showed three thousand yards yet to be removed before the level of eighteen feet was reached.

The character of this material was next to solid rock, as none of the dredges could make the slightest impression on it; neither the Osgood nor the powerful grapnel of Morris & Cummings. All the old harbor charts indicated this point to be a reef of rocks or boulders, subsequently covered by filling from the shore.

Under these circumstances, recourse was necessarily had to powder. Surface blasting was not resorted to because the locality forbade the use of heavy charges, which are essential for success. A surface charge of less than three hundred pounds would have been of no effect at all.

It was determined to make holes in the bottom of four or five feet in depth, by means of a six-inch iron pile, driven in and then withdrawn. Into these holes a cannister containing twenty pounds of powder was inserted by a driver, the pile-driver was then withdrawn, and the charge exploded by electricity. The result was, a small crater and the loosening of the contiguous boulders. Three such piles were used, twenty-two feet long, and shod with iron at point and head.

Two pile drivers were coupled together for this work, and a double gang of laborers employed day and night, under charge of Captain Scott. A week's practice reduced the matter to a system, and developed the kind of cannister to be used, the exploders and the battery. From the ordinary tin cannister we passed to lapwelded tubes, cut in lengths of two feet, and plugged at each end. They proved very effective, but the supply getting scarce, recourse was had to cast-iron shells, with sides one-half inch thick. These possessed the additional advantage of dropping to the bottom of the hole of their own weight. The average number of blasts made with one gang was thirty-five; the greatest delay, however, was experienced in withdrawing the iron piles from the ground, which frequently resisted the united efforts of two sets of triple blocks, worked by two engines.

The battery used was a small frictional machine, enclosed in a light rubber case, and supplied by the Oriental Co.