

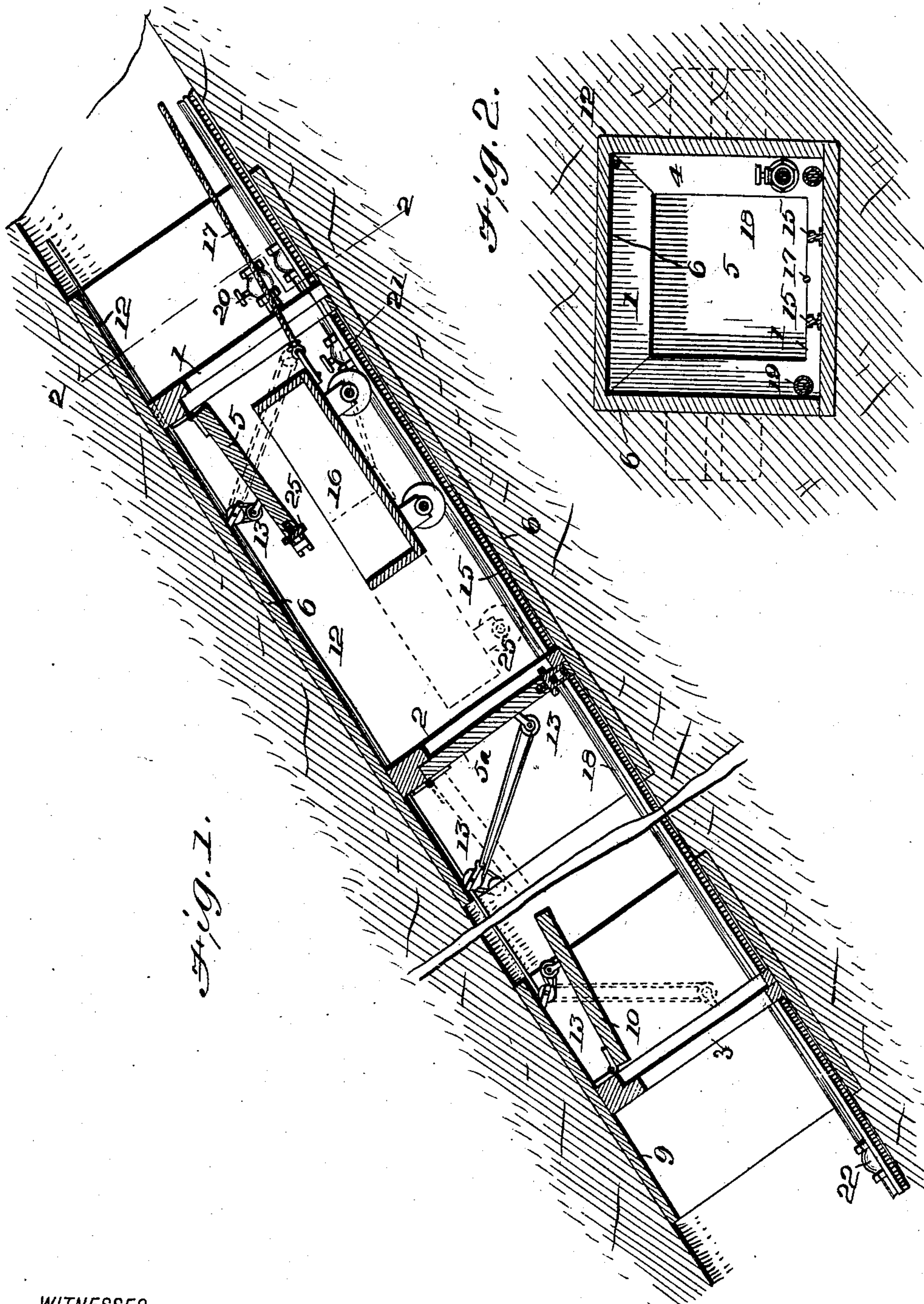
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PATENTED SEPT. 8, 1908.

P. H. DURACK.
AIR LOCK FOR MINES AND TUNNELS.

APPLICATION FILED MAY 12, 1908.

2 SHEETS—SHEET 1.



WITNESSES
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Amos W. Hart

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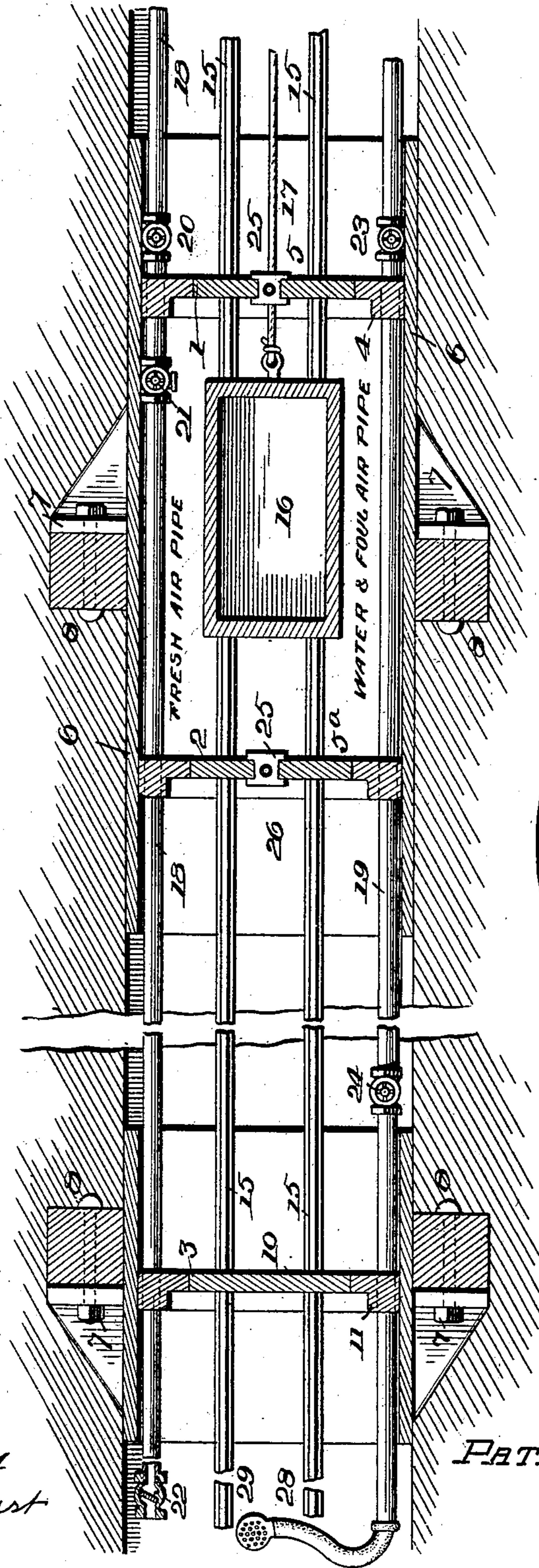
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Fig. 3.



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Fig. 5.

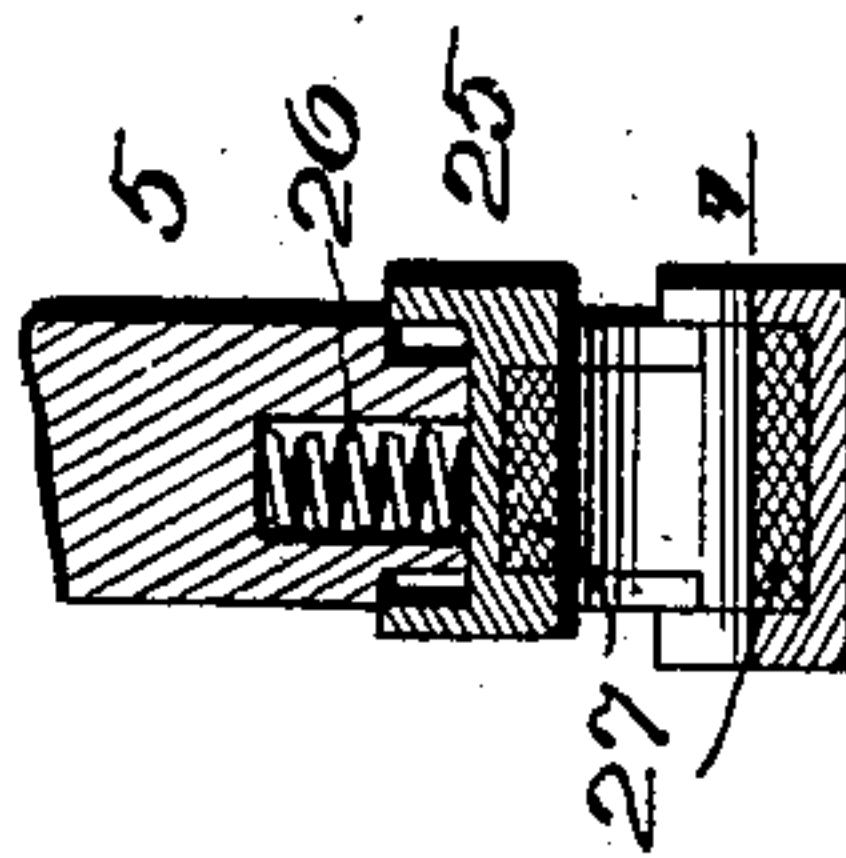
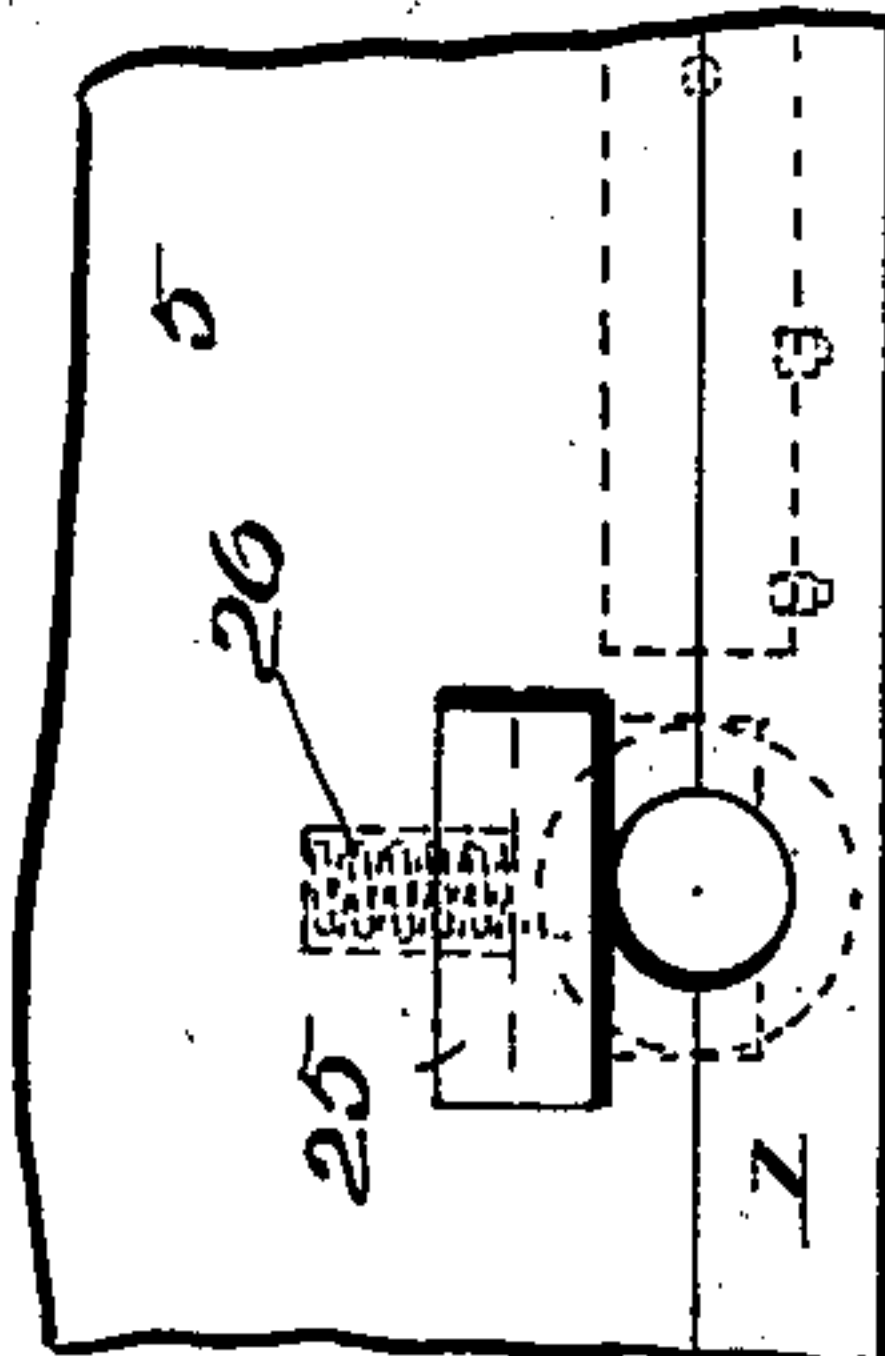


Fig. 4.

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UNITED STATES PATENT OFFICE.

PATRICK H. DURACK, OF EL PASO, TEXAS.

AIR-LOCK FOR MINES AND TUNNELS.

No. 898,343.

Specification of Letters Patent.

Patented Sept. 8, 1908.

Application filed May 12, 1908. Serial No. 432,395.

To all whom it may concern:

Be it known that I, PATRICK H. DURACK, a citizen of the United States, and a resident of El Paso, in the county of El Paso and State of Texas, have invented an Improved Air-Lock for Mines and Tunnels, of which the following is a specification.

My invention relates to improved means for removing water and foul or heated air from mine shafts or tunnels and forcing in fresh air, and also for providing for the safety of miners while blasting, so that a mine may be worked continuously with entire safety and great economy of time and labor.

In carrying out my invention, I provide two air locks, one being located near the mouth or entrance of the mine shaft or tunnel, and another being placed contiguous to the heading or foot of the shaft or tunnel; and I arrange two pipes in the shaft or tunnel one for conducting fresh air into the same and the other for removing foul air and water therefrom.

My invention is further embodied in other features and details of construction and arrangement of parts as will be hereinafter described.

In the accompanying drawings Figure 1 is a sectional view representing a portion of a mine shaft in which my improved appliances or apparatus are shown arranged. Fig. 2 is a cross-section on the line 2—2 of Fig. 1. Fig. 3 is a longitudinal horizontal section of the shaft and my invention applied thereto. Figs. 4 and 5 are detail views illustrating the rope guide formed in the air locks.

I employ three bulk-heads 1, 2, 3, the first two being spaced apart and located near the mouth of the shaft or tunnel which in Fig. 1 is shown arranged at an angle of about 45°. It is understood, however, my invention is applicable to shafts or tunnels arranged vertically or horizontally or at any intermediate angle. The lower bulk-head which in view of its function is called a safety lock, is located near the bottom of the shaft or tunnel and adjacent to the heading or chamber from which drives or, lateral galleries lead out.

As shown in Figs. 1, 2, the bulk-heads 1, 2, forming the upper air lock have doors 5 and 5^a which are hinged to the upper portions of the same and adapted to close upwardly. In other words, when the doors are opened they swing downward or toward the heading of the shaft. The bulk-heads 1, 2, are arranged and secured air tight in a suitable ob-

long box or casing 6, which as shown in Fig. 2 is preferably rectangular in cross-section. This box or casing is arranged in the shaft near the mouth thereof as before stated and is cemented or otherwise made air tight with respect to the surrounding or adjacent portions of the shaft. This may be effected by any suitable cementitious material. In practice, however, I intend to construct the box or casing 6 in sections which will enable it to be readily inserted and set in place or easily removed when occasion requires. For the purpose of firmly anchoring it in place I provide it with lateral wings or extensions 7 see Fig. 3 which are embedded in the walls of the shaft or tunnel and may be bolted to stone or other abutments 8 firmly set therein. The lower box or casing 9 is secured in a similar way in the mine shaft or tunnel near the lower end of the same and a swinging door 10 is similarly hinged to the frame or bulk-head 3 which is fixed air-tight in the center of the oblong casing. It will be noted, however, see Fig. 1, that the door 10 is so hinged as to open upward instead of downward like the doors 5, 5^a, of the upper air lock. These several doors 5, 5^a, and 10 are raised by mechanical means which may be under the control of miners or workmen in the shaft or of workmen at the mouth of the mine. For this purpose I preferably employ cords or ropes 12 which are suitably connected with the several doors and pass over intermediate sheaves 13, one sheave of each set being attached to the roof of the mine and the other to the door. In brief, I provide a block and tackle attachment for the several doors by which they may be conveniently opened and held raised as indicated in Fig. 1 for the purposes hereinafter stated.

It will be noted that when the casing or doors are to be operated from within the mine shaft, the ropes 12 will terminate therein or else be provided with branches which will serve the same purpose. On the bottom of the shaft or tunnel are laid rails 15 upon which cars 16 may be run into and out of the mine or tunnel, this being effected by the usual way by a rope 17 connected with the cars as shown. On the bottom of the shaft or tunnel on opposite sides thereof, see Fig. 3, I arrange two pipes 18 and 19, the former being used for the introduction of fresh air into the bottom of the mine or into the chamber constituting the air locks, and the other 19 being used for the removal of water or foul

air or noxious gases from the mine. As shown in Fig. 3, the pipe 18 is provided with an air discharge valve 20 at a point outside the first air lock 1 and with a second air discharge valve 21 in the upper air lock; also with a third valve 22 located at the lower end of the shaft or within the heading of the mine. The water and foul air-pipe 19 is also provided with a valve 23 outside the first air lock and with another 24 in the chamber forming the second air-lock.

It is necessary to prevent the free escape of air from the upper air lock, when the car is being lowered into or raised from the mine; and for this purpose I provide a combined guide and friction rope clamp whose construction and arrangement are as follows. As indicated in Figs. 1, 4, and 5, the door—say 5, is provided with a slot in its lower edge, and the horizontal portion or sill of the bulk-head 1 is provided with a circular groove which coincides with the slot in the door, thus forming an opening through which the rope passes. A friction rope clamp 25 is connected with the door 5 and a spring 26 is arranged in a recess in the same and presses downwardly upon the clamp as shown best in Fig. 4. The under side of the clamp has a semi-circular groove which coincides or corresponds with the groove in the base of the bulk-head 1. Through the circular opening thus formed the rope passes and the clamp 25 always presses downward upon it so that an almost perfectly air tight closure is effected. In order to relieve friction and wear of the rope, I preferably provide the adjacent surfaces of the clamp and bulk-head base with anti-friction material or packing 27, such as graphite or Babbitt metal, etc.

From the above description of the construction and arrangement of parts constituting my invention, the following operation will be readily understood. The pipe 18 serves to convey fresh air into the mine, it being necessary for this purpose that either one or both of the doors 5 or 5^a of the upper air lock shall be closed. The pressure of the air will depend upon the conditions, such as the depth of the mine and the porosity of the walls of the same. That is to say, in some mines where the walls are porous or permeable to air, the pressure required to keep back the inflow of water will be greater than in a mine whose walls are dense. This pressure will be maintained according to the indications given by a suitable air gage arranged at the mouth of the mine where the engine or air pump is located. When the valves of the air pipe 18 and the foul air pipe 19 are open and air pressure is applied through the former, a constant circulation of fresh air is maintained in the mine, and all foul air and gases are driven out through the pipe 19, as will be readily understood. In

the same way water will be forced out through the pipe 19, and for this purpose a flexible hose 28 having a head 29, see Fig. 3, is connected with the pipe so that the head is in such case inserted in the body of water at or near its deepest part.

When a blast is to be made in the heading or adjacent parts the safety door 10 is closed and also one or both of the doors 5, 5^a, in the upper section of the shaft, and the men assemble in the chamber or air lock provided between the doors 5^a and 10, wherein fresh air is admitted to the required degree of pressure. Thus the foul air or noxious gases produced by the shots or blasts will be confined in the heading without danger to the men, and they will also be protected from the force of the explosion which will spend itself in the heading and against the safety door 10 which may be, however, opened more or less according to the force applied. It will be noted that at this time the stop-cocks 23, 24 of the pipe 19 are open, and that the foul air and noxious gases escape and are readily driven out of the mine through the pipe. So soon as the heading has thus been cleared to the required degree, the safety door 10 is opened, and the men go to work again as before. Ordinarily this operation will not require more than 10 minutes counting from the time the men leave the heading and enter the chamber above the safety door 10, and their leaving the same to return to work. I thus effect a great economy in time and labor in the operation of blasting in mines.

It will be further understood that when the men enter the mine in the car 16 the door 5 is opened and the car run into chamber between the bulk-heads 1 and 2, whereupon the door 5 is closed. Then air being admitted to the required degree of pressure by the stop-cock 21 of pipe 18 the said pressure equals the pressure in the mine shaft below the bulk-head 2, and the door 5^a of said bulk-head may be opened, and the car will then pass on down to the bottom of the shaft. It is to be understood that except when blasting is to be done, the safety door 10 is not fastened and is not used, but is held supported or raised as shown by full lines Fig. 1. On the other hand when men are required to leave the mine by means of the cars 16, the door 5 is closed and the air pressure in the upper air lock is raised to the required degree which will permit the lower door 5^a to be easily opened, whereupon the car passes into the chamber and the door 5^a is closed behind it and the upper door 5 of the bulk-head 1 is opened as shown by full lines Fig. 1, which permits the car to pass out. For this purpose, it is obviously necessary that the air pressure in casing section 6 shall be reduced to that of the atmosphere outside the

mine, and hence I provide the pipe 18 with an air-discharge cock 20 at a point above the upper bulk-head 1.

What I claim is:

5 1. The improved apparatus for the purpose specified comprising two bulk-heads spaced apart and located contiguous to the mouth of the mine shaft and an elongated box or casing containing the same and anchored air tight in the shaft, the bulk-heads
10 having doors hinged and adapted to open downward, and a safety air lock comprising a casing with doors located at the lower end of the shaft, means for opening the doors of
15 the air locks, car-rope guides and clamps formed at the lower edges of the doors, pipes arranged in the shaft and provided with stop-cocks, one of said pipes serving for introduction of fresh air into the shaft and the
20 heading thereof and the other for outlet and discharge of foul air, noxious gases, and water, substantially as described.

2. The improved apparatus for the purpose specified comprising a box-like or hollow section which is open at each end and
25 located in the upper portion of a mine shaft or tunnel and two doors located therein and spaced apart, and arranged to open downward in the shaft, a block and tackle connected with the said doors for raising them and
30 holding them elevated as may be required, ropes constituting part of such tackle and a second air lock located at the bottom of the mine shaft, the door of the same opening upward, and means connected therewith for
35 raising it and holding it raised, and pipes arranged in the shaft and provided with stop-cocks as described for use in conveying fresh air into the shaft and mine under pressure
40 and for removing water, foul air and noxious gases therefrom, substantially as described.

3. In an apparatus of the class described, the combination with an air lock anchored air-tight in a mine shaft, and having doors
45 which are spaced apart and provided with doors that open downward, means for open-

ing said doors and holding them raised and an air pipe passing through the bulk-heads of the air lock and provided with an air discharge cock located in the space or chamber
50 between the bulk-heads, substantially as described.

4. In an apparatus for the purpose specified, an air lock comprising a casing anchored air-tight in the lower portion of a mine shaft,
55 and provided at its lower end with a door hinged to open vertically, means for raising such door and holding it raised, another door located above the first, or nearer the mouth of the shaft and opening downward, means
60 for raising the last-named door, and an air pipe extending through the air lock and provided with an air discharge cock within the air lock, substantially as described.

5. In an apparatus for the purpose specified, an air lock bulk-head located in the upper
65 portion of a mine shaft and including a door which opens downward and seats upward, and another air lock located at or near the bottom of the shaft and including a door
70 which opens upward and seats downward, an air conducting pipe provided with a discharge cock in the space that intervenes the two bulk-heads and a pipe extending past
75 both bulk-heads and serving for escape and discharge of water, foul air and noxious gases, substantially as described.

6. An air lock comprising an elongated hollow open end section and two bulk-heads spaced apart therein and provided with
80 hinged doors that open downward and seat upward, and means connected therewith for raising said doors and holding them elevated, and a pipe passing through the bulk-heads and provided with stop cocks for regulating admission and pressure of air
85 substantially as described.

PATRICK H. DURACK.

Witnesses:

MELCHOR MUÑOZ,
M. E. FLORER.