L. TASKIN.

Pneumatic-Tunneling Apparatus.

No. 218,597. **Patented Aug. 12, 1879.**

FIG. 3.

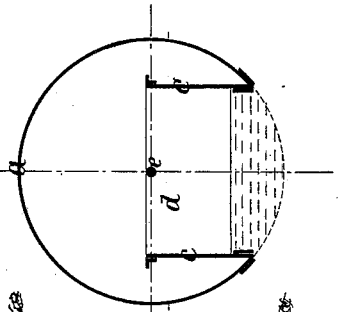


FIG. 6.

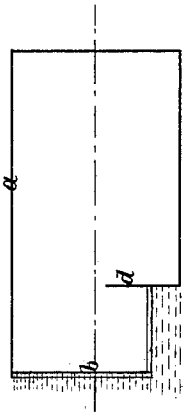


FIG. 1.

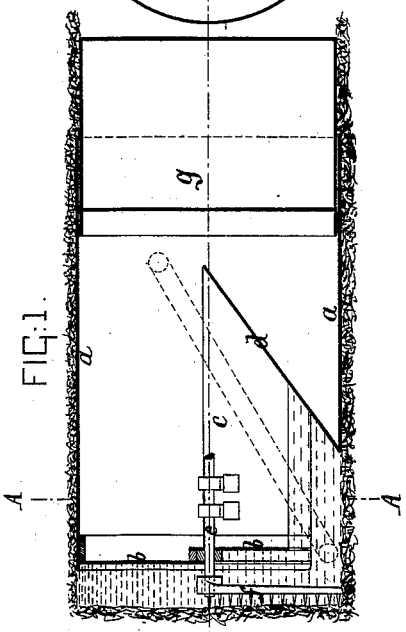


FIG. 4.

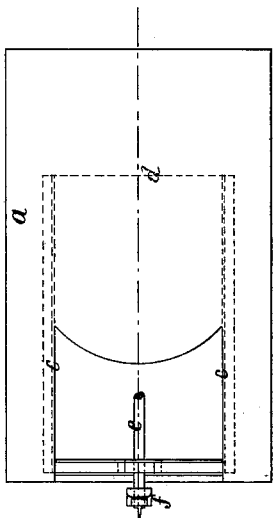


FIG. 2.

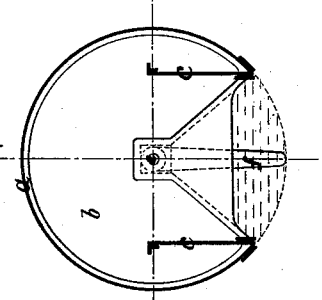
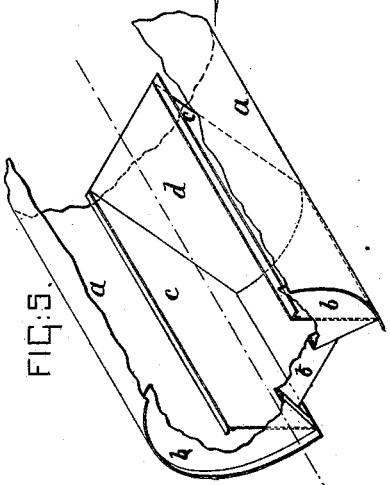


FIG. 5.



Witnesses.
H. M. Sinnott
G. B. Fowles.

Leopold Taskin.
by John J. Halsted
Atty

UNITED STATES PATENT OFFICE

LEOPOLD TASKIN, OF JEMMEPES, BELGIUM.

IMPROVEMENT IN PNEUMATIC TUNNELING APPARATUS.

Specification forming part of Letters Patent No. **218,597**, dated August 12, 1879; application filed November 27, 1878.

To all whom it may concern:

Be it known that I, LEOPOLD TASKIN, civil engineer, of Jemmepes, Liege, Belgium, have invented certain new and useful Improvements in Machines for Boring or Tunneling by Means of Compressed Air; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Referring to the class of machines heretofore in use for boring or sinking vertical shafts, and in which an open-bottomed case or cylinder is sunk in such shaft, my invention consists in certain means whereby machines of kindred character are adapted and made applicable for boring or tunneling horizontal galleries or passages for mining, railway, or other works, as well as for submarine works.

The well-known manner of boring vertical shafts is to sink a case or cylinder, open at the bottom, in the shaft. Compressed air is admitted into this cylinder to drive out the water at the bottom. The work of boring is performed by apparatus placed in the case. As the work proceeds, and the cylinder sinks farther, additional annular portions are added to the tube which forms the walls of the shaft, so that this tube always projects to a certain distance into the interior of the working cylinder or head, to admit of a water-tight packing between it and the latter.

The difficulties which this existing method offers to its application for boring horizontal shafts or galleries are obvious. The face of the tunnel to be bored being vertical, the compressed air introduced in the working-cylinder, instead of forcing the water out of the cylinder, or keeping the cylinder clear of water, would escape at the upper portion of the end of the cylinder in the working.

To overcome these difficulties I close the head of the working-cylinder by means of a shield divided in two parts, the one being placed at the upper part of the same at its outer edge and descending below the level of its axis, the other being placed farther back within the cylinder and rising from the bottom thereof to about or above the level of the axis. The result of this arrangement is, that any water which might collect in front of the working-cylinder can enter into the latter only at or near the bottom line of the shaft, and, to find its way to the general interior of the cylinder, would have to rise above the edge of the lower wall, from which it is positively prevented by a sufficient pressure of the air contained in the cylinder.

In order to make my invention more clearly understood, I will describe it in connection with the six figures of the accompanying drawings, in which—

Figure 1 is a central vertical section; and Fig. 2 is a cross-section on the line A A, Fig. 1, looking to the left. Fig. 3 is a cross-section on the line A A, looking to the right. Fig. 4 is a bottom view. Fig. 5 is a perspective view, with a part of the working-cylinder and of the front shield cut away, the boring-tool not being represented. Fig. 6 is a diagram which will be referred to below.

Similar letters of reference indicate corresponding parts in both figures.

a is the working-cylinder, placed horizontally for the purpose of boring a horizontal shaft. All the joints of the different parts constituting it should be constructed with a view of making them water and air tight; also, at the place where it reaches over the already finished part of the shaft there should be provided a suitable packing, (not necessary to be shown,) in the same manner as is done in boring vertical shafts. A part of that end of this cylinder which faces the tunnel to be bored is closed by a vertical wall, *b*, leaving only near the bottom line of the cylinder free communication between the latter and the exterior space.

Two vertical walls, *c*, running parallel with the axis of the cylinder, extend from the wall *b* inward into the cylinder, a tight joint being formed along the lines where they meet the wall *b* and the wall of the cylinder. These walls are connected with each other by the inclined wall *d*, the lower edge of which is firmly joined to the bottom part of the wall of the cylinder *a* between the walls *c c*.

The bottom of the wall of the cylinder is preferably cut out from its edge inward be-

tween the lines where it meets the walls *c c* and *d*, as clearly shown in Fig. 4.

The shaft *e* of the boring-tool *f*, which latter may be of any suitable or approved character, extends through a stuffing-box in the wall *b*, and, by means not necessary to be represented, is preferably so arranged that it can be turned and moved forward at the same time, so that the boring-tool removes a sufficient quantity of soil for the advance of the cylinder *a*.

Any water which may collect in front of the cylinder, and which would have a tendency to flow into the latter, is forced out or kept out by the pressure of the air in the cylinder, only a very small quantity remaining therein, inclosed between the walls *c c* and *d*, which will never rise to a higher level than the lower edge of the wall *b*.

Any kind of elevator or dredging mechanism, such as the chain shown in dotted lines, Fig. 1, may be employed to remove through this opening, formed by the edges of the walls *b*, *c c*, and *d*, the soil loosened by the boring-tool into the interior of the cylinder *a*, from whence it may be carried out of the apparatus at intervals, in the usual manner.

The usual or any suitable means may be employed to push the cylinder forward, and to elongate or continue the cylindrical wall of the shaft.

g is the air-chamber, placed at the commencing of the shaft, and provided on both its faces with openings fitted with air-tight covers, (not shown in the drawings,) through which communication is established between the interior of the tunnel and the surface, in the usual manner.

Many modifications may be made in the details without departing from the principle of my invention.

The wall *b*, for instance, would serve well if its lower edge, instead of being cut out, as shown in Fig. 2, were straight across the cylinder.

The wall *d*, Figs. 1, 3, 4, and 5, can be made to reach quite across the cylinder, having its entire edge, except the upper straight horizontal part, joined directly thereto. In this case the walls *c c* are obviously dispensed with, and the bottom part of the cylinder may here also be cut away in front of the wall *d* up to a level a little below or even flush with the lower edge of the wall *b*. This wall *d* may be made more or less inclined than here shown, or it may be made also vertical; but I prefer to make it inclined, because this position offers considerable advantages for the arrangement of the elevating or dredging mechanism, if it be desired to employ such mechanism in connection with my invention.

What I claim as my invention is—

1. In a machine for boring horizontal galleries or tunnels, the working-cylinder *a*, provided at or near its head with a shield composed of two walls—namely, an upper one, *b*, descending below the axis of the cylinder, and a lower one, *d*, situated farther back and rising above the level of the lower edge of the front wall, *b*, for the purpose of excluding, by means of compressed air, water from the general interior of the cylinder.

2. The working-cylinder *a*, provided with a shield composed of two walls—namely, an upper one, *b*, descending vertically beyond the axis of the cylinder, and a lower one, *d*, situated farther back and rising diagonally within the cylinder to above the level of the lower edge of the front wall, in conjunction with the two inner vertical walls, *c c*, extending between the walls *b* and *d*, and connected thereto as well as to the wall of the cylinder, substantially as and for the purposes specified.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

L. TASKIN.

Witnesses:

R. H. BRANDAY,

H. A. ZANGE.