

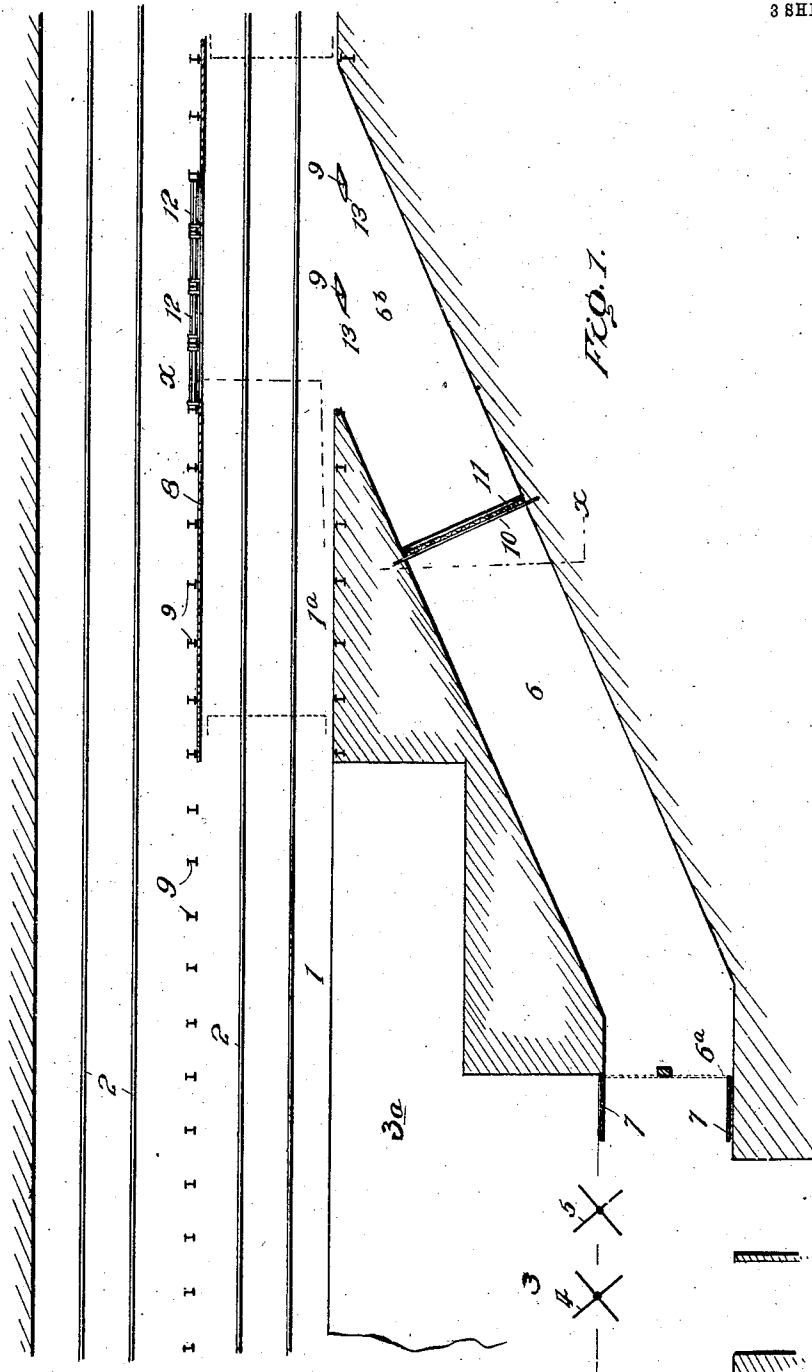
No. 848,834.

PATENTED APR. 2, 1907.

W. E. LAMB.
SYSTEM OF VENTILATING SUBWAYS.

APPLICATION FILED JULY 16, 1906.

3 SHEETS—SHEET 1.



Witnesses

W. E. Lamb
W. E. Lamb

By

W. E. Lamb
W. E. Lamb, Attorney.

Inventor

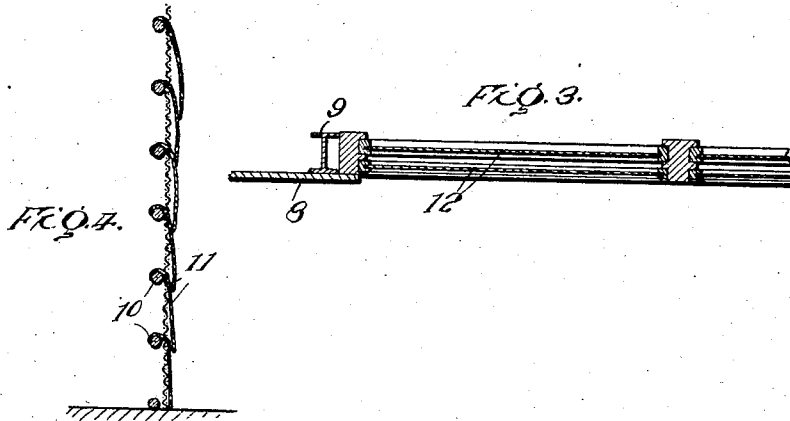
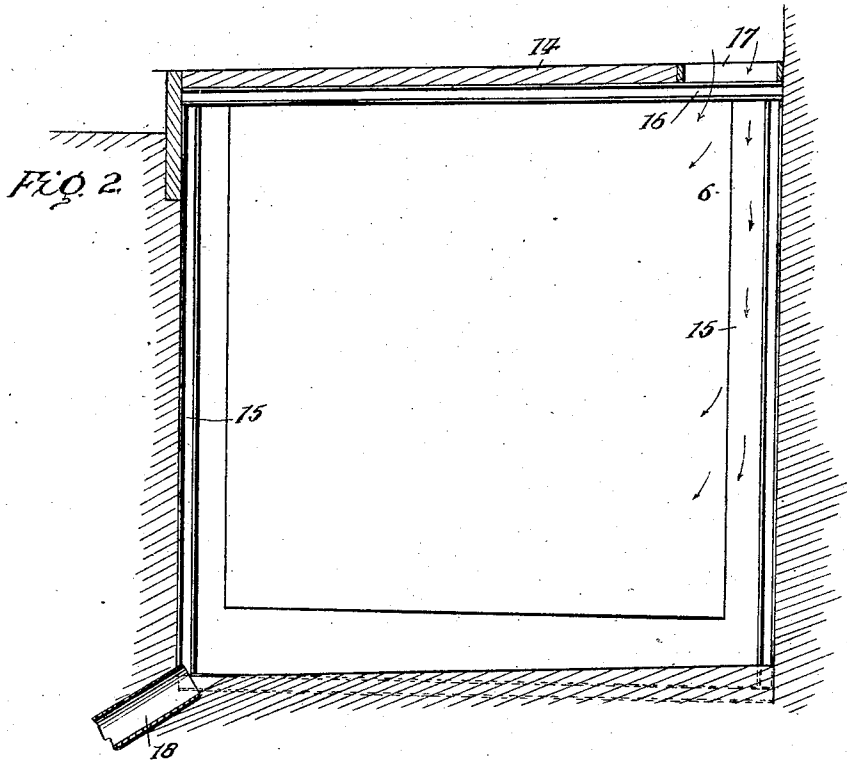
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3 SHEETS—SHEET 2.



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W. E. Lamb
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Inventor

W. E. Lamb,

By

Pharazacy, Attorneys.

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3 SHEETS—SHEET 3.

FIG. 5.

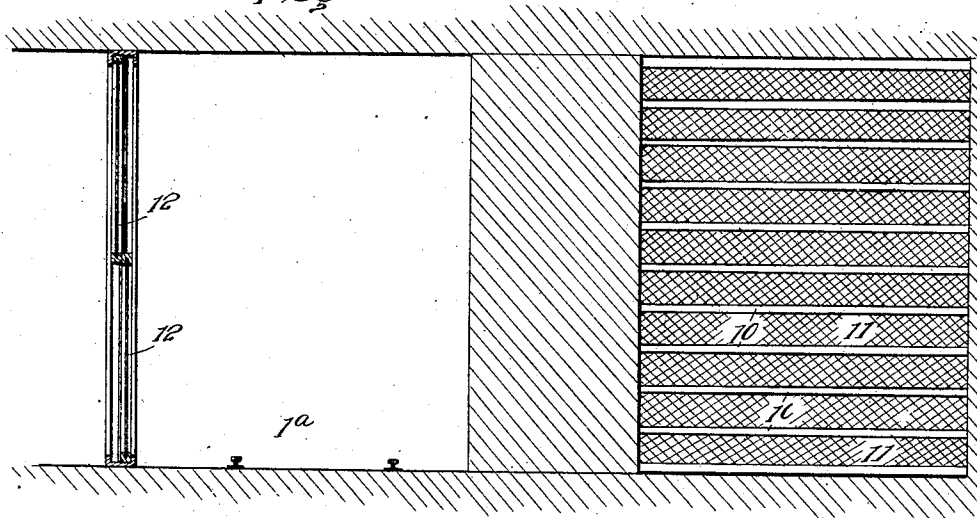
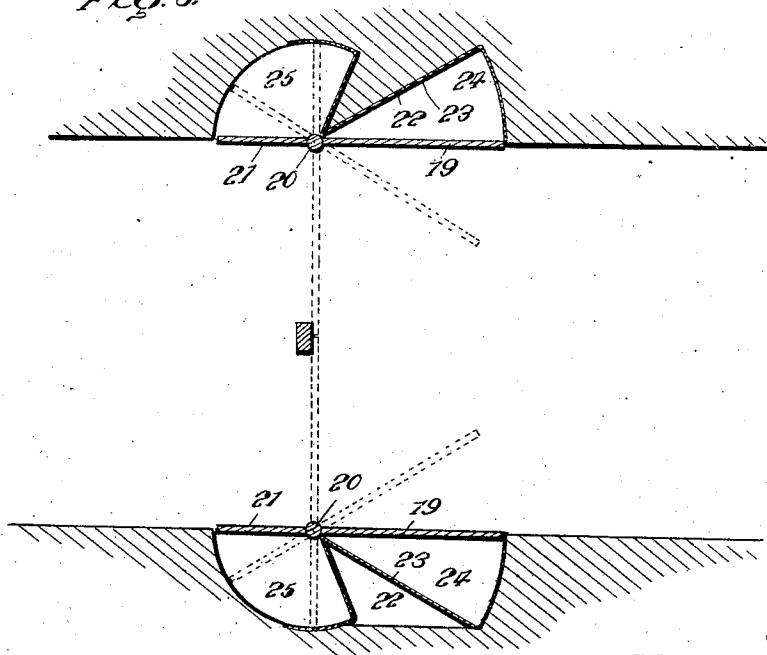


FIG. 6.



Inventor

W. E. Lamb

Witnesses

J. J. Moore
W. P. Woodson

By

W. B. Blaney, Attorney

UNITED STATES PATENT OFFICE.

WALTER E. LAMB, OF RANSOMVILLE, NEW YORK.

SYSTEM OF VENTILATING SUBWAYS.

No. 848,834.

Specification of Letters Patent.

Patented April 2, 1907.

Application filed July 16, 1906. Serial No. 326,446.

To all whom it may concern:

Be it known that I, WALTER E. LAMB, a citizen of the United States, residing at Ransomville, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Systems of Ventilating Subways, of which the following is a specification.

As is well known, the patronage of the subway railroad systems in large cities is considerably reduced, particularly in the more heated seasons of the year, by reason of the inadequate means provided to facilitate ventilation therein. The air in the subways frequently becomes so foul as to be extremely offensive and disagreeable to the traveling public, which under such conditions prefers to utilize the elevated or surface railways where possible, materially decreasing the earnings of the underground roads. Consequently it is an important desideratum for subways to have as perfect ventilation as possible, and this invention includes a system of ventilation especially designed to overcome the disadvantages hereinbefore mentioned.

For a full description of the invention and the merits thereof and also to acquire a knowledge of the details of construction of the means for effecting the result reference is to be had to the following description and accompanying drawings, in which—

Figure 1 is a horizontal sectional view showing a portion of a subway, an adjacent station, and ventilating means embodying the invention. Fig. 2 is a vertical sectional view showing the construction of the auxiliary passage adjacent to the inlet end thereof when said passage is located intermediate the stations and communicates with the surface of the ground. Fig. 3 is a horizontal sectional view bringing out more clearly the mounting of the closures of the partition. Fig. 4 is a vertical section of the valved closure in the length of the auxiliary passage. Fig. 5 is a section on the line X X of Fig. 1. Fig. 6 is a horizontal sectional view showing modified closure means to be located in the length of the auxiliary passage.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

Referring to the drawings and specifically describing one of the adaptations of the in-

vention, the numeral 1 designates the subway-tunnel, which is ordinarily constructed of a width sufficient to provide at least two tracks, on which the ingoing and outgoing trains travel. The rails of the tracks are indicated at 2, and Fig. 1 illustrates a station 3 such as commonly located at intervals in the length of the subway and including doors or gates 4 and 5 of suitable construction, the former being designed for exit purposes, while the latter permits ingress of the passengers. The gates 4 and 5 will of course be located near the base of the stairs which lead from the surface of the ground.

The construction of the station need not be specifically set forth, as it is contemplated that the invention may be applied to various forms of stations or, properly speaking, used in connection with stations of various constructions.

The invention may include the provision of an auxiliary air-passage 6, leading off at an acute angle to the main tunnel or subway 1 and in communication at one end with the latter. The passage 6 will be of a length dependent upon the particular arrangement thereof and determined by tests to ascertain the most preferable construction of the ventilating system. However, in the construction shown in Fig. 1 the passage 6 joins with the subway 1 a short distance beyond the station 3, while the outer end of said passage 6 terminates adjacent to the points of ingress and egress to said station, as shown most clearly at 6^a. In Fig. 1 it is designed to utilize the air-shaft or entrance means of the station 3 in order to supply air to passage 6, the quantity of air being regulated by means of suitable doors or equivalent devices 7, adapted to be operated and adjusted to positions admitting more or less air to said passage 6. The doors 7 are located at the outer terminal of the passage 6 in the construction shown, though this is not necessary.

In the practical embodiment of the invention the train which passes through the subway is utilized as a piston virtually in its movement through said subway to create a suction or draw on the passage 6, by which fresh or pure air is caused to enter the subway to take the place of impure or foul air forced out of this tunnel or passage-way for the rolling-stock. To secure the piston-like effect of the train as it moves through the subway and with respect particularly to the

passage 6, it is necessary to locate a partition 8 between the tracks in the subway and at a point opposite the mouth of the passage 6, the point where said passage joins the subway, (indicated at 6^b.) The partition 8 may be of any substantial construction and is preferably supported by means of the vertical columns 9, customarily provided in subway construction in order to support the roof of the tunnel. The partition 8 divides the subway 1 into suction-passages 1^a at the mouth of the air-inlet passage 6, because the portion of the subway inclosed by the partition 8 and sides of said subway is of a size not much greater in sectional area than the space required for passage of the train or car traveling in the tunnel. In other words, as the train moves through the suction-passage 1^a at the mouth of the passage 6 a strong draft or suction is created in said passage 6 by reason of the compression of the air in advance of the train and the tendency of the train to create a vacuum in rear thereof. The action of the train or car as a moving piston through the passage 1^a is obvious, and it will further be very clear that the suction created by the train as it moves past the mouth of the passage 6 will be sufficient to draw a large quantity of fresh pure air into the subway to take the place of the foul or impure air which is compressed or forced along in advance of the train. The foul air is forced from the subway to stations at intervals in the length of the subway and is permitted to pass from the tunnel to the exterior atmosphere through the ingress and exit means provided for the passenger traffic of the station.

It is necessary in connection with the passage 6 to provide means for preventing air drawn into the subway 1 through this passage escaping from the subway through the same passage 6 after the train has passed out of the suction-passage. Such means may embody any suitable construction; but that illustrated consists, generally speaking, of a valved closure 10, located at a point intermediate the ends of the passage 6. The valved closure 10 may comprise a number of transverse bars or rods suitably attached to the walls of the passage 6, a screen secured to said bars and extending across the passage, and a plurality of inwardly-opening valves 11, attached in a substantial way to the bars of the closure 10. The valves 11 may be of any desirable type, but are preferably flap-valves constructed of fabric material or the like in order to readily open inwardly or toward the mouth of the passage 6 on the creation of a suction on this portion of the passage and to readily close against the screen of the closure 10 when the suction in the passage 6 is relieved or when the pure air drawn into the subway tends to escape through the passage 6 for any reason.

Special means are provided for regulating

the suction which may be exerted on the mouth of the inlet-passage 6 by the passing train in the tunnel, such means being desirable by reason of variation in conditions of service incident to the use of a system of ventilation such as hereinbefore described. For the above-mentioned purpose it is therefore contemplated to so construct the partition 8 as to provide a number of openings just opposite the mouth of the inlet-passage 6. These openings are adapted to be closed or opened by means of suitable closures 12, and in the preferred arrangement and construction of parts the closures 12 may comprise closed sashes or frames to be raised and lowered, and thus adjusted so as to determine the area of the opening or openings opposite the mouth of passage 6. It will be seen that if the closures 12 are so arranged as to provide a number of openings the suction effect produced by the passage of the train will be reduced proportionate with the combined area of said openings, while if the area of the openings in partition 8 is reduced by adjustment of the closures 12 the degree of suction created at the mouth of inlet 6 will be proportionately increased. The closures 12 are preferably vertically slidable in suitable ways provided in the frames in which they are mounted, as shown most clearly in Fig. 3 of the drawings. The supporting-columns 9 at the mouth of the inlet 6 are preferably provided with suitable pointed deflectors 13 vertically thereof to offer a minimum amount of resistance to passage of air.

The embodiment of the invention shown in Fig. 1 simply illustrates the same in one application thereof; but it is to be understood that under ordinary conditions the auxiliary passage 6, partition 8, and other cooperating parts used in connection therewith may be located at points intermediate of stations, in which instance the passage 6 will incline upwardly toward the surface of the ground or terminate in a vertical air-shaft which extends to the surface of the ground. Fig. 2 discloses the construction wherein the outer terminal of the air-passage 6 communicates with the surface of the ground and not with the air-shaft of a station. In this instance the walls 15 of the passage 6 will be suitably constructed to support the sidewalk 14, the means permitting inlet of air to the passage 6 consisting of a suitable opening or openings 16 at the top of the passage and covered by a grating 17 of a construction suitable to prevent entrance of trash or foreign matter into the passage 6. The openings 16 will of course be of an area found necessary and desirable in the actual practice of the invention, and this will be determined by actual test also. The bottom of the passage 6 is inclined toward one of the side walls thereof, so that water or the like will pass off from the passage through an outlet 18, connecting with

sewage-pipes or arranged to carry off such water in any suitable way.

Fig. 6 shows a modified construction of a closure intermediate the ends of the passage 6^a. This modification does away with the utilization of valves 11 of the type above described, substituting instead the doors 19. The doors 19 are pivoted at 20 and have wings 21 extending therefrom adjacent to the pivots 20, said wings 21 being in line with the bodies of the doors. The walls of the passage 6 in the modification in Fig. 6 are recessed, as shown at 22, and in these recesses 22 are arranged plates 23 of the form illustrated in the drawings, which plates provide air-spaces 24 and 25 in the recess 22. The provision of the air-spaces 24 and 25 is advantageous, as these air-spaces constitute air or elastic cushioning means for the door 19 and the wing 21 at each side of the passage 6 as said door opens and closes. The axes about which the doors 19 operate are so inclined from the vertical that said doors normally occupy half-open positions, so as to be readily influenced by the suction of air through the passage 6 to open entirely or by a current of air moving toward the outer end of passage 6 to close entirely and prevent escape of such air which is pure and fresh and which has been just previously drawn into the subway. When the doors 19 close, the wings 21 prevent jar and vibration, which might effect injury to the door by reason of the fact that the wings compress the air in the spaces 25. The doors likewise act in the same manner with reference to the air in the spaces 24 as said doors open, and the advantages of the construction just described will be obvious.

It is comprehended within the scope of the invention and the claims hereinafter set forth that the specific construction described may be modified and changed in various ways to secure the best results.

The foregoing description generally sets forth a desirable embodiment of the invention; but the invention as covered by said description is designed for modification in various ways within the broad scope and spirit thereof. Thus it is to be understood that it is contemplated by the invention to force the foul air out of the subway instead of drawing the fresh air in, though the latter way is preferred in order to secure the most satisfactory results.

So far as the disadvantages of the present system of ventilating subways are concerned it is well known that the air in most subways becomes foul, offensive, and laden with disease germs by reason of having been breathed over and over many times by persons in various states of health and disease, a condition inimical to the health and comfort of the traveling public, which under these conditions necessarily prefers to utilize the ele-

vated or surface railways where possible, this course materially decreasing the earnings of the underground systems. It is intended to emphasize that within the scope of the invention the air acted upon by the rolling stock can be drawn through the station itself and the auxiliary air-passage dispensed with.

One of the most important features of the invention is the provision of a partition opposite the mouth of the auxiliary air-passage, and it may be stated that this partition does not extend the entire distance between the stations, but is preferably of a length equal to about one-third or one-fourth of this distance. This length may be varied, however. Preferably the hereinbefore-described apparatus is used to draw air into the subway mainly, which air is allowed to flow out of its own accord at points distant from the points where it was drawn in, thus producing a flow of air conducive to thorough ventilation. With regard to the structure shown in Fig. 2 it is preferred that the air-passage 6 terminate in a simple vertical air-shaft, as above described, located, preferably, in the rear of buildings, but where the air-supply has to be taken from the street it is necessary to provide the special means dwelt upon hereinbefore to prevent dirt and foreign matter on the street from being drawn into the subway. As shown in Fig. 2, provision of the vertical air-shaft and the manner of supplying air thereto will exclude rubbish and foreign matter and collect the finer and smaller particles of such matter in the vertical air-shaft or outer chamber and such will not be drawn into the air-passage 6, as the formation of the opening 16 leading to the air-shaft or the outer terminal of the passage 6 is such that as air is drawn through said opening 16 it is given a whirling motion, causing the foreign matter drawn in thereby to gravitate to the bottom of the chamber or shaft at the outer terminal. The whirling effect given to the air drawn into the openings 16 may be increased by making the air-passage 6 proper smaller in cross-sectional area than the chamber or shaft at its outer terminal. This last-mentioned chamber or shaft may extend horizontally for forty feet more or less.

It is to be understood that the revolving doors (shown in Fig. 1) near the base of the stairs leading into the station 3 and near the platform 3^a of the station have curved pieces at the sides, necessary in order that they may prevent the air from flowing inward or outward through them. The reason for using doors of this construction is to avoid various unpleasant effects that would result from drawing a current of air through the station, such as the condensation of moisture on all parts of the station, and, furthermore, such construction prevents the escape of fresh air at this point after it has been drawn in.

Having thus described the invention, what is claimed as new is—

1. In a system of ventilating subways and in combination with a subway, a fresh-air-inlet passage communicating at one end with the subway, an automatically-operating closure for the fresh-air-inlet passage permitting ingress of air to the subway, but preventing egress or outlet of such air through said passage, and doors situated at a suitable point in the length of the passage to regulate the quantity of air to be drawn into the same.
2. In a system of ventilating subways and in combination with a subway, an auxiliary fresh-air passage communicating with the subway, and a partition longitudinally of the subway and arranged opposite the mouth of the air-passage aforesaid.
3. In a system of ventilating subways and in combination with a subway, an auxiliary fresh-air passage communicating with the subway, a partition longitudinally of the subway and arranged opposite the mouth of the air-passage aforesaid, said partition being provided with a plurality of openings, and means for closing and opening said openings of the partition.
4. In a system of ventilating subways and in combination with a subway, a plurality of tracks arranged in said subway, an auxiliary fresh-air-inlet passage communicating with the subway, and a partition arranged in the subway longitudinally thereof, said partition being located opposite the mouth of the auxiliary air-passage and between the tracks aforesaid.
5. In a system of ventilating subways and in combination with a subway, a plurality of tracks arranged in said subway, an auxiliary fresh-air-inlet passage communicating with the subway, a partition arranged in the subway longitudinally thereof, said partition being located opposite the mouth of the auxiliary air-passage and between the tracks aforesaid, the partition having a plurality of openings therein, means for closing and opening said openings of the partition, and means in the length of the auxiliary air-passage permitting air to pass into the subway through said passage but preventing air from escaping from the subway there-through.
6. In a system of ventilating subways and in combination with a subway, a plurality of tracks arranged in said subway, an auxiliary fresh-air-inlet passage communicating with the subway, a partition arranged in the subway longitudinally thereof, said partition being located opposite the mouth of the auxiliary air-passage and between the tracks aforesaid, the partition having a plurality of openings therein, means for closing and opening said openings of the partition, valve means for the auxiliary air-passage permitting air to pass into the subway through said passage but preventing air from escaping from the subway therethrough, and means for regulating the quantity of air admitted to the subway through the auxiliary passage.
7. In a system of ventilating subways and in combination with a subway, a plurality of tracks arranged in said subway, an auxiliary fresh-air-inlet passage communicating with the subway, a partition arranged in the subway longitudinally thereof, said partition being located opposite the mouth of the auxiliary air-passage and between the tracks aforesaid, the partition having a plurality of openings therein, means for closing and opening said openings of the partition, means in the length of the auxiliary air-passage permitting air to pass into the subway through said passage but preventing air from escaping from the subway therethrough, and doors arranged to regulate the quantity of air admitted to the subway through the auxiliary air-passage.

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

WALTER E. LAMB. [L. s.]

Witnesses:

MARY W. LAMB,

KITTIE L. CLAPSADDLE.