A NEW TRANSANDINE RAILWAY.

A revival seems to be approaching the South American railway building industry. We notice that our English exchanges are writing articles on the enterprise and industry of Harry Meiggs, and he may be an object of renewed interest to English capitalists. More than this, we read of a new road across the Andes, which will complete the connection between Valparaiso and Buenos Ayres. The section between Santa Rosa de los Andes, the present terminus of the Valparaiso railway, and the town of Mendoza, at the other side of the Andes, comprises the most difficult part of the road. Starting at Santa Rosa, situated at the entrance of the Uspallata pass, on the Chilean side, at 2,704 feet above the level of the sea, the line follows the course of the river Aconcagua for a distance of 33 miles, until it reaches the foot of the pass at 7,315 feet above the level of the sea. In this point where the Aconcagua river receives the Juncal the line follows the course of this river, turning to the south, and after 11½ miles turns again to the east until reaching the western portal of the large tunnel at the summit, situated at a hight of 11,484 feet. The difference between Juncal and the mouth of the tunnel is 21½ miles, a grade of 3½ per cent. The length of the tunnel is estimated to be 10,665 feet. The top of the mountain is 3,260 feet higher. Crossing the tunnel the line descends to the Cueros valley, with a grade of 3 per cent. for eight miles to the bridge over the river Cueros. The altitude of Cueros valley is 10,257 feet. From this point to Puente del Inca, a distance of 12 miles, the grade is 2½ per cent., and continues softening till it reaches the town of Mendoza, 102 miles from Puente del Inca, and 2,500 feet above the level of the sea.

An Italian engineer, Mr. Olivieri, has recently made a new survey of this route, comprising only the mountain region between Juncal and the Cueros river, and has proposed to shorten the line 44 kilometers, avoiding all the difficult part, and thus reducing the cost of construction considerably. His plan is to start at Juncal river, 2,240 meters high, with an inclined plane, as invented by the celebrated engineer, Mr. Agudio, and recommended by the several engineers commissioned by the Italian and French governments, as well as by the delegates of various railway companies who attended the series of practical experiments that took place in the month of August, 1875, at Lanslebourg, Savoy. The inclined plane would have a length of nearly 6,000 meters, with only one curve of 450 meters radius, and of various grades, the heaviest being one in five. An altitude of 1,000 meters being gained in this manner, the line would continue 3,000 meters further with a grade of 1 in 36, to the entrance of a tunnel which would have a length of about 3,750 meters, and emerging at the side of the Cueros river at 3,180 meters high. This shows that the valley at the eastern side of the mountain is about 1,000 meters high, which is, to a certain point, an advantage, requiring only grading on one side. Both the Juncal and Cueros rivers would at all times furnish ample water power to work the turbine water wheels, with which power the cars would be lifted. There is also a small lake at the summit of the incline, the water of which can with facility be applied to the same purpose.

With this system the cost of construction would be reduced some $4,000,000, and, according to the report of the joint committee of engineers, the working expenses of a line of this class, taking into consideration the corresponding development required in the other system, are in proportion very much less.

NEW BRIDGES AT ROTTERDAM.

Dutch engineering skill and enterprise have just completed an undertaking of a magnitude second to none of the many great works achieved by the Dutch before. It is well known that for centuries the Dutch people have waged constant war against the encroachments of the sea and the rivers by which their country is intersected. The hydraulic works are the first in the world; their bridges at Kutphen, Kuylenburg and Maesdijk rival those of America. The *Builder* says: Another, the new railway bridge which crosses the Maas at Rotterdam, has just been added, which was formally opened on April 29th, and the importance of which for Holland need hardly be pointed out. The work, after an expenditure of 2,000,000 florins (£160,000), of which rather more than half has been expended on the superstructure, and less than half for the substructure, has been completed within eight years, about the same time required for the construction of the similar bridge at Hamburg, and that between Venice and the continent. Five gigantic wrought-iron arched girders, resting on granite piers, and of spans ranging from 216 feet six inches to 295 feet four inches, and a hight of nearly 20 feet above ordinary high water level, connect the city with an island in the middle of the stream, two other arches uniting this island with the opposite shore. Another great work at Rotterdam is now in course of completion, which has attracted general attention on the continent. A few paces below the railway bridge, another bridge, the so-called "Willemsbrug," to serve for the ordinary carriage traffic of the city and foot-passengers, is in course of construction. The foundation-stone of this bridge was laid three years ago by the king of Holland in person. This, like the railway bridge, is provided with two pivot arrangements, of which one is within the city and the other in the canal called the King's Harbor (Koning's Haven), 656 feet wide, between the opposite shore and the island above mentioned, to permit the passage of the largest ships.

The Jetties.—From the latest reports from Capt. Eads it appears that in 60 days a ship drawing 22 feet of water can pass from New Orleans to the sea. The addition of another foot or two to the depth of the channel will only be a matter of time.

MOVING CLEOPATRA'S NEEDLE.

Engineers of the present are about to attempt a problem which Cleopatra's workmen successfully solved. A correspondent writing from Alexandria, Egypt, gives the following account of the arrangements prepared for transporting Cleopatra's needle to England. The "needle" is a monolith 69 feet long and eight feet square—not uniformly, but at the base. It weighs about 220 tons, and lies in the sand 15 feet above high-water line. To get this mass safely into the sea and across the sea, it is intended to build up around it on shore a cylindrical iron case or ship, and then to roll the entire mass, nearly 300 tons, into the Mediterranean, and when the necessary ballasting and additions have been made to the ship in dry-dock, to have her towed to England. The iron vessel is now being made at the Thames Iron Works, and when ready will be sent out here in pieces, to be built around the obelisk, under the superintendence of Mr. Waynman Dixon, brother to Mr. John Dixon, the enterprising designer and contractor. The vessel must be considerably longer than the obelisk, because of the shape of the stone. It will be 92 feet long and 15 feet in diameter, with plates three-eighths of an inch thick. It will be divided into nine water-tight compartments by eight bulkheads; total weight of iron, 75 tons. To lift the end of the obelisk jacks of immense power will have to be sent from England, and after the cylinder is built tremendous tackles will be required to roll it into the sea. It will float in nine feet water, and to reach this depth it must be rolled 400 feet. Once afloat and in dock it will be fitted with bilge keels, rudder and steering gear. It will be cutter-rigged, with one mast and two sails, and will have a deck-house for Mr. Carter, who will have charge of it on the voyage; for, although it will be in tow of a steamer, it will be in every respect a ship, and able to take care of itself for a time in case of accident or breaking away of the tow lines, which are to be of steel wire. If the undertaking is a success, the entire expense will be borne by Mr. Erasmus Wilson, the eminent surgeon. Immense care and nicety will have to be exercised in obtaining the necessary strength and rigidity; the obelisk must be so packed, forming with the iron cylinder one solid mass, as to avoid any strain from the rolling into the water, or from the heavy working of the ship afterward. I presume the most anxious part of the work will be to get the vessel and her precious cargo into the sea. Once afloat other difficulties will be mastered. Three thousand five hundred years ago this obelisk formed one of the pillars in front of the great Temple of Tum (the setting sun), at Heliopolis (near Cairo), and was brought to Alexandria during the reign of Cleopatra. No accounts exist of the appliances used; but if this and larger monuments could be safely moved about some 1,600 years B. C., it is not possible to doubt our ability to do likewise in the 19th century A. D.

SPLITTING WIRES FOR BRIDGE CABLES.

Work is progressing rapidly on the Brooklyn bridge. The wire, as it comes from the factory, is in coils, containing about 1,000 feet. As each coil is oiled it is drawn to the top of the anchorage and placed on a flat drum which moves horizontally. From this drum the coil is wound with great care over a wheel four feet in diameter, moving about a horizontal axis. This wheel and its carriage are placed in position before one of the drums. It is then necessary to fasten the end of the wire to that already on the drum. A workman steps up with a double vise, in which he puts the two ends of wire which have been previously threaded, and joins them by a hollow nut of crucible steel two inches long and an eighth of an inch thick. The inside of the nut is threaded in opposite directions, to conform to the threads on the ends of the wire. The nut is then fastened in a hand vise, by which it is screwed up so as to bring the two ends of the wire almost together. By aid of this contrivance the joint is given 96 per cent of the strength of the wire. When the fastener steps to another drum, a man, with a box of chemicals and acids, cleans the joint. Then another, with a pot of melted zinc, gives the joint a bath, in which some chloride of ammonia has been thrown to destroy the dross. Another man, with a tool, runs the zinc well on to the wire to galvanize it thoroughly. Next a man, with a pan of linseed oil and a piece of sheep's skin rug dripping with oil, seizes the wire where it has been joined and holds it fast in his oily grasp, while the other workmen carefully wind it from the small reel to the large drum.

Although the popular impression is that the cable is to be of twisted strands of wire, the contrary is true. The wires are kept parallel, and as soon as 133 wires are sent across the river they will be tied with temporary wrappings. These will make one of the 19 strands of which one cable is made. There are suspending pendulum rods from one of the wires to prevent the entangling of the wires as they pass to and fro and are fanned by the wind.

There are now four wires in position on each of the down-stream cables. These are the first wires that have been put up that will enter into the big bridge's ultimate structure. It will take about two years to carry across the 24,000 wires.

Asparagus Paper.—A man of science, writing to the *Patrie*, explains what is the principal use to which the bundles of white stalks of asparagus, from which the tips have been bitten, may be put. They may be made into paper, and that not ordinary brown paper, or even foolscap, but letter paper of the finest description. It appears that in a few favored places there are manufactories where the asparagus ends are used in this way, and where the careful housekeeper hoards up the scraps with a diligence unknown elsewhere. But the work of collecting them is an up-hill task as yet, and it will be years before, in the natural order of things, the practice of saving them and packing them off to such factories for sale is at all generally adopted.

COLD STORAGE OF DAIRY PRODUCE.

The *Butter, Cheese and Egg Reporter* in its last issue says: Messrs. Mackenzie, Newman & Co. leased the entire building, No. 92 Warren street, from May 1st, and at once fitted up the three upper lofts with a refrigerator, which is practically one room, the floors being simply slatted, and the walls being fitted up continuously from the roof to the floor of the first loft. The interior measurement of the rooms is 65x22 feet, with ante-rooms on the first and second lofts. The top loft is used for the ice, and contains layers to the hight of four feet two inches, covering the entire surface between walls. About 150 tons are now in the room, though it is constructed with a capacity of 300 tons. The side walls from the roof down to the first floor are cased with matched pine boards, back of which a space of eight inches to the brick walls is filled with sawdust. On the ends a thickness of 14 inches of sawdust is used. The roof and first floor are ceiled in the same manner.

In constructing the refrigerator 1,900 barrels of sawdust were used. The two ante-rooms are intended chiefly for showing goods, and are kept at higher temperature than the storage rooms, in order to make them comfortable to customers and salesmen, but if necessary, they can be kept at as low a temperature as the other rooms, and used for storage. The capacity of the two storage rooms is 10,000 packages. There is an abundance of daylight in each room to admit of the inspection of goods.

The temperature is kept at from 40 to 42, and there is a fine circulation of dry air in every part of the rooms. The ice rests on a rack just above the beams of the top floor, and free contact of the air with the ice, and at the same time perfect drainage, is secured by roofing the floor beams with galvanized iron projecting into a gutter of the same material between the beams. As the ends overlap but do not come in contact, there is no hindrance to the circulation of the air.

The drippings from the ice fall into the gutters, which are slightly inclined toward the center, and then empty into a conducting pipe which passes down through the building and finally leads into the sewer-pipe. There is no opening at any point into the open air. The principle upon which the refrigerator works depends upon the gravity of cold and heated air, and as the ice covers every inch of surface, it will be seen that there must necessarily be a constant and uniform circulation from the floor to the ice, and downward. The cost of the refrigerator is between $6,000 and $7,000. A steam elevator is being erected to perform the heavy work, and also to connect with the cellar and sub-cellar of the store, which are used by Messrs. McKenzie, Newman & Co. for their flour and egg trade, and are both well lighted and well ventilated rooms.

OLD AND STICKY BUTTER.

Prof. L. B. Arnold, Secretary of the American Dairymen's Association writes to the New York *Tribune* as follows: Of the great mass of butter which finds its way to the general market and is reckoned as "good," the first and most obvious defect is an old taste, derived, probably, from too much or too long exposure of the cream to the air before churning. Everybody understands the fact that butter exposed to the air soon acquires an old and disagreeable taste; but everybody does not seem to appreciate the fact that cream deteriorates the same as butter by standing open to the air. But it certainly does so, and very much more rapidly than butter, and especially if exposed to air which is warm, or which contains any bad odors or vapors. Owing to the nitrogenous matter mingled with cream, it is very susceptible to change. Exposed to warm and damp air, cream will decay about as much in one day as butter would in a week in the same situation. It is, therefore, very easy, and certainly very common, for butter to acquire an old taste by too much exposure of the cream before churning. The surface of cream which is exposed to the atmosphere, especially to a faulty atmosphere, is all the time changing and working toward decay while standing for the slower particles to get up and ready for the skimmer. The longer this exposure continues the greater the change and the more is the flavor of the resulting butter affected. It is one of the striking advantages of the more modern modes of raising cream that they bring it to the surface quickly and improve the butter by shortening the exposure of the cream to atmospheric influences. The cleanest-flavored butter, that which has the fullest, freshest and most delicious taste, and the best keeping quality, is now made by heating the milk to expel objectionable odors, and then, under an air-tight covering, lowering the temperature to hasten the ascent of the cream. If cream must be exposed to the air while rising, it will do very much toward avoiding the old taste, so often found in butter, to have the air in contact with the cream as cool as possible. Cold retards change, and the cooler the surface is kept the less progress toward decay. The cooler air now sought in modern creameries makes a marked improvement in their butter over those who have used cold water but warm air in their rooms for setting milk.

Another defect is indicated by the word "sticky." This is occasioned by over-churning or over-working, and the grain becomes considerably injured. Butter is composed principally of three fats: olein, margarin and stearin. These fats exist in the milk in very minute globules, one-two-thousandth of an inch in diameter, not each fat in a separate speck by itself, but all combined in one atom of cream.

When the little grains are unmashed the butter breaks short and with a distinct fracture; but when they have been mashed or broken the butter appears sticky and handles more like lard. Its flavor becomes at once changed, and it loses greatly in keeping quality. It is difficult to work butter without mashing some of its grains of fat, but the less it is worked the less of this there is done. The mode of working, too, has much to do in producing this objectionable condition; a sliding or drawing stroke of the lever or ladle injures the grain most. In the most improved processes of butter-making the buttermilk is got out and the salt mixed in without working the butter at all. The first step in accomplishing this is to cool the butter in the churn, just before it is ready to gather, down to about 55°, and then churn very slowly until it forms into minute lumps or grains, as it will soon do at that low degree, and the lumps so formed will be perfectly solid butter, with not a particle of buttermilk inside of them. These lumps are then washed in cold water or brine, and the buttermilk all washed off of them, which can readily be done without having the granules of butter stick together. After taking the granulated butter from the rinsing water it is laid on an inclined table and drained and salt stirred in, which is easily done with perfect evenness. By leaving it upon the table till it warms up to about 60°, the lumps or grains are pressed together with the lever or ladle, and a solid mass of butter, evenly salted and with a perfect grain is the result, without a particle of working.

Electric Lighting.—One of the late English improvements in the application of electricity to lighting, promises to enable us to admit the lightning to our houses. We read that a novelty has been introduced which consists in placing the carbons side by side in an insulating but fusible envelope, the result being that clockwork regulation can be entirely dispensed with. The insulating material used is kaolin, which, in its solid state, is an insulator, offering offering high resistance to the electric current, but which, under the influence of a powerful electric current, becomes heated and liquifies, in which state in is no longer an insulator, but conductor, offering a slight resistance to the current, which, when passed through in this condition, affords a light which is soft, steady and brilliantly white, although it may be colored by mixing with the kaolin the color required. No mechanism is required to regulate this light, which, once set up, continues to burn during passage of the current until the carbons are consumed, when they are replaced by others. The electrical arrangement consists of an ordinary magneto machine, which sends positive and negative currents alternately. From this machine radiate wires by which the current evolved is conveyed to the buildings or points at which it is required for use. The illuminating arrangement is put in circuit with these wires, and on the current traversing the carbon electrodes it fuses the kaolin and produces the light. Thus, given a means of producing the necessary electric current, any number of lights may be obtained from the same electro-motor, each dependent upon itself, and all entirely independent of each other. Any one light may be brought into use at pleasure, and extinguished when required by merely connecting or disconnecting the wires in connection with them, whilst a light consumed may be replaced by another with equal ease. As many as 50 lights have been set up in one circuit with success.

Proposed Narrow Gauge.—The St. Louis Board of Trade is urging the project of the construction of a narrow gauge railway from St. Louis to Colorado, through Missouri and Kansas. The construction of this proposed railway through Kansas to Trinidad, in Colorado, will give St. Louis direct railroad connection with the entire system of narrow gauge railways in southern Colorado and open up to their smelting interests the whole range of valuable mining country of Colorado, Utah and Arizona. This road is but one item of a grand onslaught which St. Louis proposes to make upon outlying regions. The St. Louis *Journal of Commerce* says: "The jetties of South pass have assured ample water for all vessels to enter the Mississippi river and made a direct trade between St. Louis and all European ports practicable, and it becomes the duty of St. Louis to seize upon this advantage and develop herself a commerce which shall absolve her from all dependence on the Eastern seaboard. Her efforts in this direction will be greatly assisted by the building of the proposed narrow gauge railway, penetrating, as it eventually will, by means of the numerous branches proposed to be connected with its main line, the most fertile regions of Missouri, Kansas, Nebraska and Colorado."

No Limit to Microscopic Progress.—As we have formerly remarked, Helmholtz and other mathematicians of the first order who have applied their methods of analysis to the subject, have alleged that the limit of visibility with the microscope has been reached. This belief is based on the theory that light itself is too coarse to permit the subdivision by which yet smaller objects may be revealed to our most powerful lenses. The limit of visibility has been named as the 180,000th of an inch. But this view is not wholly accepted by microscopists. The Rev. Wm. H. Dallinger has made experiments which point to a very different conclusion. He employs a new method of practical observation specially adapted to testing this question, and has constructed lenses which carry the limits of distinct visibility far beyond the boundary announced by the mathematicians. Much smaller objects are thus revealed than the theory referred to would indicate as capable of being seen. Furthermore, Mr. Dallinger does not believe that he has yet reached the limit of division and visibility by instrumental means.

The Trade in Human Hair.—The trade in human hair continues to increase at Marseilles, and has now become a staple article of commerce in that city. Six or seven years ago the annual quantity imported did not exceed 16 tons, but it had increased in 1873 to 50, in 1875 to 80, and in 1876 to 92 tons. Formerly all the hair imported into Marseilles came from Italy, but that country has been unable to meet the increasing demand, and a brisk trade has been opened with the extreme East. Thus, of the 92 tons imported last year, 43 came from Italy, while China supplied 36, Turkey 5, and Japan 3 tons, the remainder being made up of importations from Egypt, India, Germany, Belgium, Spain and Algeria. The total quantity of hair imported into France last year is estimated at 122 tons, value $900,000, so that Marseilles, with 92 tons, has three-fourths of the trade in her own hands.