the wheels on each side of the machine, and keying them into the screws which are placed in a small hole excavated to receive them.

The engine is then set to work, and the piles screwed down as far as possible. The coppers holding down the cross beam are then removed, and the latter is raised by the donkey engine pumping into the cylinder in the centre of the machine, and lifted off the piles. The machine is then moved forward to the centre line of the next piles, and the operation takes place as before.

Should a pile meet with any obstruction, or be found fast enough without screwing down to the estimated depth, it may be either unscrewed by reversing the engine, or the shaft may be cut off to the right height, so that the cross beam may be lifted clear, a slide rest and tool holder being provided, which is actuated by the horizontal wheels.

At a trial of this machine, conducted in our presence at the maker’s works, two piles were screwed 10 ft. deep into stiff clay in 23 minutes, and withdrawn at the rate of 3 ft. in 2½ minutes with a mean pressure of 90 lb. steam in the boiler; and to test the efficiency of the cutting apparatus one pile was cut off in 29 minutes. The machine altogether does great credit to its designer, and from its great handiness and the rapidity with which it performs its work, it will no doubt recommend itself to those having to erect such structures as those for the carrying out of which it was specially constructed.

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APPARATUS FOR SAWING OFF PILES BELOW WATER.

The illustration on the next page shows a very simple arrangement for cutting off piles under water, designed by MM. Perdriel Frères, of Nantes, and which has been very successfully employed by them on the works necessitated by the reconstruction of the Pont de la Bourse in that city. The framework of the apparatus consists simply of the pair of upright timbers, A A, which are secured at their upper ends to the cross beams, B, and which are stiffened by the struts, b b, and tie rods, l. The timbers, A A, are 4 in. square, and are placed 2 ft. apart, while at their lower ends they are connected by the arched iron frame, C (see Fig. 4), which is so shaped at the ends as to form axes for the cast-iron pulleys, D D. These pulleys, each of which is furnished with a flange on one side, are 1 ft. 3 in. in diameter, and round them is passed a band saw, the ends, d d, of which are provided with hooks, by which it is connected to the tension rods, F F. These rods are attached at their upper ends to the beams, G, adjusting screws, K K, being provided for giving the saw the requisite tension. The beam, G, is 6 ft. 3 in. long, and it is provided at each end with a cross handle, g, of a length sufficient to enable it to be grasped by two men. The tension rods, F, are ¼ in. in diameter, and the points, K K, at which they are coupled to the beam, G, are 4 ft. 7 in. apart.

It will be readily understood, from the description already given, that by working the beam, G, by hand, a reciprocating motion will be imparted to the band saw, and it now remains to be explained how the rate of cut is regulated. This is done in a very simple manner. The beams, B, by which the whole apparatus is carried, have distance pieces secured between them at the ends resting on the timbers, M M, and at the underside, where the compound beam thus formed bears upon those timbers, it is slightly rounded, so that the whole frame is free to oscillate in a vertical plane. To the upper end of the timbers, A A, also, is attached the iron frame, m, shown in Figs. 1, 2, and 3, and by placing a plank over the cross bar of this frame, and with its end under the centre of the beams, B, the saw can be forced with any desired degree of pressure against the pile to be cut. In practice, the plank just mentioned is loaded to an extent necessary to produce this pressure, and the rapidity of the cut of the saw is regulated by the arrangement which we shall now describe.

This arrangement, which is shown clearly by Figs. 2, 4, and 5, consists of a pair of guide bars which extend from the arched iron bar, C, to the lower ends of the timbers, A A, and which are traversed by sliding brackets, Q, which serve to support the cross shaft, Q. This shaft bears against the pile which is being sawn,