

H. M. HAMILTON.

Improvement in Subaqueous Tunnels.

No. 131,437.

Patented Sep. 17, 1872.

FIG. 1.

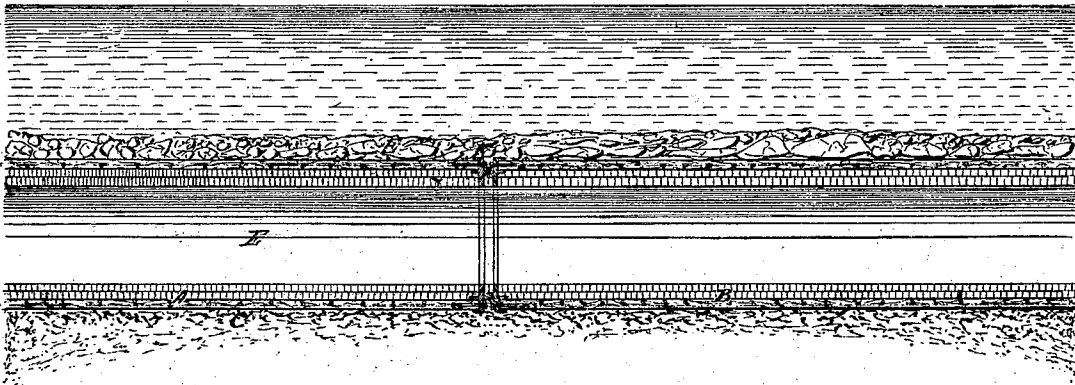


FIG. 2.

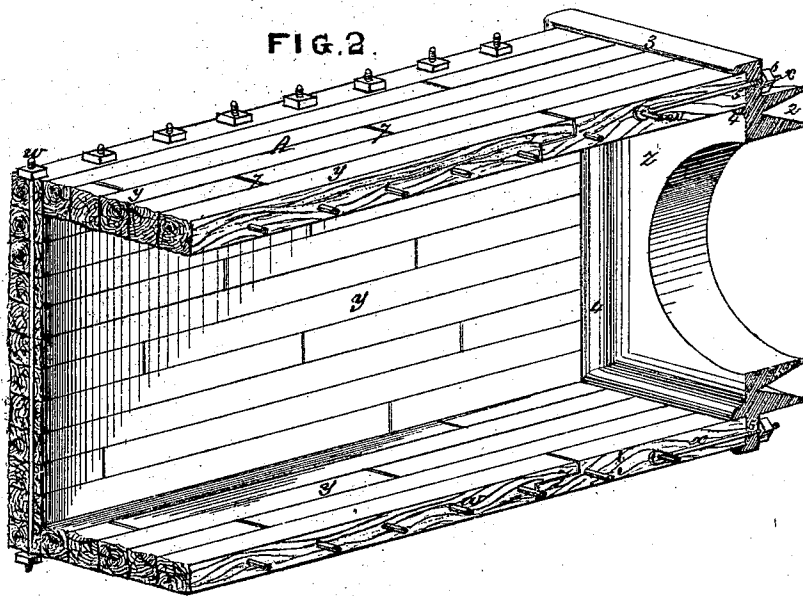
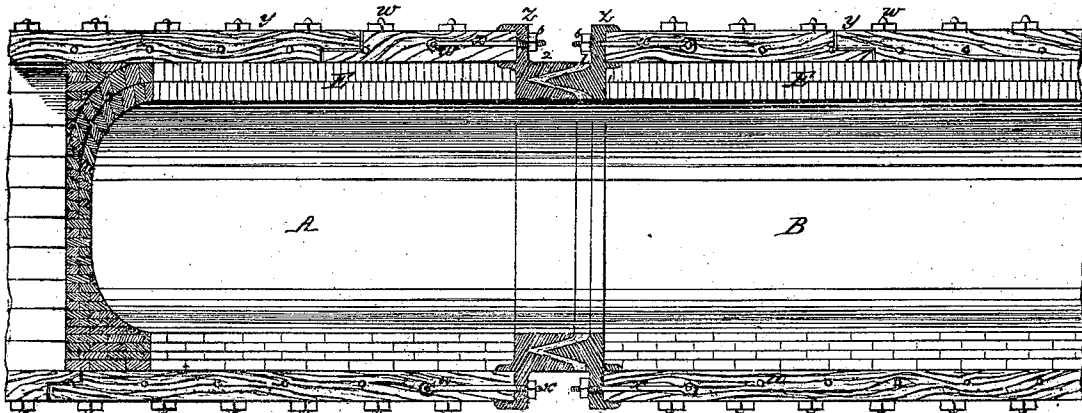


FIG. 3.



WITNESSES.

Geo. L. Swin
H. C. Elliott

INVENTOR.

H. M. Hamilton
By Knight & Sons attys

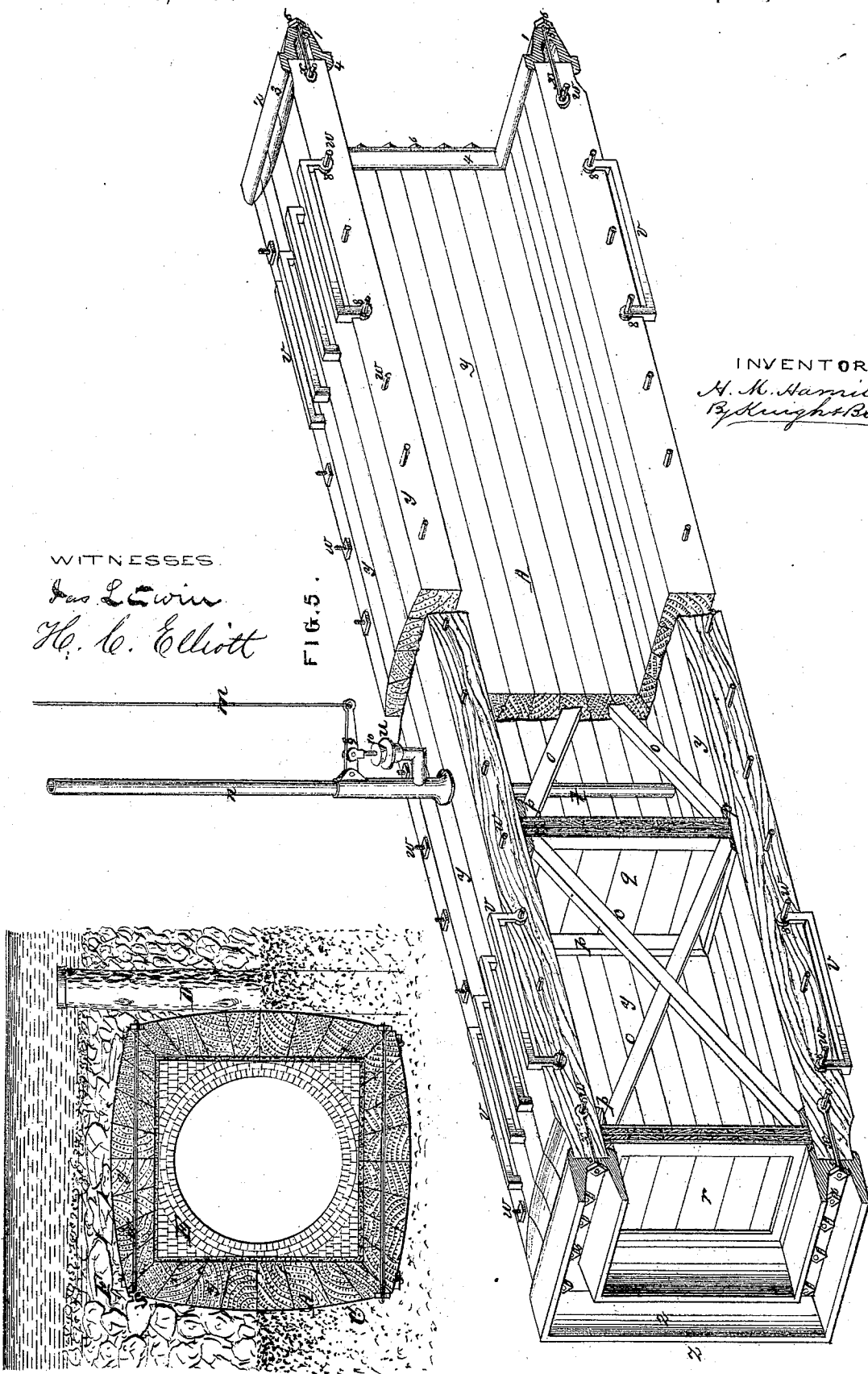
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WITNESSES.
Jas. L. Win
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FIG. 5.

FIG. 4.



UNITED STATES PATENT OFFICE.

HENRY M. HAMILTON, OF BLOOMFIELD, NEW JERSEY.

IMPROVEMENT IN SUBAQUEOUS TUNNELS.

Specification forming part of Letters Patent No. **131,437**, dated September 17, 1872.

To all whom it may concern:

Be it known that I, HENRY M. HAMILTON, of Bloomfield, in the county of Essex and State of New Jersey, have invented an Improved Subaqueous Tunnel, of which the following is a specification:

Nature and Objects of the Invention.

My invention relates to those subaqueous tunnels the shells or outer walls of which are built in sections on land, made air-tight, or sufficiently so to render them buoyant, then floated to place, sunk, connected, and anchored. The first part of my invention consists in making such sections with cast annular ends, and sides composed of longitudinal timbers bolted together, and thus securing an imperishable shell. My invention further consists, secondly, in the employment of cast-iron socket-joints, constructed as hereinafter described, in combination with tunnel sections or tubes of any suitable construction; thirdly, in applying staples for the attachment of hydraulic-jacks, to draw the sections together between the timbers, and attaching the same by means of the bolts employed primarily to unite the said timbers, thus securing an unbroken interior to the shell and dispensing with separate fastenings.

Description of the Accompanying Drawing.

Figure 1 is a longitudinal section of a tunnel illustrating the first part of my invention. Fig. 2 is a sectional perspective, on a larger scale, of one end of one of the sections of the same previous to floating; and Fig. 3, a longitudinal section, on the same scale as Fig. 2, of the adjoining ends of two sections thereof united, and finished with brick lining. Fig. 4 is a transverse section of a modified form of my tunnel, illustrating the first part of my invention. Fig. 5 is a sectional perspective of the two ends of one of the sections of the tunnel, shown in Fig. 4, prior to sinking, illustrating all the several parts of the invention combined.

Like letters of reference indicate corresponding parts in the several figures.

General Description.

To construct a subaqueous tunnel according to my invention I build, at any convenient

point, shell-sections A B, square, and of the requisite area in transverse section, and five hundred feet (more or less) long, using for the purpose cast-iron annular ends *z* and longitudinal timbers *y*, united by longitudinal bolts *x* and transverse bolts *w*. The ends *z* are adapted, by V-shaped projections and grooves on their outer sides, to interlock, and by inwardly-projecting flanges 3 4, or their equivalent, to receive and support the ends of the timber sides, and are perforated, 5, for the reception of the ends of the longitudinal bolts *x*, the nuts 6 of which are applied externally thereof. Their coupling-flanges may be circular or of other preferred shape, and within the line of the timbers *y* and bolts *x*, and the inside thereof flush with the interior of the finished tunnel, as represented in Figs. 1, 2, and 3; or said flanges may be in line with said timbers, and said bolts pass therethrough, and the inside be concentric with the timber sides, as represented in Figs. 4 and 5. The timbers *y* are preferably so shaped that each side of the section shall constitute an arch, as represented in Figs. 4 and 5, but may be square, as represented in Figs. 1, 2, and 3. Their abutting ends in the sides are scarfed, 7, and they are made to break joint, as represented in Fig. 2. They are further grooved to receive the longitudinal bolts *x*, which pass between them to the first transverse bolts *w*, and perforated coincidentally to receive the said transverse bolts. To provide holds by which to draw the sections A B together, I employ staples *v*, (see Fig. 5,) terminating in eyes 8, which are sunk or laid up in recesses between the timbers *y*, near the ends of the sections, and held by pairs of the transverse bolts *w* passing through the said eyes. Any sufficient number of these staples are employed, and they may be applied to either or all sides of the sections. One or more cocks, *u*, (Fig. 5,) applied to each section, provides for the admission of water to sink it, and a pipe or pipes, *t*, opening at the floor, means for discharging the water. These may be combined, as represented, or separate, and of any proper form, and may be applied before or after the sections are floated. The sections A B, otherwise completed, are made water-tight by calking. End bulkheads *r* and intermediate ones *q*, of any suitable construction, supported by cleats

p and braces *o*, or other sufficient means, are then applied—the outer to close the sections and the inner to form compartments, each compartment being supplied with more or less of the material required for the lining of masonry as ballast. The sections are then launched and floated to the site of the tunnel. This is prepared by dredging a bed, *C*, to receive the shell and sinking guide-piles *D*, which may be subsequently withdrawn. The sections are here provided with pipes *n*, connecting with the previously-applied internal pipes *t*, and cords *m*, connected, through levers *q*, or otherwise, to the valves 10 of the cocks *u*, these being adapted to reach to the surface in the sunken condition of the sections. The several sections are sunk separately by admitting sufficient water through the cocks *u*, being lightened, if necessary, by withdrawing more or less through the pipes *n*. They are suspended in this manner near the bottom, and there joined by hydraulic-jacks applied to the staples *v*, a lead or other packing, *l*, (Fig. 3,) having been first introduced into the joints between the sections. The connected shell is now sunk to place; the pipe *t* and cords *m* removed from the several sections; the cocks *u* removed or plugged; one or both land-connections made; the several compartments pumped out; the successive bulkheads removed; and a lining, *E*, of brick laid in cement, or of other material, built.

In the operations of floating and sinking the intermediate bulkheads *q* serve to prevent the displacement of ballast or swashing. This

is peculiarly important in sections of the great length I propose using. By the admission of water to or its withdrawal from either of the separate compartments thus formed—say, in joining the sections—the elevation or depression of either end of a section may be accomplished.

The shell, covered with a layer of mud and stones, *F*, is practically imperishable, as is demonstrated by the numerous specimens of wood which have remained thus embedded for ages. It is understood that the details of construction and use may be varied, and the several parts of the invention used independently.

Claims.

I claim as my invention—

1. A sectional shell for subaqueous tunnels, composed of cast-iron annular ends *z* and longitudinal timbers *y*, united by longitudinal and transverse bolts *x w*, substantially as herein set forth.

2. The cast-iron annular end pieces or socket-joints *z*, constructed with V-shaped tongues 1 and grooves 2, and employed in the manner and for the purposes herein specified.

3. In connection with the described wooden-shell sections *A B*, the staples *v*, secured by the transverse bolts *w* of the same, for the purpose set forth.

HENRY M. HAMILTON.

Witnesses:

RAYMOND WOOD,
RICH. STE. BROWN.