The St. Gothard Tunnel.

The machine piercing of the Swiss tunnel through the Alps commenced last month. The cost of the preliminary arrangements, plant, etc., is estimated at about $400,000. The compression of the air for the rock-boring machines and the machine work of the shops will be effected by hydraulic motors of a combined power of 500 horses. At the northern extremity of the tunnel, there is an available fall of water of about 95 feet, close to the entrance, which will be utilized for turbines. At the southern end the waters of the Tremola, with an available fall of 984 feet, will be turned to account with turbines or by a hydraulic machine with vertical column of water. It is expected that upwards of 100 yards at each end of the tunnel will be driven each month, or considerably over a mile by the end of the year.

The Swiss *Times* says: The first monthly report with reference to the state of the works of the St. Gothard line has just been published. This report, which has already been communicated to the governments interested, shows that on the 31st of December the tunnel at the Göschenen end has been pierced 60 feet, at the Airolo end 336 feet, or nearly 400 feet altogether. At Airolo 43 feet of the masonry of the arch has been completed. The average number of workmen employed during the month of December was 272—171 at Airolo, and 101 at Göschenen. In addition to the work already executed on the tunnel proper, about 60 feet of the cutting at the opening of the tunnel have been completed. At this side the boring has hitherto been entirely through hard granite. At Airolo, although softer descriptions of stone have been met with, operations have been carried on with extreme difficulty, on account of the water filtering very abundantly through the rocks. Strata of dolomite and mica-schist, with veins of quartz, have been met with.

BRIDGE OVER THE MISSOURI RIVER, NEAR LEAVENWORTH, KANSAS.

There is no branch of engineering in which the native genius of America is more effectively displayed than the construction of bridges. The almost illimitable West presents, in its rivers, gorges, and mountain sides, localities difficult enough to trouble the ingenuity and numerous enough to weary the patience of any ordinary mortal. But these things are to our engineers merely opportunities to display their skill and perseverance, and the clever devices and fertile invention of our railroad constructors have always been equal to the occasion, and have elicited the admiration of the civil engineers of the old world. Our present instance is a bridge for both railroad and highway traffic, erected over the river Missouri at a distance of 1⅞ miles north of Leavenworth, Kansas. It is entirely of iron, and very substantial; and it presents a fine appearance. The funds required to construct it were principally raised by bonds, which nearly all the prominent citizens personally pledged themselves to redeem, and which were thus negotiated in New York.

Work on the approach was commenced on July 20, 1869, but the piers were not started until October following. On October 20 the first column was placed in position, and on July 1, 1871, the whole substructure was completed. The bridge would have been completed fully twelve months earlier, had not many vexatious delays occurred. The total weight of wrought iron in the bridge is 2,093,300 lbs., and of cast iron 700,417 lbs., making a weight of iron per lineal foot of 2,812 lbs., exclusive of the floor. The bridge consists of three spans, the western and middle being each 340 feet, and the eastern, 314. Being intended for both railway and highway traffic, a single railway track is laid in the middle of the roadway, and the top course of floor planks is laid even with the top of the iron rails, so that wagons can pass freely from one side to the other. The western railroad approach may be considered as extending from the end of the bridge to a point where any railroad desiring can connect with it. This point is about 1,500 feet from the bridge, and is reached by a cutting through a hill, with a maximum depth of 50 feet. The eastern railroad approach commences at the bridge, with a substantial wooden trestle 50 feet high, decreasing in hight to 35 feet in a distance of 1,600 feet; it is then continued by an earth embankment 2,400 feet further, to a point where the grade is but 10 feet above the natural surface, and where all desired railroad connections can be easily made.

The most remarkable feature about the bridge, and the one which, by its comparative cheapness and peculiar adaptation to the conditions of the Missouri river, enabled the work to be undertaken and completed, is the use of pneumatic iron columns for piers. In no case had this principle been carried to such a depth or to so great a hight. How successful the experiment has proved is best seen and appreciated by an inspection of these graceful and substantial piers.

The total cost of the bridge was $800,000. The whole work was planned by the engineer in chief, General W. W. Wright, under whose personal supervision it has been executed.

Rather Foggy.

There often appears in Europe and in some parts of America, a peculiar kind of dry fog which is visible during the early morning of summer days, and is regarded as a presage of fine and warm weather. It is of a reddish tinge and is hardly visible except through distances of several miles, when it appears near or above the horizon in proportion as the dryness and heat of the atmosphere are less or more augmented.

In explanation of this phenomenon, M. Collas, in *Les Mondes*, advances the theory that it is due to the combustion of aerolites or shooting stars. These bodies, coming within the sphere of attraction of the earth, are precipitated to its surface at a speed which is considered to exceed twelve miles per second. By this great rapidity, they are heated, inflamed, and finally volatilized. The vapor thus produced is rapidly condensed into particles so extremely small that they may be regarded as the last limit of the divisibility of solid matter. These descend to the earth with great slowness on account of their tenuity, and are scattered, by the winds, to various quarters where they appear as the dry fogs.

Ruins of the Boston Fire.

Although it is some months since the great fire, the rains and snows of winter have not succeeded in entirely quenching it. In many parts of the burnt district, dense columns of smoke are still ascending, and bright flames dart out from beneath piles of brick and granite. The influence of heat upon various kinds of merchandise found among the ruins has afforded, says the *Boston Journal of Chemistry*, examples of metamorphosis interesting and curious in a high degree. Huge piles of leather in some cases were precipitated into cellars, and so covered with *débris* as to undergo a kind of dry distillation or fusing, out of contact with air. The resultant mass resembles a dry gum, with a clean vitreous fracture, upon the surfaces of which are seen the lines between the hides, like thin strata in a mass of silt. We have a lump of coke, produced from clover seed, which closely resembles cannel coal. It came from a mass of two thousand bushels which tumbled into a cellar, and was subjected to dry distillation under the bricks and mortar. Many other substances have undergone curious changes, and we may allude to some of them at a future time.

The Bar at the Mouth of the Mississippi.

A correspondent, E. B. B., of Cal., refers to the report of Mr. C. W. Howell, U. S. engineer, on the value of the screw dredging machines employed. He states that between December, 1868 and May, 1869, a channel originally 12 feet in depth was dug down to 17 feet at mean low tide, and nearly to 18 feet at high tide; and to show the efficiency of this apparatus, he mentions that the channel began to fill up when the screw ceased working. In another instance, 22,400 cubic yards of earth was dug out in 28¼ hours; a channel was cut to a depth of 19 feet and another to 18 feet 10 inches. The work was done so thoroughly that, during one year, all vessels drawing not more than 19 feet water went over the bar, and one ship of 20 feet draft passed over; and he avers that there has been a depth of from 17 to 19 feet on the bar for three years and more, for proof of which he refers to the official reports of the government engineers.

He quotes these facts to show that Mr. Stewart's statement that costly dredge boats can hardly keep a channel open to a depth of 14 feet is erroneous. The work which he describes was done with Bishop's submarine screw, with spiral boiler-iron scrapers.

Novel Life Preserving Apparatus.

M. Tellier, in *Les Mondes*, proposes a new method for saving shipwrecked persons. His apparatus consists in a life preserving vest, a balloon of a few cubic yards capacity attached to the belt of the swimmer, and a receptacle for holding liquefied ammoniacal gas which is fastened to the life preserver. When the vessel strands, the person to be saved turns a cock which allows the gas to flow through a long rubber tube and distend the balloon. As the latter rises, he jumps overboard. He is then buoyed up by his life-preserving waistcoat and also by the balloon which, being acted upon by the wind, tows him to the shore. By this means, it is suggested that a person might carry a line from the wrecked vessel to the beach, or an apparatus might be devised to contain several individuals who could thus be drawn ashore in safety.

THE GREAT KANSAS AND MISSOURI BRIDGE.