

THE SUTRO TUNNEL.

The silver vein known as the Comstock Lode, situated in the State of Nevada, is probably the most important gold and silver bearing vein now worked. Its yield, during the six years ending Jan. 1, 1868, was \$75,000,000. Its present annual yield is \$16,000,000, but owing to the depth now reached, and the high price of fuel, the expenses for pumping have become so great, that very small profit is realized by the Companies (thirty-five in number,) now at work upon it. The \$16,000,000 now produced involve an expenditure of almost the entire amount to cover the expense of raising ores, pumping, etc.; and these expenses are increasing so rapidly, with increasing depth, that unless something can be done to obviate the present difficulties, attending the working of these mines, their total abandonment, at an early period, is inevitable. Forty-seven engines are now at work to keep them free from water. The fuel for these engines is wood, and costs, delivered at the mines, sixteen dollars in gold per cord.

In view of such facts, it has been proposed to open a tunnel called the Sutro tunnel (because projected by M. Adolph Sutro), which shall cut the Comstock Lode 2000 feet below its highest point, for the purpose of draining and ventilating the mines, and transporting ores therefrom to a point upon the Carson River, where their concentration may be cheaply and conveniently accomplished.

The estimated cost, including a large margin for unforeseen contingencies, is \$8,000,000, and its dimensions are as follows:—

Length of main tunnel.....	21,178 feet.
Aggregate length of branches.....	17,688 "
Aggregate depth of shafts.....	4,220 "
Total	43,086 "

The section of the tunnel is twelve feet square, and is intended to afford passages for two lines of cars, each car having a capacity of five tons. A drain beneath the roadway of the cars will carry off all the water from the different mines.

The advantages of such a tunnel are so great, that some time since the several mining companies at work upon the Comstock Lode were induced to take \$365,000 stock in a company then organizing for the purpose of constructing it. The whole amount of capital stock was placed at \$5,000,000, and it was thought that if \$500,000 of it were taken by the mining companies themselves, the remainder would be easily secured from New York capitalists. Unanticipated difficulties have, however, been realized in the attempt to raise the required capital. So many such projects have proved themselves mere schemes to procure profit to their projectors at the expense of those who have been induced to invest in them, that, added to the general distrust which seems to pervade money centers, in regard to mining operations, the effect has been adverse to the success of the Sutro Tunnel enterprise.

The State of Nevada, although extremely anxious to aid a work so important in its bearings upon her future destiny, found herself restrained from so doing, by constitutional inhibitions. Nothing remained but to memorialize Congress, and ask the aid of the General Government, which was accordingly done by the legislature of Nevada, Jan. 25, 1867. The memorial was referred to the Committee on Mines and Mining, who reported a bill June 3, 1868, providing for the loan of government credit to aid the construction of the proposed tunnel. The bill and report were ordered printed, and now await further action. We have given some attention to the merits of this subject, and we are convinced that the Sutro tunnel, if constructed, is destined both directly and indirectly to benefit the whole country. Directly, by largely increasing the amount of bullion, thereby cheapening money, which amounts to the same thing as decreasing our national debt; and indirectly, because it will ultimately put an end to what has been so properly characterized as "Piratical Mining" in this country, and initiate in its stead a permanent and effective system.

There can be no doubt remaining in the minds of experts about the continuity of the Comstock Lode to depths beyond any that can be worked. There is also little doubt that other veins than the Comstock would be crossed by the Sutro tunnel; but capitalists who are not conversant with the facts upon which these opinions are based, can be convinced of their truth only by ocular demonstration. It is of little use to talk to them about "true fissure veins," and the like; to them "seeing is believing," and faith in the continuity of gold and silver veins to great depths being once established upon sight, would, by initiating a rational system of mining, develop such an extent of mineral wealth as would command the admiration of the world. We should no longer pursue the wasteful and ruinous system of surface mining which has prevailed to such an extent hitherto, but ores that have heretofore been considered too poor to be profitably worked, would be made to swell the amount of the precious metals at present produced. That we have not overestimated the benefits of deep tunnelling, will be seen when we state that the Comstock Lode is estimated by the best authorities in Europe and America, as being capable of a yield of \$50,000,000 per annum, upon the completion of the tunnel; more than three times the amount at present produced.

So far are we from believing that our Government should hesitate about establishing a precedent in the assistance of mining enterprises, that we think it has hesitated too long. The history of the internal improvements of almost every other nation goes to show unmistakably, that until such enterprises are fostered by the general Government, nothing like a full development of mineral resources will be attained. We believe however that the Government needs but to de-

monstrate the feasibility of deep tunnelling in this country, in order to turn the flow of private investment into similar channels.

The securities offered the Government for the loan, are such as to justify its negotiation. We see then nothing that can be considered a valid argument against the passage of the bill reported by the Committee; on the contrary, we see so much that renders it desirable that we trust it will speedily become a law. The interests not only of one section or of one industry are involved in the success of the Sutro tunnel, but all sections and all branches of industry are involved in common.

That such a measure should meet with opposition, is only what is to be expected in an enterprise of such magnitude. The improvements from which the United States as a nation, and the several States have individually received the greatest benefit, met with the most violent opposition at the outset. But as the opponents of the measures alluded to have been put to shame by the utter failure of their predictions, so we confidently believe, will those who have set themselves to oppose the Sutro tunnel, eventually be compelled to acknowledge their want of judgment and foresight.

RECENT BOILER EXPLOSIONS.

From a correspondent we have an account of a destructive steam boiler explosion which occurred at Westphalia, Clinton County, Mich., June 15th, by which an extensive flouring mill was destroyed and one man killed and two others injured. Our correspondent says he examined minutely the wreck. The iron was rent as though it were paper; the seams were started in many places, the rivets being pulled partially through, or cut off in the seam, in the latter case leaving them smooth and bright. In some cases the rupture was parallel with the seams, not four inches from them. The dome or steam chamber and safety valve, placed about midway of the boiler, and weighing about four hundred pounds, was thrown a distance of thirty rods, and evidently went to a great height. The boiler was fifteen feet long, five feet in diameter having eighty-three inch flues, had been used two years, and run two engines of forty and thirty-five horse power. At the time of the explosion only one was running, driving a saw, planer, etc.

The engineer says he had just pumped water to the second cock and had, according to the gage, fifty-five lbs. of steam, and was letting the steam down preparatory to going to dinner. The boiler was broken into eight large pieces beside smaller fragments, and the flues and the debris were scattered in all directions. The boiler had evidently burst at the middle, as the ends lay about sixty feet each way from the arch. The pieces which had formed the lower side appeared to have been exposed to great heat. The safety valve was stuck fast.

EXPLOSION OF A STEAM FIRE ENGINE.

At a fire in the Bowery, New York city, on the evening of June 18th, one of the steam fire engines, of the Metropolitan Fire Department exploded her boiler, causing the death of six persons and wounding over a score. The explosion occurred just after the engine was started succeeding an interval of rest. At the time of this writing the official examination and report has not been made, but we made a personal examination of the engine the next morning. The rupture occurred on that side of the fire box opposite the inlet pipe. The inner skin of the water leg was torn, the rivet heads broken off, and the sheet itself bent up on the torn edges. The crown sheet did not appear to be burned, as it had a coat of soot. From appearances low water and the injection of cold water on the heated plate were the probable cause of the explosion. The safety valve appeared to be stuck to its seat, but this may have been caused by concussion when the engine struck the pavement after being overturned. The official investigation is not concluded as we go to press, and that may throw more light upon the matter.

TUG BOILER EXPLODED.

On the morning of June 20th, the boiler of the tug *La Vergne* exploded while rounding the Battery, New York harbor, having in tow a lumber barge. As the vessel sunk a few minutes after the accident, we have no data derived from examination of the boiler to guide us as to the cause of the accident. We copy a notice of the catastrophe from one of our dailies, the *New York Sun*:

The crew were thrown by the violence of the shock into the water, and with the exception of one were rescued; but all were more or less injured by the sad mishap. The mate, Henry Lynch, who was steering the boat at the time of the disaster, has not since been seen, and it is feared he was either blown to pieces, or sank with the vessel. The Captain, David Decker, who was near the boiler when she exploded, was only slightly bruised and scalped, and, although thrown from his feet by the shock, was enabled to escape in a boat before the vessel went down, which happened soon after the explosion. The engineer, Daniel Taulman, was blown over the side of the vessel, and sank; but on rising to the surface he was rescued by the boatman who had gone out to the help of the sufferers. He was very seriously injured, his left arm being badly scalded and cut, and his leg severely bruised. He had but a few moments before left the engine room to speak to the captain, and he states that the steam was only 74 pounds to the inch—three pounds below the fixed limit—and that there was plenty of water in the boiler. He had examined the gages but an instant before the boiler burst, and therefore could not account for the mishap. John Lewis, the steward, was forced nearly fifty feet into the air, and then fell into the water, whence he was rescued by the boatman. He received a compound fracture of the arm, a severe scalp wound, and had his face fearfully lacerated. His condition is thought to be critical. Edward Wilson, a deck hand was blown over the side of the boat, but received no serious injuries, and James Burke, the fireman, was but slightly hurt. The more severe cases were promptly taken to the New York hospital, where every care and attention was given to the sufferers.

The Captain, in his statement, alludes to a leaky rivet in the boiler, which defect he had previously pointed out, but which was not considered by the authorities to be of any serious consequence. He also states that the vessel was not at the time under a full head of steam, and further, that no recklessness of conduct was manifested by either himself or the engineer. In fact, all the statements agree in one thing, and that is, no satisfactory reason can be assigned for the explosion. The propeller was not an old boat, and her boilers had recently been overhauled and repaired. They were furthermore cleaned out that morning, and could not therefore, have been encrusted with rusty or saline matter.

One thing will strike the practical engineer queerly, that in this, and many other accounts of boiler explosions, it should be thought necessary to apologize for, or, at least, to mention the fact of a leak in the boiler. We cannot conceive that a leak in a boiler can in any way tend to an explosion. That the leak may deaden fire or diminish the pressure of steam, or that it can aid in a rupture is possible, but that it tends to an explosion we have yet to learn.

IMPORTANCE OF REGULAR HABITS.

A person visiting New York for the first time, and curious to observe the peculiarities of the metropolis, would probably immediately notice the great number of restaurants, eating houses, and stands in the markets and streets, loaded with eatables. Go where he would, by day or night, he would find accommodations for eating, and people availing themselves of them. The facilities thus afforded for obtaining meals at all hours, are, without doubt, leading to great irregularities in eating, and thus exciting a deleterious influence upon the public health. It may, therefore, not be amiss to devote a brief space to the consideration of the effect of all irregularities in habits of living upon the animal economy.

It is a fact well recognized by physiologists, that the constitution of living beings possesses a recuperative power that is capable of resisting attacks from external agencies, or, rather, is able to restore the damage caused by such attacks. The lower in the scale of existence an animal is found, the stronger is the power of its organism to restore parts removed by mechanical means, and the less is its susceptibility to the influences which cause disease. If from individuals of the lower orders of animal a limb, or even a portion of the body be removed, a new one will grow in its place, and in many cases the part removed will supply the necessary parts which are absent, and become a complete organism. In vegetables this is almost universally the case, and the propagation of plants by slips cut from the parent stem, is a process of daily occurrence in horticulture. The recuperative power is indeed so great in many plants that they can, by the most extreme efforts, be scarcely removed from a soil where they have once obtained a foothold. The plant known to farmers as Quack-grass is a good example.

The power to restore parts which have been lost extends to the highest orders of the animal creation. Teeth which have been removed by mechanical means have often grown again in the human jaw years after the second set which take the place of the first, in the regular course of nature, had been supplied. This is, however, probably the only organ that the human recuperative energy has power to restore.

As age advances, this power becomes less, so that repair takes places slowly, and in very advanced age ceases altogether. Broken bones refuse to unite, and abrasions of the skin become chronic ulcers.

There is, however, a striking characteristic of the power of recuperation, which has a most important bearing upon the health, both of men and animals. It is this: The power to restore increases with the regularity of the power and periods of attack. It is as if the constitution were a citadel, upon the reduction of which two kinds of tactics were employed. So long as the attacks are made at regular intervals the garrison may sleep while the besieging forces are withdrawn, and rise refreshed to increased resistance; but attack it at unexpected times, and with irregular force, and unremitting vigilance must at last wear out the strength of the besieged.

Many phenomena which cannot be accounted for in any other way, at once find an explanation by the application of this truth. A man who is addicted to the use of alcoholic liquors may often drink very freely for years without any apparent serious detriment to health, if he is regular in the times and quantities of his potations; while another, who only takes an occasional "spree," will suffer from the consequences of his indulgence.

The taking of proper exercise, pure air, sustenance, sleep, and recreation, may be compared to the withdrawal of the attacking forces. If the withdrawals are regular, the attacks will also be regular, and the resisting power of the vital structure will in the meantime have accumulated.

We believe that six hours of sleep per diem, begun and ended at uniform times, are as good as eight taken at irregular periods. It follows, then, that regular sleep gives two hours at least more time per day, available for business, pleasure, or study, than can be otherwise obtained.

In short, nothing is so economical as regular habits. Less food, less sleep, less clothing, less medicine is required to sustain nature, and better health, more happiness, more wealth, more knowledge, and longer life are obtained in their exercise.

SHADOWS FROM TRANSPARENT BODIES.—By means of the electric light a piece of glass can be made to throw a perfectly black shadow. This will be the result provided the two surfaces through which the ray passes are not perfectly parallel, the deepness of the shadow depending upon the variation.