PETROLEUM—ITS SOURCES—VARIOUS THEORIES.

Number II.

Different opinions exist respecting the source of petroleum. Prof. Silliman states that it is of vegetable origin, and was produced by the agency of subterranean heat. This is a very general but unsatisfactory opinion. Geologists most generally believe it to be derived from bituminous shales situated below the coal formations. It is commonly found in the American rocks called the Portage and Chemung Group. This group of rocks is of immense thickness on some parts of our continent, being no less than 4,900 feet thick in Michigan. The bituminous shales called Utica Slates have yielded large quantities of oil in Canada by distillation, and the spouting petroleum wells of Enniskillen are in this formation. But petroleum is not always found in this class of rocks, as no oil has been found in various parts of New York State, where these rocks have been bored to a great depth.

Many practical men in the Alleghany and Ohio valleys believe that petroleum has its origin in coal beds. They assert that a low heat in the coal seams drives off hydrocarbon vapor, which is condensed in the pores of the rocks and the soil, and is washed by rains into subterranean recesses, situated at various depths in the rocky strata. Coal is found in all the hills adjacent to the petroleum wells in Pennsylvania, Ohio and Virginia. Cannel coal is abundant in the hills within one mile of Oil Creek, Pa. Is it not reasonable to suppose that reservoirs of petroleum must be situated at a considerable hight above the level of the ground where all the overflowing wells are pouring out their oily fluids? In all artesian wells the water rises to the hight of the fountain head, and the same law must prevail in petroleum wells. May not the reservoirs of the petroleum spouting wells be situated far above the level of the rocks where the oil is tapped in boring? The proprietor of a petroleum well near Parkersburg, Va., has assured us that the oil obtained in his well is of the very same character as that derived from the coal in its vicinity by distillation. It is a heavy oil, more unctuous than the common petroleum of Pennsylvania, and it is chiefly used for lubricating machinery. It is well known that oil of different qualities is obtained from different coal beds, and the petroleum of the United States differs in several characteristics from that of Canada.

Facts would appear to favor the theory that petroleum wells have two sources of supply, namely, coal beds and bituminous shales. In western Pennsylvania, Ohio, Michigan, Virginia and Kentucky, petroleum is usually found in the vicinity of coal seams, and it was a petroleum well in England, situated close to a coal bed, which suggested to James Young the idea of distilling coal at a low heat and obtaining oil therefrom. The commercial success of his efforts led to the very extended use of such oil, and finally to the very general application of petroleum for light.

This much may be accepted in favor of coal beds in certain localities being the sources of petroleum. On the other hand petroleum wells are found in Italy, Sicily, Syria, the Crimea, Persia, Siberia and Canada, very far removed from coal beds, but where there are bituminous shales, and this kind of petroleum differs frequently in several essential features from that which is found in coal regions. The Canadian crude petroleum far surpasses that of Pennsylvania for concentrated stench, and we can easily credit it with a lower, older and different origin.

Geologists who adhere to the idea that bituminous shales are exclusively the source of petroleum will be pleased to make a distinction between the source of the decent, clear oil obtained at Smith's Ferry, on the Ohio river, and that found north of the upper lakes. But whatever may be the source of petroleum and whatever theory may be the most plausible, it must be admitted that we are unacquainted with most of the operations of nature in the interior of the earth. The most important question is, will not our present sources of petroleum soon become exhausted? In answer to this it may be stated that petroleum springs have been known, and the petroleum used to some extent, for thousands of years. Thus, in the island, of Zante, in the Mediterranean, there are two springs which have been open many thousand years, and the more rapidly the substance is removed from the wells, the more powerful and prolific the springs become. If this has been the case with the petroleum springs of Zante, may it not be so with those on our continent?

Petroleum, or rock oil, may not always be a proper name for this peculiar substance. It is found in swamps and peat bogs as well as rocky strata. In the swampy forests of Borneo the Dyoks collect petroleum from the surface of ponds, but all the flowing wells in America have been sunk to a considerable depth in rocky strata.

VALUABLE RECEIPTS.

Case Hardening Iron.—The hardness and polish of steel may be united, in a certain degree, with the firmness and cheapness of malleable iron; by case hardening, it is a superficial conversion of iron into steel.

The articles intended to be case hardened, being previously finished, with the exception of polishing, are stratified with animal carbon, and the box containing them luted with equal parts of sand and clay. They are then placed in the fire, and kept at a light red heat for half an hour, when the contents of the box are emptied into water. Delicate articles may be preserved by a saturated solution of common salt, with any vegetable mucilage, to give it a pulpy consistence. The animal carbon is nothing more than any animal matter, such as horns, hoofs, skins or leather, sufficiently burned to admit of being reduced to powder. The box is commonly made of iron, but the use of it, for occasional case hardening upon a small scale, may easily be dispensed with, as it will answer the same end to envelope the articles with the composition above directed to be used as a lute; dry-it gradually before it is exposed to a red heat; otherwise it will probably crack. The depth of the steel induced by case hardening, will vary with the time the operation is continued.

A very speedy and most excellent method of case hardening, is effected by reducing some of the prussiate of potash to powder, and making it into paste, rubbing over the finished iron while it is at a red heat, and then putting it in the fire again, and plunging it into water when the iron is at a blood red heat. Another method consists in covering the polished iron with a paste of the prussiate of potash and flour, allowing it to dry, then placing it in a clear fire until it becomes red hot, when it is plunged into cold water. This may be repeated, to insure a greater depth of hardening.

Enamelling Cast-Iron Vessels.—Reduce into fine powder and grind together nine parts of red lead, six parts of flint glass, two parts of purified pearlash, two parts of purified saltpeter and one part of borax. This is put into a large crucible about half full and melted until a clear glass is obtained. This glass is then ground with water and the cast iron vessel is covered with a coating of it and then heated in a muffle in a furnace. This will melt in a very short time if the furnace is at a good heat, and the cast-iron vessel will be covered with a very fine black enamel of a shining appearance. To make it tough, it should be put into an annealing oven.

Another very fine enamel for iron vessels is made as follows: Twelve parts of flint glass, four parts of pearlash, four parts of saltpeter, two parts of borax and three parts of the oxide of tin calcined with common salt. This is treated the same as described above and makes a white enamel.

The cast-iron articles to be enameled are scoured bright with sand and dilute sulphuric acid, then dried and the enamel paste put on with a brush, or poured on the surface, and the excess dripped off. This paste is dried slowly in the air, and the articles baked in a hot oven until the paste fuses. The heat is gradually raised to the melting point.

The *Desert News* states that a cotton mill has been built at Parowan, in that Territory, and that some of the machinery has been put up and is now running. A considerable quantity of cotton is now raised in southern Utah, and it is for its manufacture into cloth that this factory has been constructed.

The *Lake Superior Miner* states that the National Copper Mine, at Ontonagon, produced 51 tuns 1,375 lbs., during the month of May last.

Correspondence

OUR SPECIAL CORRESPONDENCE.

The Van Nest Gap Tunnel—The beauty of New Jersey Scenery—A Subterranean Tour and an Awful Report.

Oxford Furnace, N. J., June 15, 1862.

Messrs. Editors:—At 8 o'clock yesterday morning I left Jersey City, for a trip to this delightful region, to examine that great engineering work, the Van Nest Gap Tunnel, and to see some practical experiments with Wiestling's new blasting powder. Taking the cars of the New Jersey Central Railroad, I proceeded to Hampton Junction and thence by the Warren Railroad to this place. I have traveled all over the United States, from Maine to California, and from Michigan to Texas, and I know of no finer region than this portion of New Jersey through which I have just passed. Beginning quite level in the eastern portion, it gradually becomes more rolling, and in the Western part of the State the road winds among high hills and mountains. All the way the land is well cultivated, and the country shows that it is inhabited by an industrious, thrifty and prosperous people.

At this station I found Mr. Wiestling, the managing partner of the firm, who have cut the Van Nest Gap Tunnel, waiting for me with his carriage, and we were soon whirled up the side of the mountain to his head quarters at the work. The Warren Railroad is the New Jersey portion of the Delaware, Lackawana and Western Railroad, which was built for the purpose of bringing coal from the Lackawana mines in Pennsylvania to the New York Market. Near the western edge of New Jersey it passes over a chain of high hills, at the Van Nest Gap, and as it was desired to carry the road 165 feet below the surface, it was necessary to cut a tunnel. The contract for the tunnel was taken by McAlister and Wiestling, the former now a Colonel in the army, and the latter a young civil engineer, who has had the principal charge of the work.

After a good dinner, ending with a feast of delicious strawberries and cream, Mr. Wiestling and myself prepared for an inspection of the tunnel. You are probably aware that Philadelphians always call india rubber *gum*, and Mr. Wiestling arrayed me in a gum coat, gum boots and gum overalls; while he put on his dress, made expressly to wear in the tunnel. Riding down to the west end of the tunnel, the carriage was sent round to the eastern end to take us home, when we should emerge. Mr. Wiestling lighted the miners' lamp on the front of his hat, and wading in the shallow water between the high sides of the open cut, we passed beneath the rocky arch into the darkness of the tunnel. There is a short curve at the west end, and as soon as we had passed this, we saw far before us lights dancing about, and heard the click of hammers from the workmen who were giving the finishing blows to their labor of eight years. At the same time we could see a glimmer of light coming through from the east end, and looking back, the vapor about the mouth of the tunnel was illuminated with a soft radiance by the declining sun; the whole forming an impressive and novel scene.

The whole tunnel is cut through scienitic granite, but while the rock in the east half is exceedingly hard and solid, that in the west half is in process of disintegration; making it necessary to protect this portion by an arch of masonry. Springs of water are oozing through cracks and seams in the rock, keeping the tunnel constantly wet, and down one of the shafts a stream is pouring as large as a man's arm. It has been not only a great, but a very damp and dirty job. The excavation is now completed, and besides the workmen employed on the masonry arch, only one gang is at work, and they are cutting a support for an arch which is to be turned in one of the shafts to prevent any thing from falling down the shaft into the tunnel. We climbed up the long ladder to the platform on which this gang were at work. They are all English miners, and each one had a miner's lamp hung on the front of his hat. They were busy drilling holes in the rock for blasting out a skew back, as it is technically called, on each side, to receive the foot of the arch.

Coming down from the dripping platform, we waded along a little nearer the eastern end, where Mr. Wiestling had caused a number of holes to be drilled in the rock to show me the operation of his newly invented powder. Workmen were ready to load the holes, the charge was thoroughly tamped, and we went onward a few yards to be out of reach of the flying fragments. The match was applied, and after a minute's suspense the explosion came. It is possible that Sir Walter Scott might have given some idea of that report, but it is beyond the descriptive power of my pen. I never heard the Crack of Doom, though I have listened to Ralph Waldo Emerson talking about it in his clear tenor, but I imagine if ever I do hear it, it will bear a close resemblance to the firing of a blast in a railway tunnel. I first felt myself moved sideways about two feet, and at the same instant my ears were crushed and my whole frame was enveloped and shaken by a power of sound more tremendous than anything of which I had ever formed any conception. Then followed the reverberations, more penetrating and overwhelming than those of thunder, or any other echoes ever heard by mortal ears. The awful operation was repeated half a dozen times, and it was to me a new experience which I shall not soon forget.

The Van Nest Gap Tunnel is 3,020 feet long, 26 feet wide in the clear, and 20½ feet high. These are the finished dimensions, and in that portion of the tunnel which is arched the excavation of course had to be much larger. In the progress of the work three shafts were sunk, one 75 feet deep, one 165, and the other 110. At each shaft a steam engine was employed to pump out the water, and raise the rock. The work was commenced in 1854, and has cost about half a million of dollars.

The experiments with Wiestling's powder were perfectly successful, as has already been stated in the Scientific American. One of the holes chanced to be crossed by an obscure seam, and in this case the powder blew out through the seam, but where the rock was solid the effect seemed to equal that produced by gun powder; showing the harmlessness of the new powder when not confined, and its effectiveness when thoroughly inclosed. B.

A Fatal Boiler Explosion.

Messrs. Editors:—I yesterday visited the scene of the late boiler explosion of the iron works of Lazell, Perkins & Co., in Bridgewater, Mass., by which six persons were instantly killed, one mortally wounded and many others more or less injured. The boiler was located in the forge shop directly over one of the forge fires and by which it was heated. It was used in connection with another boiler, principally to drive a large steam hammer. It was a horizontal flue boiler 24 feet in length by 4 feet in diameter, with two 15-inch flues. It had been in use but about three years, and was considered as good as any boiler in the works. The force of the explosion was such that the entire end of the large forge shop, together with a greater portion of the roof of that wing was totally demolished. A piece of the boiler, containing 40 or 50 square feet, was lodged in a grove 50 or 60 rods distance, and near the same place was an iron rod 30 or 40 feet long, twisted in among the tree tops like a grape vine. The boiler was ripped and torn in every direction, both at the joints and through the solid plate, as if it had been of paper, while the flues were collapsed for more than half their length as if they had been of sheet lead instead of strong iron. The boiler plate appeared to be of uniform good quality throughout. The only defect I could find was a bad weld in one of the stays, but which was not sufficient, in my opinion, to account for the explosion. It is evident that at the instant of explosion there was, from some cause, a tremendous development of elastic force, the boiler being rent and torn in strong and weak places indiscriminately. No simple over pressure of steam could effect this. Some have attempted to account for it by the decomposition of the steam and subsequent explosion of the hydrogen. But the steam could have been decomposed only at a temperature at least equal to that of red-hot iron, and the oxygen would unite with the iron and the free hydrogen could only explode when it found a combining equivalent of oxygen, which it could not do in the boiler.

From the best evidence I could obtain, and after a careful examination of the collapsed flues, I think this case can be satisfactorily explained without calling in any gas, electrical or any other unknown theory.

While the steam hammer was running, it was usual not to have the pump on the boiler as it deadened the steam. At the time of the explosion the hammer had just been stopped to give the iron a fresh heat. It is probable that while the hammer was running the water had gradually fallen below the upper parts of the flues. The upper side of the flues being intensely heated, and consequently weakened, was crushed down, and the arch of the flue being destroyed, they very readily collapsed, and the act of collapsing plunged the red-hot iron under water, thus causing the sudden generation of steam sufficient to produce the effects described above. Stephen Moore.

Natick, Mass., June 26, 1862.

Is Petroleum Injurious to Health?

Messrs. Editors:—Will you allow me to suggest the expediency of an article in your valuable journal upon the elements of petroleum, and the oil produced from it, upon the health of those engaged in it. The whole business being new, and a large number of refineries having been located in and about cities, and in many places the people having imbibed the idea that the odor arising from these refineries is prejudicial to health, an article giving an analysis of the crude and refined oil, and showing the effect of refineries upon the public health would be both instructive and useful. And in this connection it may be proper for me to say, that throughout the entire oil regions of Pennsylvania and Canada, where some ten thousand people are constantly engaged, and some of them literally drenched in the fluid, a healthier set of men cannot be found in America. It is also a fact that those engaged in refineries are proverbially hale and hearty, and even among uneducated physicians, and especially the common people, who live in the vicinity of these works, a restless anxiety prevails lest their health will become unfavorably affected. This idea, it is true, is lessening, but still it prevails to a large extent. I understand that Dr. Jackson and other chemists of Massachusetts, have written upon the subject, but no publicity has been given to their writings. I hope it may engage your attention. It will require but a brief article to set the country right in the premises. B. Hughes.

[The inquiry into the effect of any substance on the health of a community is perhaps the most difficult investigation that has ever been undertaken. There are so many causes of disease that some of them are sure to come into the experiment and vary the results. Petroleum is composed of hydrogen and carbon, though it frequently contains sulphur and other impurities in very small proportions. We have no idea that it is injurious to health in any perceptible degree.—Eds.

Coal Oil as a Lubricator.

Messrs. Editors:—In connection with an article on lubricating oils, in a number of the Scientific American a few weeks since, I would remark that it will be to the interest of a great many of your readers to know that such an oil is manufactured in Cleveland, Ohio, (and probably in other establishments at the East) from the crude ground oil, after the kerosene has been extracted. I have used it on my engine and all other machinery for three years, and find that it surpasses all lard and other lubricating oils to be found in our best country stores, or, all that I was ever able to obtain, while it costs only 25 cents per gallon. I saw it used two years since on all the locomotives of the Michigan Central Railroad, and their cars, on a trip West. The engineer, with whom I conversed about the oil, objected to it only on account of its greenish dirty color. It is very slow and requires large discharge spouts. I surmise that it is not fit for cutting screws, but for bearings, &c., it equals the best oils that are called pure. This is a matter of real experience. H. Lampert.

Nunda, N. Y., June 24, 1862.

Worcester's Improvement in Pianos.

Messrs. Editors:—I beg permission to correct the wording of a sentence that appeared in your otherwise accurate description of my Hinged Plates for Pianofortes, printed and illustrated in your paper of this date, since a wrong impression is conveyed concerning an essential point in the invention. In the fifth paragraph of the article above named, you remark that "By this arrangement the vibration of the strings is imparted to the piece, *b*, prolonging the note," &c., &c. It should have read thus: "By this arrangement the vibration of the strings is imparted to that portion of the sounding board extending under the plate, or in other words to the entire sounding board." By hinging the plate I have merely freed the board and strings, the slight vibration or motion of the detached piece, *b*, (see engraving last week) aside from this fact is of no musical importance whatever, as a little reflection will show any one acquainted with the mechanism of the instrument. H. Worcester.

New York, July 5, 1862.

Varnishing Picture Frames.

Messrs. Editors:—I had occasion lately to varnish some picture frames of pine cones, acorns, &c., that would not bear brushing much, so I made the lac varnish very thin with alcohol, laid the frames on a board, and threw the varnish upon them from the brush, making them look nicely. E. I. A.

Steamboat Propelling Experiments.

A correspondent has sent us an account of some experiments made at Tidioute, Pa., to test a new system of propelling for flat boats of very light draft, to be used for towing on shallow rivers. It was tried on an old boat called by the new name, *Locomotive Steamboat Pioneer*. The driving wheel is like a cart wheel, 12 feet in diameter with projections on the tire. It is sustained by a frame composed of three sides of a parallelogram, the short side crossing forward of the bow, and the long sides reaching back each side of the boat to points directly in line with the engine shaft, and there held by bolts on which the frame can rise and fall. Two timbers, 18 inches apart, run forward from the front side of the frame to sustain the wheel. Such is the base of the frame. Posts, braces, rods and bolts complete it. The frame and wheel may then be raised and lowered past the bow of the boat in an arc of which the engine shaft and bolts are the center.

The driving power is then applied as follows: A rim of endless chain teeth 9 feet in diameter is bolted into one side of the spokes. Another endless chain wheel 16 inches in diameter is placed in line with this on the engine shaft. The chain does not pass direct from one of these wheels to the other, but over friction wheels in the top of posts rising from the frame at the bow. The engine shaft then operates the driving wheel and propels the boat.

This method of steamboat propulsion was patented by J. W. Wetmore, of Erie, Pa., in 1857. The boat has been tried for towing flat boats loaded with petroleum. She has towed three flat boats loaded with 227 barrels of oil, from Tidioute to Irvine, Pa., (14 miles), in about five hours. Each flat boat is about 75 feet long and 12 feet wide. The current in the severest rapids on the river is about ten miles an hour, and in the lower stages of the river can not be ascended by paddle-wheel boats at all. There are 16 projections on the tire of the driving wheel to prevent it from slipping. These are seven inches long, and made of chilled cast iron. The same boat failed as a stern-wheel propeller, as it required four horses besides her engines and wheel to bring her up the rapid current from Tidioute to Irvine.

In Chicago, an extensive iron-working establishment is now being erected by Messrs. Charles Kellogg & Co., of Detroit. These new iron works are to be devoted to manufacturing iron and railroad bridges, engines and machinery, and other iron work, and they expect to have the establishment in full blast in less than a year from the present time. They have just completed for Ward's Iron Rolling Mills, in Chicago, two immense Nasmyth steam hammers, each striking blows of 70 tuns, and under, as may be required.

The Boston *Commercial Bulletin* states that T. F. Wells, of that city, has completed a contract with the government to raise the vessels which have been sunk at the Gosport Navy Yard and in Hampton Roads. Altogether there were 13 vessels sunk. The contractor is to receive 45 per cent of the value of the vessels as salvage.