No. 675,355. Patented May 28, 1901.

W. S. MacHARG.

TUNNELING DEVICE.

(Application filed May 16, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

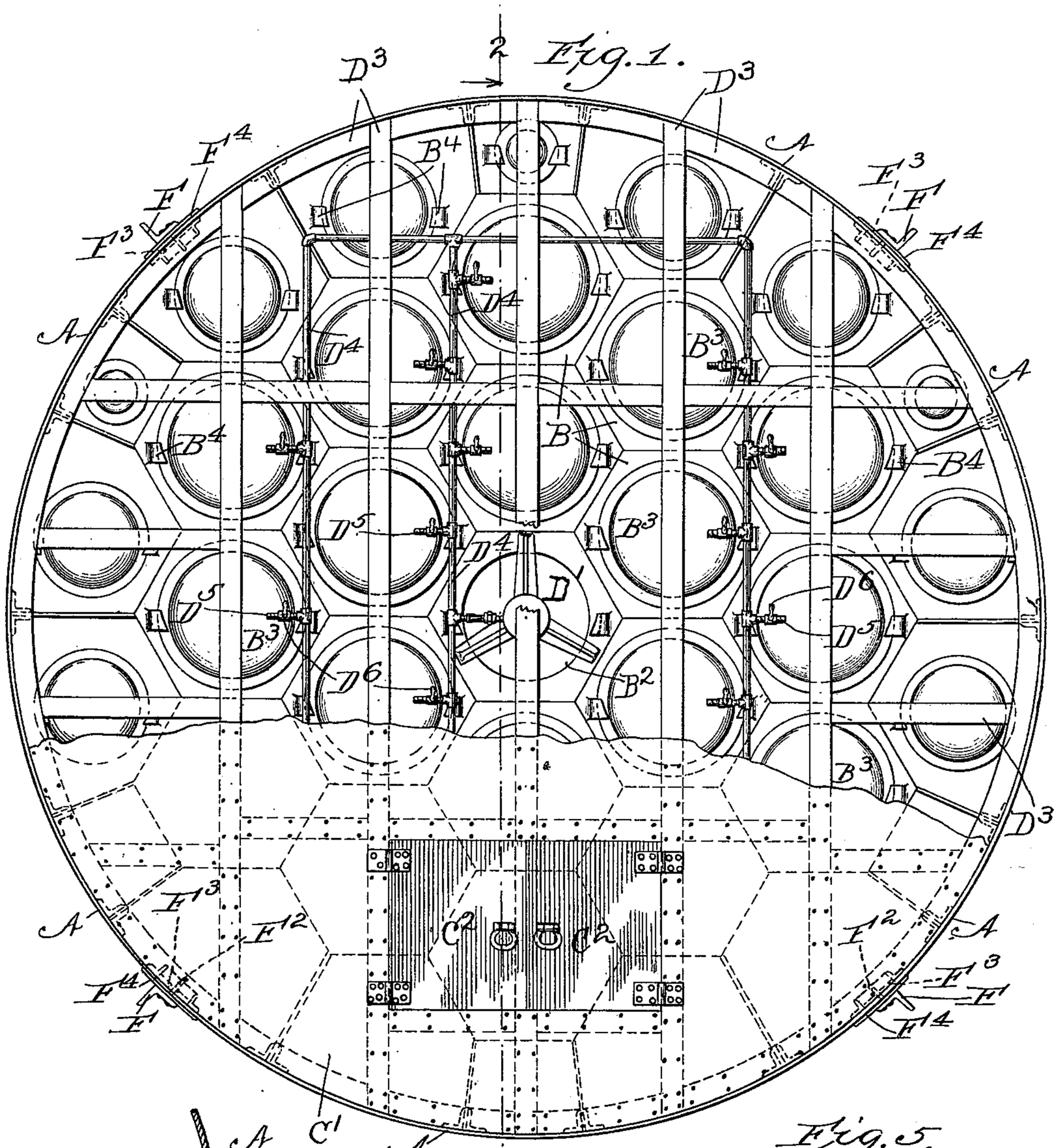


Fig. 4.

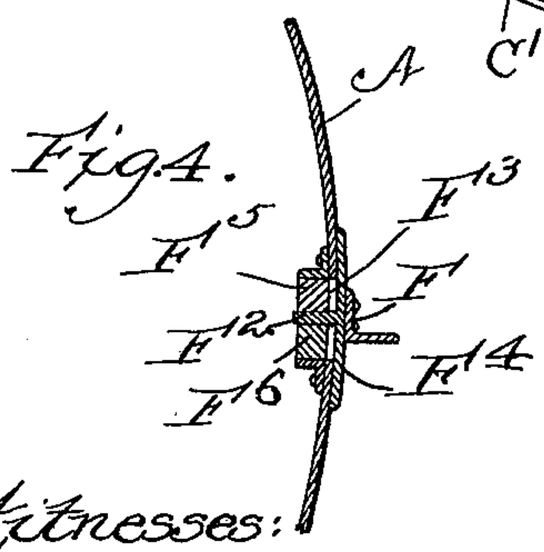
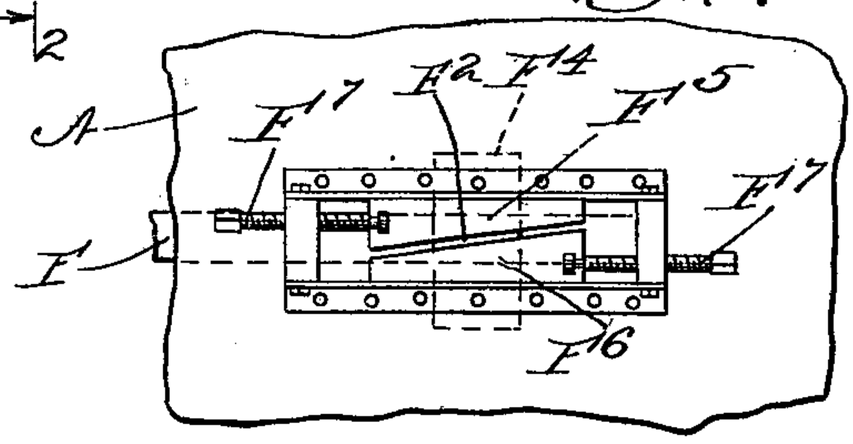


Fig. 5.



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Harry E. White.

Inventor:
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(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

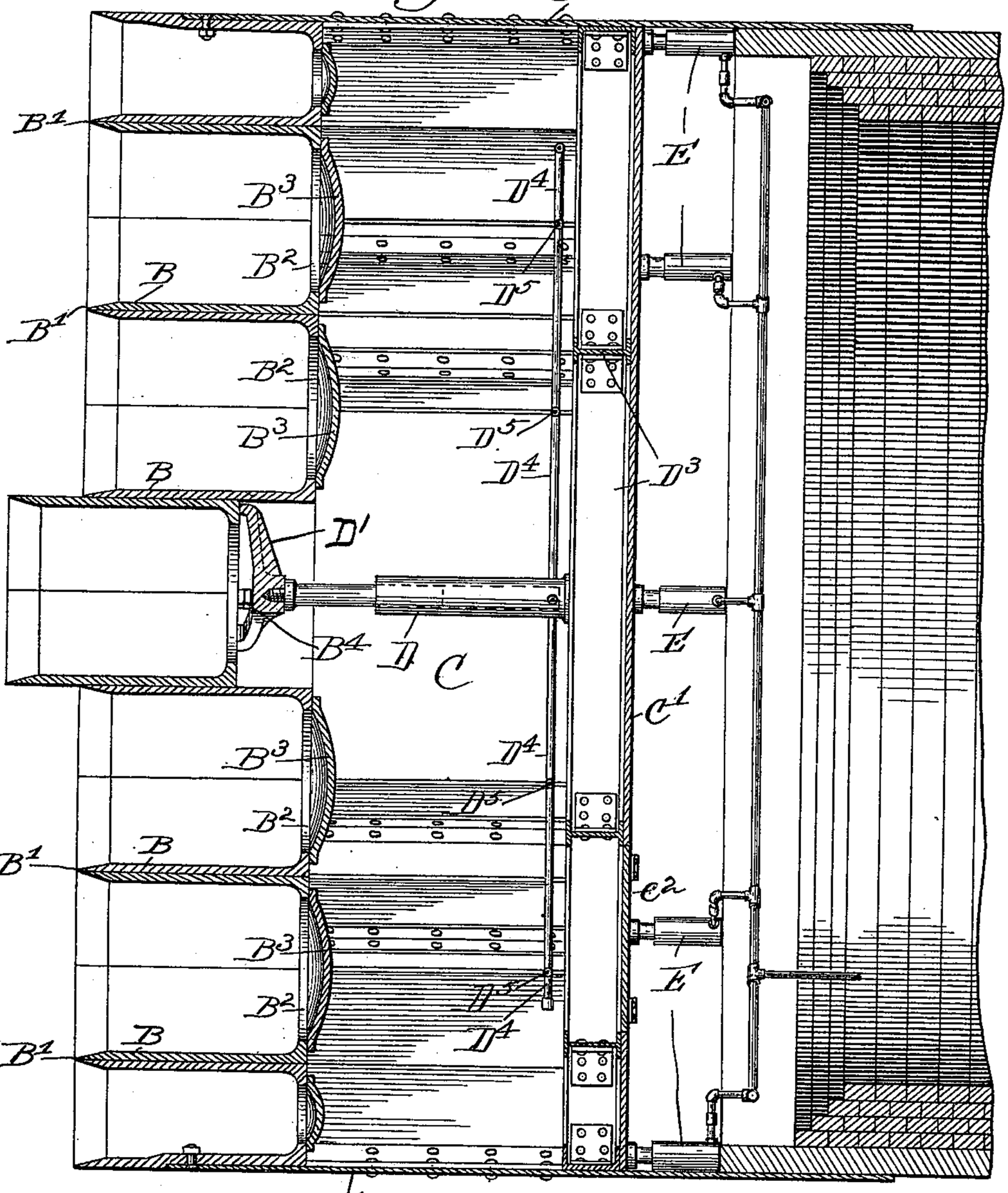
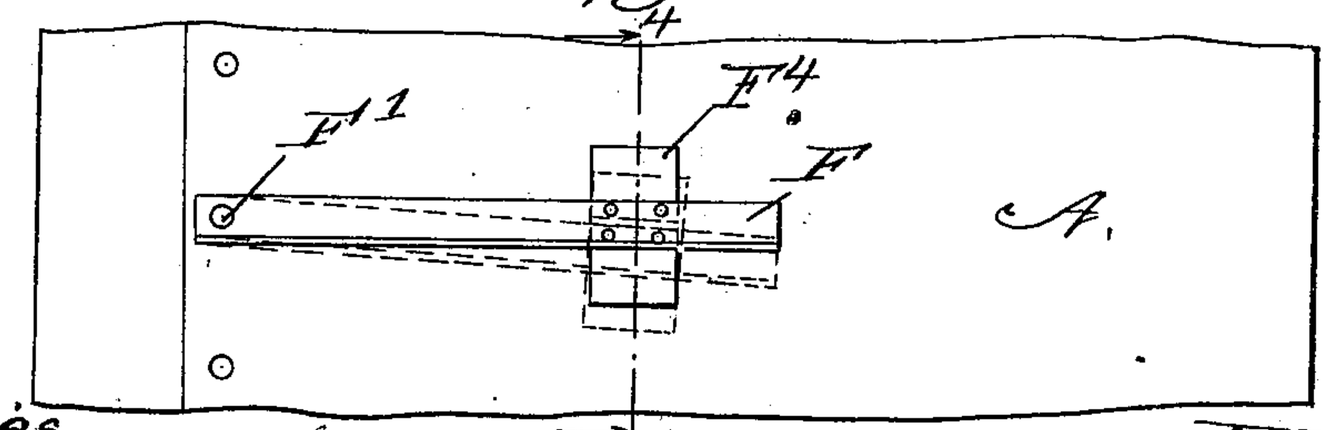


Fig. 3.



Witnesses
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UNITED STATES PATENT OFFICE.

WILLIAM S. MACHARG, OF CHICAGO, ILLINOIS.

TUNNELING DEVICE.

SPECIFICATION forming part of Letters Patent No. 675,355, dated May 28, 1901.

Application filed May 16, 1898. Serial No. 680,811. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. MACHARG, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Tunneling Devices, of which the following is a specification.

My invention relates to tunneling devices, and has for its object to provide a new and improved device for this purpose.

My invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a rear view with parts omitted of a device embodying my invention. Fig. 2 is a section on line 2 2, Fig. 1. Fig. 3 is a view of a portion of the outside of the device, showing the means for guiding it in its forward movement. Fig. 4 is a section on line 4 4, Fig. 3. Fig. 5 is an enlarged view with parts omitted, showing the means for adjusting the guiding devices shown in Figs. 3 and 4.

Like letters refer to like parts throughout the several figures.

The device herein illustrated is adapted to be used when it is desired to form an underground tunnel for any purpose.

I have illustrated the device diagrammatically, as it were, so as to simplify the drawings, and have only attempted to set forth sufficient to make the device and its application clear to those versed in the art.

Referring to the drawings, I have shown a shield A, having a cross-sectional area approximating the cross-sectional area of the excavation to be made. The face of this shield is composed of a series of sections B, preferably independent of each other and preferably formed with cutting edges B′, each of the sections adapted to be forced forward independent of the others. Each section is preferably provided with an opening B^2 at its rear, which is normally covered by the door B^3. These doors may be of any suitable construction and preferably slide along the face of the opening instead of opening outwardly, the door being held in position by the lugs B^4, said lugs being beveled, so as to force the door against its engaging surface when in position. Some suitable means are provided for separately forcing these sections forward, the door of the section operated upon being first removed. The forcing of the section forward causes the material through which the tunnel is being made to be forced through the openings B^2, so as to fall within the apartment C. A rear partition C′ is preferably connected with the shield A and is provided with suitable doors C^2, by means of which the operators may enter the apartment C and remove the material therefrom. The sections B may be moved forward in any desired manner. As shown in the drawings, a hydraulic jack D is placed in position opposite the section to be moved forward, and a suitable engaging device D′ is connected with the jack and with the section to be moved. Suitable supports are placed in position to resist the backward pressure of the jack—as, for example, the I-beams D^3—and suitable connections or pipes D^4 are placed in position and provided with suitable attachments D^5 and valves D^6, so that the jacks can be connected with the pump producing the pressure. These attachments and valves are so arranged that there will be one for each section, and the jacks may be removed or placed in position when desired, instead of being permanently in position, so as not to interfere with the laborers in the apartment C. The means of supporting and operating the jacks may of course be varied at will in order to meet the conditions to be met and the views of the parties operating the device. I prefer to have the outer row of sections connected with the shield A, so that they can all be moved forward simultaneously when the shield is moved forward; but of course this outside layer may be made separate and independent like the rest of the sections, if desired. The outside shield is moved forward in a manner similar to that in which the sections are moved forward and by means of the jacks E, which engage the shield and some suitable resisting device, as shown. These jacks may be placed in any manner desired and are preferably connected with a suitable source of power, so as to simultaneously operate. In order to prevent the shield A from rotating or becoming displaced and also for the purpose of guiding it, I provide on its outside surface a series of guiding devices F, which may be of any suitable construction. As illustrated in the drawings, these guiding devices consist simply of an angle-iron, as shown, for example, in Fig. 4, the angle-iron

being pivoted at one end, as at F′, the other end being provided with some means for changing its position, so as to move it about the pivotal point F′. Any suitable means for this purpose may be used. As illustrated in the drawings, a projecting flange F^2 is connected with the guiding device and projects through an opening F^3 in the shield A, a suitable protecting or covering device F^4 being placed over the opening. Within the shield are the wedge-shaped pieces F^5 and F^6, adapted to be moved longitudinally by means of the screws F^7 and between which is received the inwardly-projecting part F^2, connected with the guiding device. It will thus be seen that the end of the guiding device may be moved about the pivotal point F′ by manipulating the screws F^7, so as to vary the position of the wedges F^5 and F^6. It will also be seen that these guiding devices may be utilized to prevent the shield from turning and may also be used to guide the shield by varying their inclination. Any number of these guiding devices may be used, the number depending, of course, upon the conditions to be met and the size of the shield. This tunneling device is particularly adapted to be used in sandy soil or soft soil of any description or soil which is not homogeneous, some parts being soft and others being hard. The sections B may be made of any size desired, such size depending, of course, upon the soil in which the device is to operate.

In operating this device the several sections are independently forced forward, the material being forced through the openings B^2 at the rear and falling within the apartment C. This material may then be removed in any manner desired. After all the sections have been moved forward the outer shield is moved forward by means of the jacks E until its front face is approximately as far forward as the several sections. The tunnel is then built up back of the shield in any of the well-known ways, the construction depending, of course, upon the use of the tunnel. The sections are then again independently forced forward and the above operation repeated. In the event of boulders or the like obstructing any section the material in the section may be removed through the opening B^2 and the boulder or other obstructing material taken out.

It is of course evident that various constructions may be used, that the form and arrangement of the parts herein shown may be varied, if desired, and that some of the parts may be omitted and others used in connection with parts not herein shown without departing from the spirit of my invention, and I therefore do not wish to be limited to the construction shown.

I claim—

1. In a tunneling device, the combination of an outer shield with a series of inner relatively small independent excavators filling the forward end of the shield, each excavator open in front and provided with a cutting edge around such opening and with a rear opening and a cover for such rear opening, so that when the excavators are in position and the covers in place the forward end of the shield is entirely closed, and means for independently moving forward each excavator and the shield.

2. In a tunneling device, the combination of a cylindrical shield adapted to be pushed forward with one or more longitudinal projections on the outer surface thereof, protruding into the cylinder, means for swinging such projection upon the periphery of the cylinder, and upon the axis normal to the axis of the cylinder, whereby the tendency of the shield to rotate can be variably resisted.

3. A tunneling device, comprising an outer movable shield, a series of independent sections forming the working face of said shield, each section provided with a retaining side wall forming a chamber open at the front, said wall having a sharpened cutting edge, a discharge-opening at the rear of the chamber, and means for independently moving each section and the shield itself.

4. A tunneling device, comprising an outer shield adapted to be moved forward, a series of independent sections forming the working face of said shield and adapted to be independently moved with relation to each other, said sections consisting of chambers provided at the front with cutting edges and at the rear with discharge-openings, said discharge-openings being provided with suitable doors, which are moved bodily across the openings to open or close them.

WILLIAM S. MACHARG.

Witnesses:
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