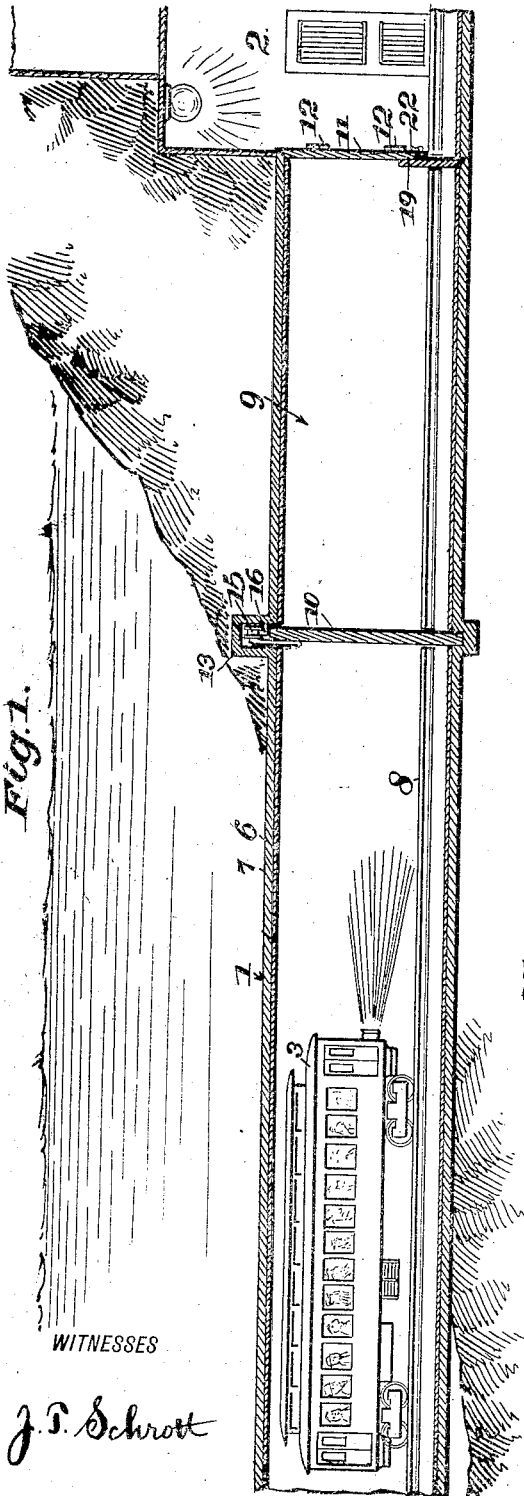


R. B. DAVY,
VACUUM RAILWAY,
APPLICATION FILED MAY 23, 1919.

1,336,732.

Patented Apr. 13, 1920.
2 SHEETS—SHEET 1.

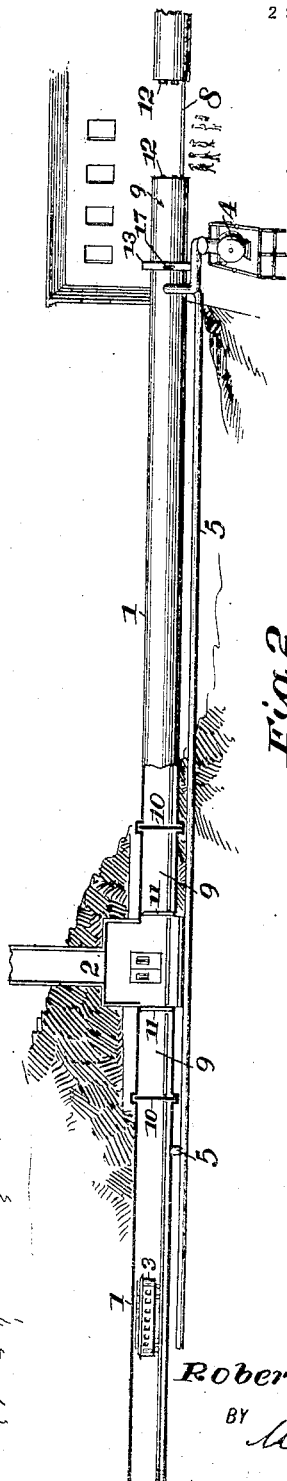
Fig. 1.



WITNESSES

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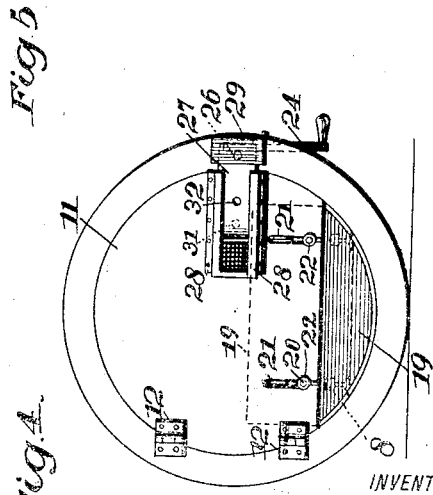
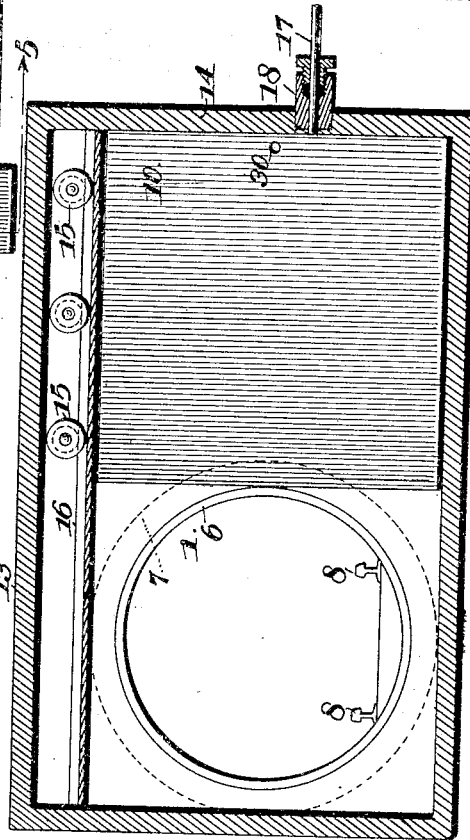
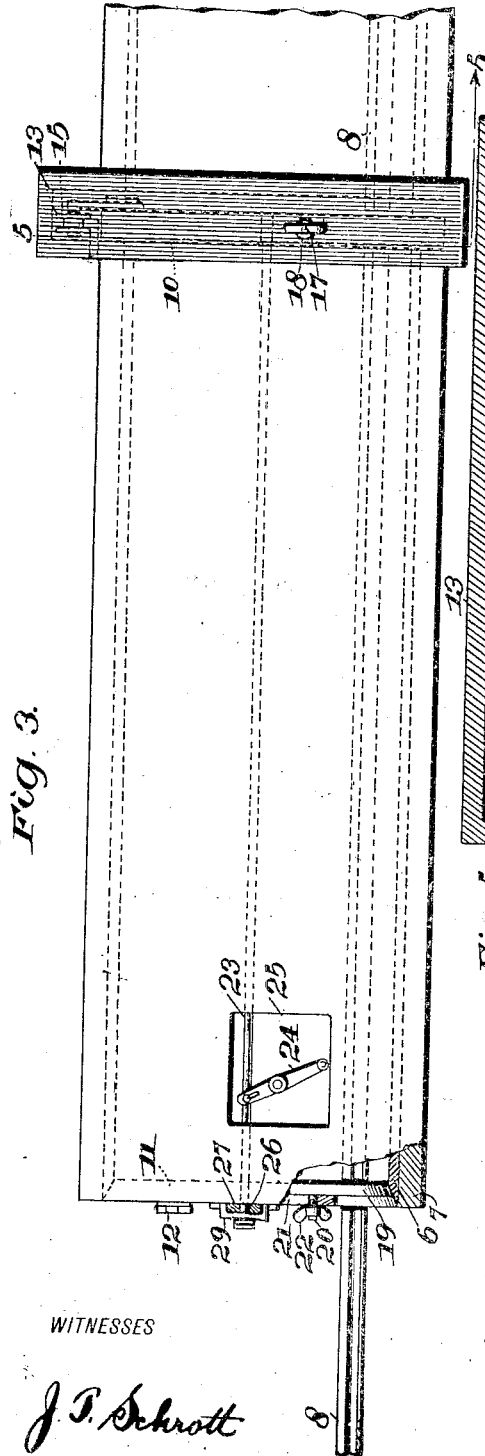
Fig. 2.



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VACUUM-RAILWAY.

1,336,732.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ROBERT B. DAVY, a citizen of the United States, and a resident of Hayward, county of Alameda, and State of California, have invented certain new and useful Improvements in Vacuum-Railways, of which the following is a specification.

My invention relates to improvements in railways, and it consists in the constructions, combinations and arrangements herein described and claimed.

An object of my invention is to provide a railway, comprising generally, a tube with stations at intervals, the tube between the stations having a partial vacuum produced therein so that suitably propelled cars moving therein may travel with greater speed by reason of the lessening of the air resistance.

A further object of the invention is to provide a novel arrangement in the stations, whereby the car has egress and ingress to the adjacent vacuum tube portions, without admitting enough air to said tube portions to destroy the vacuum.

A further object of the invention is to provide a novel locking arrangement for the sliding and hinged doors which form important parts of the aforesaid stations.

Other objects and advantages will appear in the following specification, reference being had to the accompanying drawings, in which:

Figure 1 is a sectional view showing a part of the tube and a portion of one of the stations, with a car approaching the station,

Fig. 2 is a view showing the tube on a smaller scale but illustrating the general arrangement more clearly,

Fig. 3 is a side elevation of one station end of a tube section, showing the arrangement of the hinged and sliding door with the locking means therefor,

Fig. 4 is an end elevation showing the hinged door, and

Fig. 5 is a cross section on the line 5-5 of Fig. 3, showing the sliding door open.

In carrying out my invention, I provide a tube 1, the continuity of which is interrupted at predetermined places by stations 2 where persons may get off and on of a car 3 or a train of such cars. A partial vacuum is created and maintained in the

tube sections between the stations 2, by means of a suitable air pump 4, which has pipe connections 5 to the various tube sections, substantially as illustrated in Fig. 2.

The tube 1 is capable of construction in many different ways, depending altogether on particular circumstances. In order to illustrate one construction, the drawings show it to consist of an inner metallic lining 6 which is covered by suitably reinforced concrete 7.

The tube may be laid or erected on the surface of the ground, under ground or under water as the nature of the ground of the region wherein the vacuum railway is to run, may make necessary. Rails 8 are suitably supported in the tube, these running up close to the various doors of a station 2, where substantially air tight joints are maintained in the manner described below.

The station structure comprises a car compartment 9 at each side of the central station 2 where air is present at ordinary atmospheric pressure. There is a compartment 9 at the end of each tube 1 adjacent to the station 2, as clearly shown in Fig. 2.

The compartment 9, in each case, is defined by a transversely sliding door 10, and a door 11 hinged at 12 to open into the station 2. A superstructure 13 including a portion at the top and at one side as at 14 in Fig. 5, accommodates the sliding door 10, and the sheaves 15 by means of which the door is supported on the track 16 at the top.

A handle 17 extends from the sliding door 10, through a suitable stuffing box 18 at one side, where the operator or attendant may grasp the handle and pull the sliding door open so that the approaching car 3 may enter the compartment 9. In actual practice, the joints around the door 10 adjacent to the respective sides of the tube 1, will be provided with suitable devices for making close connections. As the tube contains rarefied air and the station air is at normal pressure, the compartment will contain the same by turns and consequently must have air tight connections to prevent leakage.

Coming now to the door 11: This door should have a relatively tight joint in the beveled end of the tube. The lower part of the door may either be hinged or provided with a slide 19 so that the door may swing above the rails 8 in opening and closing.

It is preferable that the slide 19 be used, because a tight joint at the bottom may be made more easily by this means, than by employing the hinged section above spoken of.

5 To carry out the construction, the slide 19 is provided with a plurality of studs 20 which occupy slots 21 in the door, and have suitable fastening means 22 through which the slide is firmly clamped in position when
10 once adjusted.

The door locking means is a feature of importance in the present construction. As shown in Fig. 3 the locking means comprises a locking rod 23 which is manually actuated
15 by a suitably pivoted handle 24 in a recess 25 in the side of the tube 1.

Normally the forward end of the locking rod, namely that end nearest the station 2, occupies an opening 26 in the extremity of a sliding latch or bolt 27. The bolt is carried in guides 28 on the door 11, and as
20 stated, is normally positioned in the keeper 29 so that the door 11 cannot be opened without first retracting the locking rod out of the opening 26.

The sliding door 10 also has an opening 30 for the locking rod 23, but normally the adjacent end of the locking rod does not engage the opening. The foregoing description
30 covers the construction generally, and in order that the mechanism may be understood more clearly, attention is directed to the operation.

As before stated, the locking rod is positioned as in Fig. 3, with one end fitting in the opening 26 across the bolt 27, preventing the sliding of the bolt in the guides 28 and consequently preventing the opening of the door 11. The other end of the locking rod is
40 free of the opening 30 in the sliding door 10, and consequently the latter can be slid open by the operator on the approach of the car 3, permitting the car to enter the compartment 9.

Thereafter the sliding door 10 is again closed. The operator now moves the handle 24 to the left in Fig. 3, retracting the locking rod from the opening in the bolt and causing the other end to enter the opening
50 30 in the door 10. The door 11 can now be swung open on its hinges, but the door 10 cannot be slid open.

The act of retracting the bolt 27 finally brings apertures 31 and 32 respectively in the door and bolt, into registration, so that
55 an equalization of air pressure in the compartment 9 and station 2 may begin to take place. On opening the door 11, the car 3 is brought out into the station where passengers may alight or enter. In order to get
60 the car into the continuation of the tube 1, the doors 10 and 11 of the following compartment 9 are actuated in reverse order to the above. That is to say, the hinged door
65 11 is opened first, then closed and locked,

whereupon the sliding door 10 is opened to enable the car to proceed.

The advantages.

It is thought unnecessary to dwell at length
70 on the advantages of this particular arrangement of railway, but in order that some of the features may be appreciated it is desired to say that one of the most important benefits to be derived from running cars or trains
75 of cars in a tube wherein the air is partially exhausted is, extremely rapid transportation from congested commercial centers to more open and free parts of the country.

The question of transportation is one that
80 gives rise to problems that are sometimes most difficult of solution. Crowding of cars is an annoyance commonly experienced, which has many attendant evils. This crowding is produced largely by the condition
85 that the cars are limited in speed and consequently cannot make trips quick enough. By running them in a tube where they will not have to overcome great air resistance, they can be made to move much more quickly
90 so that more trips can be made.

The provision of fresh air in each car is also a matter of consideration. Fresh air can be maintained by tanks of oxygen, portions of which are released at suitable intervals to compensate for the vitiated air in the car. It is of course important to observe that the car is of air-tight construction, for reasons that are now doubtless apparent. Since the pressure is always from the inside,
100 by reason of the partial vacuum in the tube, rubber cushions can be employed around the doors with good results, to maintain air-tight connections. This applies both to the doors of the tube and of the car. 105

Crossing accidents are entirely avoided by the use of this system. Expansion, contraction and oxidization of the rails is also reduced to the minimum. The rarefaction of the air in the tube discourages the growth
110 of vermin, fungus or mold. The foregoing gives a general idea of the advantages of the vacuum railway, and in conclusion it is to be borne in mind that one of the important features resides in the means whereby
115 cars can be removed and introduced from the tube sections at the stations, without materially affecting the interior pressure of the tube sections.

I claim:—

1. A vacuum railway, comprising a vacuum tube in a plurality of sections, and means embodied in the adjacent ends of all of the sections, enabling the egress and ingress of cars into the sections without materially affecting the vacuum condition therein. 125

2. A vacuum railway, comprising a tube divided into a plurality of sections, each having a vacuum maintained therein; and relatively movable means defining compart- 130

ments at adjacent ends of the tube sections, enabling the egress and ingress of cars from and into said sections without destroying the vacuum conditions therein.

5 3. A vacuum railway, comprising a tube divided into a plurality of sections by suitably disposed stations, and including movable means defining a compartment at the adjacent end of each tube section, enabling
10 the entrance and exit of a car into the station without destroying the vacuum conditions normally maintained in said tube sections.

15 4. A vacuum railway, comprising a tube divided into a plurality of sections, with means defining a car compartment at the adjacent ends of the tube sections; said means comprising a slidable door in each tube section, a hinged door at the end of
20 each section; means for maintaining a vacuum in the tube sections, and means operatively associated with each sliding and hinged door, preventing the opening of both at the same time.

25 5. A vacuum railway, comprising a vacuum tube section, provided with means defining a car compartment; said means comprising a door normally across the tube but to be opened on the approach of the car, a
30 second door normally closing the end of the tube, and instrumentalities normally locking the second door but permitting the opening of the first, but capable of movement to unlock the second and then lock the first.

35 6. A vacuum railway, comprising a vacuum tube section, with means defining a car compartment; a door housing in the tube, a movable door in said housing normally across the tube, a door hinged on the
40 end of the tube, both doors constituting said compartment forming means; means for normally locking the hinged door, and an

operatively associated movable member cooperating with said locking means to prevent the opening of the hinged door without
45 first locking the other door.

7. A vacuum railway, comprising a vacuum tube section with rails, means defining a car compartment at one end including a transversely slidable door normally across the tube, housing means for
50 the door, supporting means therein for the door, a door hinged on the end of the tube, with means forming a tight closure below the rails, locking means for the hinged door,
55 and a manually operated locking member cooperating with said locking means to prevent the opening of the hinged door without first locking the sliding door by means of said manually operated locking member. 60

8. A vacuum railway, comprising a vacuum tube section with rails, a sliding door in the tube defining one end of a car compartment, a housing for the door, suitable actuating and supporting means for the
65 door in the housing, a hinged door at the end of the tube defining the other end of the car compartment, a slidable portion carried by the door enabling the opening of the door above the rails and making a tight joint
70 when the door is closed, a bolt on the door with a keeper on the tube, said bolt having a locking opening and an air opening normally out of registration with a similar opening in the door, and a manually actuated locking rod operatively carried by
75 the tube, occupying said locking opening to normally prevent the opening of the hinged door, but free of the sliding door whereby it may be opened, said locking rod
80 being movable into locking engagement with the sliding door to enable the opening of the hinged door.

ROBERT BALLARD DAVY.