

(No Model.)

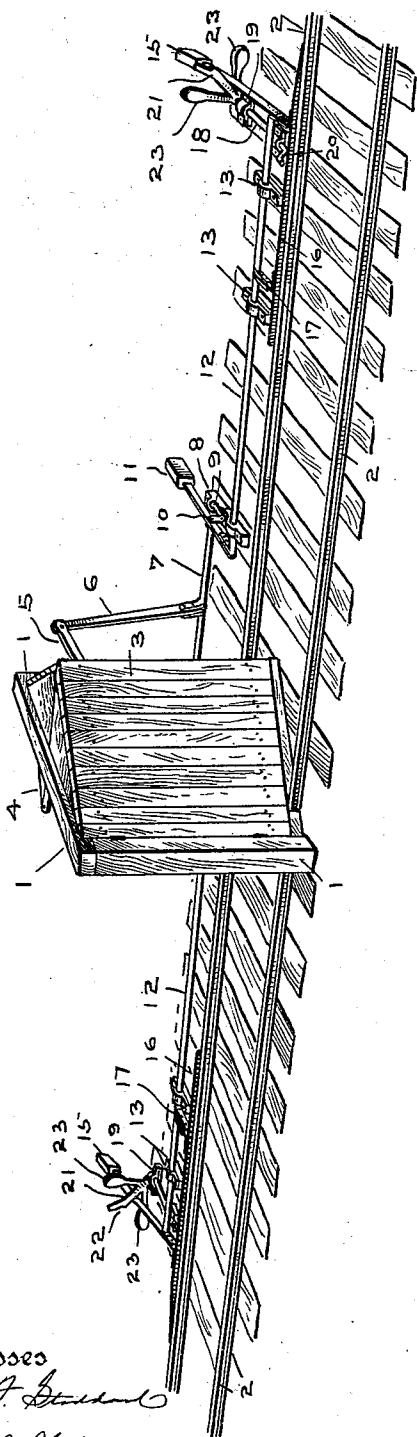
3 Sheets—Sheet 1.

H. KEYES.
MINE TRAP DOOR.

No. 551,932.

Patented Dec. 24, 1895.

FIG. 1.

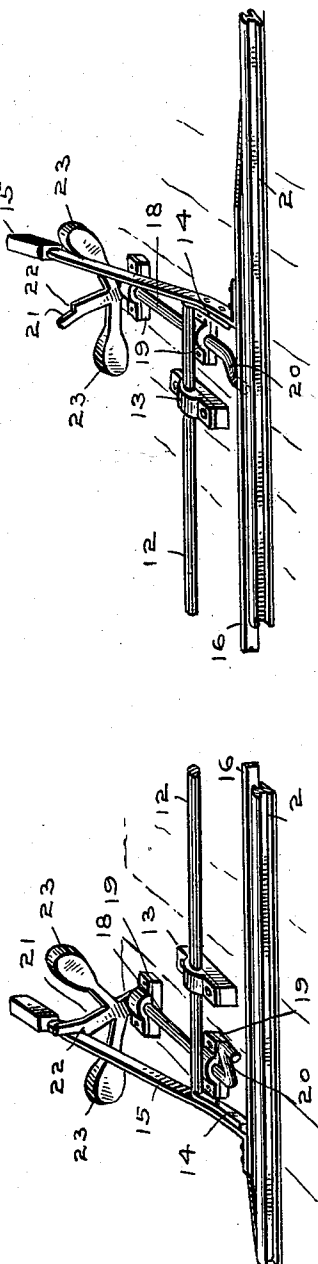


Witnesses

P. F. Stearns

W. F. Weitzmann

FIG. 2.



Inventor

Horatio Keyes

By Attorney

H. D. Neely

(No Model.)

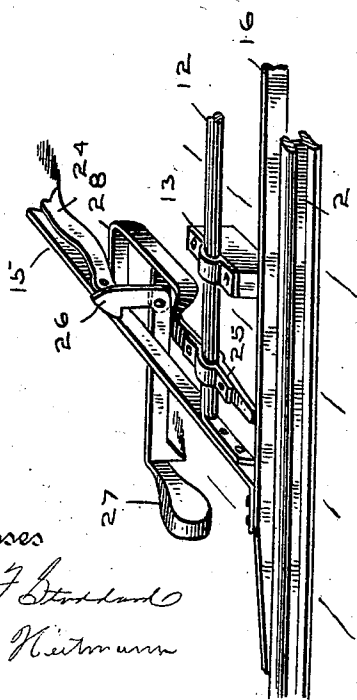
3 Sheets—Sheet 2.

H. KEYES.
MINE TRAP DOOR.

No. 551,932.

Patented Dec. 24, 1895.

FIG. 1.

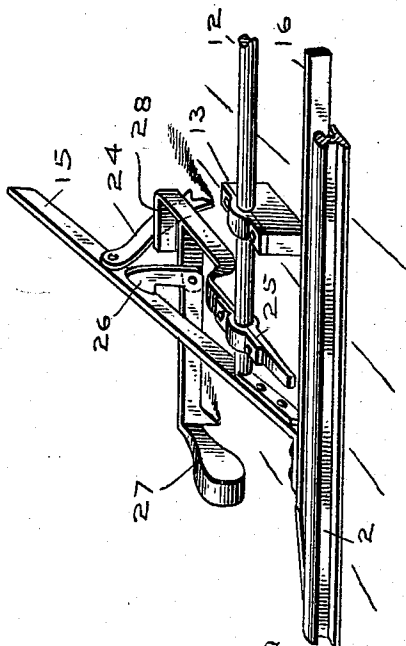


Witnesses

P. F. Litchfield

W. F. Kiehn

FIG. 2.



Inventor

Horatio Keyes

By Attorney

H. W. Neely

(No Model.)

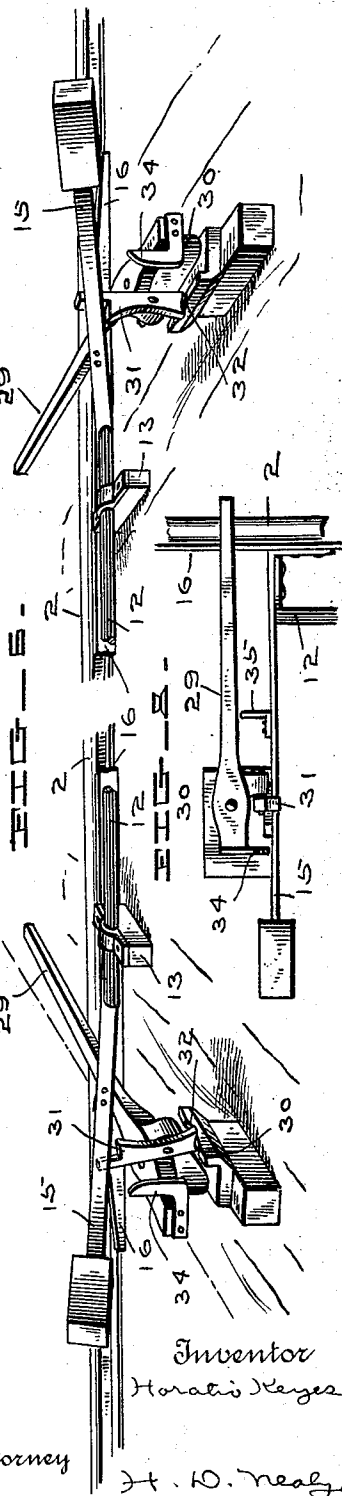
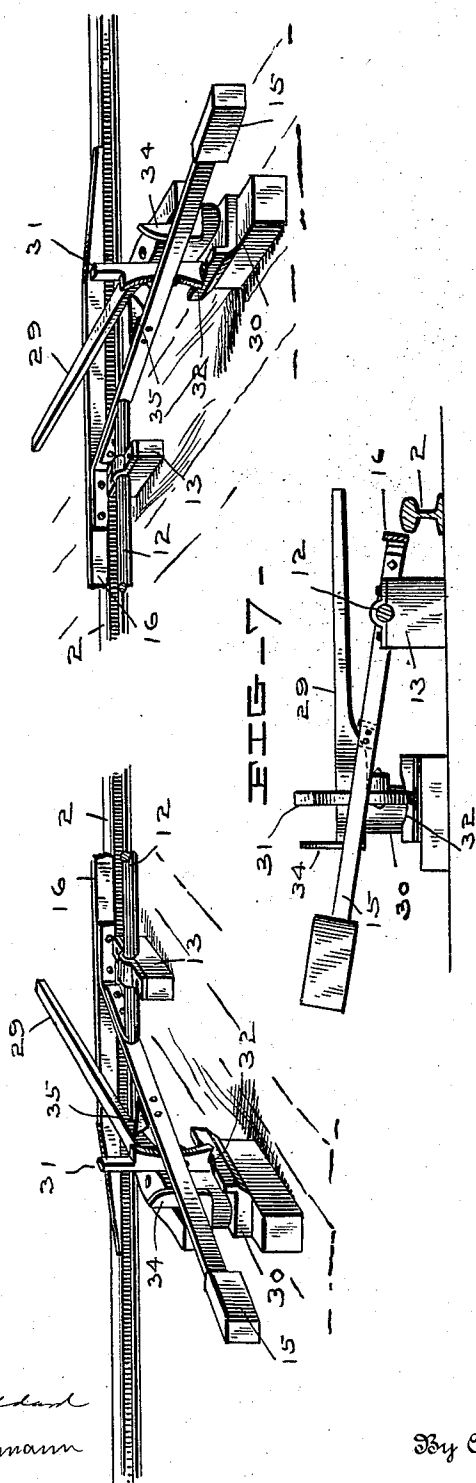
3 Sheets—Sheet 3.

H. KEYES.
MINE TRAP DOOR.

No. 551,932.

Patented Dec. 24, 1895.

FIG. 5.



Witnesses

T. F. Standland

W. F. Wickmann

By Attorney

Inventor
Horatio Keyes

H. W. Neal

UNITED STATES PATENT OFFICE.

HORATIO KEYES, OF TERRE HAUTE, INDIANA.

MINE TRAP-DOOR.

SPECIFICATION forming part of Letters Patent No. 551,932, dated December 24, 1895.

Application filed June 13, 1895. Serial No. 552,747. (No model.)

To all whom it may concern:

Be it known that I, HORATIO KEYES, a citizen of the United States, residing at Terre Haute, in the county of Vigo and State of Indiana, have invented certain new and useful Improvements in Mine Trap-Doors; and I do declare the following to be a full, clear, and exact description of the invention, such as 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 figures of reference marked thereon, which form a part of this specification.

My invention relates to new and useful improvements in mine trap-doors and to that class which are placed in the rooms or entries of mines for the purpose of cutting off or controlling air-currents, and which are adapted to be automatically opened on the approach of a car or cars toward the door, held open while the cars are passing through the same, and automatically closed after they have passed entirely through.

The object is to provide such a door-operating mechanism that will be at a short distance from the door on each side, one that will operate positively to open or close the door and one that will be simple in construction; and it consists in the construction and arrangement of parts, as will be hereinafter described, and more particularly pointed out in the claims, reference being had to the accompanying drawings, in which several forms of my device are shown, and where the same figures of reference refer to the same or similar parts.

Figure 1 is a perspective view of a mine trap-door and operating mechanism embodying my invention, the door being closed. Fig. 2 is an enlarged detail perspective view of the two operating devices or trips, the one at the right having been operated and the one at the left locked and in position to hold the door open. Fig. 3 is a similar view of a modified form of two operating devices, both in their normal position when the door would be closed. Fig. 4 is a view of the same, the trip at the right having been operated and the one at the left locked and in position to hold the door open. Fig. 5 is a similar view of still another modification of the operating devices, both in their normal position when the door would be

closed. Fig. 6 is a view of the same, the trip at the right having been operated and the one at the left locked and in a position to hold the door open. Fig. 7 is a cross-section through one of the rails in the mine and the moving bar, the trip being in elevation. Fig. 8 is a top plan view of the same.

In detail 1 represents a framework which is set up in the entry or room of a mine and across the track 2 therein, 3 being the doors which are hinged to the framework and are preferably set on an angle to each other across the track and toward the direction from which the air current or draft in the entry comes.

4 are arms connected to the top of the doors whereby they open and close simultaneously.

5 is a link pivoted to one of the doors, and also to the upper end of a lever 6, which is mounted on a shaft 7 carried in boxings 8 on the cross-ties at each side of the door-frame 1 and outside thereof. A crank 9 is formed on each end of the shaft 7, and to these cranks are connected by links 10 the weighted arms or levers 11, whose inner ends are fixed to arms or cranks on the ends of the operating-shafts 12, of which there is one on each side of the door, and which are carried in boxings 13 at the side of the track for a distance of say ten or fifteen feet away from the door. The outer end of each of the shafts 12 is turned to form a crank 14, and each is connected to a weighted arm or lever 15, the inner end of which is connected to a moving bar 16, which lies parallel with and close to one of the rails 2, the moving bar having its outer end tapering and its inner end connected by a bracket 17 with the operating-shaft 12, so that on the depression of the moving bar by the wheels of a passing car the shaft will be turned.

18 is a short shaft lying at right angles to the operating-shaft 12 and under the outer end of the same, it being carried in boxings 19. 20 is a crank on its end near the moving bar 16, and is in line to be moved or depressed by the wheels of passing cars at the same time the moving bar is. On the outer end of the short shaft 18 is carried a locking-arm 21 provided with a notch or tooth 22, which at times hereinafter described is adapted to engage with the outer end of the arm or lever 15.

23 are weighted arms connected on either

side of the locking-arm 21, and tend to hold such locking-arm on either side of a vertical position in which it may be thrown, as hereinafter described.

5 In the modification shown in Figs. 3 and 4 the moving bar is connected with the operating-shaft 12 and arm 15 in the same way as the first, and the connection of the tripping devices with the door is the same, the only
10 difference in the trips being that the arm 15 of each has a pivoted brace 24 on its outer end which drags preferably on a cross-tie as the arm is raised and acts as a brace to hold it up—that is, on the tripping device on the
15 side of the door opposite that from which the car operates, and as shown at the left in Fig. 4, where the car has operated the right-hand trip and locked the left-hand one. Instead of the short shaft 18 there is provided a lever
20 25, which is loosely mounted on the operating-shaft 12 near its end and has a pivoted locking-arm or hook 26 pivoted to it, the locking-arm being provided with a weighted arm 27. The lever 25 also has a turned end 28, which
25 lies under the brace 24 on the end of the arm 15.

In the modification shown in Figs. 5, 6, 7, and 8 the door attachments to the operating-shaft are the same, as are also the attachments
30 of the moving bar to the operating-shaft and arm 15. Instead of the short shaft 18, however, I provide an arm 29 which is pivoted to a block 30 outside of the rails, the arm lying over one of the rails and adapted to be moved
35 by the wheels of passing cars. This lever carries on its side near its pivoted point a pivoted locking-arm 31, which is adapted to be moved on the moving of the lever through the lower end of the locking-arm bearing on a
40 curved way or guide 32 formed on the block 30. The arm when in its normal position lies against the side of the locking-arm 31, as shown in Fig. 5. 34 and 35 are beveled guides or projections formed on or connected to the
45 pivoted arm 29 and weighted arm 15 for bringing back such arm to its normal position after its trip has been operated, as will be herein-
after described.

The construction of the several forms of
50 trips having been described, I will now set forth their operation, beginning with the one shown in Figs. 1 and 2. In Fig. 1, where the trips are shown in their normal position and ready to be operated on by a car approaching
55 from either direction, we will suppose a car moved along the track 2 from the right. As it came in contact with the moving bar 16 on that side of the door it would depress it, lifting the weighted arm 15 and through its connection with the operating-shaft 12 turn it,
60 and the shaft 7 thus opening the door and simultaneously operating the shaft 12 on the opposite side of the door and its moving bar and arm. The first result of this would be
65 for both arms 15 to engage with the notches 22 in the arms 21 of the short shaft 18. When the first car, however, has passed on the right-

hand moving bar far enough, the wheels would depress the crank on the end of the short shaft 18 and unlock the locking-arm
70 21 from the arm 15, as shown on the right in Fig. 2. It will thus be seen by reference to Fig. 2 that the left-hand trip is still locked and holds the door open, so that if only one car passes the right-hand trip the door would
75 still remain open until the left-hand trip be operated. As the car passes on the second or left-hand moving bar it will merely lift that locking-arm slightly, but when the wheels strike the crank end of the short shaft 18
80 such cranks will be turned, throwing the arm 21 inward and out of the way of the weighted arm 15, so that when the car or cars have passed entirely off of the left-hand moving bar, neither arm 15 being supported, both will
85 fall, as will also the weighted arms 11 near the door. As the outer ones fall, and thus through their connections close the door, they will strike the outer weighted arms 23 of the locking-arm 21, simultaneously throwing such
90 locking-arms outward and into their normal position, (shown in Fig. 1,) where the trips will be again ready to be operated on by a car from either direction. It will be thus seen
95 that when either trip is operated the doors are opened and the opposite trip locked, so that the doors remain open until the second trip is operated. Therefore if one or a dozen cars pass over the trips the result is the same, for the second trip is not unlocked or the moving
100 bar released until the car or cars have passed over such trip. The advantages of this construction are that the trips can be placed at a short distance from the doors, only short moving bars are necessary, and the coaction
105 of the trips are perfect.

In the first modification we will suppose a car approaches from the right hand. The moving bar on that side will first be depressed and through its connections open the door and
110 depress the moving bar of the opposite trip, thus lifting both of the weighted arms 15, and the braces 24 will thus be in position to support them, as shown at the left in Fig. 4. As, however, the car passes over the arm 25 of
115 the right-hand trip it will rise, lifting the weighted arm 15 with it and also the brace 24, and the arm or latch 26 will engage with the arm 15, thus holding its brace in an inoperative position, as shown at the right in Fig. 4.
120 The parts will remain in this position until the car has passed over the left-hand trip and arm 25, which will lift its locking-arm into engagement with the weighted arm 15 and also lift the brace 29 into an inoperative position.
125 When the car has passed off of the left-hand moving bar the weighted arms 15 will both drop, and the weighted ends of the locking-arm 26 striking the ground will unlock such arms from the weighted arms and
130 bring all parts into their normal position, as shown in Fig. 3. It will be readily seen that the entire operation of this door and its trip is in principle precisely like the first one. In

the third form (shown in Figs. 5, 6, 7, and 8) upon the approach of a car, we will suppose from the left, the moving bar will first be depressed and the door opened. The weighted arms of both trips would be raised and locked by engagement with the locking-arms 31, as shown at the right in Fig. 6. When the car-wheels struck the pivoted lever 29 of the left trip, it would be moved inward a certain distance, and the pivoted locking-arm on its side working on the curved way or guide 34 the upper end of the locking-arm would be brought out of line of engagement with the weighted arm 15, thus releasing it, as shown at the left in Fig. 6. The parts then remain in that position until the car has passed through the door to the right-hand trip, when by moving the pivoted lever 29 on that side its locking-arm 31 would disengage with the weighted arms 15 as just stated, so that then both trips would be unlocked, but would be held raised until the car had passed off of the right-hand moving bar, when they would fall, closing the doors through their connections. As they dropped, the beveled projections 34 and 35 on the pivoted lever 29 and weighted arm 15 would contact with such arms, so that when the two weighted arms had reached their lowered position the pivoted levers 29 would be again in their normal position at right angles to the track and both trips ready to be again operated. The principle of this modification is precisely the same as the first and, while for some reasons not quite so advantageous, can be made to give good results.

It will be seen from the foregoing that in the trips described the result is obtained in precisely the same way by depressing both moving bars and raising the weighted arms simultaneously, and through locking-arms, locking the one on the opposite side of the door from which the car approaches, the doors are held open while a car or train is passing through the doors, and from one locking-bar to the other, and in all cases the trips are unlocked and the doors closed as the cars pass over and off of the second moving bar.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a mine trap door, two trips, one on each side of the door, said trips being connected together, each trip consisting of a short moving bar in the path of passing cars, suitably connected with the door to open and close the same when the bar is depressed, an arm connected to such bar, and a locking de-

vice in line of engagement with such arm and in the path of passing cars, said locking device being thrown out of engagement with the arm of the moving bar by cars passing in one direction and into engagement by cars from the other direction, or by the falling of the arm of the moving bar.

2. In a mine trap door, a trip on each side thereof consisting of a short moving bar operated by passing cars and connected with the door to open and close the same, a pivoted arm attached to such bar, a locking arm normally in line of engagement with the first arm whereby it will lock such arm when raised, such locking arm being thrown out of engagement with the first arm by a car passing in one direction and into engagement by a car from the opposite direction or by the falling of the first arm.

3. In a mine trap door, a trip on each side thereof consisting of a short moving bar operated by passing cars, such bar attached to an operating shaft which is connected with the door for opening and closing the same, a weighted arm connected to such moving bar, a locking arm having weights on each side carried on a shaft and adapted normally to lie in line of engagement with such weighted arm, said locking arm being thrown out of engagement with the weighted arm by cars passing in one direction operating to turn its shaft, and again into engagement by cars from the opposite direction or by the falling of the weighted arm.

4. In a mine trap door, a trip on each side thereof consisting of a short moving bar operated by passing cars, such bar attached to an operating shaft which is connected with the door for opening and closing the same, a weighted arm connected to such moving bar, a locking arm normally lying in line of engagement with said weighted arm, and provided with weighted projections on each side, such locking arm being carried on a short shaft having a crank end in the path of passing cars, whereby on the raising of the weighted arm, the latter will be locked, while the locking arm will be moved out of line of such engagement by passing cars from one direction and again into line of said engagement by passing cars from the opposite direction or by falling of said weighted arm.

In testimony whereof I affix my signature in presence of two witnesses.

HORATIO KEYES.

Witnesses:

J. H. KEYES,

CHARLES O. REICHERT.