

J. W. Cochran.

Tunnel.

N^o 19,685.

Patented Mar. 23, 1858.

Fig. 3.

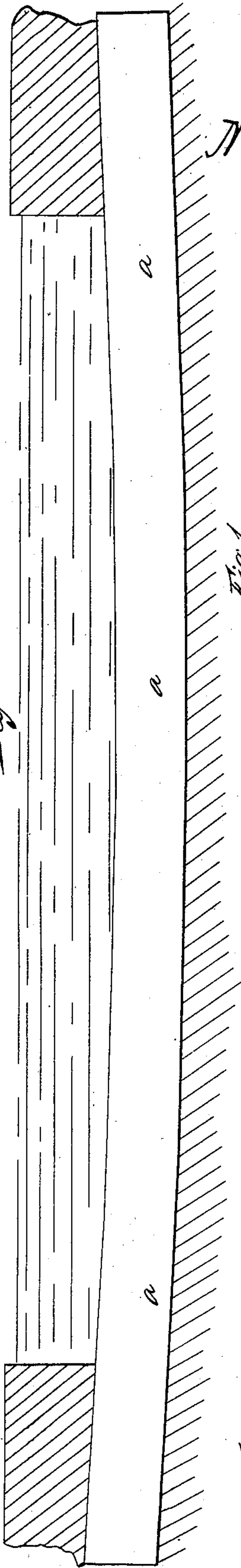


Fig. 1.

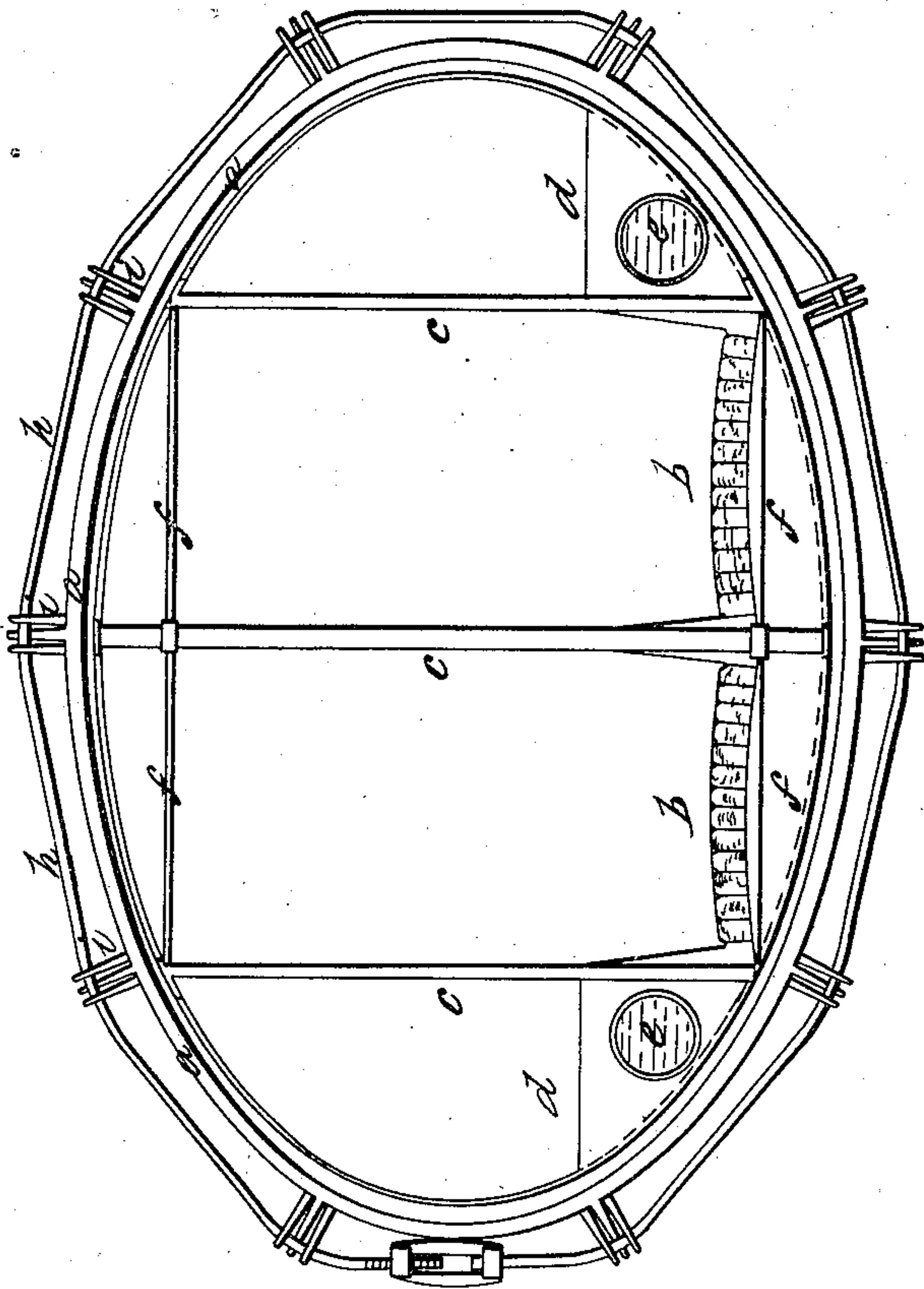
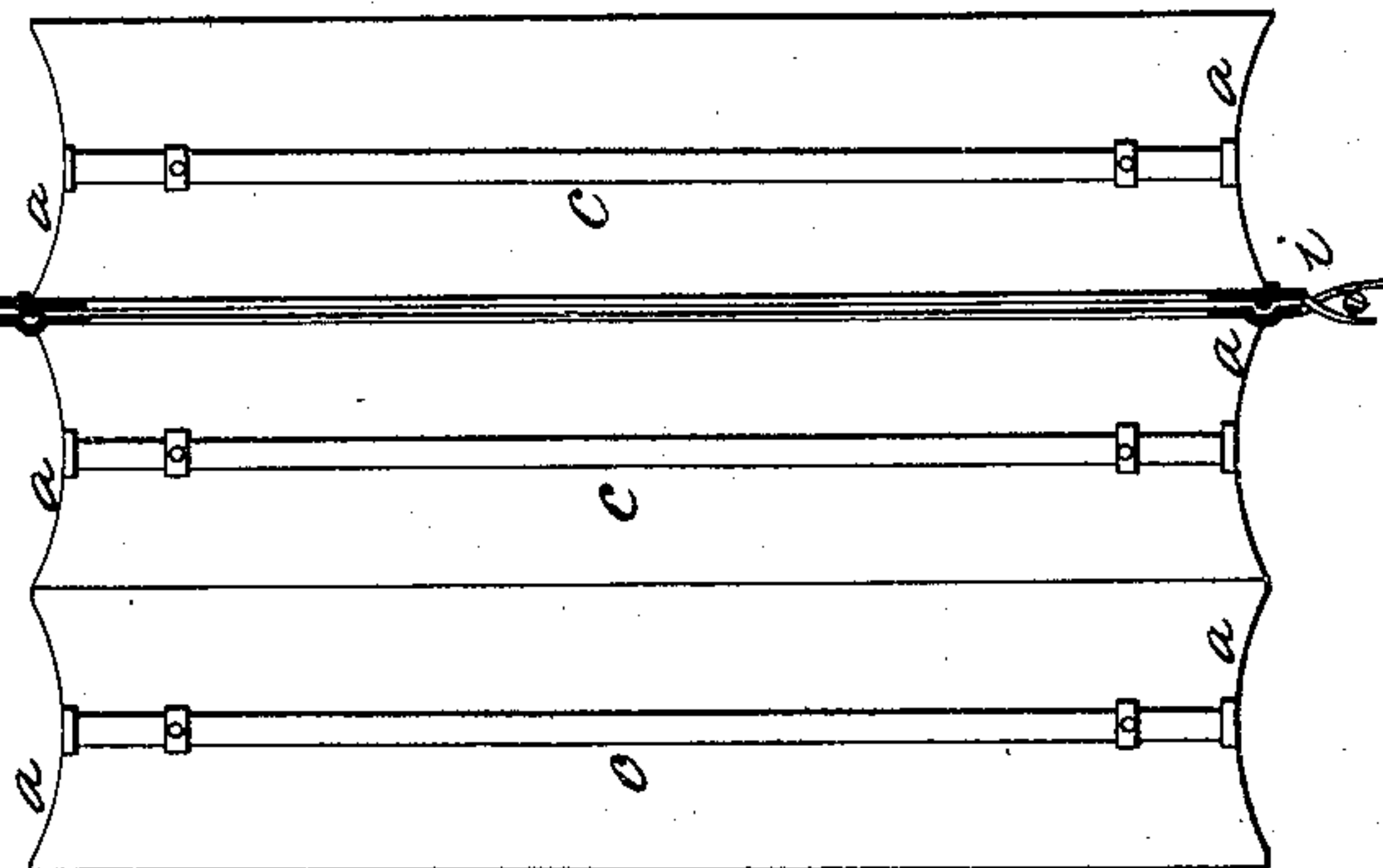


Fig. 2.



UNITED STATES PATENT OFFICE.

JOHN W. COCHRAN, OF NEW YORK, N. Y.

MODE OF CONNECTING THE SECTIONS OF METALLIC TUNNELS.

Specification of Letters Patent No. 19,685, dated March 23, 1858.

To all whom it may concern:

Be it known that I, JOHN W. COCHRAN, residing in the city, county, and State of New York, have invented a new and useful improvement in metallic tunnels, to be used for submarine or submerged tunnels, also for lining railway-tunnels instead of brick or other arching; and I do declare that the following is a full and exact description thereof, reference being had to the accompanying drawings and to the letters of reference marked thereon.

In constructing my tunnels I employ what I call a series of compound arches welded or riveted together by any well known process the said arches being internally braced in such a manner that the external pressure upon the tunnel shall act both as thrust and tension upon the said internal braces from whatever point the external force or pressure may be greatest.

To construct what I call a compound arch I take a wrought iron plate of any given dimensions and roll or form it into a trough of semi tube shape, longitudinally; in this shape I call the plate so formed, a simple arch, or inverted arch. If this plate thus formed is of sufficient length, for the purpose I roll or form it in such a manner as to bring the two ends together in the form of a hoop, ring, ellipsis or any other required shape or form and when the two ends are secured by rivets or welding I call the hoop or ellipse a compound arch, as it is arched both laterally and longitudinally. The edges of the hoop or ellipse are flanged or bent in such a manner that they will fit nicely and firmly into each other so that they may be welded or riveted firmly together water tight. This series of arches may be continued to any required length but if in submerged tunnels the series may be constructed in sections.

When the arches are being put together they are also braced laterally and vertically with wrought iron tubes or other material as before mentioned which is more fully shown in the drawings.

I propose to construct my tunnel for submarine purposes upon land or camels and launch it in any of the well-known ways and float the tunnel by its own buoyancy to the locality where it is to be submerged. A channel is there excavated in the bottom of the river in the earth of sufficient depth to receive the tunnel and to bring it to a suffi-

cient depth not to obstruct navigation and to protect the tunnel from ship's anchors or other accident. After the channel is sufficiently prepared and the tunnel is floated over the excavated channel water is then let into the tunnel sufficiently to gradually overcome its buoyancy till it settles to its proper place in the excavated channel when the tunnel is covered with sand rock or other material to overcome its buoyancy after the water is pumped out. The ends of the tunnel may have inclined extensions of sufficient length to bring them to a level with the earth or access and egress may be had by inclined circular ways or otherwise as may be most convenient.

My improvement relates to the connecting of the several sections of which it is necessary to construct tunnels when designed for rivers and channels or gorges of considerable width, which connecting means I will now explain.

At the ends of the sections of the tunnel I attach strong iron arms which project at an angle over each end of the different sections, these arms project at such an angle that if two ends of the sections are placed near each other the arms of each section shall cross the other at an angle of say twenty seven degrees. I then pass a wire cable around the tunnel over the points or intersections of the arms and then by connecting the two ends of the cable by means of a suitable screw joint this cable acts as a continuous wedge in the inclined arms and as the screw is turned the two sections of the tunnel are drawn firmly together, the flanges being suitably packed with india rubber or other suitable material to make a water tight joint till it can be welded or riveted after the water is pumped out.

In the accompanying drawings Figure 1 shows a transverse section or end view; Fig. 2 an outside or horizontal view and Fig. 3, shows a longitudinal view of the tunnel as it might appear deposited in the bed of the river the blue lines showing the water above it.

a, a, a, shows the rim or circumference of the tunnel; *b, b* road ways or track; *c, c, c,* vertical supports or braces; *f, f,* and *f, f,* upper and lower horizontal braces these braces are welded to the arches of the tunnel at the different points of contact.

It will be seen that the shape of the tunnel is represented as being oval or elliptical,

and of course that the greatest external pressure will be greatest at the top and bottom of the tunnel. In this case the strain upon the internal supports will be a thrust or
5 negative strain upon the vertical supports and tension or positive strain upon the horizontal braces, and if the outside pressure is greatest horizontally the strain upon the internal braces will be reversed the thrust being brought upon the horizontal braces and
10 tension upon the vertical braces.

d, d, are elevated walks at the sides for foot passengers; *e, e,* aqueducts for carrying fresh water from shore to shore if re-
15 quired, or gas pipe may be also used for conveying gas.

i, i, i, are the inclined arms attached to the ends of the sections, through whose points of intersection the wire cable is
20 passed for drawing the two sections to-

gether as before described; deeper excavation of the channel at this point being required for the arms to drop into.

I prefer the oval or elliptical shape as less depth of excavation is required, and it also
25 being a better shape for floating. The tunnel may be ballasted both before or after it is submerged.

What I claim as my invention and desire to secure by Letters Patent in metallic tunnels, is— 30

The inclined arms, *i,* attached to the ends of the sections and the cable, *h,* for securing and connecting the same substantially as herein set forth.

J. W. COCHRAN.

In witness of—

JOHNS HOLLINGSHEAD,
SAM I. GRUBB.