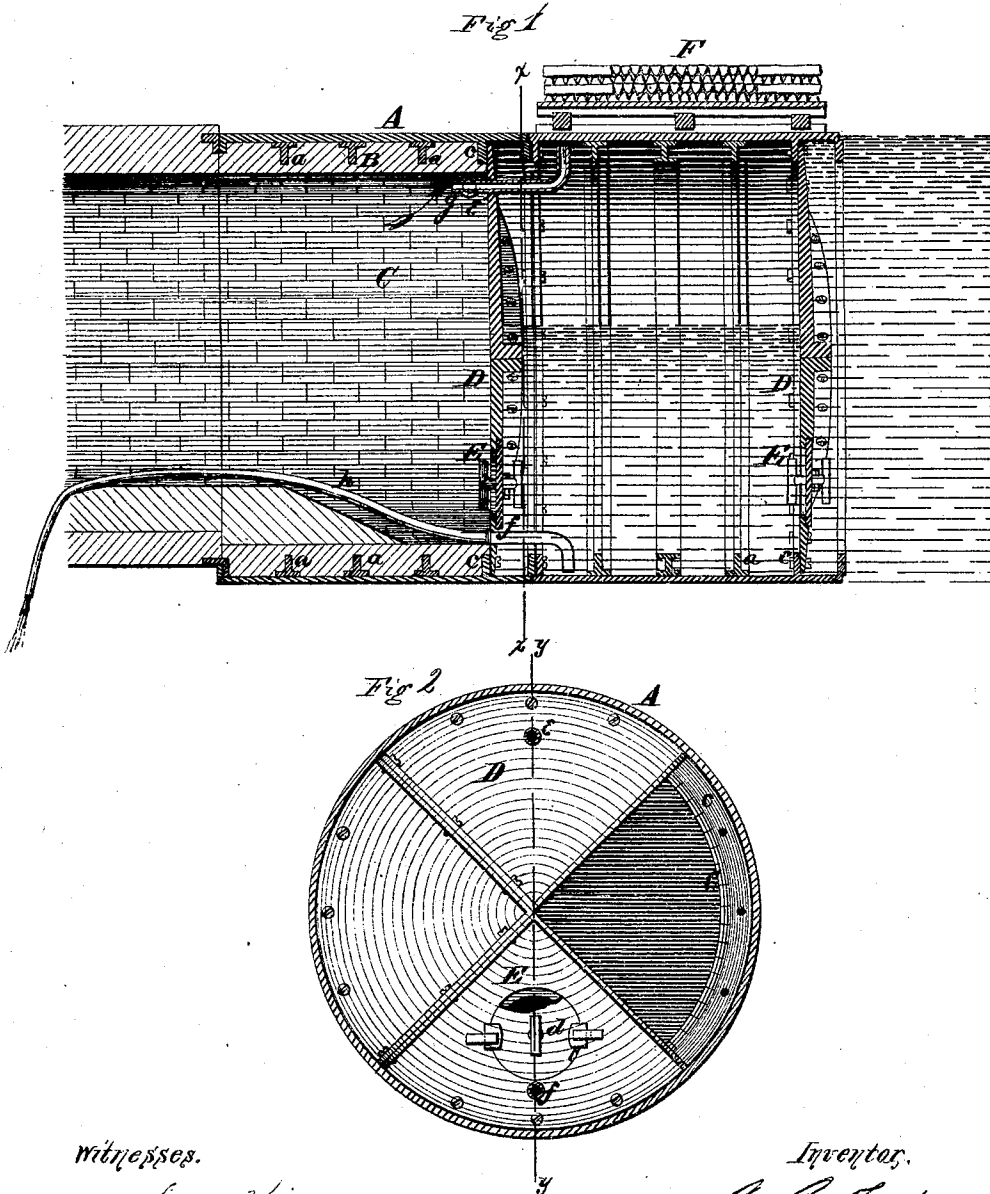


J. G. FOSTER.

Improvement in Constructing Sub-Marine Tunnels.

No. 124,045.

Patented Feb. 27, 1872.



Witnesses.

Harry King.

Phil. T. Dodge.

Inventor.

J. G. Foster
by Dodge & Munn
his attys.

UNITED STATES PATENT OFFICE.

JOHN G. FOSTER, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN CONSTRUCTING SUBMARINE TUNNELS.

Specification forming part of Letters Patent No. 124,045, dated February 27, 1872.

SPECIFICATION.

To all whom it may concern:

Be it known that I, JOHN G. FOSTER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Method of Constructing Tunnels, of which the following is a specification, reference being had to the accompanying drawing.

My invention relates to marine tunnels; and consists in a novel method of constructing the same in or upon the bed of a river or other body of water by means of shells or hollow metallic cylindrical sections provided with a movable head, as hereinafter fully explained.

In the drawing, Figure 1 is a longitudinal vertical section on the line *yy* of Fig. 2, and shows a portion of a tunnel in process of construction by the use of my hollow metal sections; and Fig. 2 is a vertical cross-section on the line *xx* of Fig. 1, and shows an end view of one of my metallic sections with a portion of one of the movable heads in place.

The object of this invention is to construct a tunnel either upon or partially or wholly in the bed of a river or other body of water, and in this way to avoid the expense and difficulty of tunneling under the bed. As is well known, when the bed is sandy, or of any porous formation, the running of the shaft under the surface is attended with great expense and many difficulties. And, again, when the water is very deep, it is also expensive and difficult to carry the tunnel under its bed, as well as to construct the approaches to it. By means of this invention, a tunnel may be constructed upon the bed of the river when the water is deep enough for that purpose; or, if desired, an excavation may be made of any desired depth, in which to place it, and in this way avoid the expense and difficulty of excavating under the bed and then constructing it.

In constructing a tunnel after this plan, after determining its location and making such excavation in the bed of the river, if any, as may be desired, the approaches on one side are made and completed; but before it reaches the water a short iron hollow cylinder or shell, A, having narrow bands B on its inner side, with projecting ribs *a*, is secured in its end, and a circle of brick-work or suitable masonry, C, is then built against the inner surface

of this cylinder, as clearly shown in Fig. 1. This mason-work is the continuation of that in the entrance or approach of the tunnel, and, in combination with the cylinder and its strengthening bands or ribs, makes the structure very strong. Near the other end of the cylinder is attached a head, D, so as to be movable. This head is made in four or more sections, so constructed that they can be united and bolted together, and then the whole be secured and bolted to a rib or flange, *c*, a short distance within the outer rib *a* of the cylinder. One of the sections of this head is provided with a man-hole and cover, E, so constructed and arranged that, when in place, it will be water-tight; and also that it may be removed by means of handles *d* from either side. There are also two small openings, *e* and *f*, one near the upper and the other near the lower side of this head, for a purpose hereinafter explained. All the joints of the head, as well as its connections to the cylinder, are made water-tight. After this cylinder, with its head, is properly secured in place, all necessary excavation on the end beyond the head for the attachment to it of a similar cylinder, A, with a similar head, D, is then made; and this similarly-constructed cylinder is then sunk in line with first cylinder, and arranged so that its outer rib, or its inner end, will adjoin the outer rib of the outer end of the first cylinder, and there held in place by weights F until secured to the first cylinder, which is done by a marine diver, who enters the outer man-hole, and bolts the adjoining flanges of the adjoining cylinders together, so as to be water-tight. This done, he returns through the man-hole, and secures that in place. An air-tube, *g*, is then introduced through the opening *e*, and a siphon-tube through the opening *f*, when the water is withdrawn from the second cylinder. After it is withdrawn, it is entered through the inner man-hole, and the inner head is then removed, and the mason-work is continued on into the second cylinder. The head thus removed is attached to another cylinder, which is sunk, arranged, held in place, and connected in the same manner; and in this way the work proceeds until the tunnel is completed.

It is obvious that the form of the iron shells may be other than cylindrical, if desired, as any other form possessing suitable strength

can be used. In this way, it will be seen that tunnels may be constructed in or upon the beds of streams, and in like manner, when there is a sufficient depth of water, they may be run across harbors, connecting their different shores, and without interfering with navigation. The method of construction is simple and comparatively cheap, while the tunnel made is strong and durable.

Having thus described my invention, what I claim is—

The herein-described method of constructing submarine tunnels, in which the sections, made each with a single removable head, D, having a man-hole therein, are sunk successively, held in place, connected, and emptied of water as shown and set forth.

JOHN GRAY FOSTER.

Witnesses:

J. MCKENNEY,
PHIL. T. DODGE.