3 Sheets—Sheet 1.

P. HEVNER.

Railway System.

No. 209,480. **Patented Oct. 29, 1878.**

FIG. 3.

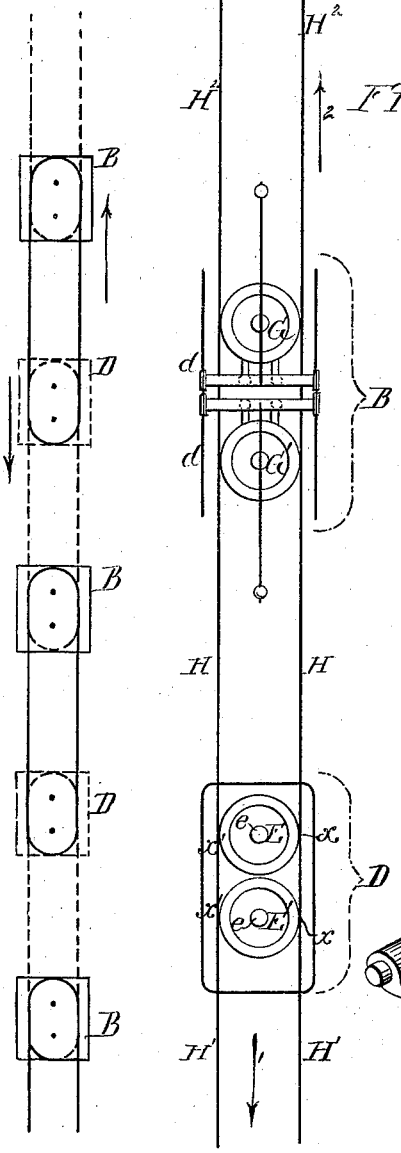


FIG. 2.

FIG. 1.

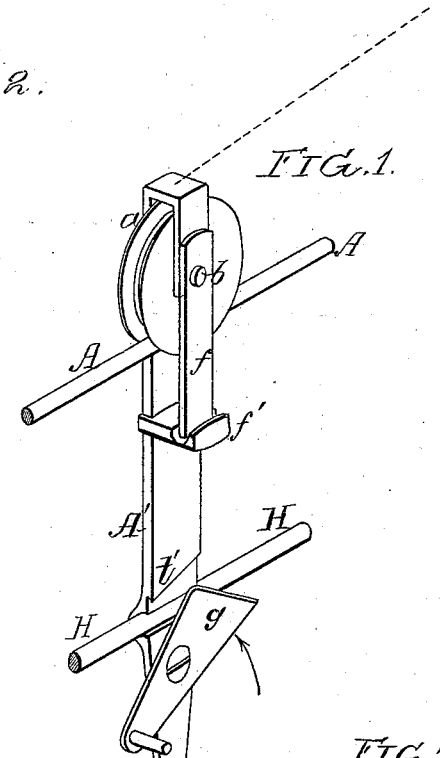
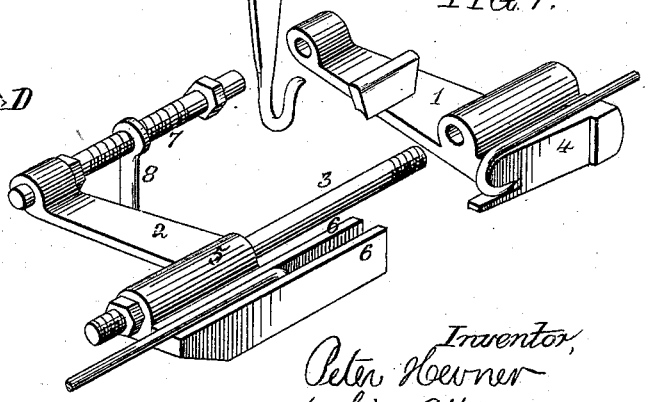


FIG. 7.



Witnesses,
Henry Howson Jr.
Harry Smith

Inventor,
Peter Hevner
by his Attorneys
Howson and Co

3 Sheets—Sheet 2.

P. HEVNER.

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FIG. 4.

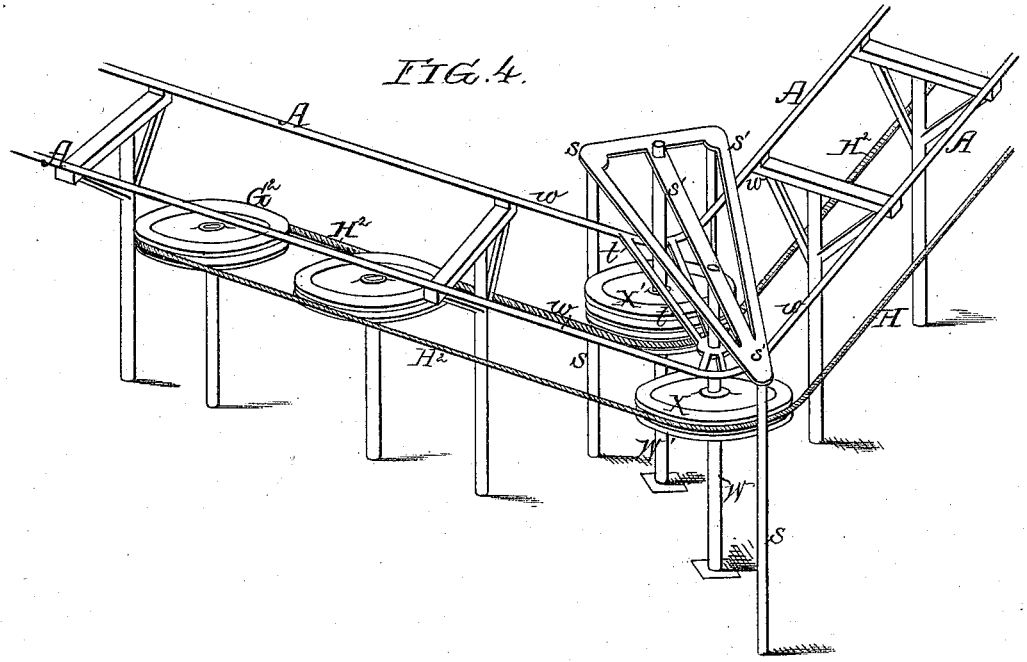
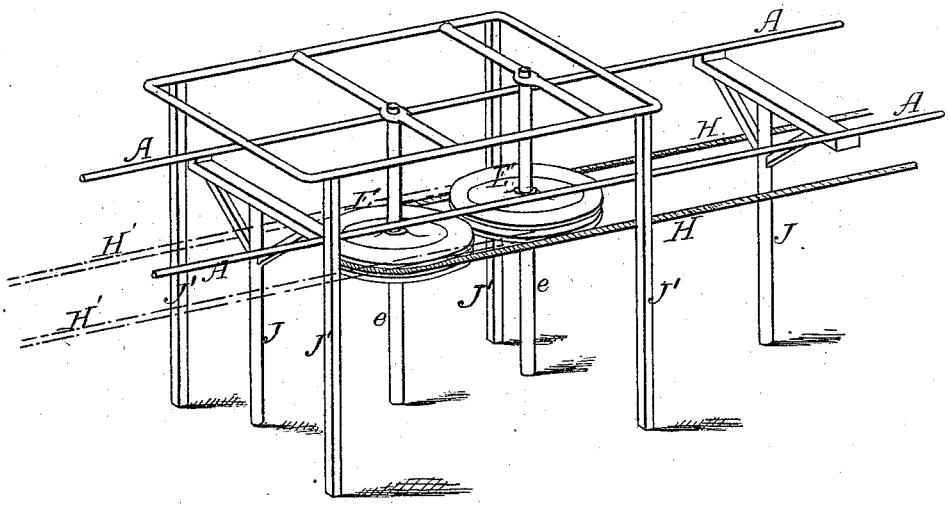


FIG. 5.



Witnesses,

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Harry Smith

Inventor,

Peter Hevner

by his Attorneys

Howson and Son

3 Sheets—Sheet 3.

P. HEVNER.

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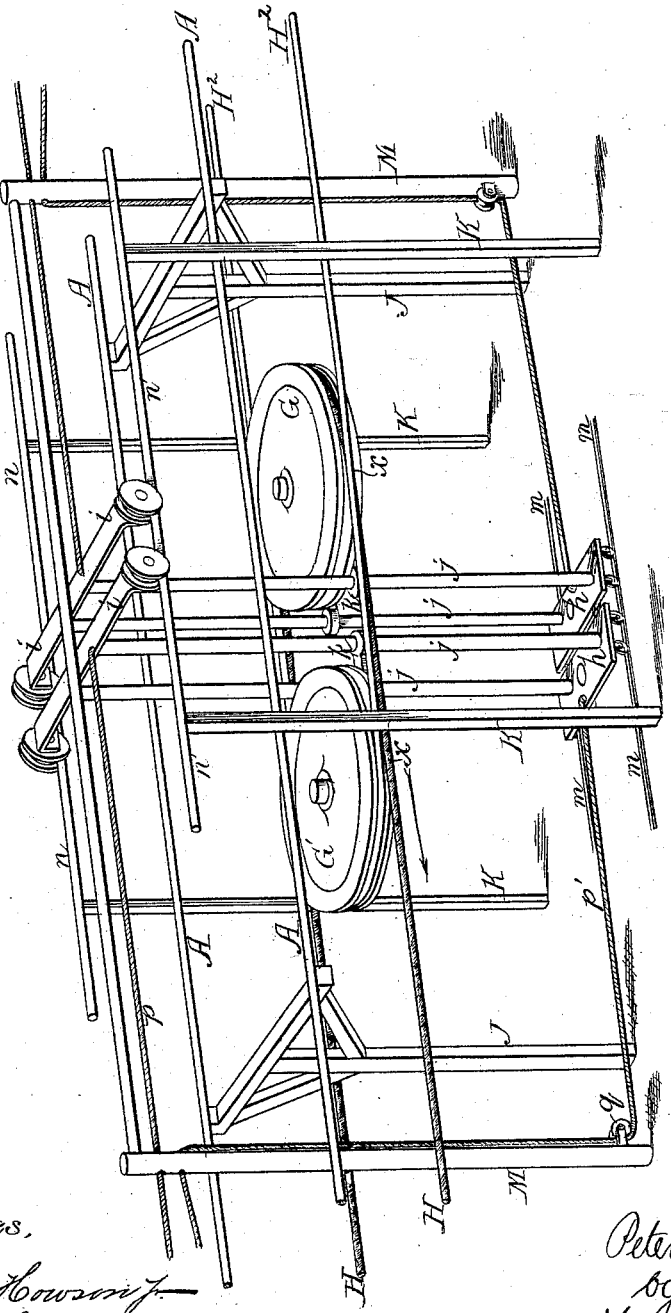
FIG. 6.



Witnesses,
Henry Howson Jr.
Harry Smith

Inventor,
Peter Hevner
by his Attorneys
Howson and Son

UNITED STATES PATENT OFFICE.

PETER HEVNER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO GEO. E. HEVNER, OF SAME PLACE.

IMPROVEMENT IN RAILWAY SYSTEMS.

Specification forming part of Letters Patent No. **209,480**, dated October 29, 1878; application filed October 9, 1878.

To all whom it may concern:

Be it known that I, PETER HEVNER, of Philadelphia, Pennsylvania, have invented a new and useful Improvement in Railway Systems, of which the following is a specification:

The main object of my invention is to combine two continuous rods, forming a double elevated track, with a series of endless traction-ropes, so arranged that hangers or carriages, to which the loads are suspended, may be caused by the said endless ropes to traverse the track continuously.

Further objects of my invention will appear hereinafter.

It may be stated here that the main advantages of my improved railroad system are its economy in construction and its applicability to localities where ordinary railways could not be built without great difficulty and expense—as, for instance, in mountainous mining regions, where minerals have heretofore been transported on the backs of mules.

In the accompanying drawing, Figure 1, Sheet 1, is a perspective view illustrating part of one of the elevated rails, part of the traction-rope, and the hanger to which the load is suspended; Fig. 2, a diagram representing a plan or top view of the track, and illustrating the relative positions of the driving and tightening stations; Fig. 3, another diagram illustrating my invention; Fig. 4, Sheet 2, shows the manner of constructing the railway where an abrupt turn of the track takes place; Fig. 5, a perspective view of one of the driving-stations; and Fig. 6, Sheet 3, a perspective view of one of the tightening-stations.

The track consists of two parallel rods, A A, or rather of a series of rods connected together, and this track is elevated, being carried by posts driven into the ground, as shown in Fig. 5, or by such frames and other appliances as the character of the country which the road has to traverse may suggest. The loads are carried by these rods through the medium of hangers A′, one of which, with part of one of the rods A, is illustrated in Fig. 1, Sheet 1, a pulley, *a*, having a groove adapted to the rod, running loosely on a pin, *b*, projecting from the upper end of the hanger, which has a griping device, described hereinafter, for seizing the traction-rope H, so that the movement of the latter shall be followed by that of the hanger on the rod.

The arrangement of traction-ropes will be best understood by reference to the general plan view, Fig. 2.

Throughout the entire elevated railway there are driving-stations D, situated preferably about five miles apart, and tightening-stations B, situated between the driving-stations. In other words, the tightening-stations and driving-stations alternate.

Immediately below the rods which compose the elevated rails of the track are the traction-ropes, or rather series of endless traction-ropes, which are disposed of in the following manner, reference being had to the diagram, Fig. 2.

It will be noticed that at each tightening-station B there are two horizontal pulleys, G G^1, and at each driving-station two similar pulleys, E E′. The former are on vertical shafts, each carried by a separate adjustable frame, and the frame is so controlled by weights or otherwise that the pulleys have a tendency to move away from each other, as more fully explained hereinafter.

The shafts *e e* of the pulleys E E′ of each driving-station are adapted to fixed bearings, and are driven by a stationary engine or other motor; or the shafts may be fixed and the pulleys driven through the medium of any suitable system of gearing.

The endless traction-rope H passes around the pulley G at the tightening-station B, and around the pulley E′ at the driving-station D. Another endless traction-rope, H^1, passes around the pulley E at the station D, and around a pulley on the next driving-station which occurs in the direction of the arrow 1, Fig. 2, and a third endless rope, H^2, after passing around the pulley G^1 at the tightening-station B, passes around a pulley, G^2, at the next driving-station in the direction of the arrow 2, the rope in this instance being guided by pulleys, so as to follow the track above, which takes an abrupt turn at I, in a manner hereinafter fully described.

The diagram, Fig. 3, will, perhaps, serve better to illustrate this succession of endless traction-ropes. In this diagram the quadrangular figures in plain lines represent the tightening-stations and the quadrangular figures in dot-

ted lines the driving-stations, and the dark circular spots are the vertical shafts, without their pulleys, and the endless ropes are shown, one by dotted lines, the next by plain lines, the next by dotted lines, and so on, it being understood that the stations shown in this figure, as well as in Fig. 2, are about two miles and a half apart, the distance between the driving-stations being about five miles and the distance between the tightening-stations the same. These are distances which I have assumed in the present instance, and may be departed from.

On turning the pulleys at one of the driving-stations, two endless ropes will be driven, and on moving the pulleys G G¹ of one tightening-station two endless ropes will be tightened.

When the pulleys of all the driving-stations are driven, there will be two continuous lines of traction-rope traversing in contrary directions, the two lines of rope being immediately below and pursuing precisely the same course as the rods.

The ropes are suspended to the rails through the medium of the hangers referred to above, so that when the railroad is in operation one series of loads suspended from one system of rods is traversing in one direction and another series of loads suspended by the hangers from the other system of rods is traversing in the other direction.

While there are two continuous lines of traction-rope extending from end to end of the railway, and formed by the series of endless ropes, there are two ropes traversing together on each line where the driving-pulleys or tightening-pulleys occur. Thus, where the driving-pulleys G G¹ occur at the driving-station D in Fig. 2, two ropes are traversing together between the points *x x* on one side and two between the points *x' x'* on the opposite side, (see Figs. 5 and 6,) and it is these double ropes at these points which insure the continuity of the two lines; but each hanger, as it passes between the points *x x* or *x' x'*, must be released from one endless rope and attached to the other endless rope, for which purpose there must be one or more attendants at every station to make the necessary transfers as fast as the hangers with their loads arrive.

Fig. 5, Sheet 2, shows one of the driving-stations in perspective, E and E′ being the two driving-pulleys, H H a portion of one endless traction-rope passing around the pulley E, the course of another endless rope, H¹ H¹, being indicated by the dotted lines.

A A are the rods which constitute the track, and which are supported by the posts J and their cross-bars.

A frame, J′, for carrying the bearings of the two vertical shafts, is built on a suitable foundation. This frame, as shown in the drawing, is of the simplest character, the necessary braces, &c., being omitted to prevent confusion. For the same reason the engines and gearing by which the shafts are driven have been omitted. Indeed, many different systems of driving appliances may be used.

Whatever style of frame-work is used at each driving-station, it must be such as to permit the hangers and the loads to pass freely through it.

The appliances used at each tightening-station are illustrated in the perspective view, Fig. 6, Sheet 3.

Each of the tightening-pulleys G G¹ is carried by a frame, each frame being composed, in the present instance, of a bottom plate, *h*, a cross-bar, *i*, and two vertical bars, *j j*, for connecting the said bottom plate and cross-bar together; and from the vertical bars project brackets *k*, carrying the wheels.

The bottom plate has wheels adapted to rails *m m*, secured to a suitable foundation, and the cross-bar has wheels adapted to rails *n n*, supported by posts K K, which are to be suitably steadied by an appropriate system of bracing, (not shown in the drawing,) for the reasons above given.

A rope, *p*, attached to the cross-bar of one frame, passes over a pulley near the top of the post M, and another rope, *p'*, attached to the bottom plate, *h*, is guided by a pulley, *q*, passing upward and over a pulley in the same post, M. On pulling at the two ropes simultaneously the movable frame, with its pulley E′, will be moved in the direction of the arrow, and the endless traction-rope H² will be tightened. The pulley E may be moved in a contrary direction by similar appliances, in which case the endless traction-rope H H will be tightened.

Any suitable tackle may be used for hauling the ropes, or weights may be suspended to the same, so as to insure constant tension on the traction-ropes, and so that the movable frames will accommodate themselves to the expansion and contraction of the said ropes.

It will be understood that the posts M are to be properly braced, and that different styles of frame-work may be substituted for these posts, and, indeed, for the permanent structure generally, a skeleton or outline frame being purposely shown in the present instance to prevent confusion in illustrating the more important parts.

It is between the points *x x* in this Fig. 6 where two traction-ropes traverse together, and where each passing hanger has to be detached from one rope and griped to the other.

Fig. 4, Sheet 2, illustrates the structure where a curve occurs in the suspended track. Rigid rails *w w*, properly bent, are substituted for and form continuations of the elevated rods where the curve occurs, and are connected together by a frame-work, *t*. Another frame, composed in the present instance of posts *s s* and angular cross-piece *s'*, straddles the track at the curve; and in the frame-work *t* and said cross-piece *s'* the vertical shafts W W′ have their bearings, additional bearings being secured to a suitable foundation.

To the shaft W is secured a guide-pulley, X,

and to the shaft W′ a guide-pulley, X′, and these two pulleys are of such a diameter and are so located that the traction-ropes which run on the said pulley will follow the same curve as the track formed by the rigid bent rails *w w*.

The elevated rails A A′ consist, as before remarked, of a series of rods, the latter being as long as the distance of the posts apart from each other.

A device for so connecting these rods together that proper tension may be imparted to them is shown in Fig. 7, Sheet 1. Two arms, 1 2, rest on the cross-bars of the posts, and the two arms are connected together by a bolt, 3. One rod, A, is bent into a recess in the head 4 of the arm 1 and the other rod into a recess in the end 5 of the arm 2. This end 5 of the arm 2 is slotted, so as to present two ribs, 6 6, between which the portion 4 of the arm 1, with the bent portion of the rod A, fits. When the two arms are secured together the ribs 6 6 form a bridge between the gap which exists between the bent ends of the two rods, and the pulleys of the hangers ride freely over this bridge.

The rods may be tightened by simply manipulating the nut of the bolt 3, and thereby moving the arms toward each other.

A guide-rod, 7, passes through eyes in the arms, and this guide-rod may be secured to the cross-bars of the posts by eyebolts or screws 8.

The rods are secured through the medium of appropriate appliances, by which they can be maintained in a proper state of tension, and yet not interrupt the continuity of the bearing for the pulleys *a* of the hangers.

Different devices may be employed for this purpose, and hence it has not been deemed necessary to illustrate any mechanism for connecting the rods to the cross-bars of the posts.

Turning back to the hanger B, (shown in Fig. 1,) it will be observed that the upper portion extends over the pulley and down in front of the same far enough to receive the spindle *b* of the said pulley, and to a projecting portion of this spindle is loosely hung a pendulous arm, *f*, the lower end of which fits freely in a groove in a projection, *f′*, on the hanger. When the latter is traversing the rod between the supporting-posts this arm tends to strengthen the upper overhanging portion of the hanger; but when it reaches the connecting devices shown in Fig. 7, where the ends of the rods A are secured, the pendulous arm will yield to the obstruction presented at this point, after passing which it will, by its own gravity, return to its former position (shown in the drawings) and resume its strengthening duty.

The device for griping the traction-rope to the hanger consists, in the present instance, of a plate, *g*, Fig. 1, pivoted to the said hanger, which has a recess for receiving the rope. When the plate is moved in the direction of the arrow it will jam the rope into the recess, the upper beveled edge of the plate fitting tightly into an undercut shoulder, *t′*, on the hanger. When the latter has to be released from the rope in making the transfer above alluded to, all that is necessary is to move the plate in a direction contrary to that pointed out by the arrow, when the hanger will be free, and can be secured to the other rope, which traverses alongside of the first where the stations occur.

Other devices equally as effective as that just described may be used for griping the rope to and releasing it from the hanger.

Two hangers may be connected together. Indeed I prefer to let them travel in pairs, the connection of one hanger to another being by rods. (Indicated by the dotted lines in Fig. 1.)

It may be stated here that the track may have any inclination which the nature of the region may suggest. It may be extended over mountains or across rivers and ravines, the inclines presenting no impediment to the progress of the traversing hangers. Hence the railway is especially applicable to mountainous districts and mining regions.

It will be understood, however, that when the track has to cross rivers, &c., a proper system of supporting guides or trusses must be substituted for the posts.

I claim as my invention—

1. In an elevated railway, the combination of two continous rods, forming a double elevated track, with a series of endless traction-ropes, so arranged that the traveling hangers or carriages may traverse the said track continuously, as herein described.

2. A railway in which two continuous lines of elevated rods and a series of endless traction-ropes below the rods are combined with driving stations arranged at intervals throughout the track, each station having two driving-pulleys, E E′, to which the said endless traction-ropes are applied, substantially in the manner described.

3. An elevated railway in which two lines of elevated rods and a series of endless traction-ropes are combined with alternating driving and tightening stations, the former having driving-pulleys and the latter having tightening-pulleys, with devices by which the said tightening-pulleys may be controlled, all substantially as set forth.

4. The within-described tightening device, consisting of two pulleys, G G¹, each carried by an adjustable frame controlled by ropes or chains, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PETER HEVNER.

Witnesses:

HENRY HOWSON, Jr.,

HARRY SMITH.