

(No Model.)

H. F. RUDLOFF.

SAFETY CHAMBER FOR SUBMARINE TUNNELS.

No. 260,502.

Patented July 4, 1882.

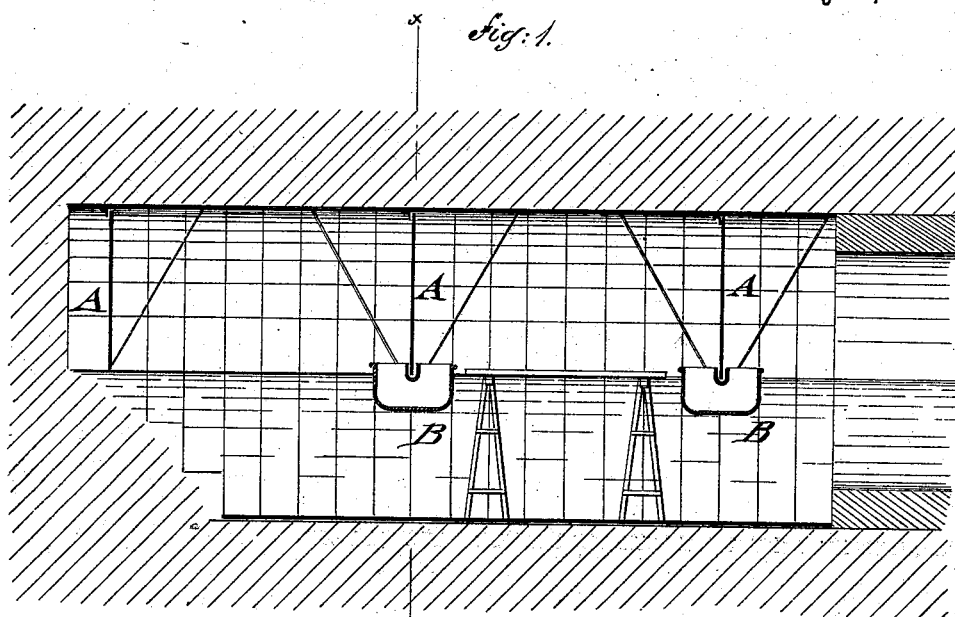
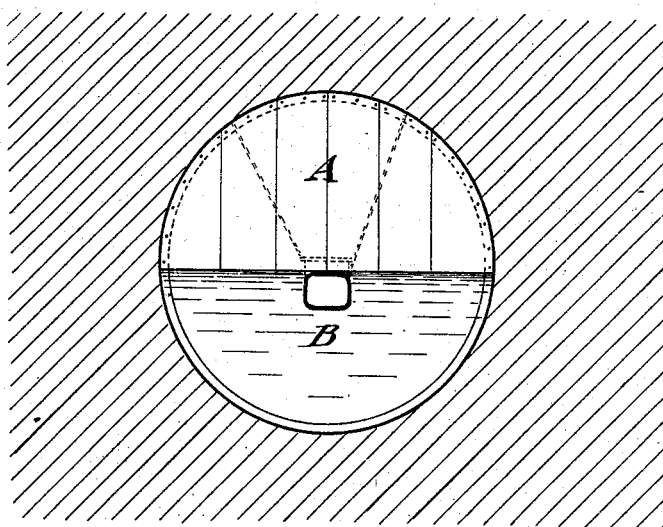


Fig. 2.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

HENRY F. RUDLOFF, OF NEW YORK, N. Y.

## SAFETY-CHAMBER FOR SUBMARINE TUNNELS.

SPECIFICATION forming part of Letters Patent No. 260,502, dated July 4, 1882.

Application filed July 22, 1881. (No model.)

*To all whom it may concern :*

Be it known that I, HENRY F. RUDLOFF, of the city, county, and State of New York, have invented certain new and useful Improvements in Safety-Chambers for Submarine Tunnels, of which the following is a specification.

The object of this invention is to provide means in the building of submarine tunnels by which the danger arising from a flooding of the partly-built tunnel-section by a sudden break in the protecting-shield or by the escape of the compressed air, when the latter is employed for keeping out the water, is to a great extent avoided, and also a means of escape furnished to the men employed at the tunnel-head.

The invention is also adapted for the headings of deep mines, especially as it furnishes a means of access to the flooded section for getting to the men and resuming work.

The invention consists in arranging at the forward end or head of the tunnel two or more transverse partitions, which extend from the top to a point somewhat below the middle of the tunnel, and which are secured tightly to the upper half of the tunnel. To the lower end of each transverse partition is applied, when an air-lock is used, a U-shaped tubular channel, which extends to some distance above the lower edge of the partition for establishing communication from one tunnel-section to the other in case the tunnel should be flooded with water.

In the accompanying drawings, Figure 1 represents a vertical longitudinal section of a submarine tunnel with my improved safety-chamber, showing the same as flooded; and Fig. 2 is a vertical transverse section of the same on line *xx*, Fig. 1.

Similar letters of reference indicate corresponding parts.

The dangers connected with submarine tunneling are well known, and accidents cannot be entirely prevented with the safeguards at present known, whatever be the system employed. Means for protecting the workmen against the sudden breaking in of the water and flooding of the tunnel from the head have been proposed, but they were either too clumsy and complicated for use or not adapted to the systems employed.

In the recently-proposed system of tunnel-

ing by means of compressed air the danger of a break and the flooding of the completed tunnel-section becomes the greater the farther the tunnel-head advances under the water. In case of a break there is almost no escape for the workmen, while the clearing of the flooded tunnel and the resumption of work is connected with considerable difficulty. For giving a protection to the workmen in case of danger, two or more transverse partition-walls, A, of boiler-iron, which extend from the upper part to the middle, or some distance below the middle, are employed and secured to the upper half of the tunnel-section and tightly packed, so that no water can pass through at the connection of the partitions with the tunnel-surface. These transverse partitions A are moved forward as the work proceeds, they forming safety-chambers for the workmen in case of a break and the sudden flooding of the tunnel, in which case the water can only rise to such a level till the pressure of the air in the upper part of the chambers neutralizes the upward pressure of the water and prevents thereby effectively the further rise of the water-level. These air-chambers provide the air necessary for the workmen and protect them against drowning. Whenever there is danger of an accident there will always be sufficient time for the workmen to get back of the first safety-partition, so as to reach the first air-chamber formed between the two outermost partitions, from which they can escape through a U-shaped tubular channel, B, which, when an air-lock is used, is attached to the lower edge of the safety-partition and extended to suitable height above the same, as shown in Fig. 1, to the next chamber, and from the same through the channel B of the next partition to the end section of the tunnel, at which point assistance can easily reach them. When the air-lock and U-shaped tubes are not employed the men may escape by diving under the partitions from one chamber to another.

As by the safety-partitions A and channels B means are furnished to reach the outer end of the tunnel, the work in the tunnel can be readily resumed by divers, who can stop the leak and remove obstructions. By extending, then, the partition-walls in a downward direction as near as possible to the bottom of the tunnel and furnishing an additional supply of

air the water can be quickly removed by pumping out section by section until the tunnel-head is reached, where work can be resumed and pushed forward with less expense, less delay, and less danger of life than heretofore. In case no air-lock is arranged at the land end of the tunnel, it is preferable to arrange a larger number of partition-walls than when an air-lock is used. The air-lock will be formed in any well-known manner.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A safety device for submarine tunnels, consisting of two or more transverse partitions secured tightly to the upper part of the tunnel-section, substantially as set forth.

2. As a safety device for submarine tunnels, the combination of two or more transverse partitions extending from the top of the tunnel to the middle or a point below the middle of the same, and U-shaped tubular escape-channel arranged at the lower part of the partitions, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 24th day of June, 1881.

HENRY F. RUDLOFF.

Witnesses:

PAUL GOEPEL,  
CARL KARP.