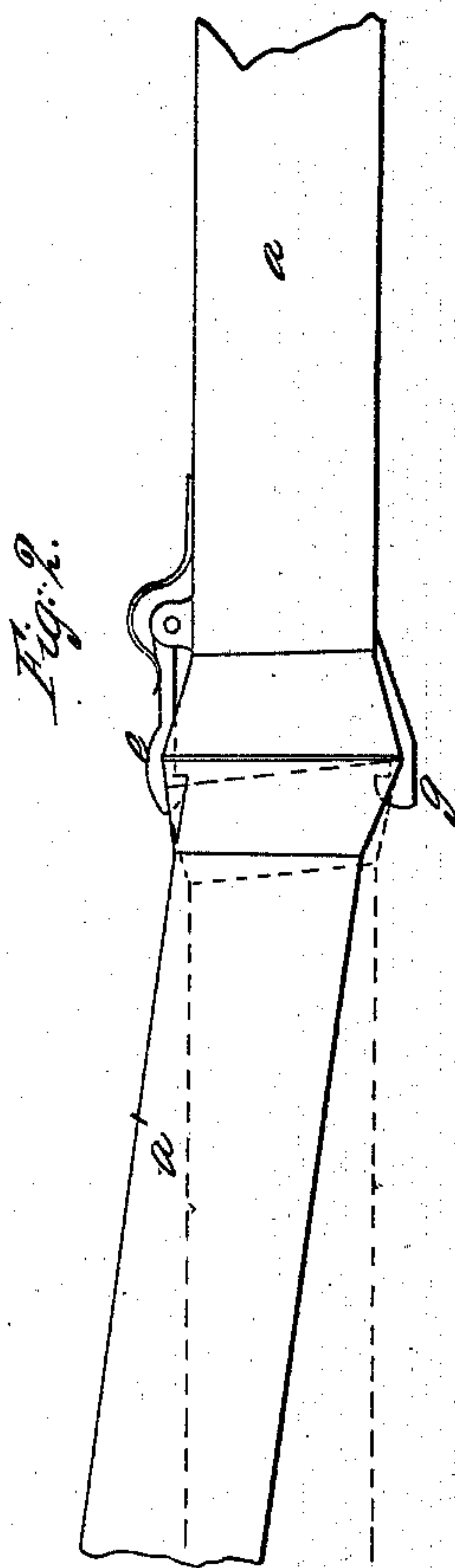
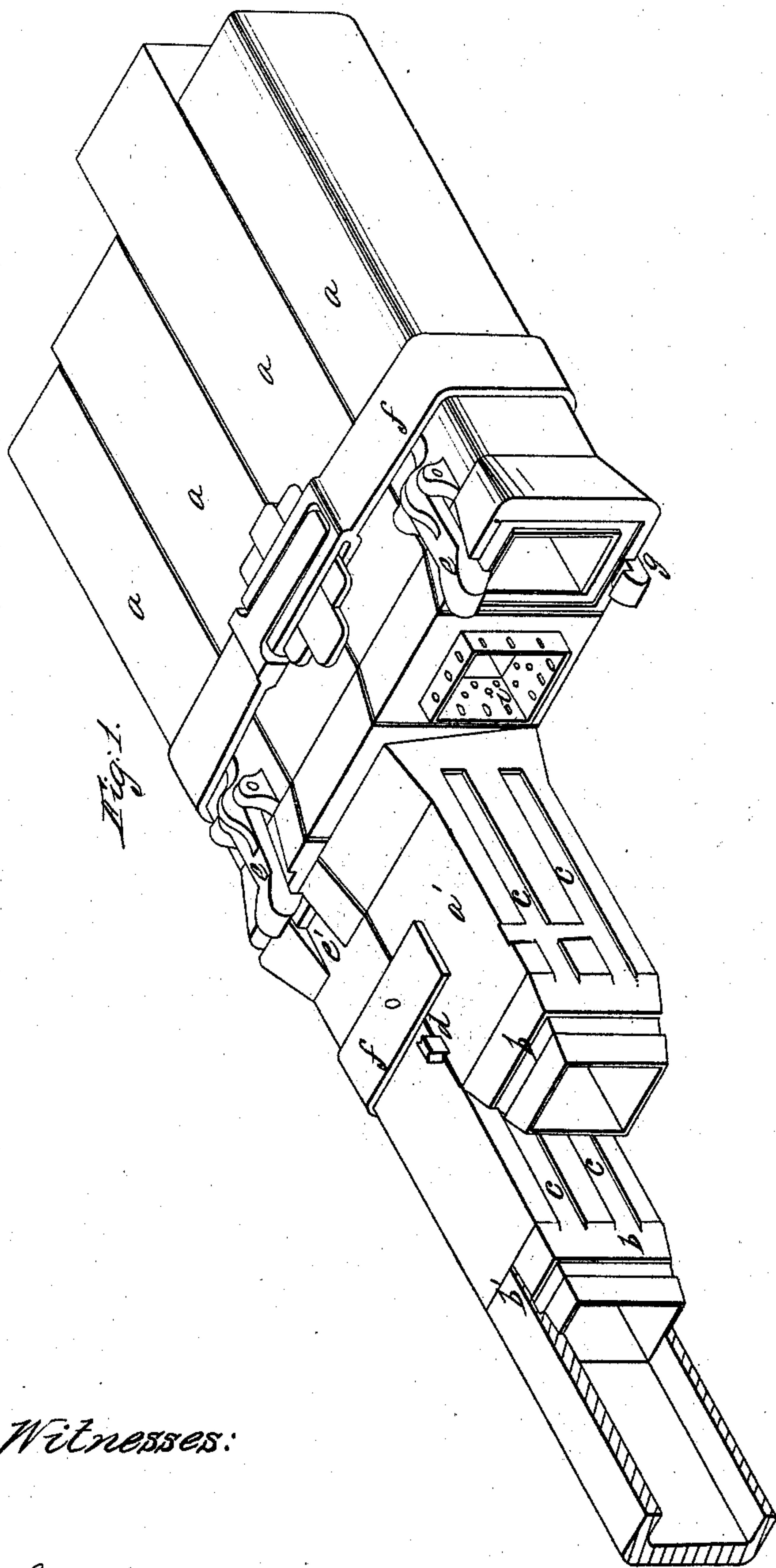


*A. Folson.*

*Submarine Tunnel.*

*N<sup>o</sup> 26,665.*

*Patented Jan. 3, 1860.*



*Witnesses:*

*S. H. Maynard*

*Inventor:*

*A. Folson*  
*by his Attorney*  
*J. P. Sirson*



# UNITED STATES PATENT OFFICE.

ARTHUR FOLSOM, OF BOSTON, MASSACHUSETTS.

## TUBULAR SUBMARINE TUNNEL.

Specification of Letters Patent No. 26,665, dated January 3, 1860.

*To all whom it may concern:*

Be it known that I, ARTHUR FOLSOM, of Boston, county of Suffolk, and State of Massachusetts, have invented certain new and useful Improvements in Tunneling Rivers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being made to the annexed drawing, making a part of this specification which is fully described herein—that is to say, my invention is a method of constructing submarine tunnels for the passage of rivers or other waterways without requiring excavation through the earth. This I accomplish by means of square cast iron tubes of the size of the required passage and of such lengths as may be conveniently handled. The ends of these are so arranged that they can be joined together beneath the water and form of themselves a water tight joint. My plan contemplates the employment of a series of such tubes lying side by side and connected one to the other in such manner as to break joints, and form several passages.

In Figure I is a perspective view of a series of tubes thus arranged and bound together as ready to be lowered into the water. At (a) are the tubes, cast of a square form. The bottom of each, if intended for rail road to pass through may have the rails also cast upon it. The weight is to be such as will effect so much displacement of the water that the tubes will sink of themselves it being understood that the ends before letting down are closed with water tight bulk heads to be afterward removed. The manner of constructing is as follows: A plan and profile of the bed of the river at the place where the tunnel is to be laid across, having been obtained by soundings or otherwise, any sharp protuberances above a general level can either be removed by blasting or by forming a trench through, so that the bed generally may be level, except near the banks where it rises in a curve or slope to and beyond the surface of the water. A stage or float of sufficient length to extend across the river being prepared upon one of the banks, the level portion of the tunnel is to be constructed upon it. Each of the lengths of cast iron tube for this portion is made with one end tapered down, as at (b), and the other end made enlarged in tapering form outward, as at (b'), whereby the end

of one piece can be entered into that of the piece which forms the continuation of the tube. A groove is made around the tapering part (b) and a corresponding one in the interior of the part (b'); into this, lead may be poured to effect the locking of the parts together. If the tunnel is to be composed of several tubes lying side by side, the places at which the joinings are made in each should be so arranged as to break joints, and in the sides of each a groove should be cast at (e) into which bars of iron are placed to act as "coags" whereby the vertical positions of both are made to coincide, and keys (d) are put into appropriate vertical grooves to secure them in the direction of their length. The tubes are further bound together by bands (f) keyed tightly around at intervals as shown. At each end of the level portion the separate tubes are brought to an equal length, and are to be closed with temporary bulk heads of wood or other suitable material built up within the ends. The construction of the parts which are to form the tunnel on the inclined portion of the bed, as at (a'), is now effected in like manner.

The ends of each of the portions next to the other, are to be made beveling, in a general vertical direction, in order that when brought together in place on the bottom of the river they may make a close joint, as seen in Fig. II. At these ends the parts are enlarged, since butt joints are to be made, and on the faces recesses are made into which packing of india rubber or other material can be put to make the joints tight. In order to secure the joining of the ends of the parts there is a self-acting hook or latch (e) hinged upon one end of a tube, and a catch (e') to receive the hook on the end of the opposite portion. A fixed hook (g) is secured permanently to the bottom of a tube, there being a corresponding notch in the bottom of the opposite tube for it to take into.

The manner of engaging and securing the two portions together will be thus: The lower side of the ends of (a') is brought to rest in the hooks (g) of the portion (a) in the form shown in the dotted lines in Fig. II and the whole is then ready to be lowered to its place on the bed of the stream, in doing which the shore part (a') will gradually assume the inclined position shown in that figure when the upper hooks (e) will drop into their appropriate catches on (a') and



the parts will be firmly held together. The bulkheads within each of the ends may now be taken out and a permanent joint be made by means of an interior fastening which  
5 consists of a sleeve or slip joint and is a piece of metal of the size of the interior of the tube; in fact, it is a short section of a tube, and is shown at (i). This is to be so placed as to cover the joint, a part of it being within each tube. To one it is bolted or  
10 riveted fast, but to the other it is bolted through slotted holes which do not fit the bolt in the direction of the length of the tube

in order to allow for some play in expansion and contraction of the tube.

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I claim—

Constructing a submarine roadway or tunnel in the manner described—that is to say of sections of metal tubes connected as set forth to form continuous portions, which  
20 portions are attached to each other substantially in the manner described.

A. FOLSOM.

Witnesses:

J. P. PIRSSON,

S. H. MAYNARD.