2 Sheets—Sheet 1.

J. F. JONES.

SUBMARINE-TUNNEL.

No. 172,028. Patented Jan. 11, 1876.

FIG. 1

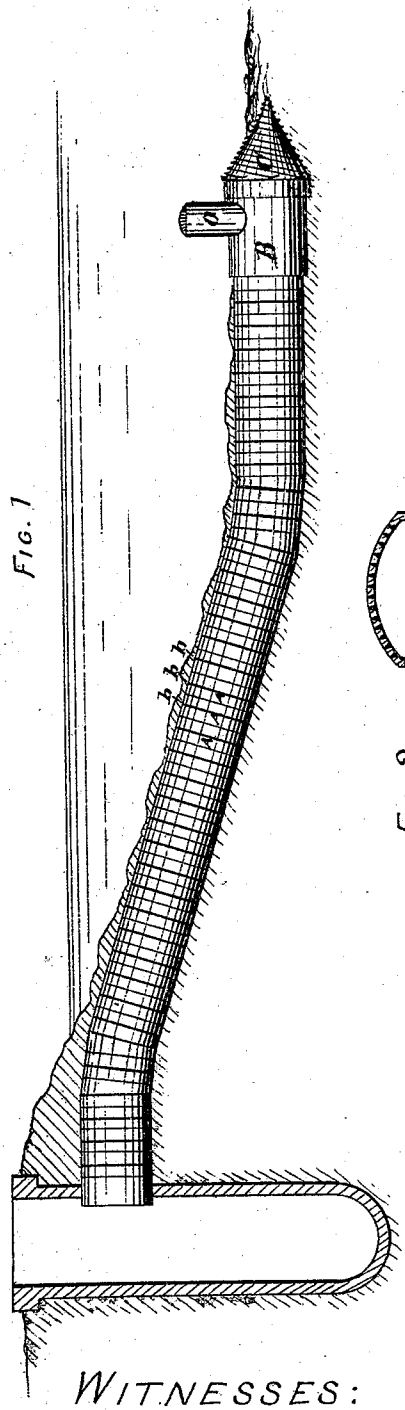


FIG. 2

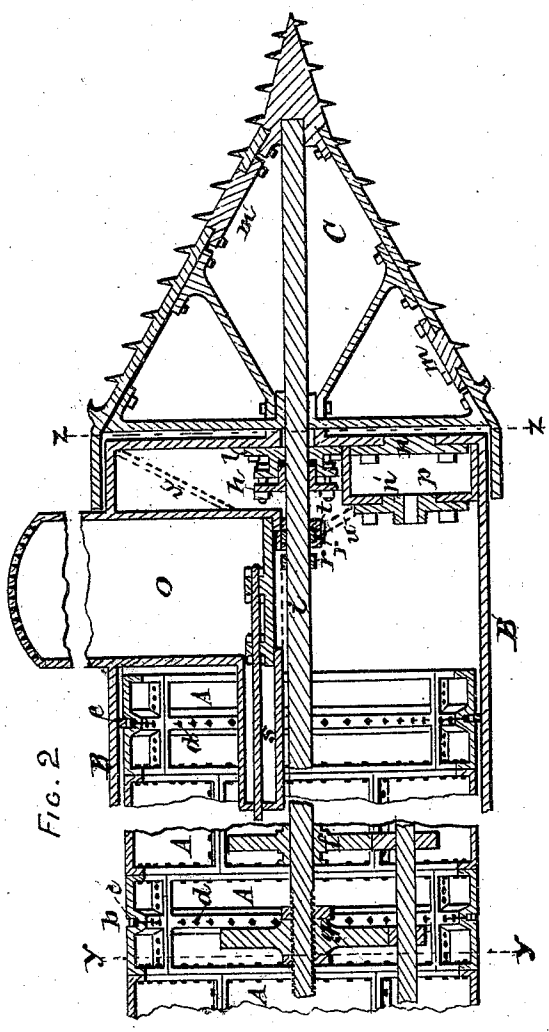
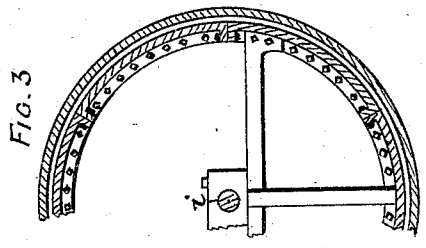


FIG. 3



WITNESSES:

Chris Kohnstrupp

Chas. H. Hay.

INVENTOR:

John Franklin Jones.

2 Sheets—Sheet 2.

J. F. JONES.

SUBMARINE-TUNNEL.

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Fig. 7

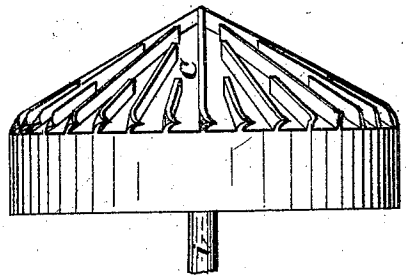


Fig. 9

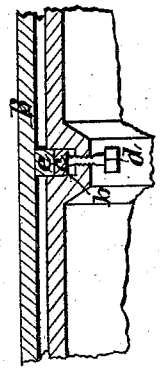


Fig. 10

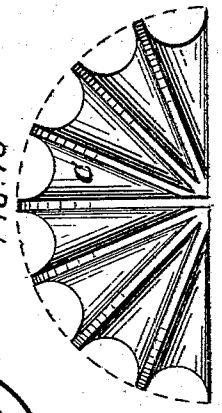


Fig. 6

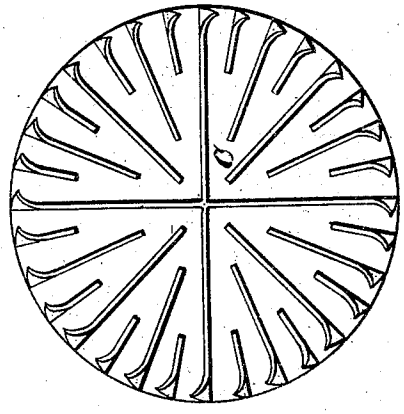


Fig. 8

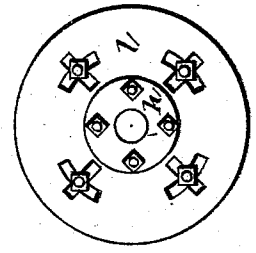


Fig. 4

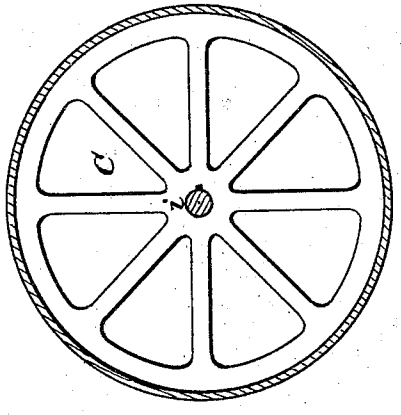
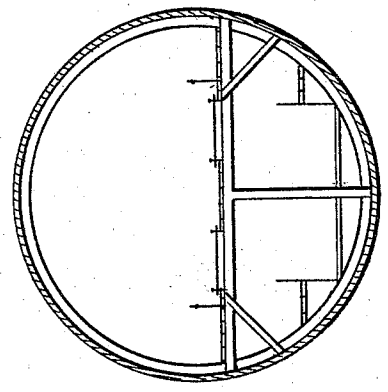


Fig. 5



WITNESSES

Chris Holmstrup

Chas. K. Kay.

INVENTOR:

John Franklin Jones.

UNITED STATES PATENT OFFICE.

JOHN FRANKLIN JONES, OF MARCELLUS FALLS, NEW YORK.

IMPROVEMENT IN SUBMARINE TUNNELS.

Specification forming part of Letters Patent No. **172,028**, dated January 11, 1876; application filed February 25, 1875.

CASE A.

To all whom it may concern:

Be it known that I, JOHN FRANKLIN JONES, of Marcellus Falls, in the county of Onondaga, in the State of New York, have invented a new and useful Improvement in Submarine Tunnels, of which the following, taken in connection with the accompanying drawing, is a full, clear, and exact description.

Nothing has taxed the skill and ingenuity of engineers more than the successful and cheap construction of submarine tunnels; yet it must be acknowledged that the various plans and devices experimented with up to the present time are either too expensive, or dangerous, or complicated.

The object of my invention is to avoid all these obstacles, and at the same time obtain a tunnel that shall be applicable for various purposes.

In the drawing, Figure 1 is a view of my tunnel, constructed for the purpose of obtaining a large supply of pure water; Fig. 2, an enlarged longitudinal section, showing the construction of the tunnel, shield, and excavator, and their connection; Fig. 3, part of a cross-section of the tunnel on the line *y y* in Fig. 2; Fig. 4, a section through line *z z* in Fig. 2, showing the construction of the excavator at that point. Fig. 5 shows the interior arrangement of one of my tunnels for the purpose of accommodating transit of cars, vehicles, and pedestrians. Fig. 6 shows a front of another form of an excavator, especially suitable to operate in hard material. Fig. 7 is a side view of same; Fig. 8, an enlarged view of the face-plate and stuffing-box for the main shaft; Fig. 9, an enlarged sectional view of the packing and expanding rings as applied to the shield, and Fig. 10 shows another form of the excavator, suitable for hard material.

The tunnel is constructed of cast-iron sections A A, having flanges around their edges, and fastened together by bolts or rivets, as shown in the drawing. The sections A are made of three or more segments, *a a*, according to the size of the tunnel, being likewise provided with flanges, and bolted or riveted together. Each of these sections A A has a recess, *b*, around its outer periphery, into which are fitted expanding rings *c*, resting on screws *d*. *e* is a rubber, wood, or other suitable packing, in the same recess, and on top of the expanding rings *c*.

By means of the screws *d* the rings *c* are expanded, and the packing *e* pressed outward against the shield B, thereby making a water-tight joint. The shield when intended for tunnels of large dimensions is also made in sections, with flanges outward where in contact with the tunnel, and inward at the forward end where in contact with the excavator.

C is the excavator, shown in three forms, to suit the material to be excavated. This excavator is attached to the shaft *i*, and turned by spur-wheel *f*, having a groove in its hub, to fit a feather on the shaft *i*, so as to allow the shaft to move longitudinally during its revolution. *g* is a wheel, having a screw-thread in its hub to fit the screw cut on the shaft *i*. The wheel *g*, being secured to prevent its lateral or longitudinal movement, will force the shaft *i* forward and the excavator into the earth in advance of the tunnel. This excavator is intended to be used for tunnels partly above the surface. The shaft *i* passes through the stuffing-box *h*, attached or cast on a face-plate, *l*, which is bolted to the inner face of the shield B. The aperture in the shield is somewhat larger than the shaft *i*, and the face-plate *l* being constructed similar to those on a lathe, the shaft can be moved out of the center, to give the excavator the desired direction, and admit of turning small angles. This device, however, is more especially intended for tunnels of small size. In large tunnels I propose to use a globe-joint in place of the adjustable face-plate.

m, *m*, *n*, and *n'* are man-holes. In case a large stone or other obstruction should be met with, a man can enter the chamber *p* through the man-hole *n'*; then, by attaching a pipe, compressed air can be employed, to admit of opening the man-holes *n* and *m*, when the obstruction can be reached and removed. The compressed air can also be employed for the purpose of freeing the space between the excavator and shield.

Tunnels constructed for obtaining a supply

of water are to be provided with an inlet, *o*, attached to the top of the shield, and arranged with a screen and gravel-filter on top, and a á valve at the bottom, having a rod extending to the shore end, whereby it can be opened and closed. It is intended to have ample space between the shield and the tunnel to admit of turning slight angles. *r r* are collars on the shaft *i*, rigidly attached thereto. *t* is a sleeve, provided with a socket for the braces *u u*, and can be connected with either of the collars *r* to adjust the distance between the shield and excavator. By means of these collars the shield is forced forward with the excavator. The inlet *o* is attached to the shield before entering the water, and carried with it the required distance for obtaining pure water, thereby avoiding the expense of building cribs or coffer-dams in deep water for that purpose.

My new cast-iron submarine tunnel is intended for all purposes other tunnels are used for, and more especially for railroads and pneumatic transit, as it is stronger, and resists more vibration, than others.

I do not wish to confine myself to any particular cutting devices on the face of the excavator, as this is dependent on the quality of the material.

What I claim as my invention is—

1. A cast-iron submarine tunnel, constructed of sections A A, provided with packing *e* and expanding rings *c*, in recess *b*, substantially as described, for the purpose specified.

2. The stuffing-box *h*, provided with the adjustable face-plate *l*, constructed as shown, in combination with the shield B and excavator-shaft *i*, substantially as described, for the purpose set forth.

3. The cone-shaped excavator C, provided with cutting devices on its surface, and the shaft *i*, in combination with the shield B and iron tunnel, constructed and operating substantially as described.

4. The combination of the man-hole *m* in the excavator C, man-hole *n* in the shield B, and chamber *p* in said shield, provided with man-hole *n'*, the whole constructed and arranged substantially as described and shown, for the purpose specified.

5. The inlet *o*, provided with a screen and filter on top, and a valve on the bottom, constructed as described, in combination with a submarine tunnel, substantially as and for the purpose set forth.

In testimony whereof I have signed my name and affixed my seal in the presence of two attesting witnesses at Syracuse, in the county of Onondaga and State of New York, this 17th day of February, 1875.

JOHN FRANKLIN JONES. [L. S.]

Witnesses:

CHAES. H. HEY,

CHRIS. HOLMSTRUP.