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S. E. JACKMAN.

POWER AND GRAVITY RAILWAY.

No. 452,791. Patented May 26, 1891.

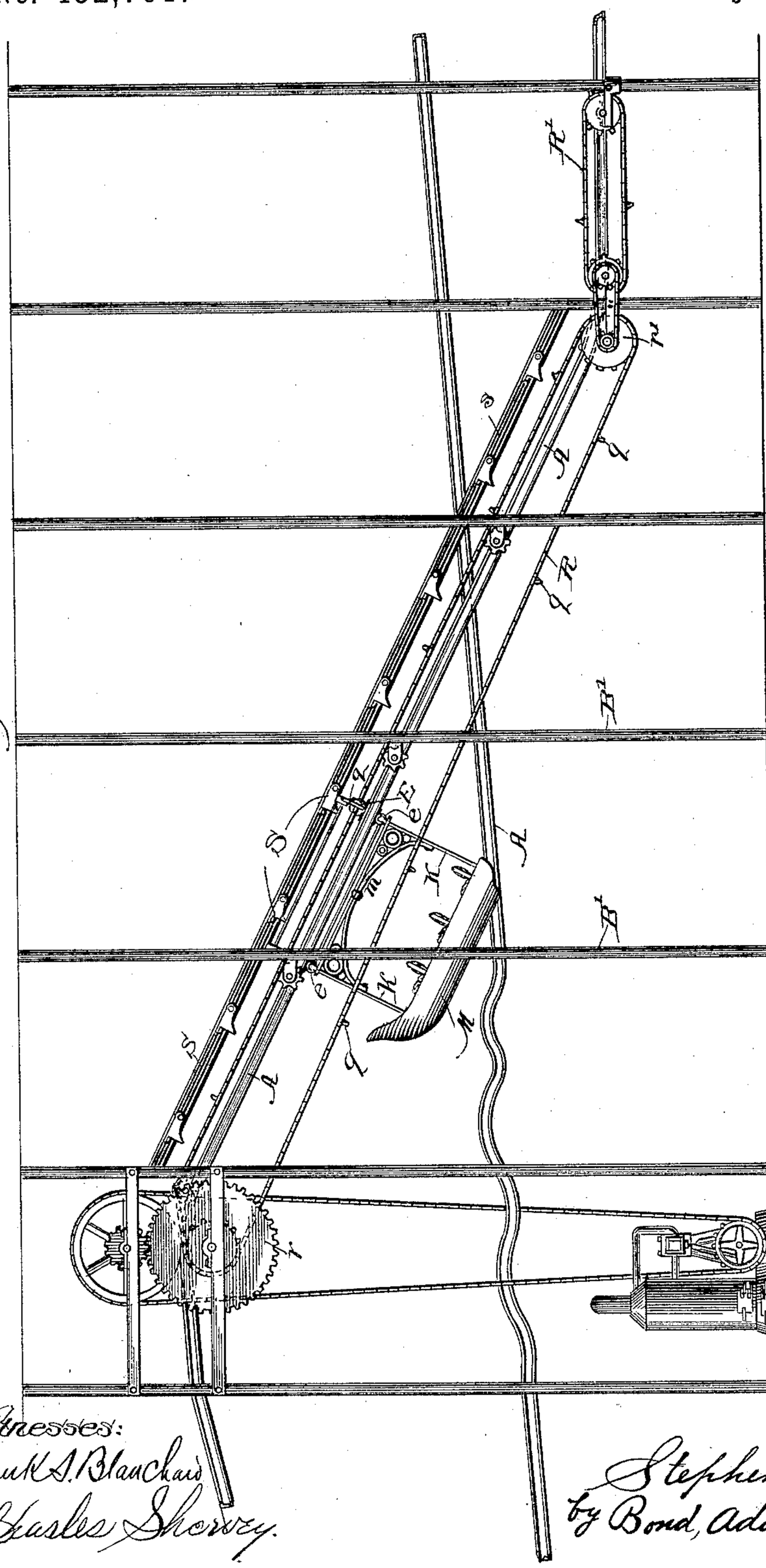

Fig. 1.

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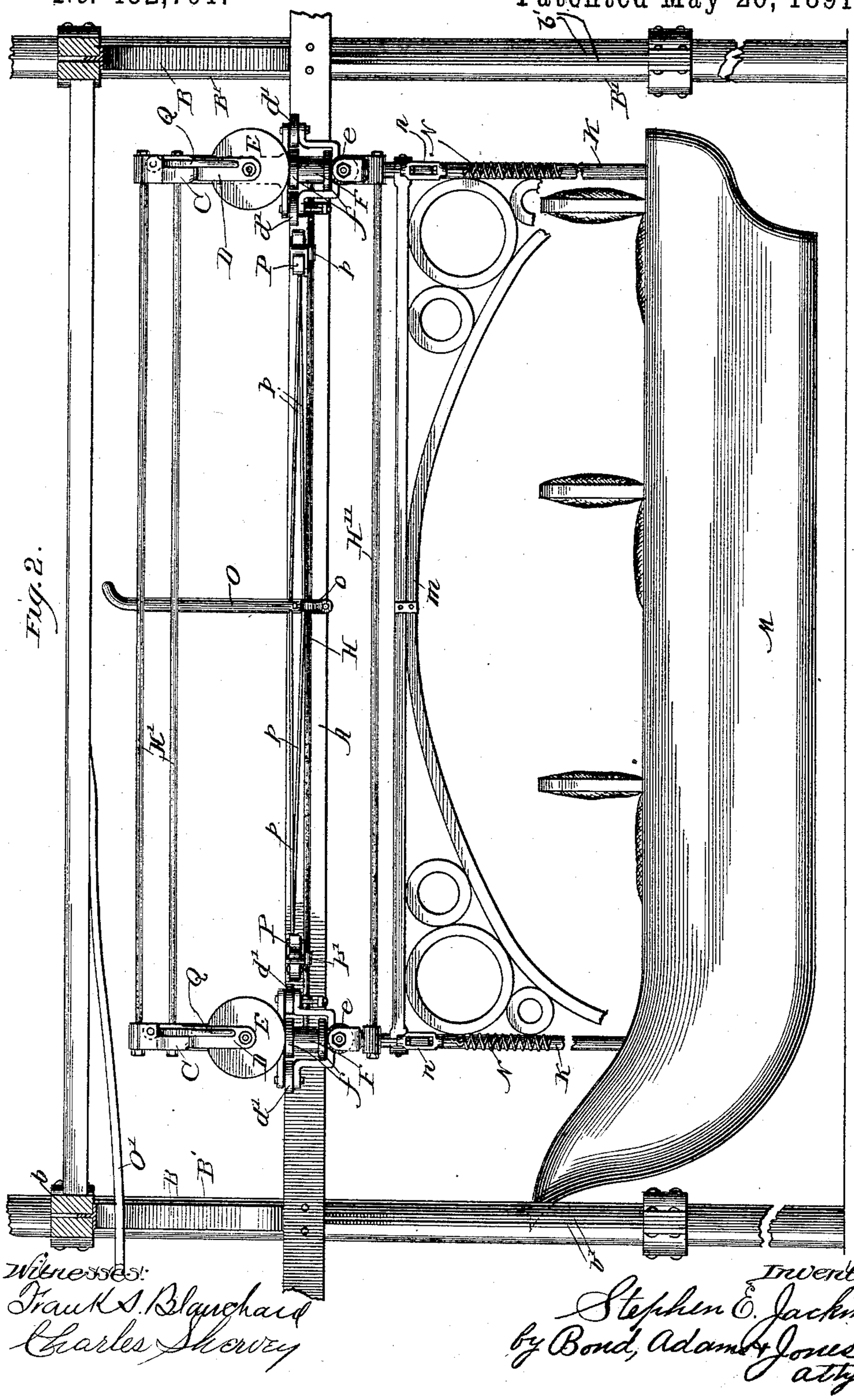

Fig. 2.

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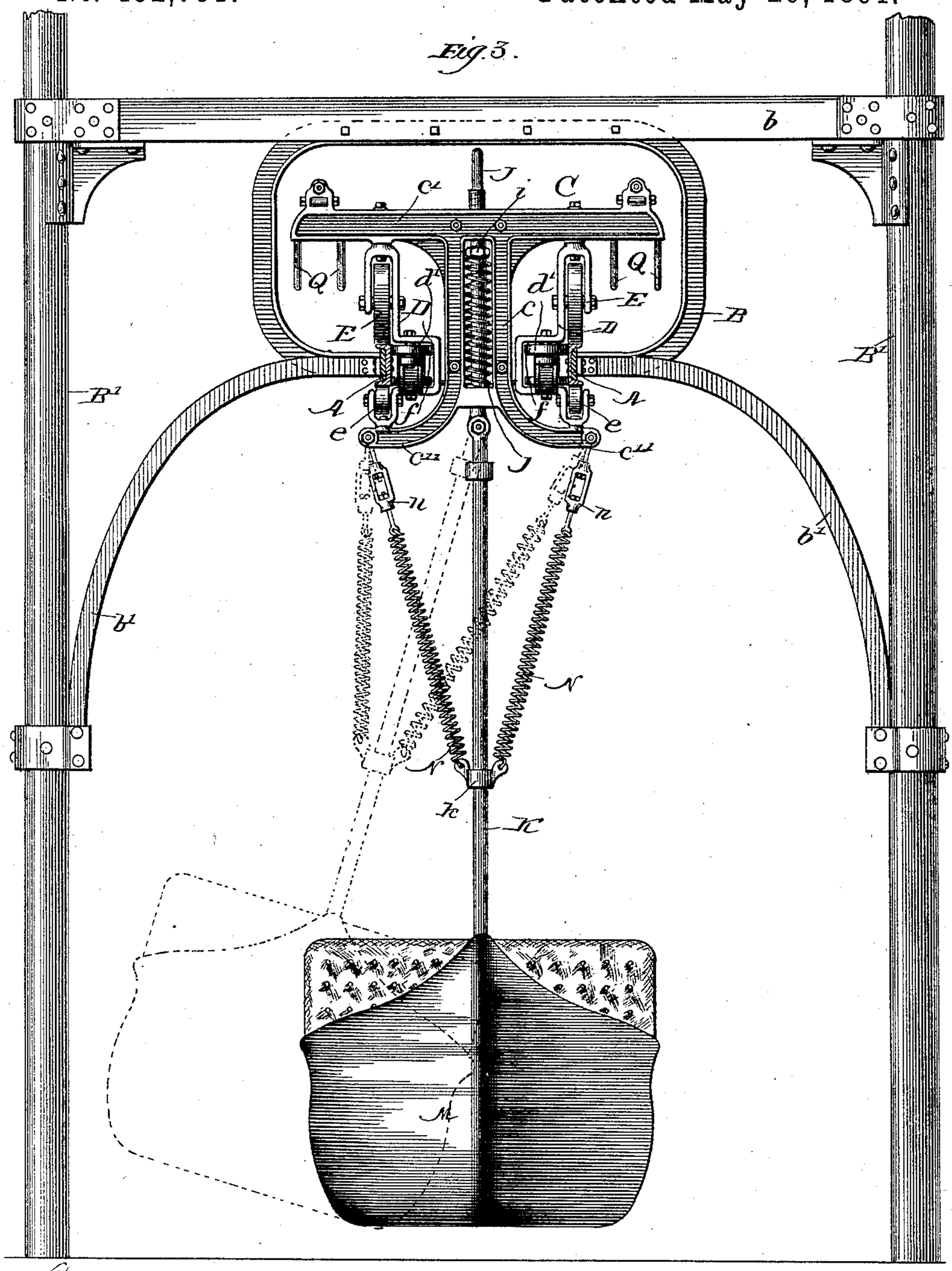
Fig. 3.



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POWER AND GRAVITY RAILWAY.

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Fig. 4.

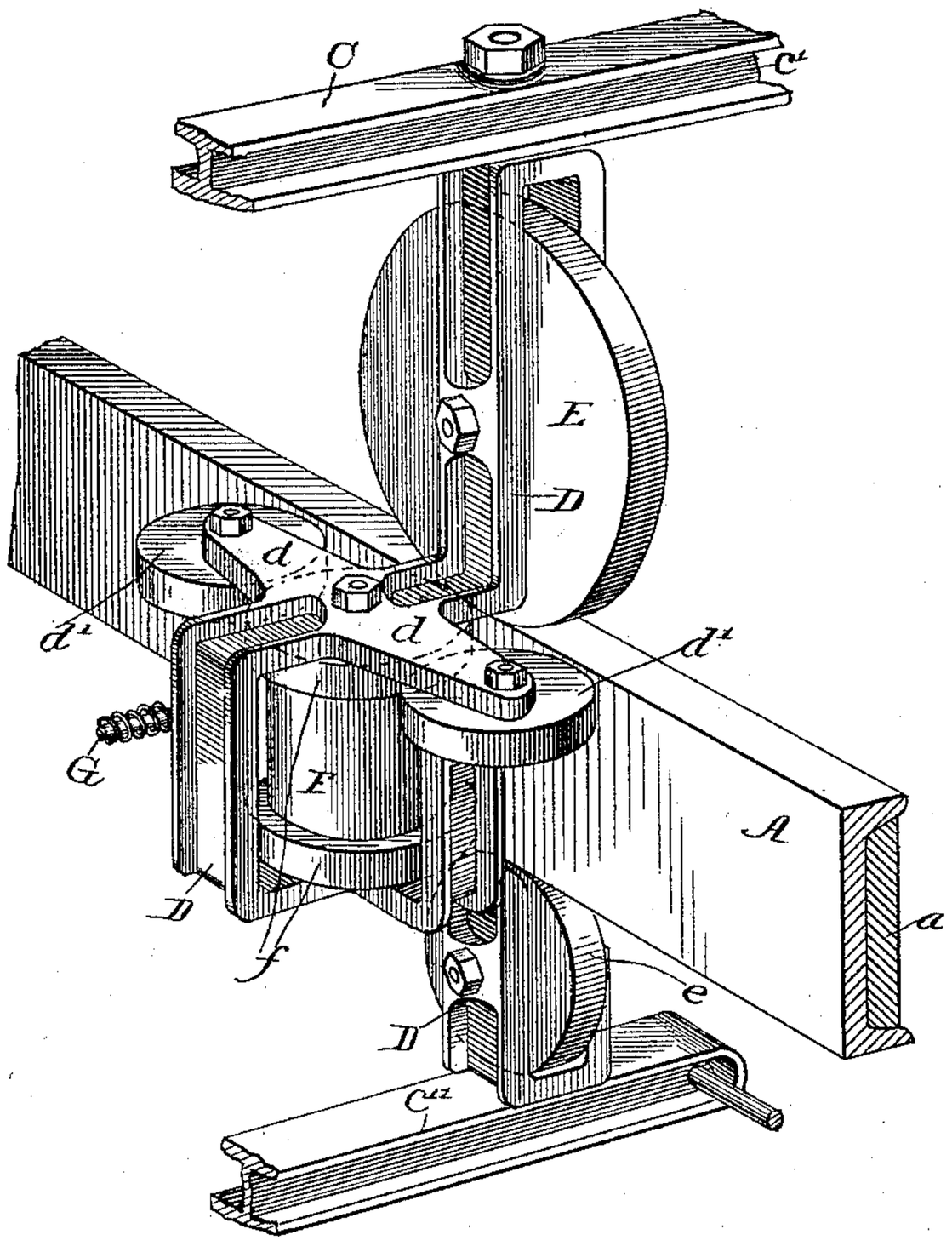
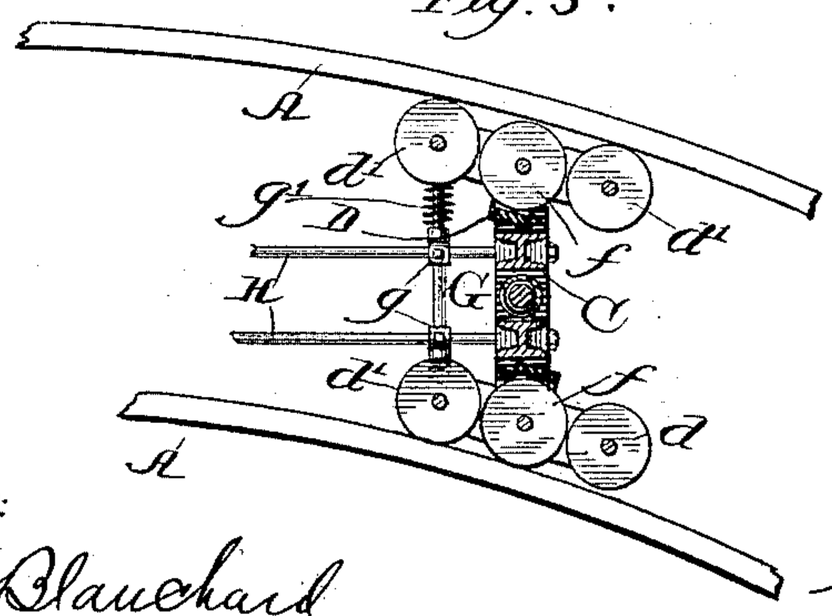


Fig. 5.



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POWER AND GRAVITY RAILWAY.

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Fig. 6.

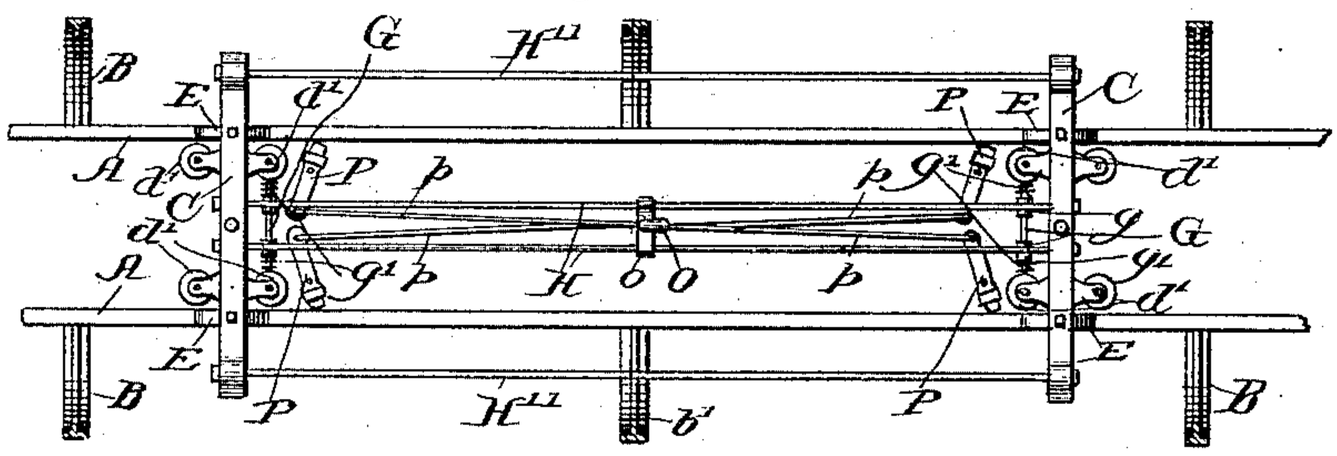


Fig. 7.

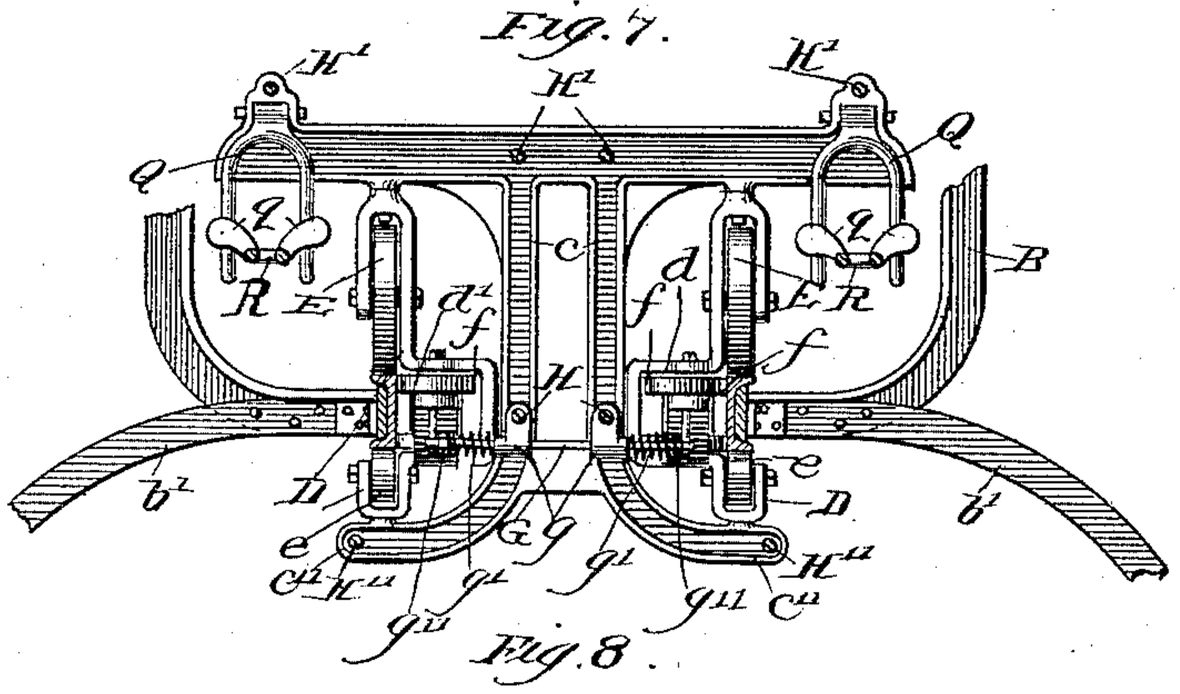
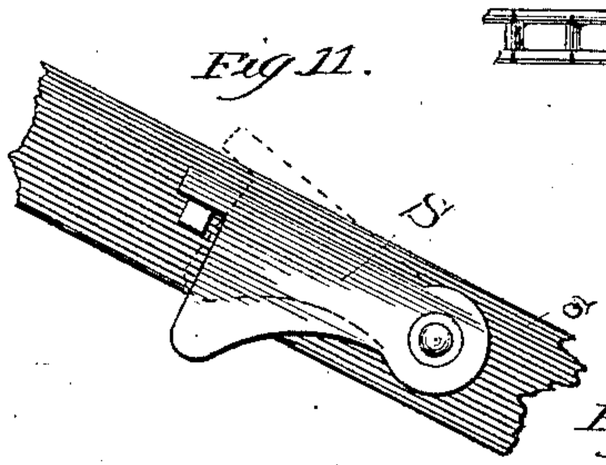


Fig. 8.

Fig 11.



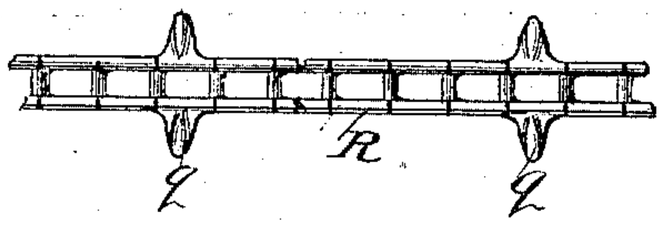


Fig. 9.

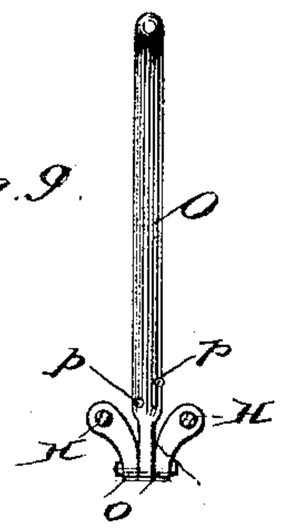
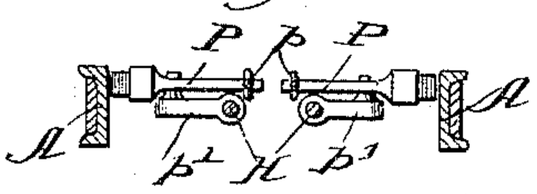


Fig. 10.



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UNITED STATES PATENT OFFICE.

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POWER AND GRAVITY RAILWAY.

SPECIFICATION forming part of Letters Patent No. 452,791, dated May 26, 1891.

Application filed August 5, 1890. Serial No. 361,140. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN E. JACKMAN, residing at Haverhill, Essex county, Massachusetts, and a citizen of the United States, have invented certain new and useful Improvements in Power and Gravity Railways, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation showing the car being raised by power. Fig. 2 is a side elevation of the car and one side only of the track. Fig. 3 is an end elevation of the car, the track being shown in cross-section. Fig. 4 is an enlarged detail, being a perspective view of a portion of the carrying device. Fig. 5 is a detail showing the manner in which the wheels travel around a curve in the track. Fig. 6 is a detail showing the brake mechanism. Fig. 7 is a detail, being a cross-section through the carrying device. Fig. 8 is a detail showing a driving-chain. Fig. 9 is a detail showing the brake-lever. Fig. 10 is a detail showing the means for supporting the brake-shoes, and Fig. 11 is an enlarged detail showing a safety-stop.

This invention relates to railways designed for carrying passengers for pleasure; but many of the features of my invention may be applied to other forms of railways.

The objects of my invention are to provide an improved track, to provide an improved supporting device adapted to run upon a track, to provide improved automatic brakes, and to provide driving mechanism for elevating the cars, and various other improvements hereinafter more specifically set forth. I accomplish these objects as illustrated in the drawings and as hereinafter described. That which I claim as new will be pointed out in the claims.

Similar letters refer to similar parts throughout the views.

A A represent the two rails which form the track. These rails A are preferably formed in cross-section, as shown in Fig. 4. These rails A are supported at a suitable and uniform distance apart, as shown in Fig. 3, upon brackets B, which are suspended from girders *b* and braced by arched braces *b'*. The girders *b* are each in the construction shown supported upon two posts or standards B' at a suitable height. The two braces *b'* for each bracket B are secured to the bracket near the track-rails on opposite sides, and their lower ends are secured to the posts or standards B'. The girders *b* and braces *b'* are secured to the standards or posts B' by means of bolts, so that their height may be adjusted as may be necessary for purposes hereinafter set forth. The brackets B are preferably made in the form shown in Fig. 3, so that the car-supporting devices can pass through them. The rails A are bolted to the brackets B by means of bolts passing through the middle portion of the rail, as shown in Fig. 2, and a piece of soft wood *a* or other sound-deadening material is interposed between each rail A and bracket B.

The track formed by the rail A is a continuous one, and is so arranged upon the supports or standards B that at one portion it will be considerably elevated, and from the elevated portion it may descend by various grades, so that the car will descend by gravity, as hereinafter set forth. There is a steep ascending grade in advance of the highest portion of the track, up which the car is drawn by power mechanism, as hereinafter set forth. The track may be arranged in a circle or in any other suitable or desirable form, and may have small elevations such as shown in Fig. 1 to give the car a wave-like motion. I have not shown a complete track in Fig. 1, as it is greatly extended, and it is not practicable to there show a complete track.

C represents the carriage, which is adapted to run upon the rails A and support the passenger car or boat hereinafter described. At each end of the carriage C is a frame, which consists of a vertical portion *c*, a cross-bar *c'* at the top, and two projecting arms *c''* at the lower portion. At each side of the vertical portion *c* is pivotally mounted a wheel-frame D. Each wheel-frame D is pivoted at its upper end to the cross-bar *c'* and at its lower end to one of the arms *c''*, as best shown in Fig. 3. Each frame D is provided with a carrying-wheel E, which is adapted to run upon the upper side of one of the rails A, and with

a guiding wheel or roller *e*, adapted to engage with the lower surface of the rail A. The wheel E and wheel or roller *e* are in the vertical plane of the pivots of their frame D, as best shown in Fig. 3.

In each frame D is mounted a wheel F, which has two engaging portions *f*, as best shown in Fig. 3, adapted to engage with the inner face of the rail A near its upper and lower edges. The portion of the wheel between the portions *f f* is of less diameter, so that it will not come in contact with the rail A and the bolts by which the rail is secured in place, the bolts being placed as heretofore specified and as shown in Fig. 2.

Upon each side of each frame D is an extension *d*, as best shown in Fig. 4, and beneath each extension *d* is pivotally mounted a wheel or roller *d'*. These wheels *d'* are of such size and are so arranged upon the projections *d* that their peripheries do not extend laterally as far as the engaging portions *f* of the wheel F, for purposes hereinafter set forth. The projections *d* on one side, preferably the forward side, of each of the two frames D are connected by a rod G, as best shown in Fig. 5. The rod G passes through brackets *g* upon the vertical portion *c* of the frame, and between the brackets *g* and the frames D around the rod G are placed two springs *g'*, which act to hold the pivoted frames D in the position shown in Fig. 6. Adjusting-nuts *g''* are provided for adjusting the tension of the springs *g'*. The frames at the forward and rear ends of the carriage are connected by four rods H' at the top, and two rods H'' at the bottom, and two rods H, attached to the vertical portion *c* at about the plane of the rails A.

In the vertical portion *c* of each frame of the carriage C is supported in vertical bearings a sliding rod J, and a coiled spring *j* is placed on each of said rods J, which spring abuts against the lower end of the portion *c* and against a set-nut *i* upon the rod J, which is screw-threaded to receive such nut. To the lower end of each rod J is pivotally connected a rod K, which rods K support the car or boat M, as best shown in Figs. 1, 2, and 3. As best shown in Fig. 3, two springs N are attached to a collar *k*, which is secured upon each rod K near its lower portion, and at their upper ends are connected to the outer ends of the arms *c''*. Between the upper end of each spring N and its arm *c''* is interposed a turn-buckle *n*, by which the tension of the springs N may be adjusted. These springs N should be so adjusted that they will act to hold their rod K in the vertical position shown in Fig. 3. The rods K, which support the car, are connected by a bracket *m*, as best shown in Fig. 2, in order to brace said parts and prevent longitudinal swinging. The pivots between the rods K and rods J permit the rods K to swing laterally only.

The car M may be constructed in any suitable form. The form shown is similar to that of a boat and is a very desirable one for carrying passengers; but it is evident that the form of the car may be varied for the various purposes for which it may be employed.

O represents a brake-lever, which is pivoted upon arms *o*, secured to the rods H, as best shown in Figs. 2 and 9. To this lever O are secured rods *p*, two of which extend forwardly and two rearwardly, as shown in Fig. 6. The other end of each rod *p* is pivotally connected to a pivoted brake-shoe P, as best shown in Fig. 6. Each brake-shoe P is pivoted upon an arm *p'*, as best shown in Fig. 10, each of which arms is secured upon one of the rods H. When the lever O is drawn backward, the rods *p*, which extend backward, will push against the pivoted brake-shoes P, causing them to engage with their respective rails A, and the rods which extend forward will be drawn backward, causing the pivoted brake-shoes P to engage with their respective rails, thereby acting to stop the carriage C.

As shown in Fig. 2, an engaging surface O' may be arranged above the rails A in position to engage with the lever O, thereby retarding said lever O and applying the brakes. This engaging surface O' may be made of spring metal, if desired, or other suitable material, and one or more may be applied at any desired point to retard the carriage in its movement or to stop it.

In order to draw the carriage up the ascending grade by power, I provide the frame at each end of the carriage C with two forks Q, one on each side, as best shown in Figs. 3 and 7. Each fork Q is pivoted upon the outer end of the cross-bar *c'* on a horizontal pivot in such position that it hangs in rear of the cross-bar *c'*.

As shown in Fig. 1, there is an ascending grade in the track formed by the rails A, and above this ascending grade run two chains R, which, at or near the highest point of the track, pass around sprocket-wheels *r* and at the lower portion of the grade around sprocket-wheels *r'*. The ascending portion of the chains R are in position to pass between the arms of the fork Q, as best shown in Fig. 7, when the car is at that portion of the track. The chains R are provided with a number of projections *q*, which engage with the forks Q. The sprocket-wheels *r* may be driven by an engine, as shown in Fig. 1, or by any other suitable driving mechanism. When the carriage C is brought beneath the chains R, the projections *q* engage with the forks Q upon the forward end of the carriage, and they may afterward engage with the forks on the rear end of the carriage, and the car is thereby drawn up the upward grade of the track A. When the carriage passes beyond the chains R and begins to descend, it will have a greater speed than the chains R, and the forks Q, being pivoted to the cross-bar *c'*, will swing backward, thereby permitting them to pass the projections *q* in advance of those which drew the carriage upward.

In order to bring the carriage to the as-

cending grade and to start it gradually, I provide chains R′, which are similarly located in reference to the track A and are driven from the chains R, but at a less speed. When the carriage is drawn by the chains R′, the carriage will be drawn forward by the projections *q* engaging with the forks Q on the forward end of the carriage until after such forks pass the ends of the chains R′, and the carriage will then be drawn forward by the engagement of the projections *q* with the forks Q on the rear end of the carriage until the forks Q at the forward end of the carriage are engaged by the projections *q* on the chains R, and the chains R will draw the carriage up the grade, as heretofore described.

In order to prevent the carriage and its suspended car from descending in case of breakage of the chains or other accident while the carriage is ascending, I provide safety-stops S, which are pivoted upon a support *s*, as best shown in Fig. 1. The lower faces of these stops S are inclined, while their forward ends are straight, so that when the carriage ascends the stops S will be raised successively by the cross-bars *c′* on the carriage; but in case the carriage should start to descend or go backwardly the stops will engage with the cross-bars *c′* and prevent the descent of the carriage. These stops may act by gravity or may be provided with springs, suitable devices being provided to prevent their descent too far downwardly.

The car M is to be loaded with passengers at a station located in advance of the ascending grade and the chains R R′, such station not being shown, as it is only a portion in the track A. The car M and carriage C are then pushed forward by an attendant until the forks Q are engaged by the projections *q* upon the driving-chains. The carriage and car are then drawn up the ascending grade at any desired speed. As soon as the car passes the ascending grade it begins to descend the descending grade by gravity. The descending grade may be any length and the track curved in any suitable or desired direction. The rapidity of the descent of the car and carriage will depend upon the pitch of the grade. The carriage C can pass around curves in the track A very readily, as hereinbefore specifically set forth. The weight of the carriage and the car suspended therefrom is carried by the wheels E. The wheels *e* prevent the carriage from jumping from the track, and the wheels F hold the carriage from lateral motion and prevent it from being thrown off by centrifugal force in passing curves. The wheels *d′* bear against the track A in passing sharp curves, as hereinbefore set forth.

In order to prevent the carriage from binding at such curves, the pivoted wheel-frames D swing sufficiently to permit the several wheels to follow the rails readily, and the springs *g g* act to keep the wheels *d′* from engagement with the track when the carriage is traveling in a straight line.

The car M is supported upon the rods K, which are hinged to the rods J, so that the car M can swing laterally when the carriage is passing a curve. This lateral swinging of the car is caused by centrifugal force and brings the car in such position that the occupants of the car are not liable to be thrown out in passing such curves. The springs N act to return the car to its vertical position and to hold it in such vertical position while the car is traveling in a straight line. The spring *j* gives a spring-support for the car M, so that it is an exceedingly easy-riding car, and the springs N to a certain extent aid the springs *j*.

What I claim as new, and desire to secure by Letters Patent, is —

1. The combination, with standards B′, of girders *b*, brackets B, braces *b′*, and rails A, substantially as and for the purpose specified.

2. The combination, with two rails A, supported at a uniform distance apart, of a carriage C, having wheel-frames D, each pivoted at its upper and lower extremities to the carriage, with both pivot-pins in the vertical plane of the rails, for enabling the wheel-frames to turn on such upper and lower pivots in a plane at right angles to the plane of travel, substantially as described.

3. The combination of a frame consisting of a vertical portion *c*, an upper cross-bar *c′*, and lower arms *c″* with pivoted wheel-frames D, wheels E, *e*, and F, mounted on said frames D, and rails A, substantially as specified.

4. The combination, with a carriage C, adapted to run upon a track, of rods J, sliding vertically on the carriage, supporting-springs *j*, rods K, and car M, substantially as specified.

5. The combination, with a carriage C, adapted to run upon a track, of rods K, pivotally suspended from said carriage C, springs N, connected to opposite sides of the rods K and to the carriage C, and a car M, suspended from said rods K, substantially as and for the purpose specified.

6. The combination, with a carriage C, adapted to run upon a track, of vertically-movable rods J, springs *j* for supporting said rods, rods K, pivotally suspended from said rods J, springs N, attached to said rods K and to the carriage C, and a car M, supported from said rods K, substantially as specified.

7. The combination, with two rails A, supported at a uniform distance apart, of a carriage C, having frames each consisting of a vertical portion *c*, a cross-bar *c′*, and arms *c″*, wheel-frames D, wheels E, *e*, and F, rods J, springs *j*, rods K, pivotally connected with the rods J, springs N, and car M, substantially as specified.

8. The combination, with two rails A, supported at a uniform distance apart by bolts passing through their middle portion, of wheel-frames D, wheels E *e*, and wheels F, having engaging portions *f*, substantially as and for the purpose specified.

9. The combination, with two rails A, supported at a uniform distance apart, of a carriage C, wheel-frames D, pivotally connected to said carriage in the vertical plane of the rails A, supporting-wheels E, wheels F, and wheels d', one on each side of the wheels F, substantially as and for the purpose specified.

10. The combination, with two rails supported at a uniform distance apart, of a carriage C, two wheel-frames D, each pivotally connected at its upper and lower extremities to the carriage by vertical pivot-pins, and a rod connecting the wheel-frames at a point between their upper and lower pivoted extremities, substantially as described.

11. The combination, with two rails supported at a uniform distance apart, of a carriage C, two wheel-frames D, pivotally mounted upon said carriage, wheels d', a connecting-rod G between said wheel-frames D, and springs g', substantially as and for the purpose specified.

12. The combination, with two rails supported at a uniform distance apart, of a carriage C, brake-shoes supported upon said carriage and adapted to engage with said rails A, a lever and connecting-rods for operating said brake-shoes, and engaging surfaces O' for operating said lever, substantially as specified.

13. The combination, with two rails A, supported at a uniform distance apart, of a carriage C, having connecting-rods H, brake-shoes pivotally supported upon said rods H, a lever O, pivotally supported upon said rods H, connecting-rods p, and engaging surfaces for operating said lever O, substantially as specified.

14. The combination, with a carriage C, having at its top portion a cross-bar c', of the forks Q, pivoted to the cross-bar, and chains R, having projections q, substantially as described.

15. The combination, with a track having an ascending grade, drive-chains R, arranged at said ascending grade, and driving mechanism for said chains, of a carriage C, having pivoted forks adapted to engage with the chains R, substantially as specified.

16. The combination, with a continuous track having an ascending and a descending grade, drive-chains arranged at the ascending grade, and mechanism for driving said chains R, of a carriage C, and forks Q, adapted to engage with the chains R and pivoted to the rear sides of the frames of the carriage, substantially as specified.

17. The combination, with a continuous track having an ascending grade, of drive-chains R at the ascending grade, mechanism for driving said chains R, chains R' in advance of the chains R and driven therefrom at a slower speed, and a carriage C, having forks Q, adapted to engage with said chains R and R', substantially as and for the purpose specified.

18. The combination, with a continuous track having an ascending grade, chains R, arranged at such ascending grade, and mechanism for driving said chains, of a carriage C, having forks Q, adapted to engage with said chains, and safety-stops S, adapted to permit the ascent of the carriage and prevent the downward descent on the ascending grade, substantially as specified.

19. The combination, with two rails supported at a uniform distance apart, of a carriage C, having wheels E e, adapted to engage with the upper and lower surfaces of the rails A, respectively, rods K, pivotally supported from the carriage C, and springs N, attached to said rods and to said carriage C, substantially as and for the purpose specified.

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