E. B. HESS.

SUBWAY CONSTRUCTION.

APPLICATION FILED APR. 12, 1910.

962,145. Patented June 21, 1910.

4 SHEETS—SHEET 1.

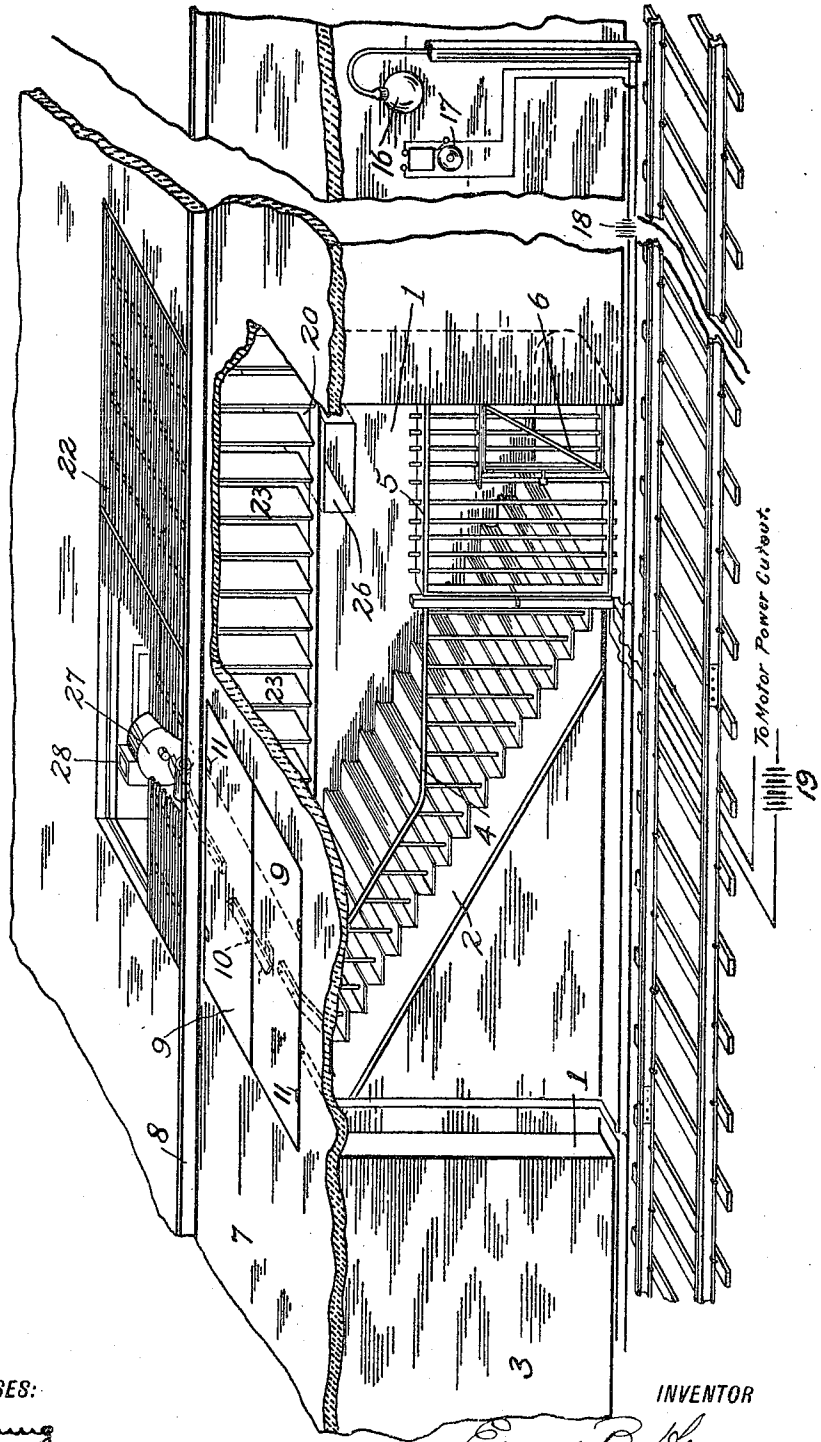

Fig. 1

WITNESSES:

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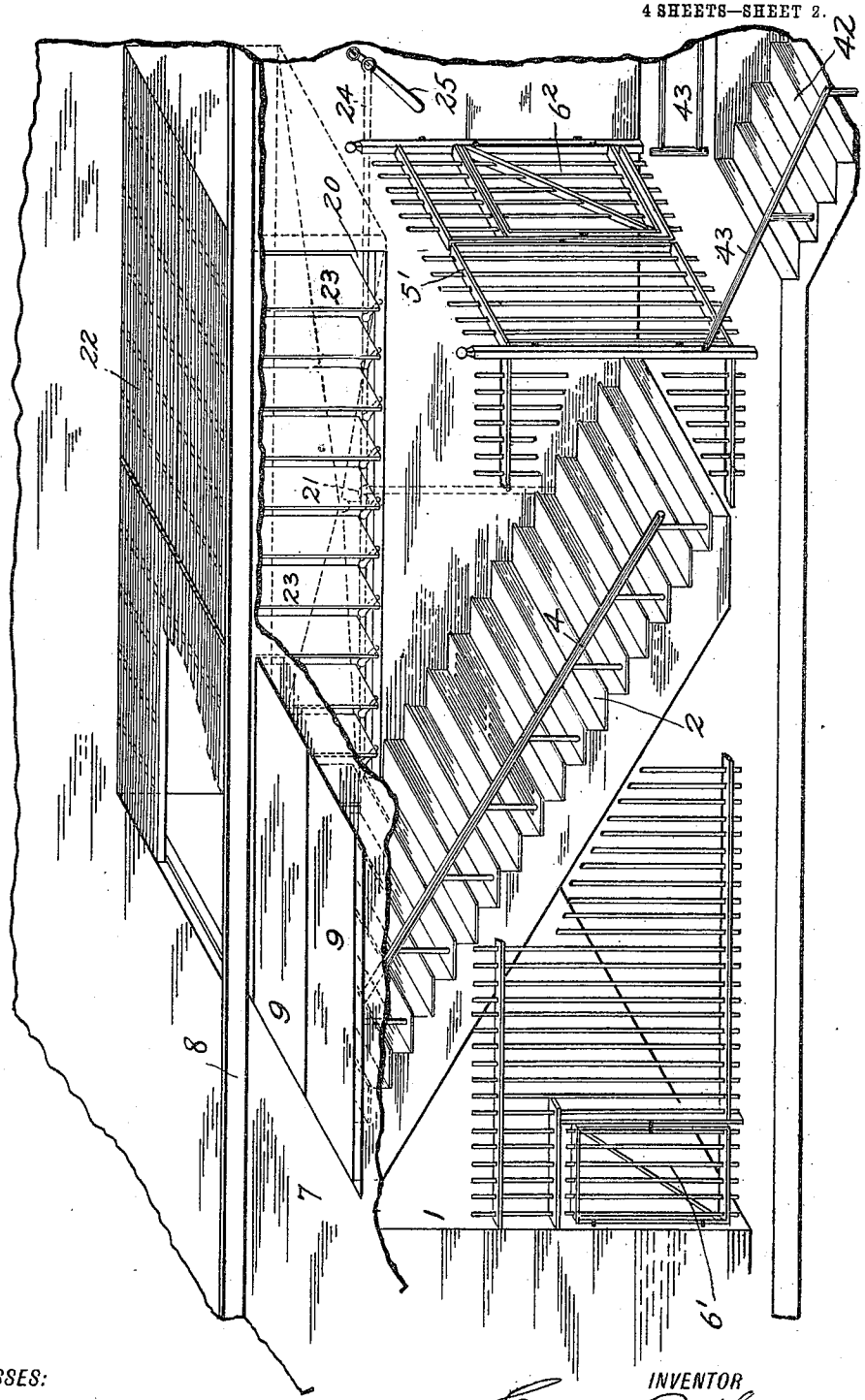

Fig. 2.

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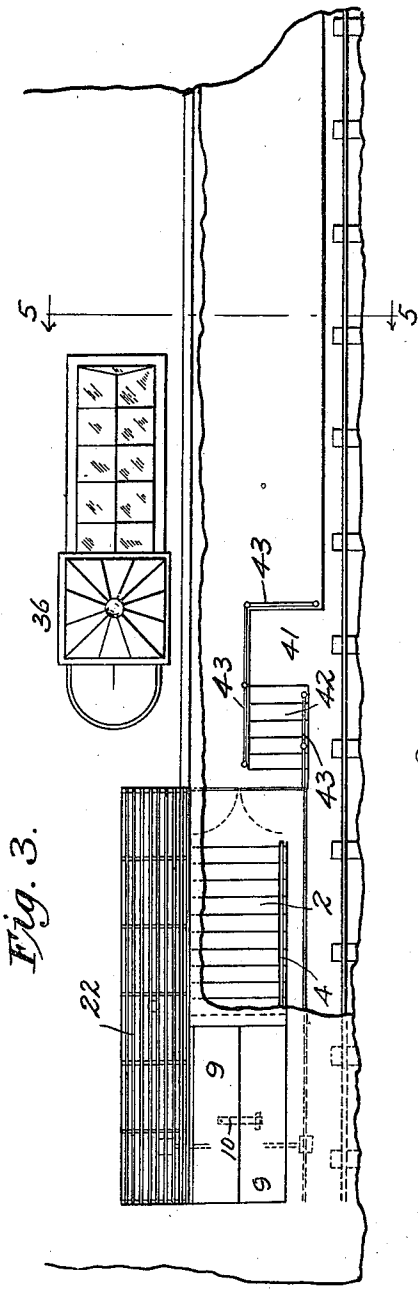

Fig. 3.

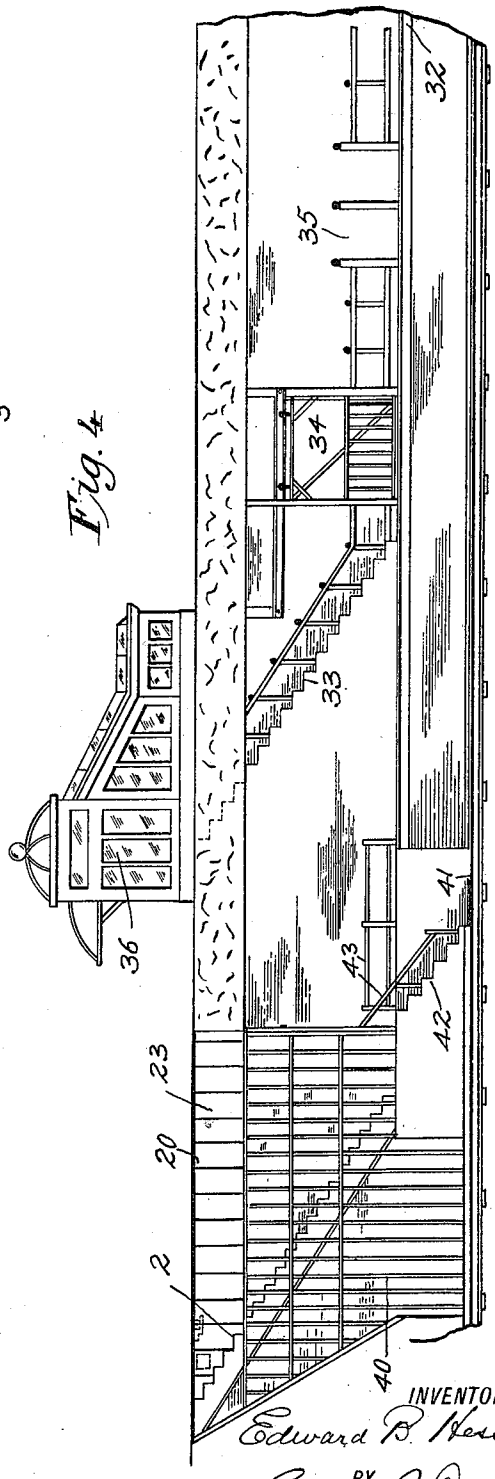

Fig. 4.

WITNESSES:

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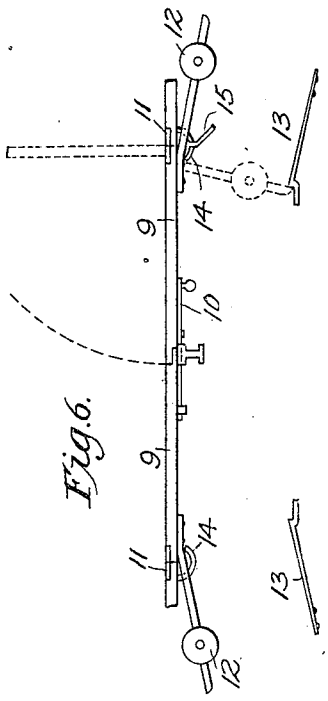

Fig. 6.

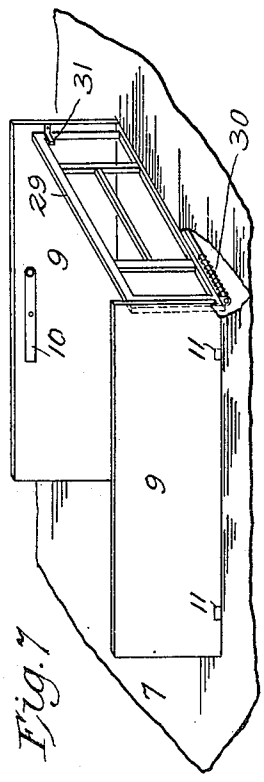

Fig. 7

Fig. 9

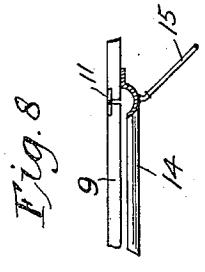

Fig. 8

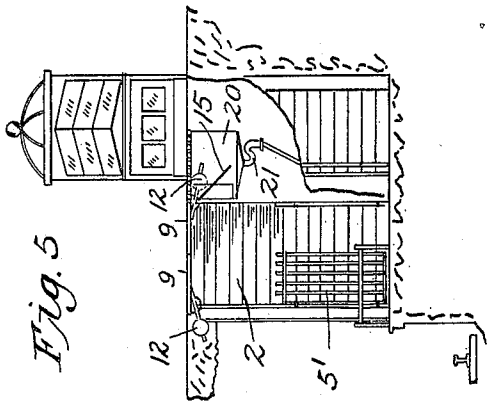

Fig. 5

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EDWARD B. HESS, OF NEW YORK, N. Y.

SUBWAY CONSTRUCTION.

962,145. Specification of Letters Patent. **Patented June 21, 1910.**

Application filed April 12, 1910. Serial No. 554,986.

To all whom it may concern:

Be it known that I, EDWARD B. HESS, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Subway Construction, of which the following is a specification.

The primary object of this invention is to afford emergency exits to be used in case of disaster or even of blockades. Incidental thereto provision is made, not only for lighting the emergency exits, but also for lighting the subway adjacent the emergency exits by daylight from the outside; and as incidental to these things, there occurs ventilation facilities at each of the emergency exits which may be made capable of control so as to modify the light admitted to the subway, as may be desired. Aside from the matter of illuminating the emergency exits from the outside and the much needed ventilation in the subway under normal conditions the lighting and ventilating features afford exits for the smoke and gases with which the tunnel may become charged in the event of fire or of the burning out of motor and other insulation. Coupled with these features, I may employ devices acting automatically when the emergency exit is put into use to disconnect electric power from the section of tracks that includes the emergency exit (or that may include several of them) and also to automatically set into operation visual and audible signals for guidance of the motorman of an oncoming train.

The construction indicated is not only applicable to the side stations and side walls of subways but may also be applied at one or both ends of island stations, usually known as express and transfer stations.

These ends are attained by providing exits usually in the form of stairways since in most locations inclined runways would involve too much expense on account of the lack of room and high price of property in congested districts where mostly subway systems are operated. It is, of course, feasible to provide escalators to take the place of inclined runways or stair cases, but that again would involve unnecessary expense not only in the matter of installation but in operation. These emergency stairways, when located at stations, are to be inclosed or guarded by railings, or otherwise, in such way that they may not be taken for ordinary exits and are, except in case of special urgency, not accessible or thrown open to the passengers. This applies particularly at station emergency exits and need not be at emergency exits located intermediate stations. Such emergency exits are provided, when necessary, by constructing offsets in the walls of the subway or tunnel and erecting therein means of suitable character, such a stairway, by which passengers may ascend and at the top of which is provided an exit that may be located either in the roadway, on the sidewalk or even within the interior of buildings, as may be desired or as the exigencies of the case may require. Such exit is to be provided with a closure means, such as folding doors, preferably counterbalance, releasable only from below and provided with means for retaining them open when they are thrown upwardly from below. Such doors may be single or double, as may be desired or as may be required, according to the special location in which they are placed. If located in the roadway, they would be naturally made of such weight, strength and stability as to withstand without danger of disarrangement, the maximum traffic of the street. If placed in the sidewalk, they need not, of course, be of such strength. In order that such emergency exits shall be adequately or helpfully illuminated from the outside, there is at each exit provided a chamber adjacent the staircase, which chamber would preferably be made of the greatest attainable vertical dimensions and be of adequate length. This lateral extension, which most ordinarily would be located in the sidewalk of the street, would be covered by a grating of adequate strength and of such design as to afford a maximum admission of light to the subway. The natural illumination of the emergency exit would be a sufficient guide during daylight and at night some fixed signal light could be placed, as for instance, a cluster of lights of two or more different colors, or a light of arbitrary color other than that used in the ordinary operation of trains, for guidance of the motorman. The daylight illumination of the emergency exits renders unnecessary their constant expensive artificial illumination and the daylight illumination is available during the rush hours of traffic. The opening of this lateral extension into that part

of the emergency exit in which the stairway or means by which the passengers may ascend, may be provided with shutters or blades vertically or otherwise disposed and operated in unison by one or more operating means to regulate the admission of light and the direction of the rays of light entering the emergency exit and incidentally these shutters would operate to control the ventilation at that point. This lateral extension, since it would be open to rainfall and snow, should be provided with an adequate means of drainage; similarly it is to be expected that more or less dust and dirt and refuse of the street will accumulate therein and therefore it should be so designed as to afford access for the purpose of cleaning.

In connection with the system of construction above outlined, I may and preferably do provide that the opening of the emergency doors or the opening of a gate affording access to the emergency staircase or at both of these points, shall set into operation signaling devices such as signal lights, audible signals or semaphores or indeed, all three classes of such signaling apparatus, which may be located at appropriate points in the subway at suitable distance from the emergency exit, to act as warnings to the motorman of an oncoming train; and at the same time a cutout device electrically controlled, may be operated to shut off the power current in that section of the track in which the train is stalled or where an accident has occurred.

The accompanying drawings are not laid out to scale nor do they purport to indicate all the conditions at points in the subway where emergency exits might be located; nor is it contemplated that the mere details of construction illustrated are controlling. On the contrary, such details may be varied to suit special cases or as the engineer may think best. The drawings do, however, afford a clear disclosure of this invention and of the essential principles upon which it is based.

Figure 1 is a view in perspective partly broken away, illustrating an emergency exit located intermediate stations. Fig. 2 is a similar view showing an emergency exit located at the end of a station platform. Fig. 3 is a plan view on a similar scale partly broken away and showing a station having the ordinary entrance and exit communicating with the platform. Fig. 4 is a sectional elevation of the general arrangement shown in Fig. 3. Fig. 5 is a cross section on the line 5 5 of Fig. 3. Fig. 6 is a detail view somewhat diagrammatic, indicating the emergency doors from the street level. Fig. 7 is a perspective view of the same showing the doors open. Fig. 8 is a detail view showing a drainage trough for carrying off moisture entering around the door. Fig. 9 is a detail diagrammatic view showing the means of simultaneously operating the lighting controlling shutters or slats.

The emergency exit shown in Fig. 1 is one that is located between stations. There is an offset 1 in the wall of the subway and located therein suitably adjacent the interior face 3 of the wall of the subway, is a staircase 2 provided with an ordinary railing or baluster 4. Preferably the entrance platform at the bottom of the staircase, which is about on a level with the track is closed by a gate 5. This gate is shown as carrying a smaller gate 6, which may be used by workmen without throwing into operation the signal and other devices hereinafter described. At the top of the staircase and in this instance, located in the roadway 7 closely adjacent the curb line 8, is an opening closed by double hinged doors 9. These doors open outwardly and are locked, as indicated by the dotted lines in Fig. 1 and as shown in Fig. 6, by a swing latch or other appropriate means 10, on their inner face. They may therefore only be opened from below. 11 indicates the hinges of the two sections of the door and 12 indicates counterbalance weights that act when the swing latch is open to elevate the doors or assist to such extent as that but little upward pressure is required to swing them to the open position indicated in dotted line in Fig. 6.

In order to guard against closing of the doors by outside pressure which might result in injury to persons passing upward, any suitable locking means for retaining them in open position may be provided. There are shown in the drawings simple spring latches 13, that automatically engage the ends of the arms that carry the counterweights. Where double doors are used, as indicated in Fig. 6, they are preferably lap jointed and may be provided at the lap with a water excluding layer of rubber or leather. To provide for the drainage of rain water or of melting snow and ice entering around the edges of the door, there is provided an interior gutter 14, indicated particularly in Figs. 6 and 8. This gutter extends around the four sides of the opening and is properly graded to discharge into a discharge or drainage pipe 15, of which there may be any desired number. Since in the particular construction illustrated the arms carrying the counterweights divide the gutters at the sides of the opening, the side portions of the gutters may be graded downwardly toward each end, or the ends of the gutter adjacent to the arms may be closed. The drain pipe or pipes 15, as shown in Fig. 5 discharge into a drainage trap hereinafter referred to.

Fig. 1 shows a danger signal light 16 of any appropriate color and an audible signaling device 17 of any suitable character. There may be as many such devices as de-

sired located at appropriate points to act as warnings to the motorman of an oncoming train. These signaling devices are connected in circuit with a source of electricity indicated at 18 and the circuit wires are connected as indicated, with the gate 5, so that when the gate is thrown open, the circuit of the signaling devices is closed and they are automatically put into operation. The circuit wires are also connected to the emergency doors 9, so at that point also the circuit for the signaling devices is closed when the doors are thrown open. The signaling devices may, of course, be on normally closed circuit and be put into operation when the circuit is open at either the gate 5 or door 9. In order that the signaling devices may not needlessly be put into operation at times when, perhaps, it becomes necessary to open the door 9 or gate 5 for cleaning or repairs, there may, of course, be provided a switch or switches by which the circuit of the signaling devices may be opened; also in order to test the signal circuits with respect to the strength of the battery, etc., a switch may be provided by which a testing signal bell or other device may be put in circuit with the door and gate contacts and the signaling devices located in the subway cutout.

It is highly desirable where the third rail system is used, as it generally is in subway construction, that power should be cut off from the third rail when the emergency exit is being used. Any appropriate electrically controlled cutout may be employed for that purpose and its circuit controlled either at the gate 5, at the door 9 or at both points. In the drawings the cutout circuit is indicated. It contains a source of electrical energy 19, and is connected with switch contacts at the gate 5 so that when the gate is opened the circuit will be closed and the power cutout operated. It may also be connected with door 9. A single battery or source of energy may take the place of the two shown.

Opening upon the emergency stairway is a chamber 20, shown in this instance as located at one side of the staircase. Its bottom is graded as indicated in Figs. 2 and 5, to drain to a trap 21. This chamber 20 is preferably made of substantial dimensions in plan to afford admission of the maximum amount of light to the emergency exit and for the same purpose it is made of such vertical dimensions as is feasible to permit of light entering at the top to pass laterally to the emergency staircase and adjacent subway. The lighting chamber 20, as indicated in Fig. 1, is arranged alongside of the offset in which is located the emergency staircase and is closed by a grating 22. Communication between the chamber 20 and the space in which is located the emergency staircase may be controlled with respect to its area, by vertical disposed shutters or slats 23, pivoted top and bottom and controlled by an endwise movable rod attached to one end of an operating lever 25, Fig. 9. By the manipulation of the slats the volume of light and the direction in which it is thrown upon the emergency staircase and into the subway, may be controlled. The lighting of the emergency exit in this or other like ways, afford also a substantial ventilation of the entire subway, since it is contemplated that the emergency exits will be placed at frequent intervals. It would be practically impossible to obtain adequate light without such ventilation. If the grating 22, for instance, were replaced by glass, the latter would have to be of such strength and thickness as that the amount of daylight illumination in the subway would be insufficient. This is particularly true where the roof of the subway is considerably below the street level. Aside from the ventilation of the subway under ordinary conditions, the illuminating box or chamber, constituting also necessarily a means of ventilation, affords a means of discharging from the tunnel, smoke and products of combustion in case of fire or burning insulation.

Extending from the wall of the offset in which the emergency staircase is located, is an exhaust duct 26, communicating to a rotary fan 27 of which 28 is the discharge outlet. This fan may be equipped with a driving electric motor which may be set into operation automatically when either the door 9 or the gate 5 is thrown open. The fan may, of course, be located at any convenient point.

For clearness of illustration the grating 22, has been broken away and the fan shown located in the chamber 20 opposite the door 9. Instead of the spring latches 13, indicated in Fig. 6, the door 9, when thrown open, may be held open by a brace consisting of a skeleton frame 29 arranged across the upper end of the opening closed by the doors. This brace is hinged at its lower edge within the door opening and its axis is provided with a spring 30 that throws the brace to upward position against a stop 31. It is, therefore, impossible that the door should be closed without drawing the brace down.

Figs. 2 to 4 show an emergency exit located at the end of a station platform. Parts corresponding with those already described, are similarly lettered and, therefore, but little description is required. The emergency staircase is located opposite the end of the platform 32 and instead of a single gate 5, a double gate 5^1 is indicated. A subsidiary gate for the use of the workmen, which in Fig. 2 is marked 6^1 may be located in the side of the railing inclosing the emergency stair case, and another subsidiary gate 6^2 may be carried by one of the double gates 5^1.

It is contemplated that in connection with the station emergency exits the signaling devices and the other appliances already described in connection with Fig. 1, may be employed. Illustration of them in Figs. 2 to 4 has not been thought necessary.

In Fig. 4 the ordinary entrance and exit staircase is indicated by 33. 34 indicates an ordinary gate for passengers leaving the train and 35, the usual gate at which passengers taking trains, pass on to the platform and at which the ticket chopper is located; and 36 shows the covering of an ordinary street entrance and exit. At some subway stations to handle the traffic, there is provided an entrance staircase such as 33, and a similar staircase particularly for exit during rush hours, to divide the current of travel.

At the left hand side of Fig. 4, a slight modification in construction is shown. The emergency staircase 2 is carried by a vertically disposed grating 40 of adequate strength located beyond the end of the station platform. This part of the construction may be built of structural iron, a suitable platform being provided at the foot of the staircase connecting it with the floor of the station platform and the staircase may be of a skeleton construction, that is to say, the treads may be composed of slats or hollow squares and the risers be similarly designed. This construction affords a greater field of illumination at the end of the station platform and the track area beyond.

It is desirable that station emergency exits shall be accessible from the track level. The station platform is therefore cut out as at 41 and steps 42 provided that lead up to the platform adjacent the entrance gate of the emergency stairway. Railing 43 is placed around the well 41 and steps 42.

I claim:

1. A railroad subway comprising an emergency outlet for passengers leading from the subway to an exit at the surface above, a closure normally closing the exit from ingress and egress, and closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit.

2. A railroad subway comprising an emergency outlet for passengers leading from the subway to an exit at the surface above, a closure disposed horizontally, or substantially so, at the street level and normally closing the exit from ingress and egress, and closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit.

3. A railroad subway comprising an emergency outlet for passengers leading from the subway to an exit at the surface above, a counterbalanced closure disposed horizontally, or substantially so, at the street level and normally closing the exit from ingress and egress, and closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit.

4. A railroad subway comprising an emergency outlet for passengers leading from the subway to an exit at the surface above, a closure disposed horizontally, or substantially so, at the street level and normally closing the exit from ingress and egress, closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit and means located adjacent the outlet for passengers for admitting daylight thereto.

5. A railroad subway comprising an emergency outlet for passengers leading from the subway to an exit at the surface above, a closure normally closing the exit from ingress and egress, closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit and signal devices automatically set when the emergency exit is in use.

6. An electric railroad subway comprising an emergency outlet for passengers leading from the subway to an exit at the surface above, a closure normally closing the exit from ingress and egress, closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit and means for cutting off the power current from the road adjacent the exit automatically operated when the emergency exit is in use.

7. A railroad subway comprising an offset in the wall of the subway intermediate passenger stations, means located therein whereby passengers may ascend to an exit at the surface above, a closure normally closing the exit from ingress and egress, and closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit.

8. A railroad subway comprising an offset in the wall of the subway intermediate passenger stations, means located therein whereby passengers may ascend to an exit at the surface above, a horizontally disposed closure normally closing the exit from ingress and egress, and located at the street level or substantially so, and closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit.

9. A railroad subway comprising an offset in the wall of the subway intermediate passenger stations, means located therein whereby passengers may ascend to an exit at the surface above, a horizontally disposed counterbalanced closure normally closing

the exit from ingress and egress, and located at the street level or substantially so, and closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit.

10. A railroad subway comprising an offset in the wall of the subway intermediate passenger stations, means located therein whereby passengers may ascend to an exit at the surface above, a closure normally closing the exit from ingress and egress, closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit and a light admitting chamber extending laterally from said offset.

11. A railroad subway comprising an offset in the wall of the subway intermediate passenger stations, means located therein whereby passengers may ascend to an exit at the surface above, a closure normally closing the exit from ingress and egress, closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit, a light admitting chamber extending laterally from said offset and adjustable means for controlling the admission of light from said chamber to the offset in the tunnel wall.

12. A railroad subway comprising an emergency outlet located intermediate stations and having means whereby passengers may ascend to an exit at the surface above and a closure normally closing the exit against ingress.

13. A railroad subway comprising an emergency outlet having means whereby passengers may ascend to an exit at the surface above, a closure normally closing the exit against ingress and signal devices automatically set when the emergency exit is in use.

14. A railroad subway comprising an emergency outlet having means whereby passengers may ascend to an exit at the surface above, a closure normally closing the exit against ingress and means automatically operated when the emergency exit is in use for cutting off the power current from the road adjacent the exit.

15. A railroad subway comprising an emergency outlet having means whereby passengers may ascend to an exit at the surface above, a closure normally closing the exit against ingress, signal devices automatically set when the emergency exit is in use and means automatically operated when the emergency exit is in use for cutting off the power current from the road adjacent the exit.

16. A railroad subway comprising an offset in the wall of the subway intermediate stations and a staircase located in the offset by which passengers may ascend to an exit at the surface above.

17. A railroad subway comprising an offset in the wall of the subway intermediate stations, a stair-case located in the offset by which passengers may ascend to an exit at the surface above and a chamber extending laterally from the offset and arranged to admit daylight thereto.

18. A railroad subway comprising an offset in the wall of the subway intermediate stations, a stair-case located in the offset by which passengers may ascend to an exit at the surface above, a closure normally closing the exit and means whereby the closure may be opened from the inside.

19. A railroad subway comprising an offset in the wall of the subway intermediate stations, a stair-case located in the offset by which passengers may ascend to an exit at the surface above, a horizontally disposed closure located at about the street level, normally closing the exit and adapted to be opened from the inside and means for admitting daylight to illuminate the stairway.

20. A railroad subway comprising an offset in the wall of the subway intermediate stations, a stair-case located in the offset by which passengers may ascend to an exit at the surface above, a horizontally disposed closure located at about the street level, normally closing the exit and adapted to be opened from the inside and a chamber extending laterally from the offset through which daylight is admitted thereto.

21. A railroad subway comprising an offset in the wall of the subway intermediate passenger stations, means located therein whereby passengers may ascend to an exit at the surface above, a closure normally closing the exit from ingress and egress, and closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit combined with signal devices automatically set when the emergency exit is in use.

22. A railroad subway comprising an offset in the wall of the subway intermediate passenger stations, means located therein whereby passengers may ascend to an exit at the surface above, a closure normally closing the exit from ingress and egress, and closure locking means located on the inside thereof and adapted to be readily operated to unlock the closure by any one seeking exit combined with means automatically operated when the emergency exit is in use for cutting off the power current from the road adjacent the exit.

23. A railroad subway comprising an offset in the wall of the subway intermediate passenger stations, means located therein whereby passengers may ascend to an exit at the surface above, a closure normally closing the exit from ingress and egress and closure locking means located on the inside thereof and adapted to be readily operated

to unlock the closure by any one seeking exit combined with signal devices automatically set when the emergency exit is in use and means automatically operated when the emergency exit is in use for cutting off the power current from the road adjacent the exit.

In testimony whereof, I have hereunto subscribed my name.

EDWARD B. HESS.

Witnesses:
S. A. STORY,
L. F. BROWNING.