.*

Artificial Sea Air.

Many, indeed, are the luxuries that the magician's wand of invention now brings into the midst of our homes. As an instance, to produce a sea atmosphere for the sick room, a foreign contemporary suggests the use of a solution of peroxide of hydrogen (10 volumes strength) containing 1 per cent of ozonic ether, iodine to saturation, and 2·50 per cent of sea salt. The solution placed in a steam or hand spray diffuser can be distributed in the finest spray in the sick room at the rate of 2 fluid ounces in a quarter of an hour. It communicates a pleasant sea odor, and is probably the best purifier of the air of the sick room ever used. It is a powerful disinfectant, the same author writes, as well as deodorizer, acting briskly on ozonized test solutions and papers. It might be well to test the subject in some ward of one of our hospitals.

The Opening of the Arlberg Tunnel and Railway.

In view of the recent opening of the Arlberg Railway for its entire length, a brief history of the origin of the railway will be read with interest. Although the building of the line itself has by no means been an easy task, the construction of the tunnel and its approaches has presented the chief difficulties to the engineer. The tunnel pierces the high watershed extending from the Silvretta (the point where the frontiers of the Tyrol, Vorarlberg, and Switzerland meet) to the north as far as the Arlberg (forming the frontier between the Tyrol and Vorarlberg), and the eastern slope of which sends its waters to the Black Sea, the western to the German Ocean. The lowest point of this watershed is the Arlberg (5,800 feet), which has given its name to the most western province of the Austrian Empire, the Vorarlberg. The latter may justly be described as a jewel among the territories belonging to the crown of Austria, for it is not surpassed by any of the other provinces in beauty, wealth, trade, and industry. But the inhabitants of Vorarlberg were almost completely separated from the mother country as regards trade, being dependent upon the neighboring States, for the postal road leading from Bludenz over the Arlberg to Landeck and Innsbruck was not at all sufficient for the requirements of the traffic. Thus it happened that Vorarlberg became gradually more estranged from the mother country, and that far-seeing men have been endeavoring to establish closer connection by means of a railway. A look at the map shows that the most direct route of communication between the greater portion of the Austrian monarchy and Switzerland and the South of France leads over the Arlberg, and a line of railway such as that now on the point of being opened is the most important link for the trade of Austria with the west of Europe.

When, in 1859, Austria lost Lombardy, she was anxious to permanently secure the possession of Venice by the construction of a direct road—the Brenner Railway. But before it was commenced (the Brenner Railway was opened in 1867, when Venice had been ceded to Italy), the idea was suggested of connecting it by additional lines from Innsbruck with Switzerland, Southwest Germany, and France. Since 1864, then, the principal engineers and political economists of Austria began to take active interest in the question of a railway by way of the Arlberg. For a number of years petitions poured into the Reichsrath and upon the government from the communities and chambers of commerce of the Tyrol and Vorarlberg, asking for the railway; but a deaf ear was turned to these appeals, until, in the spring of 1880, parliament resolved to construct it at the expense of the State. From 1864 to 1880 a number of pamphlets, written both from a commercial and engineering point of view, made their appearance; but there is no need to enter upon them here. All writers were unanimous in their opinion, however, that the climatic influences and the geological conditions of the Arlberg rendered a railway over the mountain impossible. The Arlberg Pass is one of the most inhospitable and exposed passages of the Alps. The winter lasts from seven to eight months, the temperature falls as low as 25° Reaumur under zero, and not unfrequently snow falls at one time to a depth of from 8 feet to 10 feet. Constant storms between the Rhine and Inn valleys lift up the snow in large masses, causing enormous drifts and destructive avalanches. Large landslips and dangerous freshets are also of frequent occurrence. There are several projects with a much shorter tunnel, involving less expense; but it was found that a railway with a short tunnel, situate higher up, was very risky for the working of the railway traffic, and the present long tunnel was finally decided upon.

The Arlberg Railway runs from Innsbruck to Landeck through the Inn valley, from Landeck to St. Anton through the Rosanna valley (a branch valley of the Inn valley), from St. Anton to Langen through the Arlberg, and from Langen to Bludenz through the Kloster valley. From Innsbruck to Landeck-Plettneu the railway runs south of the Inn, and rises nowhere more than 66 feet above high water of the river. With the exception of a short portion the railway runs from Plettneu to St. Anton along the northern bank of the Inn, and rises from 132 feet to 264 feet above the bottom of the valley. From Langen to Bludenz the northern side was chosen, and for about nine miles the railway is 120 feet above the bottom of the Alfenz valley, the highest elevation being 492 feet. The Oetz valley is crossed at Roppen by a bridge of 250 feet span, the Putz valley at Imst by another of 132 feet span, the Inn valley at Landeck by a bridge of 198 feet span, and the Putznau valley at Weitzberg by one of 394 feet span. There are besides a number of bridges of various spans, all being executed in the best manner. The Arlberg Railway consists of two sections—the valley railway from Innsbruck to Landeck (45 miles long) and the mountain railway from Landeck to Bludenz (39 miles long), in the middle of the latter being the great tunnel, 10,250 meters (6·13 miles) long. The first section of the railway was commenced in November, 1881, and opened for traffic on July 1, 1883. The mountain section was begun in September, 1882, and will be opened for passenger traffic on September 15 next, as has been stated. The tunnel has been constructing since July 25, 1880, and was finished in the middle of last July.

The boring of the great Arlberg tunnel proceeded very rapidly, far more rapidly than that of any other tunnel previously constructed. Instead of the estimated daily progress of 6·60 meters (21½ feet), the heading was driven at the average rate of 9·50 meters (over 31 feet), so that the perforation of the tunnel, which took place on November 19, 1883, a little over three years after its commencement, is a performance which has never been equaled. The excellent dispositions made, and the engineering skill displayed, are the main causes of the rapidity of the work. But it must not be forgotten that the experience gained in the construction of the Mount Cenis and St. Gothard tunnels was of the utmost value, and served as a guide. On the eastern side of the Arlberg tunnel Ferroux boring machines, driven by compressed air, on the west Brandt machines, worked by water under a pressure of from 80 to 100 atmospheres, were employed. The tunnel has two lines of rails, and is walled up along its whole length. In places where great pressure showed itself, the walling has been made very thick, and headings for carrying off the water have been driven at intervals for nearly 60 feet into the sides of the tunnel. From St. Anton, where the tunnel entrance is 4,272 feet above the sea level, the great tunnel rises 2 per 1,000 for 2½ miles, and falls from this point toward Langen (entrance 3,991 feet above the sea) 15 per 1,000 for a length of nearly 4 miles. The cost of the finished tunnel is 4,200 fr. per meter run (slightly over £50 per foot run). Besides the great tunnel, the Arlberg railway has nine small tunnels, varying in length from 214 feet to 696 feet. Their aggregate length is nearly one mile. All these tunnels are also completely walled up, the average cost being only 850 fr. per meter run. For securing the railway against freshets, stone and snow avalanches and landslips, a large number of supporting walls, aqueducts, and roofings for protection against avalanches had to be constructed at great expense. The total cost of the Arlberg Railway and tunnel is, in round numbers, £3,480,000.—*London Morning Post.*

Dynamite Shells.

The San Francisco *Chronicle* gives an account of the recent experiments with dynamite shells at Port Lobos. It quotes Gen. Kelton as saying of them:

"The experiments were made under my charge, and with the authority of the Chief of Ordnance," said Gen. Kelton. "The piece of ordnance used was a condemned 3 inch rifle gun, made of wrought iron; the gun was a sound one, save that it had become honeycombed by use and exposure to weather; it was a good gun for the experiments. I was ably assisted by Mr. Quinan, till recently a distinguished officer of the 4th U. S. Art., who resigned to undertake the hazardous business of improving the methods of manufacture of high explosives, for which task his scientific attainments eminently fitted him. Experiments of the kind in question need the supervision of an expert in high explosives, and Mr. Quinan's knowledge of dynamite came into great service—in fact, any one outside of a dynamite maker would be unfitted for the work of loading the shells, etc., as he would be so appalled by what he had heard of the wholesale destruction wrought by dynamite that he would be almost certain to blunder at the critical point of the work. Mr. Quinan in person loaded the shells, each shell, an elongated 3 inch rifle projectile, being charged with seven ounces of dynamite. The selected place of experiment was Lobos Beach, with the ocean on one side and a precipitous cliff on the other, the place being selected that no possible danger could occur to any one. When the gun was fired, our party was over 100 yards from the piece and under protection. The gun was placed in position 150 yards in front of a huge rock. The first projecting charge was a quarter pound of cannon powder. The rock was struck by the shell, the dynamite ignited by percussion, and the shell broken into innumerable fragments, whereas by ordinary powder it would only have broken into a few large fragments. The second charge was half a pound of cannon powder, and the experiment was attended with equally good results. It did just what was expected; the shell was expelled, and did not ignite until it struck the rock. The third charge was a pound of powder service charge. When the gun was fired the explosion of the charge, the bursting of the shell, and the shattering of the gun appeared to be simultaneous. The gun was torn into fragments. One fragment, including the breech, and weighing about 200 pounds, was hurled to the rear fully 20 feet; the muzzle part hung to the carriage by a trunnion, the carriage being only slightly injured; the third fragment of the gun, weighing several hundred pounds, flew high in the air, in a nearly vertical course and over the cliff; the immense piece of iron went up a distance of fully 90 feet. Then, as a matter of course, our experiments for the day ceased."

The results of the experiments were, in the opinion of Gen. Kelton, "exceedingly satisfactory, for they conclusively showed that shell loaded with dynamite can be used in warfare. Seven ounces of dynamite rent the gun as a charge of 100 pounds of powder could not have done. Powder would have opened a fissure in the iron, thus permitting the gas generated by its combustion to escape; but while the combustion of powder, while rapid, is progressive, the combustion of dynamite is so instantaneous that the enormous volume of gas thereby generated seems to want to escape at once; this fact was shown by the sudden rending of the gun into fragments.

"If the dynamite shell should strike the side of the vessel and explode without penetrating the armor, the destructive effect would be greatly in excess of the damage worked by the ordinary shell made of gunpowder. But the dynamite shell must penetrate to some extent to produce its full effect. I am satisfied that experiments will show that it can easily be managed to give the shell the power to thus penetrate before it explodes. The necessary penetration—about one-half the length of the shell—would be effected in the thousandth part of a second after it had reached the ship. Then the exploding dynamite would instantaneously rend asunder the entire side of an ironclad. In defending a fort against a land attack, these dynamite shells would be very effective. One of these shells exploding in the midst of a body of attacking troops would produce as much consternation as a thunderbolt; its explosion would be like unto the explosion of a powder magazine in their very midst. No troops in the world, however brave, could stand more than a few of such shells. So destructive, in fact, would be these shells that their introduction in active warfare would vastly diminish the duration of wars, if it did not make wars an impossibility."

In conclusion, Gen. Kelton expressed satisfaction that the experiments had been so successful. While experiments had been made by others, he did not think that any had gone so far or succeeded so well; these experiments with dynamite can only be conducted on the most favorable conditions, and by men who understand the dangers of dynamite and can take every possible precaution against premature explosion.

Captain Daniel M. Taylor, of the Ordnance Department, and an aide-de-camp on General Pope's staff, said: "The experiments conducted so successfully by Gen. Kelton show that a compound many times more destructive than gunpowder will add to the havoc of the battlefield in future wars. One peculiar property of dynamite may somewhat interfere with its usefulness as a destroying and rending agent, and that is the fact, authenticated by experiments, that its destroying power operates vertically and with its main effect in a downward direction; in other words, a dynamite-charged shell would not scatter death and destruction in every direction, as a gunpowder-charged shell so frequently does.

"Captain James Chester, of the 3d Artillery, has paid great attention to the subject of dynamite in its connection with the art of war. He maintains that dynamite can be used with great success in active warfare if rockets are employed to throw the death-bearing material into the ranks of the enemy. He holds that dynamite shells can be thrown by means of the rocket with fair accuracy and to very long ranges. He calls these rocket-propelled shells aerial torpedoes, in contradistinction to submarine torpedoes, and holds that with the submarine torpedo defense in the hands of the navy and the aerial defense in the hands of the army, the country would be safe against any attack."

Haulage by Rods.

Rziha, the well known tunnel engineer, has recently described a system of haulage on the east end of the Arlberg Tunnel, designed by Ceconi, that is peculiar, and has been remarkably successful in meeting the special circumstances of the case. From the portal at Langen, 1,214 meters above sea level, the tunnel has an up grade of 15 per 1,000 for a length of 6,170 meters to a height of 1,310 meters above sea level, or a total rise of 92·55 meters; while from the St. Anton portal, 1,302 meters above sea level, it has an up grade of 2 per 1,000 for a length of 4,100 meters. The highest point in the tunnel, therefore, is located more than 2,000 meters nearer the east end than the west end, and even if both tunnel headings had been driven at the same rate of advance, it would be necessary to hoist from the face of the east end over a section of 1,200 meters with an adverse grade of 15 per 1,000. This section, however, became much longer, owing to the fact that the western heading progressed much more slowly than the eastern. This rendered hoisting over the section in question a difficult matter, because the use of men and horses was out of the question, 200 of the latter being ultimately required.

As the advance heading was driven only single-track width, chain or rope haulage would have been difficult, particularly because the space in the heading would be much contracted by guide rollers and rope or chain. These considerations led Ceconi to use a wooden rod united in sections, on wheels running on the track, and hauled over the section in question by three Krauss locomotives in the following manner: The train, consisting of from 70 to 74 cars, was made up in the heading, and then the rod train was pushed into the heading until its end came into contact with the end of the train, and both were coupled together. Then the engines drew out rod and train on a side track in the level part of the tunnel. Then they were uncoupled, and the train of cars was switched on to the train track and hauled out of the tunnel by two locomotives, the wooden rod train being left standing on the side track. After dumping, the car train was pushed back into the tunnel until the steep section was reached, and then was divided into single cars, which were run to the face of the heading singly, with a man at the brake. The hauling, therefore, required from 70 to 74 brakemen, and from 10 to 12 men on the rod train. The rod train consisted of 21 by 12 centimeter timbers 7·6 meters long, mounted on two four-wheeled trucks. In October, 1883, the rod train was 1,070 meters long, and it will reach a length of 1,200 meters. It weighs 52 kilogrammes per running meter, or 55 tons in all. A full train of 75 cars weighs about 230 tons, and an empty train, 262·5 meters long, 129 tons. There are ten trains in twenty-four hours, moving a gross weight of 3,591 tons, an exceptional duty under the circumstances. An entire train with rod train has over 400 axles, and is 1,400 meters long. The trains are run on regular schedule time.