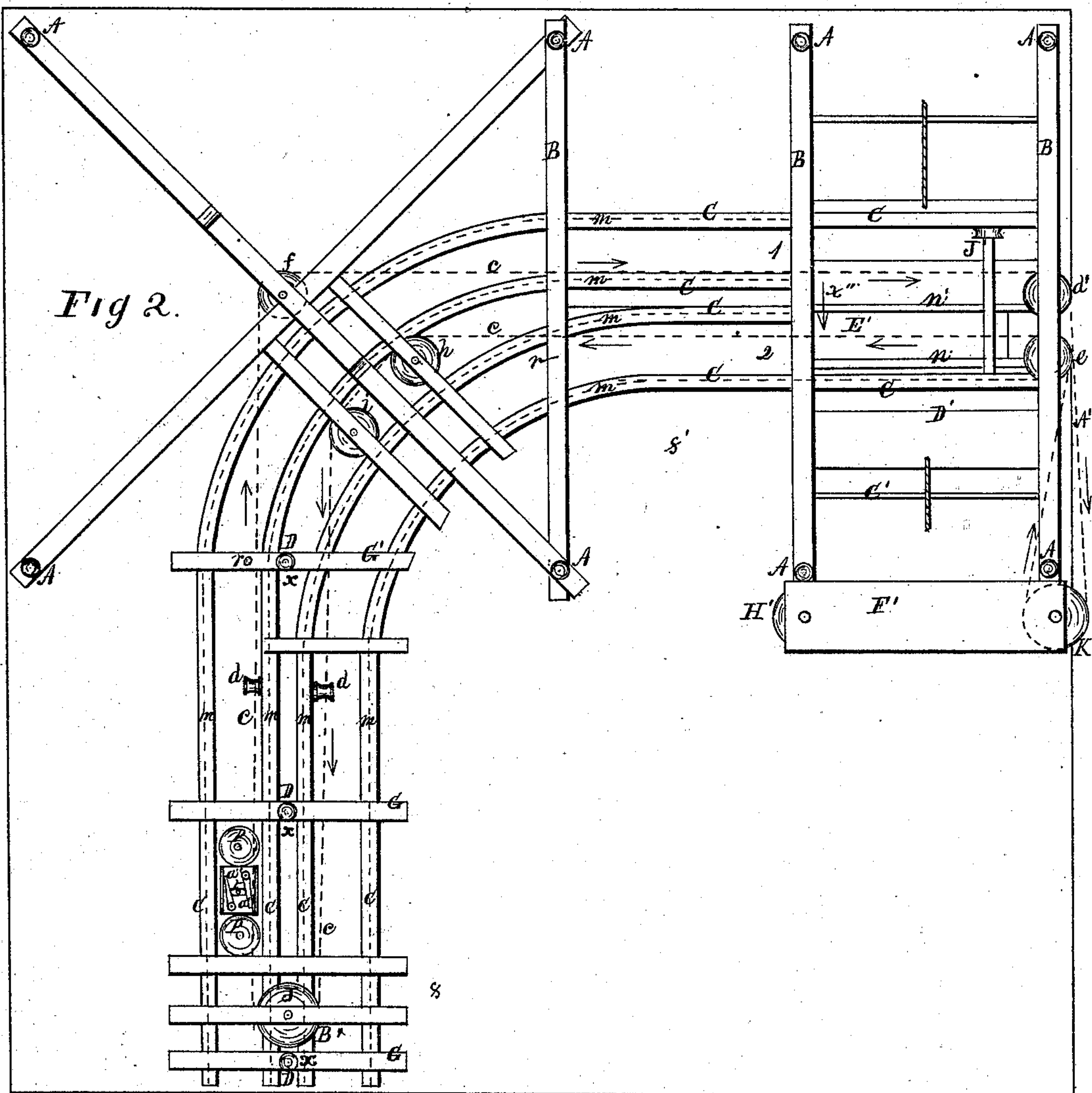
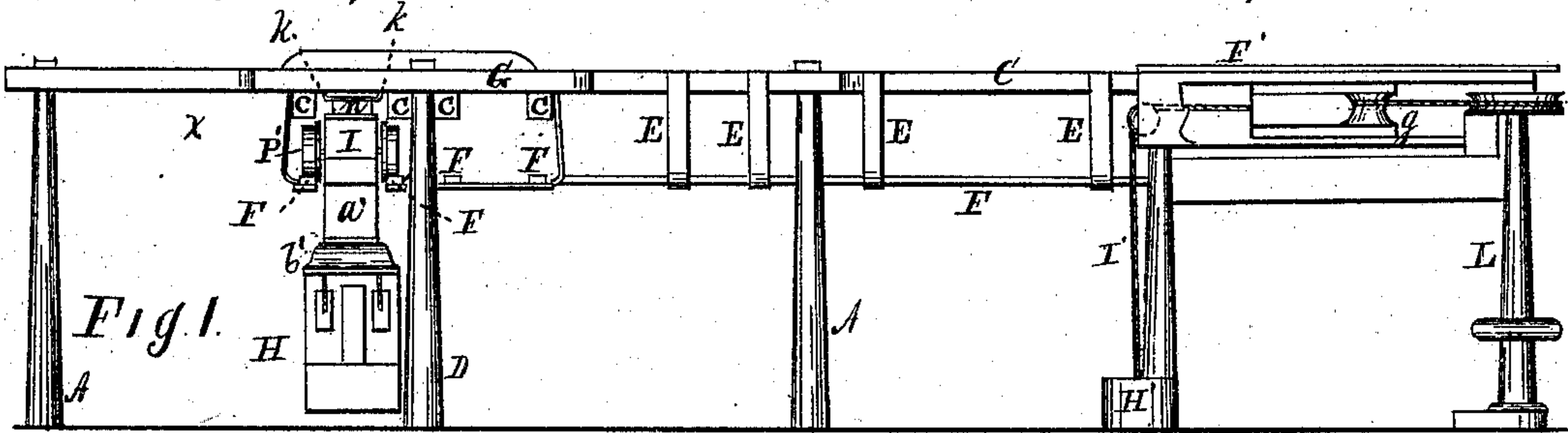


C. LEAVITT.  
Elevated Street-Railway.

No. 211,026.

Patented Dec. 17, 1878.



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Fig. 3.

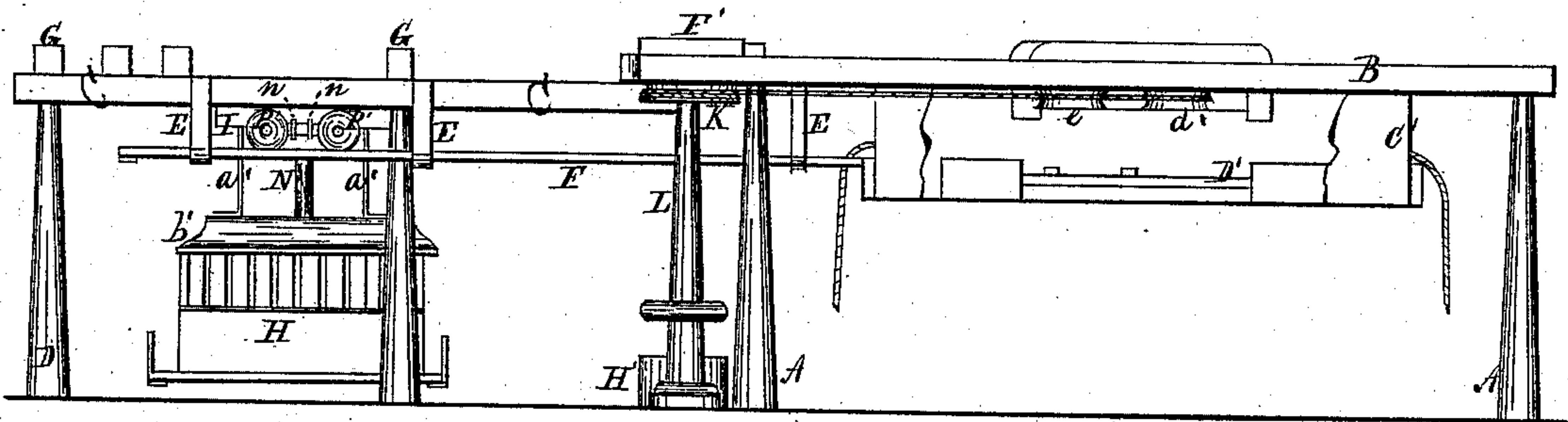


Fig. 4.

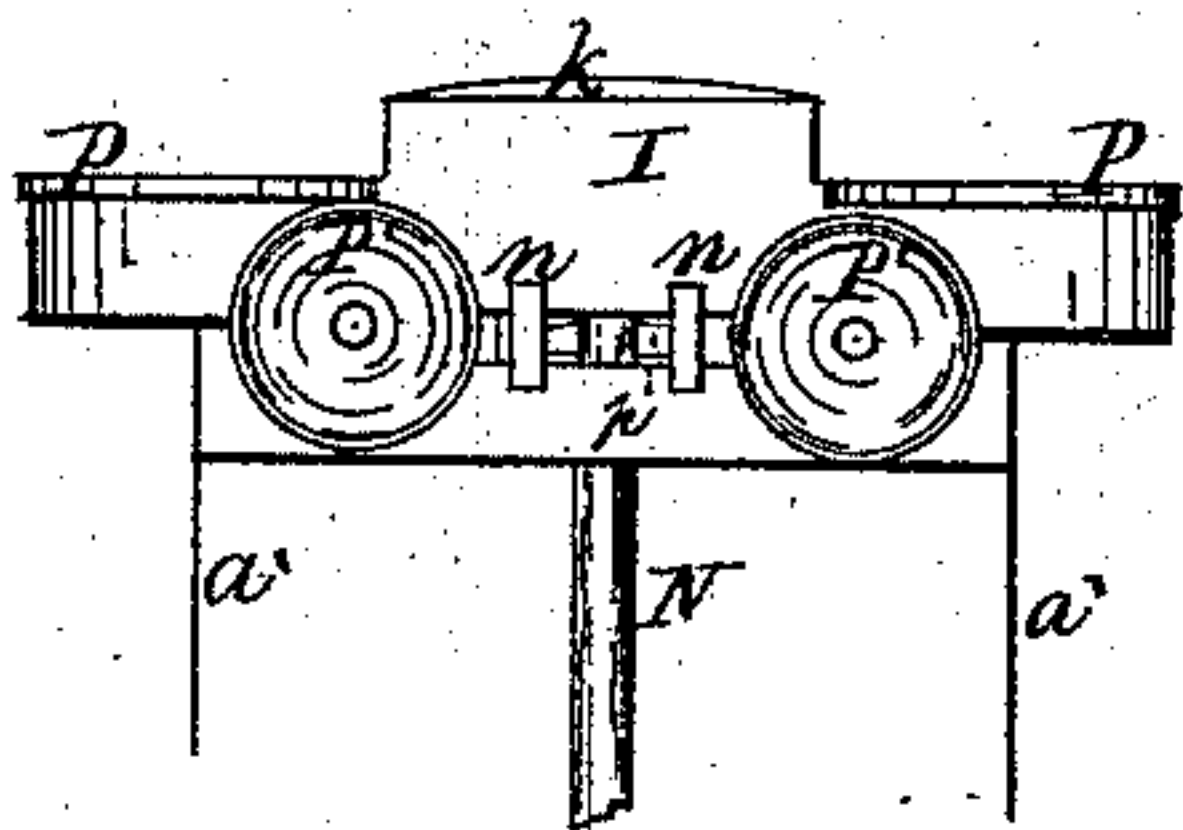


Fig. 5.

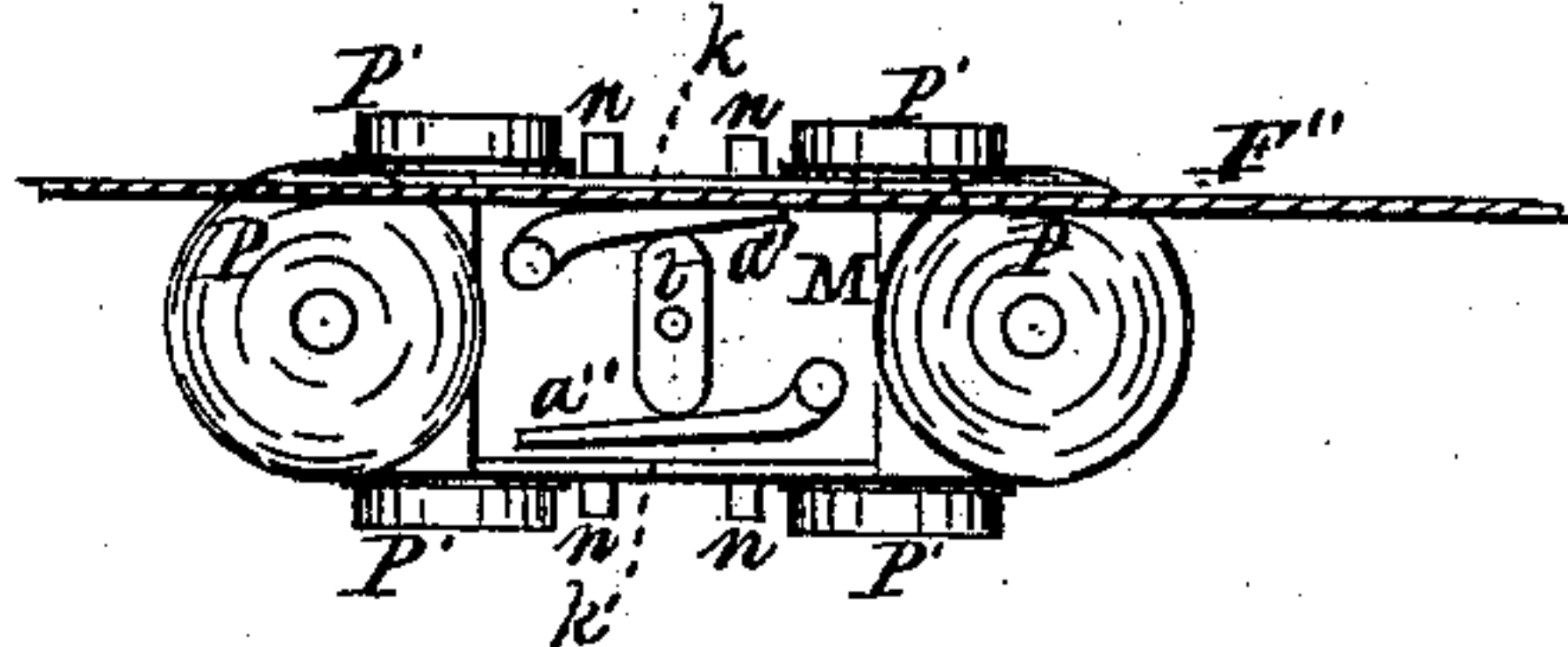


Fig. 6.

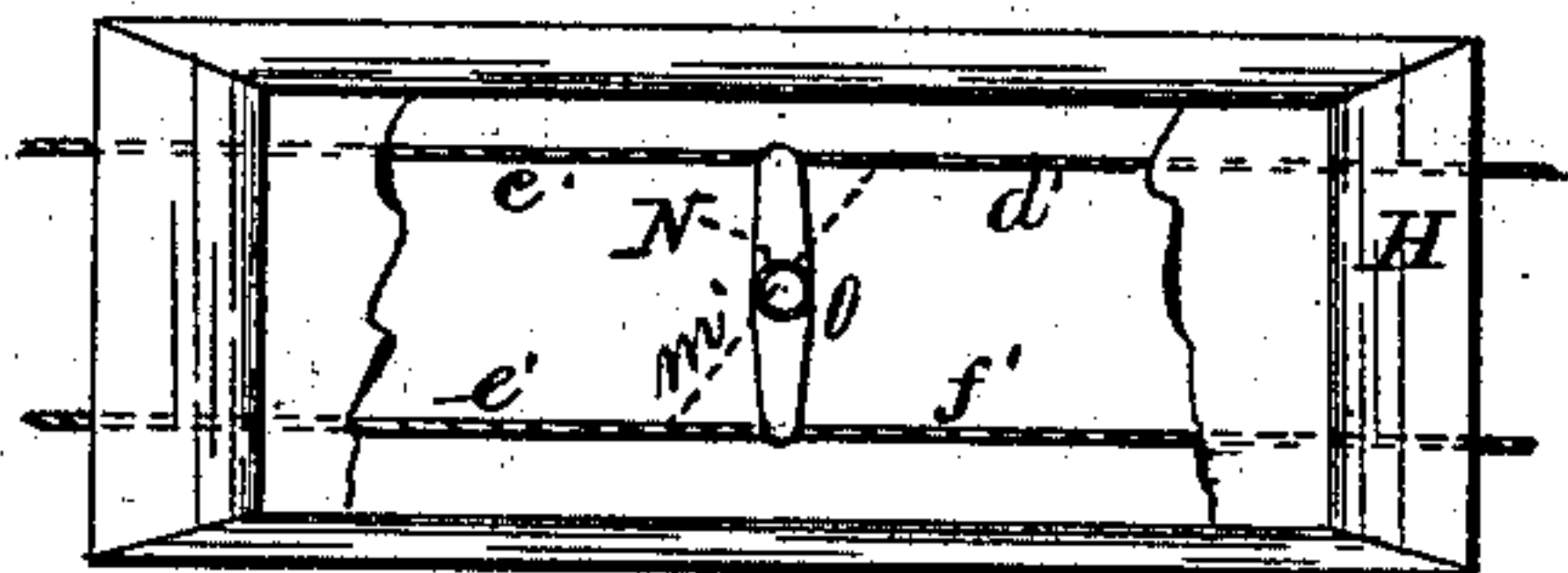
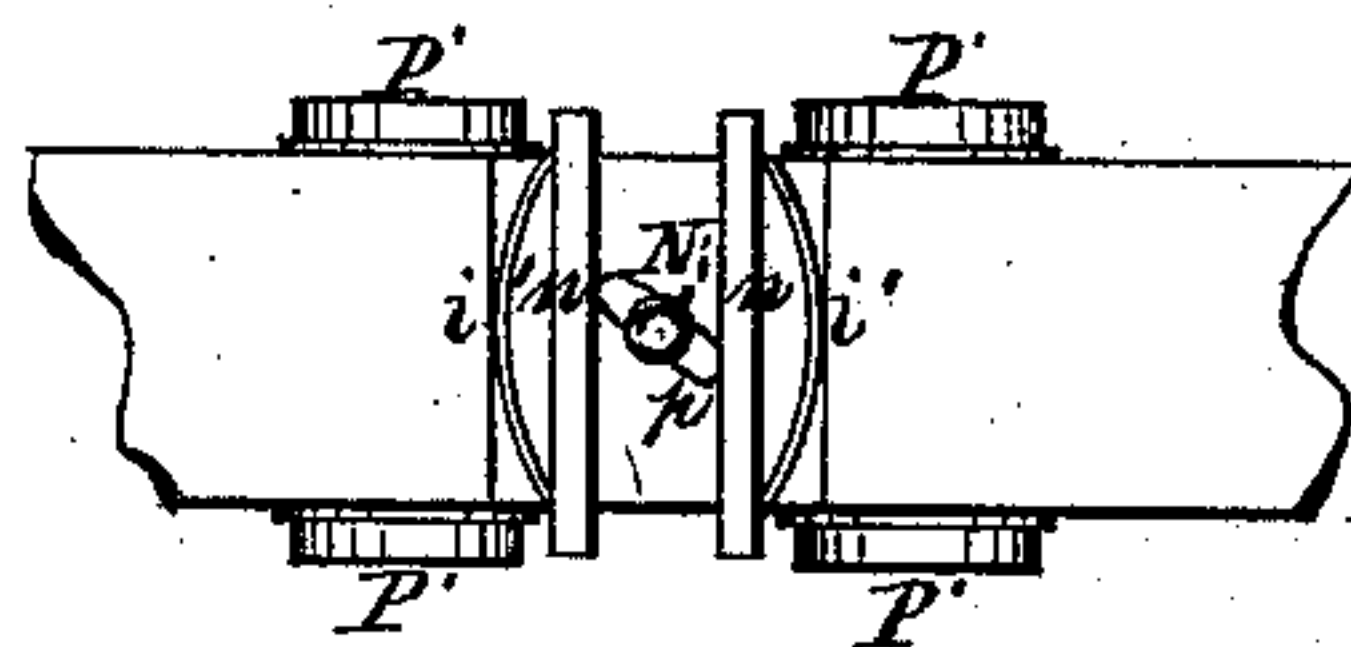


Fig. 7.



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# UNITED STATES PATENT OFFICE.

CHARLES LEAVITT, OF CLEVELAND, OHIO.

## IMPROVEMENT IN ELEVATED STREET-RAILWAYS.

Specification forming part of Letters Patent No. **211,026**, dated December 17, 1878; application filed September 12, 1878.

*To all whom it may concern:*

Be it known that I, CHARLES LEAVITT, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Elevated Street-Railways; and I do hereby declare that the following is a full, clear, and complete description thereof, reference being had to the accompanying drawings, making a part of the same.

Figure 1 is an end elevation of the railway. Fig. 2 is a plan view. Fig. 3 is a side elevation. The rest of the figures are detached sections, to which reference will be made.

Like letters of reference refer to like parts in the several views.

This invention relates to improvements in the apparatus used on cars for elevated railways, which are moved by an endless cable; and consists in a clutch whereby the car is attached to or detached from the cable; also, in an arrangement of the pulleys whereby the cable is guided in its movement; also, in a brake mechanism which is operated by the same shaft to which is attached the clutch by the means of which, when the clutch is detached from the cable, the brake operates upon the wheels, and, vice versa, when the brake is released the clutch takes hold of the cable, all of which will be more fully hereinafter described, and set forth in the claims.

Along each side of the street in which the elevated railway is to be built are erected a series of columns close to and inside of the curb-stone, as seen at A in Figs. 2 and 3, whereon are secured cross pieces or plates B, forming a frame or frames, which may be longitudinally and transversely supported in connection with each other by any appropriate system of braces. To the under side of said cross-pieces are secured stringers C, Figs. 2 and 3, from which are suspended, by hangers E, the track-rails F, running in line with said stringers and directly under them. Hence they are not seen in Fig. 2 of the drawing, but are, however, indicated by the dotted lines *m*.

Instead of a series of columns being erected along each side of the street, one row only may be placed along the middle of the street, as shown at D, Fig. 2, and the car-track suspended along on each side of the columns

from stringers attached to cross-pieces G secured to the top of the columns, as shown in Figs. 1 and 2 at *x*, which represent one end of the railway suspended from one line of columns, whereas the opposite end of the railway is represented as being supported on two lines of columns, as seen at A. It is preferred, however, to support the rails or track upon two lines of columns.

H represents the street-car, which, in its general construction, may be like ordinary street-cars. Said car, as will be seen in the drawings, is suspended from the rails F F through the intervention of the truck I, Fig. 1. Detached views of the truck are shown in Figs. 4 and 5, representing side and top views of the same. The car is attached to the truck by suspension rods or hangers *a'*. The wheels P' of the truck stand upon the rails F F, which, as above said, are directly under the stringers C. The proximity of the stringers to the wheels is so close as to prevent them from leaving the rails. The wheels would strike the stringers before being lifted far enough to leave them; hence there is no liability of the truck leaving the track.

As hereinbefore said, the car is drawn by an endless cable, to which it is or may be attached and detached by a clamp or clutch. Said cable is an endless one, and extends along the sides of the stringers, as indicated by the broken lines *c*, and is supported at intervals on rollers *d*, to prevent incurvation. At each end of the road the cable passes around from one track to another on sheaves or pulleys. At the end A' it passes around the pulleys *d'* and *e*, and around the sheave J at the end B'. The course of the cable is as follows: Supposing it to be moving in direction of the arrows in Fig. 2, and starting from the pulley or sheave J it runs around the sheave *f*, thence to the sheave *d'*, around which it turns to the sheave K, secured to the shaft L, over which it passes to the tension-pulley *g*, Fig. 1, around which it turns, thence back to the pulley or sheave K, taking one turn around said pulley K, and then passing to the sheaves *e*, and thence to the sheaves *h i*, Fig. 2, from thence to the sheave J, from which it started, thereby completing the circuit of the cable.

The above-described system of guide-rollers,



in combination with the tension-pulley *g* and its connections, constitutes one part of my invention, as will be set forth in the claims, and the following description of the method by which the car is attached to and detached from the endless cable constitutes another part of my invention.

All the remaining portion of the description is not new, but is deemed necessary to show how the railway is to be supported, and the manner in which the car is to be suspended that it may be moved to and fro, and controlled by means which are as above described.

The clutch above alluded to for attaching the car to the cable is constructed as follows: Secured to the top of the truck is a plate, *M*, Fig. 5, provided on two sides with a camber-flange, *k*, Figs. 1 and 5. Said plate is not so wide but that it will move freely between the stringers, as seen in Fig. 2. Also to the top of the truck are pivoted a pair of clamps or dogs, *a''*, Fig. 5, between which is a cam, *t*, secured to the end of a shaft, *N*, Figs. 3 and 4, by which the cam is operated for clamping the cable. To the lower end of the shaft *N* is secured a bar or arms, *O*, Fig. 6. Said figure represents a space in the top of the car at *b'* in Fig. 1, in which the lower end of the shaft *N* terminates. To said arms *O* are attached cords *c'* and *d'* on one side and cords *e'* and *f'* on the other side. The cords extend to the platforms of the car, from which they are manipulated by the conductor for starting and stopping the car.

The car, as represented in Fig. 2, is clamped to the cable. Said cable, as seen more clearly in Fig. 5, lies between the flange *k* and the clamp or dog *a''*, the dog being forced against the cable by the cam *t*, which is made to assume the transverse relation to the top of the truck for clamping the cable, as shown, by pulling either upon the cord *f'*, Fig. 6, or the cord *c'*, depending upon which end of the car the conductor may be. As the cable is supposed to be running in the direction of the arrows, the car will be carried along therewith.

In order to stop the car the gripe of the clutch upon the cable is released by the conductor pulling upon the cord *d'* or *e'*, thereby bringing the arms *O* to the position indicated by the dotted line *m'*, Fig. 6, which, as a consequence, turns the cam *t* to the same position, thereby releasing its pressure upon the dog *a''* and the hold of the dog upon the cable.

The car, thus detached from the cable, is brought to a stand-still by the brakes. Said brakes consist of the bars *n*, Fig. 7, passing transversely through the truck on either side of the shaft *N* and in relation to the wheels, as shown in Fig. 4. The ends of said bars are to be provided with shoes for rubbing upon the faces of the wheels, which, however, are not shown.

The brakes are operated by a cam, *p*, Fig. 7, secured to the shaft *N*, carrying the cam

*t* and arms *O*, alluded to. The cam for operating the brakes is actuated by the cords *d'* and *e'*, used for operating the clutch, thus: On further pulling upon the cords for detaching the car from the cable (after the clutch is released therefrom) the cam *p* will be brought to the position shown in Fig. 7, thereby forcing the bars apart from each other, and at the same time forcing the shoes of the brake upon the wheels, which, as a consequence, brings the car to a stand-still. On releasing the strain upon the cord the brakes are forced from their contact with the wheels by a spring, *i*, placed behind the bars, as shown in Fig. 7. The car is again started by clamping it again to the cable, which, as above said, is done by pulling either upon the cord *c'* or *f'* for operating the cam *t* for gripping the cable between the dog *a''* and the flange *k*, as hereinbefore described.

As above described, the car is supposed to be moving in a straight line, and drawn by the cable. In order to run around the curves at street corners and other places, the car is detached from the cable directly it reaches the curve of the track. That this detachment of the car may be made at the proper time, the cam *t* of the clutch is operated automatically by a pin, *r*, Fig. 2, projecting below the cross-piece *G*, and in such relation to the car that on its coming to the curve the said pin will engage the cam of the clutch and cause it to release its hold upon the cable. The car, thus disengaged from the cable, will be carried around the curve by its momentum, and can then be again made fast to the cable by the means hereinbefore set forth.

The purpose of the wheels *P*, Figs. 4 and 5, is to assist in carrying the car around the curve by their running against the sides of the stringers, thereby preventing undue frictional resistance of the track-rails. The cable, where it is attached to the car or the truck thereof, is higher than it is elsewhere, so much so as to allow the plate *M* of the truck to pass over the supporting-pulleys *d*, on which the main line of the cable rests. In order to transfer the car from one track to another for the return trip, as from track 1 to track 2, Fig. 2, there is provided at each end of the road, or elsewhere, as may be required, a sliding platform, constructed and operated as follows:

In a suitable frame, *C'*, Figs. 2 and 3, is arranged under the stringers a sliding table or platform, *D'*. On said platform are laid the rails *n'*, corresponding to the rails *F F* of the main track. The short rails, *n'*, are sufficiently long to allow the wheels of the car-truck to stand upon them. In the platform between the rails *n'* is an opening, *E'*, wide enough to admit the car-truck and the wheels thereof to rest upon the rails, which may be considered as a short extension of the track onto the platform. Now, on adjusting the platform so that the rails thereof will be in line with the rails of the road-track, the truck can be pushed into the opening *E'*, alluded to, the wheels run-



ning onto the rails of the platform, thereby suspending the car as previously suspended from the main track 1. The platform is now pushed in the direction of the arrow  $x''$ , Fig. 2, so far as to bring the track of the platform in line with the main track 2 of the road. The car is then made fast to the cable and drawn thereby from the platform onto the main track for the return trip. The object of the camber on the flanges  $k$ , above referred to, is to allow the truck to pass under the cable without the flanges being caught thereby.

In the drawing the car is represented as being drawn by one side, to which the cable is attached. By a slight modification of the clutch the cable can be attached to the middle of the truck, in which case the draft would be more evenly made. It is, however, preferred to attach the cable to the side of the truck, as herein described.

The slack of the cable is taken up by the tension or tightening pulley  $g$ , above alluded to. The block of said pulley or sheave  $g$  is fitted to slide in the case  $F'$ , to which is attached a weight,  $H'$ , by a cable,  $I'$ .

It will be obvious that since the cable  $F'$  passes around the pulley  $g$ , the slack of said cable will be taken up by the weight  $H'$ , drawing back the block and pulley more or less, as the slack may be, thereby keeping the cable at all times in a proper tension.

The cable is operated by a steam-engine, the power being applied to the shaft  $L$ .

In the event the road is of considerable length, two engines may be required, and for the best effect be stationed one at each end of the road.

$J'$ , Fig. 2, is a flat bar, journaled in the stringers  $C$ , and upon which the cables lie. The purpose of said bar is to lift the cable,

that the car may pass under it while being transferred from one track to another. Said lifting of the cable is done by turning the bar up edgewise, which will elevate the cable sufficiently for the purpose specified.

A street-railway constructed as above described leaves the street unobstructed by a car track or tracks, hence leaving the entire roadway for carriages, wagons, &c., which run no risk of broken axles and other injuries consequent on being caught in the rails of a ground track.

The arrangement of the pulleys for conducting the cable around curves can be adapted to any degree of curvature, and the car be carried easily around by the momentum it may have acquired from the cable.

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

1. In elevated railways, the arrangement of leading-pulleys  $J, f, d', K, e, h$ , and  $i$ , in combination with the endless cable passing around the slack-pulley  $g$ , controlled by the counterweight and cord  $H'$  and  $I'$ , whereby the cable is conducted around the curves and the slack duly compensated, substantially as and for the purpose described.

2. The truck  $I$ , plate  $M$ , provided with flanges  $k$ , clamping-dogs  $a''$ , and cam  $t$ , in combination with the cable  $F''$ , operating conjointly, substantially as and for the purpose specified.

3. The brake consisting of the bars  $n, n$ , spring  $i'$ , cam  $p$ , shaft  $N$ , and cords  $d'$  and  $e'$ , arranged to operate with the cable-clutch on the shaft  $N$ , substantially as and for the purpose described.

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