DESCRIPTION AND SPECIFICATIONS

OF A PLAN FOR A

LIGHT-HOUSE ON MINOT'S LEDGE,

NEAR THE ENTRANCE TO BOSTON HARBOR.

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HAVING long been of opinion that a permanent stone Light-House could be built on Minot's Ledge, that would be as convenient and durable as the Eddystone Light-House, or any other of the most permanent kind; and having carefully examined the Ledge since the disastrous occurrence to the iron pile Light-House, on that place; and having also examined the ledge called the "Inner Minot's," I have prepared, and propose the accompanying plan, which if Congress, in consideration of the lives and safety of a large class of our fellow citizens, and a vast amount of property, and the great pecuniary difference between supporting a Light-Boat and a common Light-House, should think proper to adopt, I am willing to enter into a contract with the Government for the erection of a building that shall be as permanent and durable as the Eddystone Light-House, before alluded to.

I find that a space sufficient for a base of only twenty-eight feet diameter can be obtained on the Outer Minot's, while on the Inner Minot's, a sufficient space at three feet above low tide, can be obtained for a Light-House of such size as may be desired.

The Inner Minot's bears about Southwest from the Outer Ledge, and is less than four hundred feet distant from the centre of each ledge; and from the security given it by the outer rock, and the

ample space it affords to build upon, I have prepared and adapted a plan for this ledge, as well as one for the Outer Minot's.

I find that by placing the Light-House on the Inner Ledge, a more convenient building can be obtained, besides a greater facility in landing; as the force of the waves is much reduced in passing the Outer Minot's, which lies directly in the line of all the severest storms we have on the coast, making a kind of natural break-water. And as there is a great depth of water on the Northeast side of the Outer ledge, even to within fifty feet of the rock, a light placed on the Inner Minot's would be sufficiently near the track of all vessels that go in and out of the harbor. The location, however, can be decided hereafter, as the cost of building from either plan would be about the same.

DESCRIPTION OF THE BUILDING.

The plan proposed for Minot's Ledge, on Outer Rock, is as follows: —The building is to be twenty-eight feet diameter at the base, commencing at low tide, and converging elliptically to the centre, to the height of twenty feet from the base, at which point it will be sixteen feet diameter. From this it will still continue to converge, gradually, to a point fifteen feet eight inches higher, being thirty-five feet eight inches above the base, and having a diameter of twelve feet six inches. It will then still continue to diminish *regularly* to the top of the stone work, at which place it will be ten feet diameter, and twenty-two feet from the last named point; making the whole height from low tide to the top of the stone work, fifty-seven feet. The perpendicular sides of the lantern will be seven feet ten inches, and to the apex of the roof, three feet six inches more; thus making the whole height to the top of the lantern, sixty-nine feet. The chimney and vane will also extend above this. The first twenty feet height from the base will be formed of solid hewn stone, bolted and hooped with iron, as hereafter described. On the top of this height, will commence a store-room or cellar, the walls of which will be two feet six inches thick, solid stone. This thickness will gradually diminish

to the top of the building, where the walls will be one foot six inches thick. The cellar will be eleven feet diameter, and seven feet six inches clear height. On the top of this cellar will be placed cast iron floor beams, covered with hard-pine plank one and a half inches thick. From the top of this floor will commence the first story, or kitchen; this room will be nine feet diameter, and seven feet two inches clear height; on the top of this will be laid an iron floor, the same as the one below; on the top of this floor will be a sleeping room, eight feet six inches diameter, and six feet ten inches high, in the clear; this also will be covered with an iron floor. Here another room will be built, eight feet diameter, and six feet six inches in height; on this will be laid another iron floor, on the top of which will be a store room for tools, rigging, &c. The windlasses for hoisting the boat, and the windlass for the provision crane will also be placed in this room. This will be seven feet four inches diameter, and six feet two inches high. On this room will be placed the covering of the tower, or lantern deck, consisting of four large stones, and projecting one foot all round the tower, to form the cornice. The lantern will be placed on this covering, and will be seven feet ten inches high, and seven feet diameter, with the requisite number of reflectors.

CONSTRUCTION.

The surface of the ledge is to be reduced as low as the tide will admit, and hammered to a perfect level; into this surface will be drilled eighty-four holes, three inches diameter, and from three to five feet deep, as the consistence of the rock may require, so that the bolts that secure the first course of stone to the ledge, will in all cases have, at least, three feet hold upon the solid parts of the rock. Into each of these holes will be inserted an iron bolt, two and a half inches diameter, extending to the bottom and projecting two feet above the surface of the ledge. On the top end of each bolt is to be cut a well proportioned screw-thread, and a proportionate sized nut is to be fitted to each bolt. The bottom ends of these bolts are to be made in the

form of a dovetail, being just large enough to fill the whole space at the bottom; the bolts are then to be secured in the hole by long and slender iron wedges, which will correspond with the sides of the bolts and sides of the holes, so as to have an equal bearing the whole depth. These wedges are to be placed all round each bolt, and the interstices that may be left are to be filled with hot brimstone and iron cement. Each of these bolts thus secured, would, according to experiments made upon the strength of iron, have a tension of one hundred and thirty-six tons; and as the whole eighty-four bolts are intended only to secure the bottom or first course of stone, it would require the enormous weight of *eleven thousand four hundred and twenty tons* to draw the bolts from the ledge, or to remove the stone composing the first course of the superstructure. This first course of the building consists of twenty-five stone, radiating from the centre, the outer layer of which will be in sixteen pieces, weighing between five and six tons each; the inner layers are of corresponding sizes, and all of them cut in a true and perfect manner; this and the nine following courses will be two feet thick each. In this first course, holes are drilled through each piece, to correspond with the position of the bolts inserted in the ledge; these holes will be two and three-quarter inches diameter; the nut to each bolt is then taken off, and each stone is lowered into its bed, the bolts passing through the holes prepared to receive them, and when the whole row is laid, and the space around each bolt filled with cement, an iron hoop, three inches wide and one inch thick, is to be placed over the outer row of bolts, and sunk in a groove in the stone, so as to lay flush with the surface. This hoop, being just large enough to enclose the outer row of bolts, is brought to its tension, by driving a wedge between it and the head of every bolt in the circumferance, thus answering the same purpose that an iron hoop does to a wine butt, and having a tension of seventy-five tons; the nut to each bolt is then replaced, and screwed down upon the top edge of the hoop, and upon the surface of the stone, every one of which will be secured by four of these bolts. In this first course, sixty-eight holes had been prepared to receive the bolts that are intended to secure the three next courses above, numbered two, three and four. These bolts will be eight feet long and two and a quarter inches in

diameter, having a large flat head at one end, and a nut and screw on the other; these bolts are passed through the bottom course, with the heads downward, before the stone is set; they are then cemented around the head and through the whole thickness of the stone, and are now ready to receive the courses for which they were designed. Each stone, having the requisite number of holes, is lowered into its bed, and the space between the bolts and sides of the holes filled with cement. This process being continued until the three courses are set, an iron hoop is then inserted in the top or last course, around the heads of the bolts, in the same manner as the hoop in the first course, and the nuts are replaced and screwed down. These sixty-eight bolts will have a tension of *seven thousand six hundred and sixteen tons;* to this is to be added the tension of the iron hoop around the heads of the bolts, equal to seventy-five tons more. The three next courses, numbered five, six and seven, are secured in the same manner, by fifty-six bolts, eight feet long and two inches diameter, having a tension of eighty-seven and a half tons each, or equal to *four thousand nine hundred tons*, while the hoop attached to the heads of the bolts, would be equal to seventy-five tons more. The courses numbered eight, nine and ten, are secured in like manner, by forty-eight bolts, eight feet long and one and three-quarter inches diameter, having a tension of seventy tons each, or equal to *three thousand three hundred and sixty tons*, with the iron hoop at the head of the bolts, equal to seventy-five tons more. This height brings the work to the top of the solid part of the superstructure, being twenty feet above low tide. The next four courses, numbered eleven, twelve, thirteen and fourteen, make the walls for the cellar, and are bolted together in like manner, by thirty-two bolts, ten feet long and one and a half inches diameter, having a tension equal to *fifteen hundred and seventy-eight tons*, and an iron hoop around the heads of the bolts equal to sixty tons more. The next four courses, numbered fifteen, sixteen, seventeen and eighteen, are secured by thirty-two bolts, nine feet eight inches long, and one and a quarter inches diameter, with a tension of *eleven hundred and twenty tons*, and an iron hoop around the heads of the bolts; these courses make the walls of the kitchen, or first story.

The courses, numbered nineteen, twenty, twenty-one and twenty-two, which make the walls of the chamber, are also secured in the same way, by thirty-two bolts, nine feet three inches long, and one inch diameter, equal in tension to *six hundred and seventy-two tons*, with the addition of an iron hoop. The courses, twenty-three, twenty-four, twenty-five and twenty-six, which make the walls of the bed-room, are secured in like manner, by thirty-two bolts, of the same dimensions as the last section, including an iron hoop, and having the same tension and power. The courses, twenty-seven, twenty-eight, twenty-nine and thirty, which make the walls of the windlass-room, are also secured in like manner, having the same number of bolts, and the iron hoop, and of the same size and tension as the two last sections; this makes the top of the tower, with the exception of the covering, which is to be in four pieces of stone, on which will be placed the lantern; this lantern will be an octagon, the posts of each section extending down through the stone covering of the tower, to the courses below, and sunk into the surface of the wall, and firmly bolted to the same; these eight parts having a shoulder or footing on the top of the stone covering, or lantern deck, being thus secured below, will answer the double purpose of securing the deck to the tower, and also permanently securing the lantern.

In estimating the strength of the bolts and hoops, I have taken the results of experiments laid down in books, from which it appears that the superstructure is secured to the ledge so thoroughly that it would require the enormous force of more than *eleven thousand tons* to draw it bodily from the rock; and I think that the consistence of the ledge is such, (considering the depth to which the bolts will be inserted,) as to resist the whole of their strength, and the whole superstructure being bolted and hooped together in a proportionate manner, renders it safe and secure against the most violent storm that ever occurred, even should the waves envelope the whole building, or if one half or three-quarters of the strength of construction be dispensed with, and this also, without taking into consideration the specific gravity of the materials of which the building is composed.

The building might be still farther strengthened by dovetailing the stone, and joggleing the courses, or by inserting a large iron shaft in

the centre, extending from the ledge to the top of the tower, and there secured by a heavy screw.

There will be an entrance to the several stories of the light-house, from the outside, except to the cellar. These entrances will be large enough to admit of barrels, &c., being hoisted in and out; the inside of which will have a sash-door, glazed with thick glass. These doors will be made to swing on the inside, while on the outside of each entrance there will be a strong iron-bound shutter, to be used only when there is a severe storm, or a great swell of the waves. There will also be two large bulls-eyes of glass to the cellar, and one to each of the stories above; these, with the sash doors, will admit sufficient light for the day-time, and the bull-eyes will be useful when the shutters are closed. Directly over the centre of these entrances, will be suspended from the deck of the lantern, a pulley, over which will pass a chain, which will be continued across the lantern deck, and pass down through the stone covering, on the opposite side into the upper story, to a windlass, which will be used for hoisting provisions, &c. Two other pulleys will also be suspended from the same place, one on the right hand, and the other on the left hand of the entrances, over each of which will be a chain, passing into the lantern, and through the deck to two windlasses in the same room; these windlasses and chains will be used for hoisting the keeper's boat to the top of the tower, or to such height as will secure it from the waves below. On the stone deck of the tower will be raised an iron frame, rising as high as the roof of the lantern, to which will be suspended a fog-bell. In the kitchen will be a cooking stove, with a funnel extending through the several stories to the roof of the lantern, passing out in the centre under the vane; into this funnel will be openings prepared in every story to receive the funnel of other stoves, as also the stove used in the lantern; there is also to be a continuous flight of iron stairs from the bottom of the cellar to the deck of the lantern; and there is to be a large scupper hole at the bottom of the cellar, extending through the wall, with a self-acting tight valve, which will be used for conducting the water from the sink in the kitchen, and also for draining any water that may get into the cellar.

The foregoing is only a general idea of the construction of the building; — many details are omitted which will have to be brought in if it should ever be erected.

The construction of the building adapted to the Inner Minot's Ledge is very similar to that for the Outer Ledge; it has, however, several advantages, such as being less exposed, the foundation of the building being three feet above low tide, with a much larger surface on the rock, more ample rooms for stores and family use, with space enough on the deck for the largest and most improved lantern now in use, its size and other proportions being such as to make it a superior building to what can ever be obtained on the Outer Ledge.