The whole of the details of the apparatus we have described are very simple, and such as can be readily repaired or renewed. The arrangement has, as we have said, been successfully employed in the reconstruction of the Pont de la Bourre, at Nantes, each abutment of which rested upon 263 fir piles, averaging 15 in. square. These piles had to be cut off in a varying depth of water owing to the ebb and flow of the tides, and the average number of piles cut off per day was forty. The time actually occupied in cutting off a pile was only from three to four minutes, but much time was taken up in shifting the apparatus and adjusting it to cut off certain piles in the neighbourhood of the old masonry of the bridge. The number of workmen employed was six, namely, one carpenter in charge of operations, four labourers to work the saw, and one boatman to collect and remove the ends cut off. It is stated, however, that under some circumstances two men suffice to work the saw, so that in some instances the cost for labour would be reduced. To prevent delays two saw blades were provided for the apparatus, one being in use while the other was being sharpened. On an average each saw cut off forty piles—equal to a day's work—without requiring sharpening, cases in which the saw came into accidental contact with a nail or stone of course being excepted. The beams, MM, by which the whole apparatus is carried, may of course form part of a fixed staging, or, if more convenient, they may extend from one boat to another.

PILE SINKING WITH THE WATER JET.

PLATE XCIII.

ON Plate XCIII. is an illustration of Mr. Brunel's excellent process of pile sinking in sand by the use of a water jet, which some years ago enabled him so successfully to throw his Leven Viaduct across the treacherous sands of Morecombe Bay. The drawing is from a sketch taken on the shore at Southport, in Lancashire, where the process was adopted with equal advantage by Mr. Dixon, the contractor for the pier works there.

The modus operandi will be apparent at a glance. The columns, 9 in. in diameter and of $\frac{3}{4}$ in. metal, terminate in an extended base 18 in. in diameter, with a contracted opening of $2\frac{1}{4}$ in. This disc is provided with toothed edges and serrated flanges to scratch away any impediments, and cut through the layers of indurated mud and silt which here and there interpose and interrupt its progress. The column is clasped by moving guides on the face of an ordinary piling engine frame, and down the inside is run an iron tube, some $2\frac{1}{4}$ in. in diameter, protruding a few inches beyond the base. The upper end of this tube being brought round, it is attached by screw couplings to a flexible hose in connexion with powerful steam or hand pumps. The whole being duly placed in position, a couple of men are told off to keep the column in reciprocating motion by means of a lever clasped round it, and all being ready the pumps are set to work. The issuing jet of water blows up the sand, which is thus kept continually agitated, and down goes the pile into the hole thus formed, steadily lowered by the men at the winch, the ascending stream keeping the sand above "alive," and preventing it setting; but so soon as the requisite depth is attained, the pumps are stopped, the tube rapidly withdrawn, and the whole in the course of a couple of minutes is firmly fixed. The columns of the Southport Pier were all put down a depth of 15 ft. to 20 ft., the average time occupied in the actual process of sinking being but twenty to thirty minutes. Two or three were fixed in a tide, the bulk of the time being necessarily occupied in moving about the apparatus and machinery. Some of the piles were sunk from a raft, the process answering equally well under water as ashore. An experimental column, with a reduced disc, was sunk in less than twenty minutes to a depth of 20 ft., an accident in attaching fresh lengths alone preventing Mr. Dixon in all probability attaining the depth he aimed at, of 50 ft., in half an hour.

By no other process, that we are acquainted with, can