(No Model.)

2 Sheets—Sheet 1.

W. S. HALL.

WIRE ROPEWAY.

No. 475,766. Patented May 31, 1892.

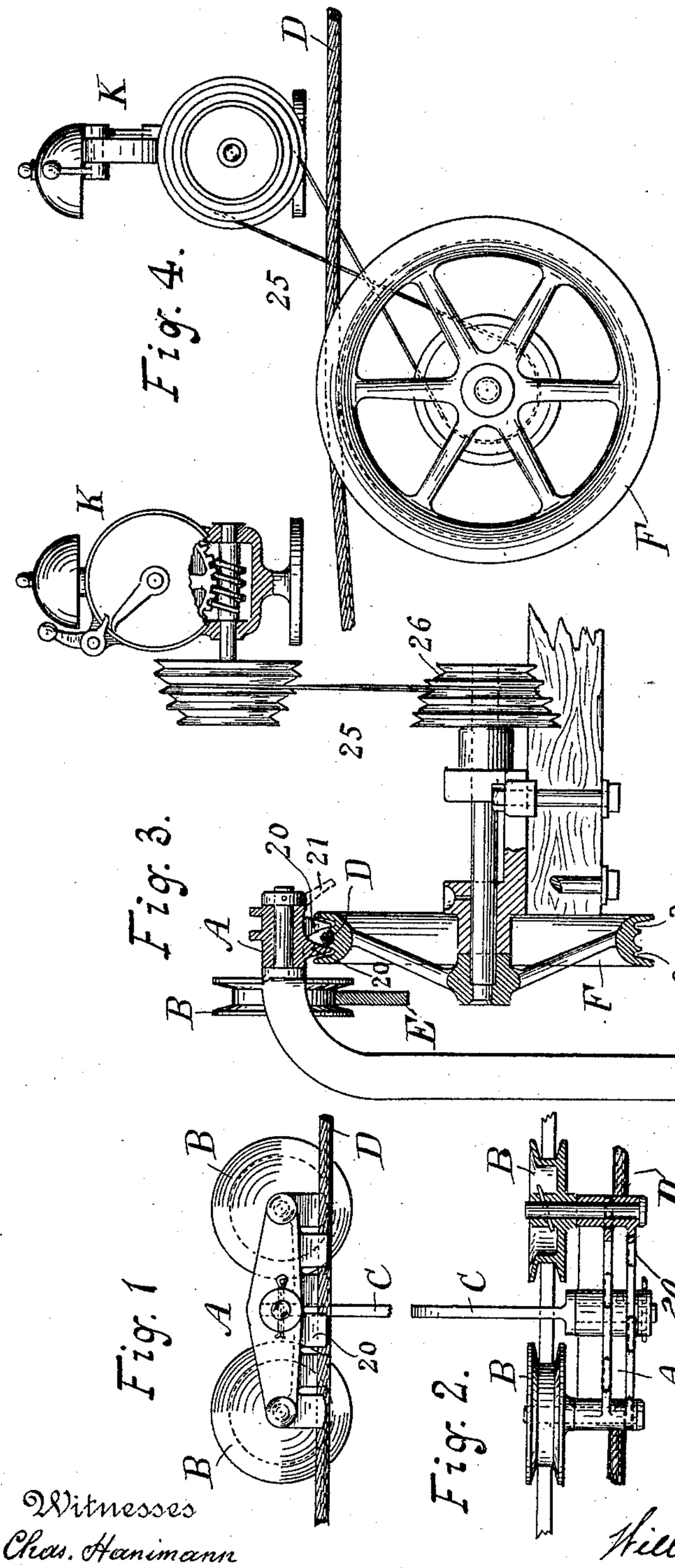

Fig. 4.

Fig. 3.

Fig. 1

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

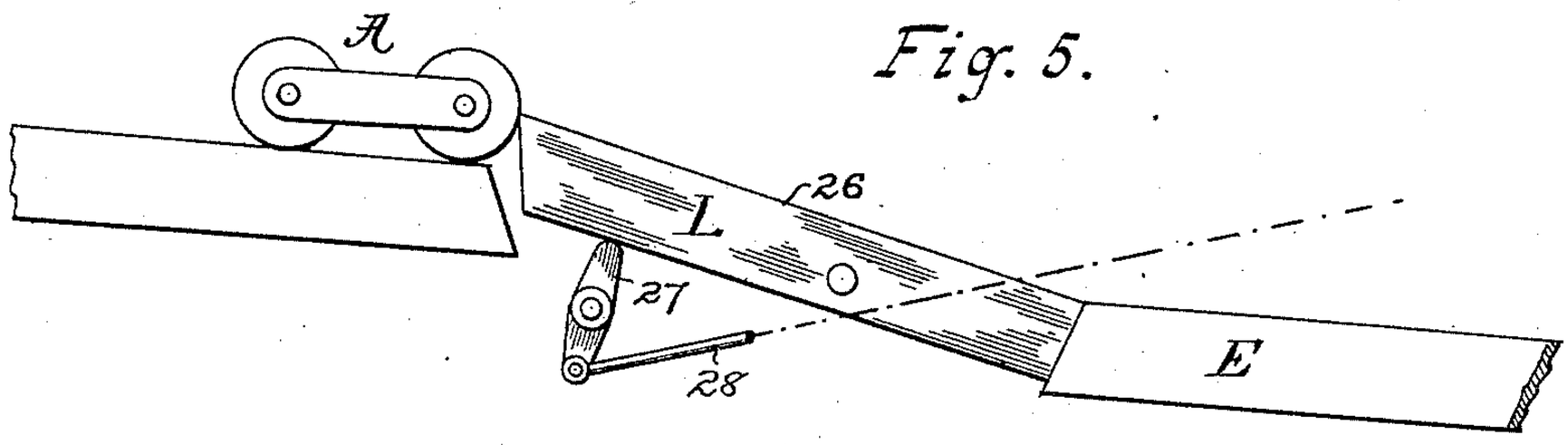


Fig. 6.

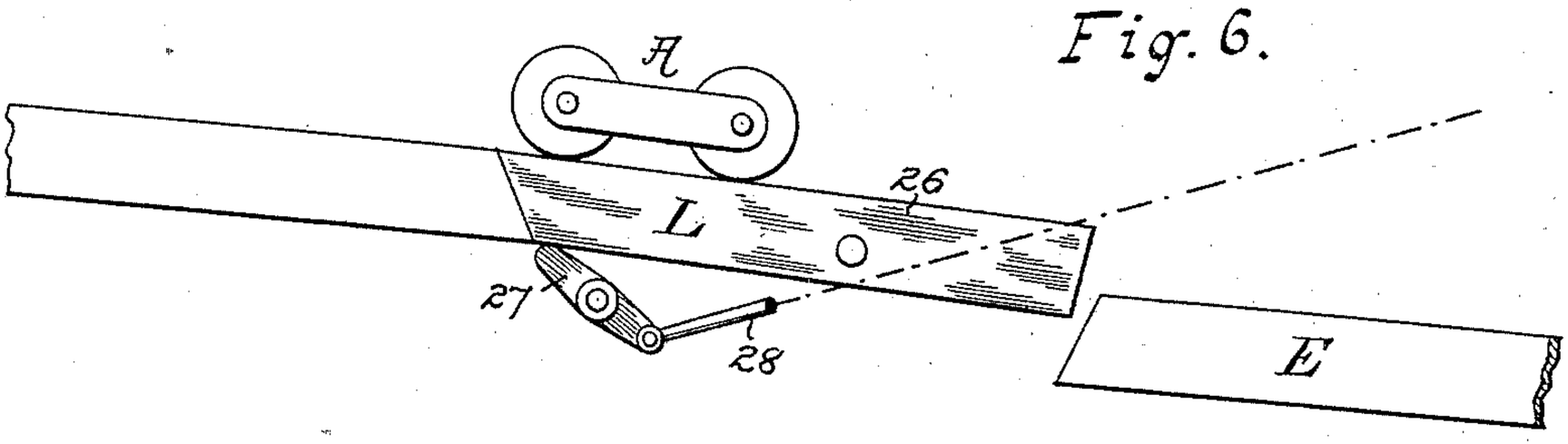
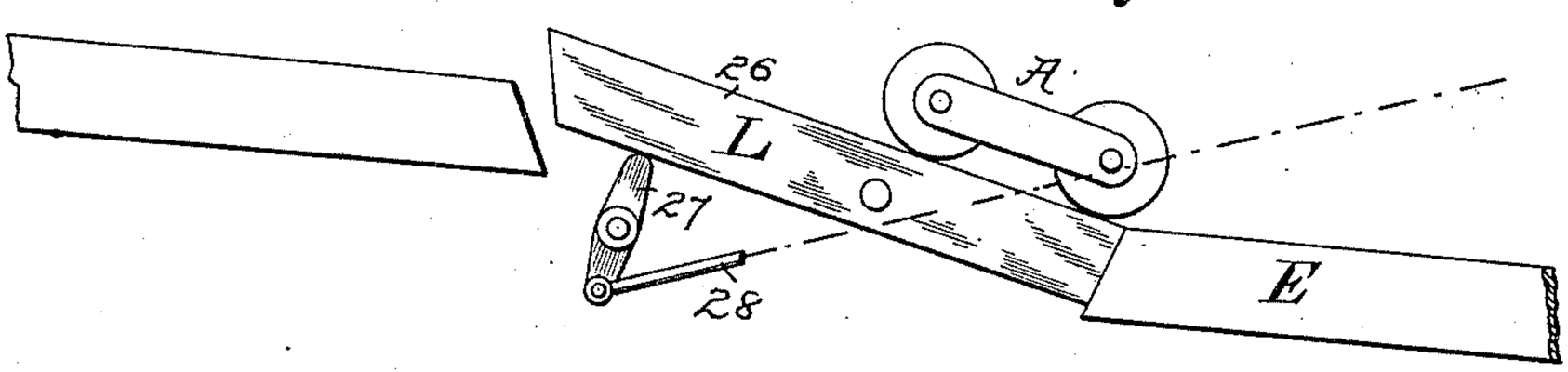


Fig. 7



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UNITED STATES PATENT OFFICE.

WILLIAM SILVER HALL, OF TOKIO, JAPAN.

WIRE ROPEWAY.

SPECIFICATION forming part of Letters Patent No. 475,766, dated May 31, 1892.

Application filed July 21, 1891. Serial No. 400,258. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SILVER HALL, a subject of the Queen of England, residing at Tokio, Japan, have invented certain new and useful Improvements in Wire Ropeways and in Appliances for Rope Haulage and the Transmission of Power by Ropes, fully set forth in the following description and represented in the accompanying drawings.

This invention relates generally to wire ropeways and in appliances for rope haulage and the transmission of power by ropes; and it consists in the improvements, novel constructions, and combinations of devices hereinafter fully set forth.

In the accompanying drawings, which illustrate various embodiments of the invention, Figure 1 is a side elevation of the improved clip or saddle. Fig. 2 is a plan view of the same, partially in horizontal section. Fig. 3 is a sectional elevation of the same, together with one of the rope-carrying sheaves and a rail, illustrating the moment when the load is equally borne by the rope and by the rail in the act of running on or running off, as the case may be, and also an elevation in partial section of an audible alarm. Fig. 4 is an elevation of the audible alarm actuated from one of the carrying-sheaves, a somewhat similar device being also applicable in connection with an apparatus for automatically releasing a carrying clip or saddle and its load and allowing it to run off the rail and onto the rope. Figs. 5, 6, and 7 are elevations of portions of a rail with an interposed tilting-rail section in different positions, illustrating one form of device by which the release of a carrying clip or saddle and its load is effected and allowing it to run off the rail onto the rope.

The first part of this invention relates to certain improvements in that class of wire ropeways or overhead cable tramways in which a single rope is used not only to carry the loads to be transported from one point to another, but also to haul or propel them along, especially in those cases in which it is desirable that the said loads shall be easily and automatically attached to or detached from the carrying and propelling rope.

Hitherto it has only been possible to employ the single-rope system when the steepest gradient or angle of inclination did not exceed one in three and one-half or fifteen degrees, or thereabout, from the horizontal plane, except by the use either of knots in the rope or ferrules, thimbles, carriers, or other excrescences permanently clamped or riveted to the rope, or of mechanical gripping arrangements involving a considerable amount of complication and numerous jaws, cams, springs, levers, or other loose parts in their construction and also considerable uncertainty in their action. In place of such permanent fixtures on the rope or of such mechanical gripping arrangements with loose parts I employ a single saddle, clip, or jaw 20 of Λ form, which may be made of a single casting in iron or steel or other suitable metal or stamped out of a wrought-iron or steel plate, portions of the right and left hand sides of such being alternately cut away to provide a plurality of gripping-surfaces arranged to alternate with one another upon opposite sides of the rope, as shown in Figs. 1 and 3, so as to press on the right and left sides of the rope alternately. The saddle or clip 20 is shown as formed integral with a trolley-frame A, carrying flanged wheels B, the said frame having a depending bar C for attachment of the load-receptacle. The advantages of this arrangement are twofold. In the first place the rope D is very slightly but not injuriously flexed or bent in a sinuous line, thereby giving a better grip than if it lay in a straight line in a plain Λ-shaped groove, and in the second place, when the rope is drawn downward from the saddle or the saddle lifted upward from the rope, (the effect of either mode being identical,) the rope leaves the one face and the other face of the Λ alternately without being jammed or wedged between the two opposite faces. This drawing downward of the rope or lifting upward of the saddle relatively to each other is effected in the ordinary and well-known manner by the use of a fixed rail E, so arranged on one side of the vertical plane in which the rope travels as to present a different inclination to the horizontal plane to that in which the rope itself is traveling, so that in running a saddle with its suspended load off the rail and onto the rope the said saddle gradually descends until it bears with its whole weight onto the rope, which it grips

with sufficient tenacity to be drawn forward thereby.

In releasing the saddle and its load from the rope, as above mentioned, the inverse method is adopted—that is to say, the rope continues to draw the saddle forward until the carrying-wheels B, projecting from one side of the saddle or the trolley-frame in the ordinary manner, come onto the fixed inclined rail, and as the said rail in its turn takes the whole weight of the load the rope is drawn downward and drops from the saddle, which then runs forward by its own gravity along the fixed rail.

As my improved clip or saddle is not encumbered with loose catches, jaws, tumblers, levers, cams, springs, triggers, or similar mechanical contrivances for gripping and releasing the rope, it is specially adapted for passing easily and freely between the flanges of deeply-grooved or "safety" pulleys, as F, Figs. 3 and 4, of suitable contour or section, as with the supplemental grooves 2, even when considerably inclined from the perpendicular, thus decreasing the danger of the rope being jerked out of the groove by any sudden or excessive oscillation from whatever cause arising. The use of such deeply-grooved or safety pulleys further enables a ropeway to be easily, cheaply, and safely led around corners involving a considerable horizontal deviation from the straight line and around curves of comparatively small radius by fixing the said pulleys so as to revolve in a plane normal to the strain of the rope, but inclined from the true vertical plane.

In cases where the gradient is excessive—that is to say, where the rope at any part of its working length forms a large angle with the horizontal plane—I form shallow grooves on the interior surfaces of said saddle jaw or clip, so as to conform approximately to the contour of the strands of the rope; but this modification is seldom necessary unless the angle of the rope with the horizontal plane approaches or exceeds forty-five degrees, or thereabout. With a plain Λ-shaped saddle of which the sides were not alternately cut away this modification would not be equally practicable, as the rope would be liable to be jammed so tightly between the opposite surfaces of the Λ as to be incapable of ready release in the manner which I have explained above.

In cases where extreme or violent oscillation of the rope is to be feared I fix a safety catch or plate 21 outside the saddle or jaw, as shown in dotted lines in Fig. 3; but under ordinary circumstances this is not requisite or necessary.

I vary the form and spacing of the teeth of the said clamps, nippers, stoppers, or compressors according to the circumstances of each case. For example, if a rope is to be permanently gripped or fixed at one point I form the teeth so as to force the said rope into a distinctly sinuous or wavy line; but in cases where the position of the clamp is only temporary and has to be frequently changed I arrange the teeth so as not to seriously distort or permanently injure the rope. This form of grip or clamp, with suitable modifications, is also applicable to that class of wire ropeways in which one rope is employed as a carrying or "rail" rope and a second rope is used as a hauling-rope, and also to the various forms of railways or tramways in which the cars or wagons are hauled by an endless cable.

Another part of my invention refers to the proper distribution of the load to be transported by a wire ropeway. As it is of considerable importance that the loads on a wire ropeway should be distributed as evenly as possible along its entire length and should not be concentrated upon one or more isolated sections while the remainder of the rope is running comparatively empty or unloaded, and as it is not convenient or economical to effect this by interpolating loads of dead weight or ballast between the "paying" loads of material which it is actually required to transport should such paying loads have been dispatched from the loading-station faster than the supplies arrive, I employ a bell, gong, or other signal K (see Figs. 3 and 4) to notify to the runner-on or attendant at the loading-station that the preceding load has traveled to a sufficient distance before the succeeding one is run onto the rope, and also to warn him that the proper time for starting the next load has arrived. When a hauling-rope on which knots, ferrules, or similar contrivances are fixed at regular intervals is used, this is frequently effected by causing the said knots or ferrules as they pass to actuate an audible signal; but according to my improved system no such knots or ferrules are necessary or desirable. I therefore fix a small self-contained apparatus, with a ball or other audible signal, at the loading or running-on station and drive the said apparatus by a belt or cord 25 from a small pulley 26, fixed on the axis of the nearest carrying-sheave, or of the driving or brake or tightening pulley, if found more convenient. By providing this pulley with successive speeds or steps I obtain an easy method of regulating the distance between the loads and of equally subdividing the total amount to be carried per day or per hour, according to the rate of supply of material to the loading-station.

In other cases (see Figs. 5, 6, and 7) I employ a detent or stop L, fixed on the running-on rail, actuated either by an apparatus K, similar to that employed for giving the audible signal already described, or by clock-work, so that at stated intervals one saddle or carrier and its load, and one only, shall be permitted to run off the rail and onto the rope. In this example of the invention the detent or stop L is interposed in the rail E, on which the trolley moves to run off onto the rope. It consists of a tilting-rail section 26, adapted in

its normal position to form a continuation of one portion of the rail, as in Fig. 5, and its end forming a stop to prevent the onward movement of a trolley. With this tilting-rail section is combined a locking and releasing toe or lever 27 that is connected by a rod 28 to some actuating part of the apparatus—as, for instance, the audible alarm apparatus K, Figs. 3 and 4. In its normal position the lever 27 holds the tilting-rail section locked in the position shown in Figs. 5 and 7, and at the proper time said apparatus K moves the lever into the position shown in Fig. 6, releasing the tilting-rail section and allowing the latter to move by gravity (it may be by a spring) into the position shown in Fig. 6, where it forms a continuation of the other portion of the rail E, thus freeing the trolley, so that it may run onto the rail-section and thence onward. As soon as the trolley passes the pivot of the tilting-rail section its weight overbalances the rail-section and tips it downward into the position shown in Fig. 7 and the trolley runs off it and onto the rail E, in which case the trolley resets the stop and allows the toe or lever 27 to return to its locking position.

What is claimed is—

1. The herein-described rope-clip or saddle, consisting of a plurality of opposed gripping-surfaces arranged to alternate with one another.

2. The herein-described rope-clip or saddle, consisting of a plurality of opposed gripping-surfaces forming a Λ-shaped groove and alternating with one another upon opposite sides of the groove.

3. The herein-described rope-clip or saddle of Λ form, consisting of a plurality of separated gripping-surfaces, a gripping-surface upon one side of the Λ being opposite the space between the gripping-surfaces on the other side.

4. The combination, with the trolley-frame, of a rope-clip or saddle on said frame, composed of a plurality of opposed gripping-surfaces alternating with one another, substantially as described.

5. The combination, with a rope-clip or saddle composed of oppositely and alternately arranged gripping-surfaces, of a rope-carrying pulley provided with supplementary grooves for the ends of the gripping-surfaces, substantially as described.

6. The combination, with a carrier and a carrying-rope, of a permanent rail for the carrier, having a stop or detent, and mechanism for actuating the stop, substantially as described.

7. The combination, with a carrier and a carrying-rope, of a permanent rail for the carrier, a stop or detent forming part of such rail, and mechanism for actuating the stop, substantially as described.

8. The combination, with a carrier and a carrying-rope, of a permanent rail for the carrier, a pivoted stop or detent forming part of such rail, a toe or lever for locking the stop, and mechanism for moving the toe, substantially as described.

In witness whereof I have signed my name, in the presence of two witnesses, this 26th day of May, 1891.

WILLIAM SILVER HALL.

Witnesses:
EDWIN DUN,
W. R. GARDINER, Jr.