GREAT CRUCIBLE-CLAY DEPOSIT IN MISSOURI.

Glass has been defined as the silicate of potash, but this definition is not sufficiently comprehensive. Glass is generally a double silicate, a combination of silica with two or more of the metallic oxides, potash, soda, lime and red lead. The silica is usually obtained in the form of sand, which has been produced by the slow grinding of quartz rock, by the action of waves, or other natural agencies. This is thoroughly mixed with the metallic oxides and the mixture is placed in a clay crucible, where it is subjected to a heat so intense as to be fused, when the several substances enter into chemical combination, and become glass. The pots are set in circular furnaces, and are so formed as to exclude the flames from contact with their interiors, openings being provided through the walls of the furnace for introducing the materials and removing the glass when it is melted. The crucibles are in the form of a cocoanut dipper, elongated and inverted, closed at the bottom, but having an opening near the top provided with a neck to enter the hole in the furnace wall. They vary in size, but are usually about four feet in diameter and four and a half feet high. They stand in a circle around the interior of the furnace, and are entirely surrounded except the bottom and narrow opening, with flames of the most intense heat, the heat to melt the glass passing through the thick walls of the crucible; though for some kinds of glass the crucibles are made open.

When a pot cracks it is very apt to cause the cracking of others, and the placing of a new pot in lieu of a broken one, is one of the most difficult and trying operations known in any of the arts. The wall of the intensely-hot furnace is broken open to admit the removal of the old pot, the new crucible is taken at a red or white heat from the annealing furnace, and trundled on an iron carriage to its place, where it is nicely adjusted in position, and the wall is then rebuilt around it with brick and mortar, which are manipulated by means of long-handled shovels and trowels.

The evils resulting from the cracking of a pot being so great, every precaution is adopted to make the disaster as rare as possible. The clay is kneaded and re-kneaded, the labor of a whole week being expended upon the formation of a single pot; after the crucible is formed it is set in a warm room to dry for several months, some manufacturers continuing the drying for more than two years; before being set in the furnace it is placed in an annealing chamber, where, by a gradual increase of temperature continuing for several days, it is slowly raised to a white heat, and it must be set in the furnace while in this condition.

With this great importance of the quality of a crucible, of course the utmost attention is given to the material of which it is formed. The properties required in the material are perfect infusibility and the greatest possible exemption from liability to crack. The desired infusibility is found in pure clay —the silicate of alumina—but this is decomposed at a high temperature by lime, the silica leaving the alumina and entering into combination with the lime to form a silicate of lime, which is easily melted. Clays, therefore, which contain lime, are worthless for making glass pots. But the most troublesome substance is sulphide of iron; where this is present, sulphuric acid is formed, and this dissolves the alumina. So serious is the difficulty from this source, that some English establishments have the clay rolled out in thin sheets upon tables, and men are employed to pick out, by the aid of magnifying glasses, every minute speck of iron pyrites.

Heretofore the clay for crucibles has been imported by all our glass works either from Germany or from Stourbridge, in England; it is worth $25 per tun in gold in this market, and a single manufactory will consume 300 tuns a year. But a large deposit has been found near St. Louis, in Missouri, which from analysis and practical trial is pronounced fully equal to the best English or German clay. This is another important step in the development of the mineral resources of the country.

The owners of this clay bed are J. L. Smith & Co., of St. Louis, and the agent for the Eastern States is H. T. Malcolmson, of No. 40 Murray street, New York.

The Artesian Well in St. Louis.

Most of the residents of St. Louis know where the artesian well is situated—on O'Fallon, above Lewis street—and have drank of its waters. This well was commenced in the spring of 1849, by Messrs. Belcher & Brothers, for the purpose of procuring water for the use of the refinery. At first, the bore was but nine inches in diameter, and the process of boring was carried on by hand for eighteen months; but as the rock became hard to penetrate, at the end of that time only two hundred and nineteen feet of rock had been bored through, and the total depth of the well was but two hundred and forty-nine feet.

In September, 1850, steam power was first employed, and used to the termination of the work, and the boring was continued until Feb. 7, 1851, with such intermission only as was requisite for repairs. During this time (five months) forty-two days were lost, and 208 feet of rock were pierced, and the total depth of the well was then 457 feet. From Feb. 7, 1851, till Sept. 29, 1851, the work was suspended.

At the latter date the work was again commenced with a 3½-inch bore, and continned till March 22, 1852, the boring during the time being carried on night and day from Nov. 18, 1851. March 22, 1852, the well had reached a depth of 1,351 feet, and, during the period of nearly six months, 894 feet had been penetrated. From March 25, 1852, to April 30, of the same year, was taken up in widening the bore of the first 80 feet of the well from 9 to 16 inches in diameter, which, accomplished, a large pump was inserted, with a view of determining the quantity of water then furnished; but the results of the experiment proved unsatisfactory. From Sept. 1, 1852, several weeks were employed in widening the 3½-inch bore of the well to 5½ inches, from the depth of 457 feet to that of 1,050 feet, which had proved a source of great trouble, and in a measure prevented the prosecution of the work.

Jan. 6, 1853, the prosecution of the work was recommenced with a bore of 3½ inches in diameter, and continued up to March 11, 1855. During this time (fourteen months), though 120 days were lost in making necessary repairs, it had sunk 848 feet deeper, making its total depth 2,197 feet. Since Aug., 1856, the first 456 feet of the well have been tubed with a 3-inch wrought-iron pipe, and, at the time of inserting this, it was found that water would rise to a hight of about 75 feet above the surface.

The boring was effected by a simple wedge shaped drill, the size of which varied according to the diameter of the bore. This drill was screwed to a wrought-iron bar, 30 feet long, and about 2½ inches in diameter, the total weight of which was about 600 pounds. To the bar was screwed a pair of slips, by which arrangement the drilling was effected by the weight of the bar alone. To this was fastened the poles, each 30 feet long (with male and female screws), made of two pieces of split hickory, joined and riveted in the center. To the last pole was fastened one end of a chain, the other end of which was attached to a spring beam worked by a steam-engine running with a speed of about eighty revolutions in a minute, and a stroke of fourteen inches. The boring apparatus was constantly turned by hand-power, and, for performing all the work connected with the boring, the labor of four men was, in general, daily required.

This well was finished at the expiration of thirty-three months' steady work, and cost $10,000. The depth of the Artesian well at Grenelle, France, is 1,797 feet. It was eight years in completion and cost $30,-000. The Louisville Artesian well is deeper than the St. Louis. What it cost, we are unable to state.

The water comes up through a twenty-inch cast-iron pipe, bolted thirty feet below the surface to the solid rock, and by means of a connecting pipe, is conducted outside of Belcher's sugar refinery, where the largest quantity of it passes into the sewer. A small pipe discharges into a box, and any one can drink of it, or carry any quantity away in bottles or jugs. Neither its quantity or quality has changed since it commenced to flow, and it discharges, according to measurement, 300 quarts per minute. It has a salty taste, and a strong odor of sulphur. In fact, so strong is the sulphur, that the white paint on the building near it has been turned blue. It is highly praised for its remedial virtues, and is visited daily by hundreds to drink of its water. The workmen in the refinery say that it is much pleasanter than ice water, and they feel better after drinking it.—*Dispatch.*

Clark on Steam Boilers.

Mr. D. K. Clark, author of the ablest and most practical work on the locomotive engine ever written, gives his views on the subject of the wear and tear of steam boilers in a letter to the *Engineer*. What Mr. Clark says about electricity and galvanism in connection with this subject, will be appreciated by every sensible person. We have generally found that when any one desires to make a display of knowlege about a matter he is ignorant of, he explains the mystery by something else he is equally uninformed upon. Mr. Clark's opinions are not liable to this imputation, for he knows whereof he affirms, and accounts for the frequency of disasters to boilers on mechanical grounds.

"Probably the most important practical inference to be drawn from the tests of the strength of riveted joints, is the explanation they supply of the failure, hitherto unexplained, of boiler plates, not at the joints, but in their neighborhood. We are aware that electrical and galvanic action are freely adduced in explanation. But these words have two meanings; they mean electricity and galvanism, and they mean ignorance and mystery. It is known that boilers fail by corrosive and other agencies eating into the plates on the inside, pitting and furrowing the surface. The pitting of the metal is readily explained by the presence of chemical agents in solution in the water, and the known inequality of substance of iron plates and bars, in consequence of which the metal is gradually but unequally separated and dissolved, and probably a weak galvanic circuit may be established between the iron shell and the brass tubes, accelerating the process of dissolution. But this explanation does not meet the frequent case of a straight, continuous furrow, cut like a groove upon the surface. Furrows are observed to be found parallel to, and close to, the riveted joints. Not in any case, that we are aware of, have they been found at any notable distance from a riveted joint, nor otherwise than parallel to one. The inference is inevitable that there is a relationship between them, and our conviction is, that the alternate tension and relaxation of the plates at the joints, as the steam is got up and let down, are attended by an alternate distortion—incipient, it may be—and resumption of the normal form, a bending and unbending of the plates on each side of the joint, in consequence of which the texture of the metal is gradually loosened in lines near to and parallel to joints, and it is thus laid open to corrosive action. On this interpretation the commencement of a groove or furrow, establishing a weak place and concentrating the action there, would suffice to extend and deepen it to the dangerous limits occasionally announced by explosions.

"The weakness attendant on lap-joints is strikingly exemplified in the lap-welded joint, when subjected to extreme tension; the tensile strength, though the metal at the weld is perfectly solid and fully as strong in itself as the body of the plate, is much below that due to the regular section of the plate. Here there is no elementary weakness in the reduction of metal by rivet-holes; the inferiority of strength arises solely from the bending of the plates on both sides of the lap, and the overstraining of the fire-box, in the endeavor to attain to the position of stability.

"The furrowing of lap-jointed plates reads an important lesson on the real and ultimately practical value of direct connection, and direct action in exerting, transmitting, or resisting forces.

"That the furrowing of the plates at the riveted joints results from the indirectness of the strain of the steam pressure, is rendered still more probable by the analogous furrowing which results from reciprocating strains of another kind. In the more ancient classes of engines, in which the cylinders are fixed to and work from the smoke-box plates, the alternate forward and backward strains by the steam pressure on the piston have been observed to weaken and to subject to corrosion and leakage the substance of the plate along the edge of the angle iron at the junction with the barrel. In further corroboration of this doctrine, Mr. Colburn states that he is not aware that any accidents from furrowing boiler plates have taken place in the United States; and we believe that their immunity from accidents arising from this source is to be ascribed to the use of very thin boiler plates—one-fourth of an inch to five-sixteenths of an inch in thickness."