(No Model.) 4 Sheets—Sheet 1.

O. M. SMITH.

AUTOMATIC GRIPPING DEVICE FOR INCLINED RAILWAYS.

No. 553,942. Patented Feb. 4, 1896.

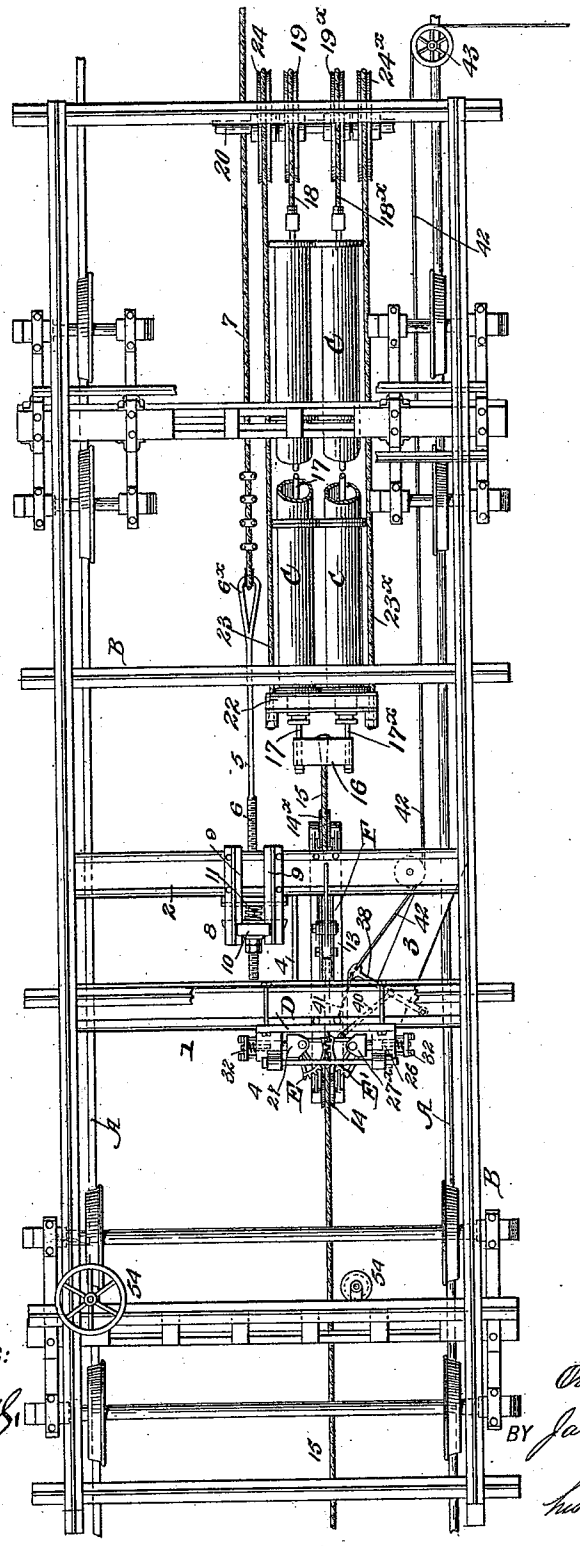

Fig. 1.

WITNESSES:

W. A. Bloodgood

C. L. Acker

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(No Model.) 4 Sheets—Sheet 2.

O. M. SMITH.

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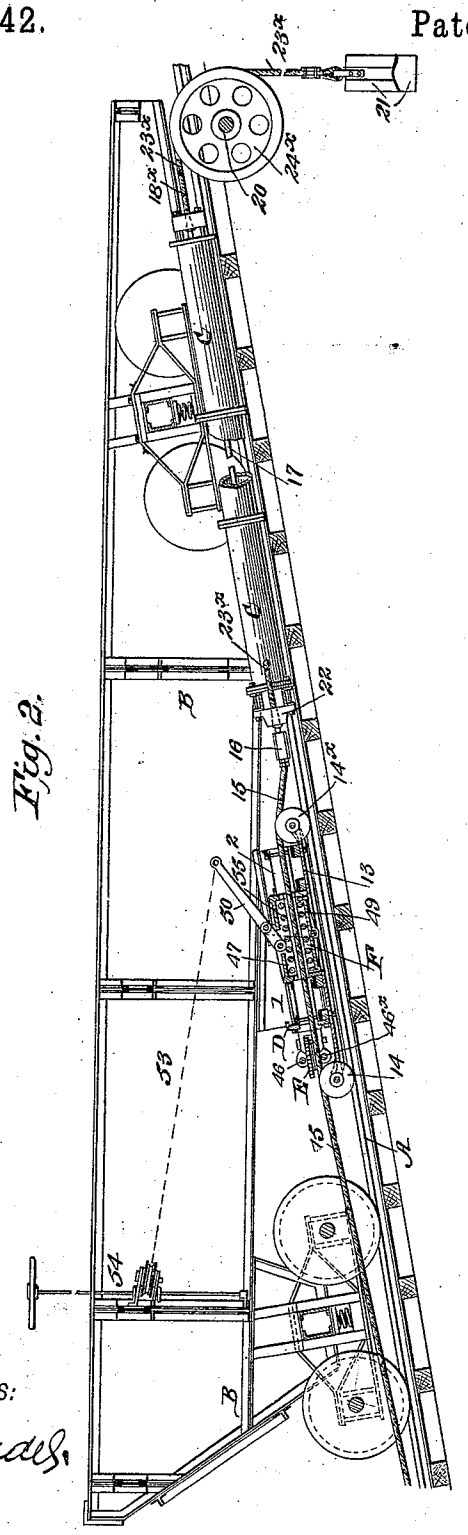

Fig. 2.

WITNESSES:

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(No Model.) 4 Sheets—Sheet 3.

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AUTOMATIC GRIPPING DEVICE FOR INCLINED RAILWAYS.

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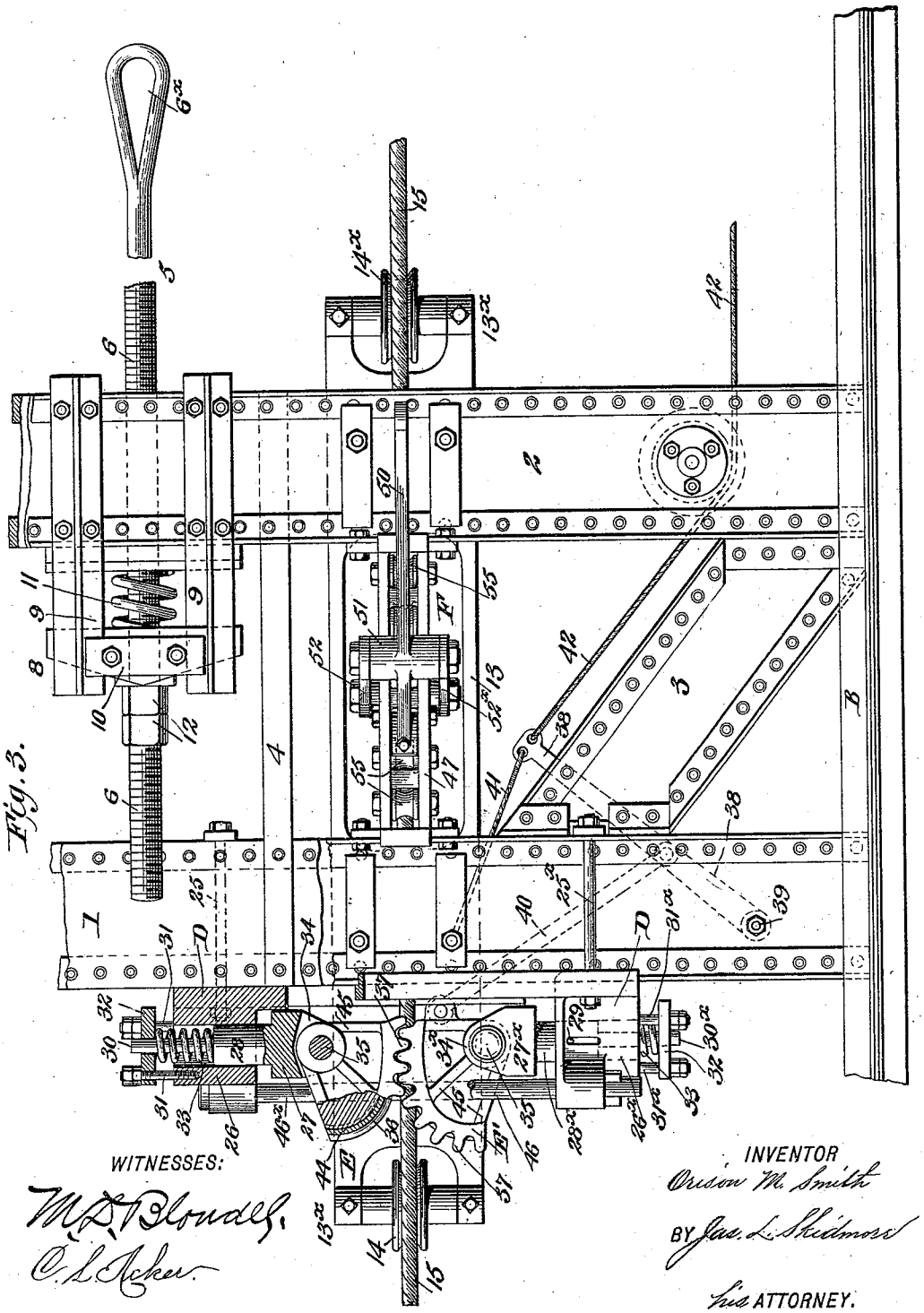

Fig. 3.

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(No Model.) 4 Sheets—Sheet 4.

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AUTOMATIC GRIPPING DEVICE FOR INCLINED RAILWAYS.

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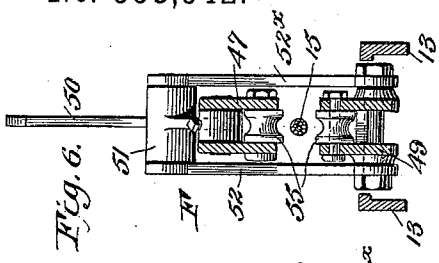

Fig. 6.

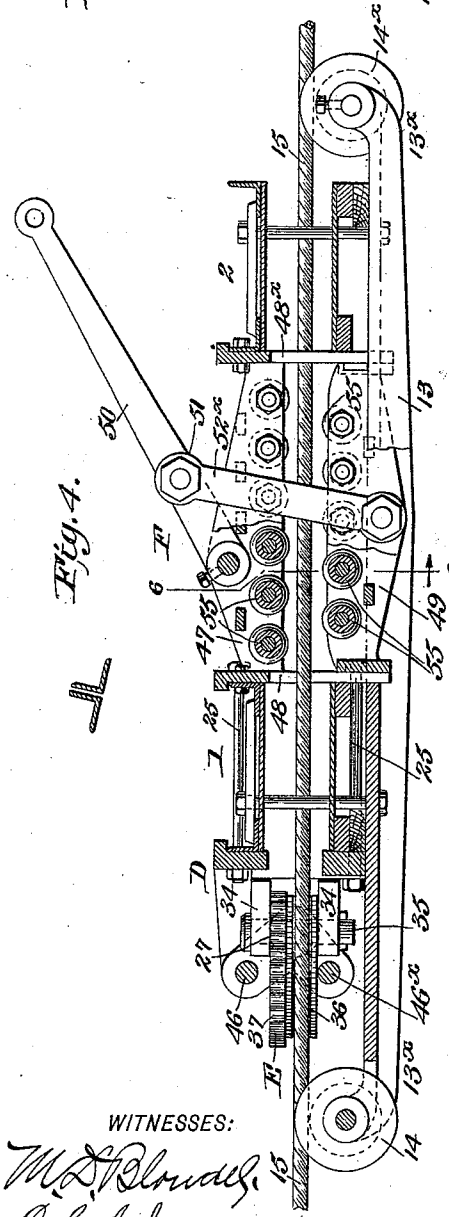

Fig. 4.

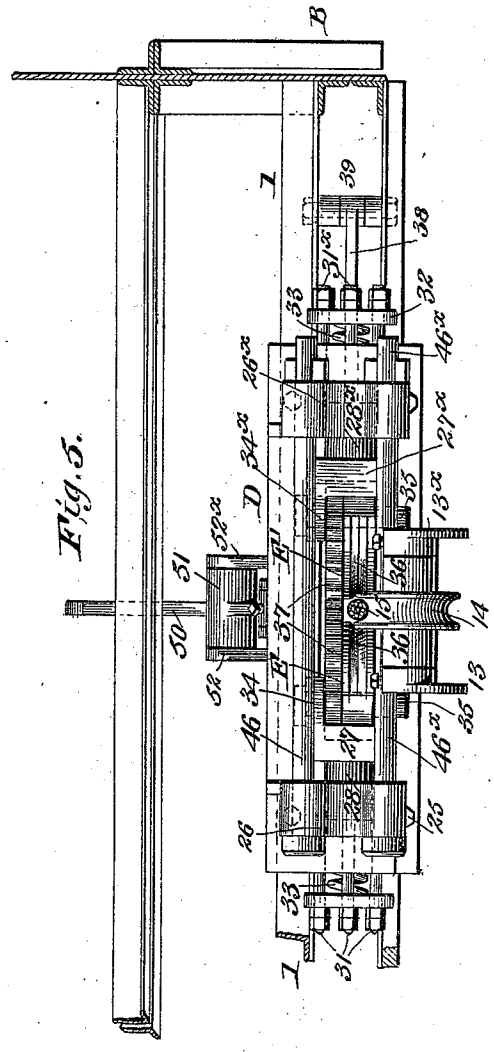

Fig. 5.

WITNESSES:

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UNITED STATES PATENT OFFICE.

ORISON M. SMITH, OF DULUTH, MINNESOTA, ASSIGNOR OF ONE-HALF TO H. BRIDGEMAN AND N. F. RUSSELL, OF SAME PLACE.

AUTOMATIC GRIPPING DEVICE FOR INCLINED RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 553,942, dated February 4, 1896.

Application filed April 27, 1895. Serial No. 547,359. (No model.)

To all whom it may concern:

Be it known that I, ORISON M. SMITH, a citizen of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Automatic Gripping Devices for Inclined Railways; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention has relation to improvements in automatic safety-grips for inclined railways; and the object is to provide an effective mechanism to automatically grasp or grip a stationary or fixed cable in connection with the inclined track, whereby in case either the motor-cable or the propelling machinery breaks the car may be held in position by the grip automatically engaging the stationary cable.

It is also the object to provide an auxiliary gripping device whereby the car may be held while the main or primary safety-grip is being released from the stationary cable, and the car then permitted to move slowly down the incline under control of the auxiliary grip.

I have fully and clearly illustrated my invention in the accompanying drawings, in which—

Figure 1 is a plan view of the bottom or lower frame of a car carrying my improved devices, the car being stopped or held adjacent to the head of the incline in order that the resilient and yielding mechanism to which the stationary cable is connected may be shown. Fig. 2 is a longitudinal section through the car and gripping mechanisms, the air-cylinders being shown in this figure and also in Fig. 1 as being broken apart. Fig. 3 is a detail plan view of the gripping mechanisms and the frames on which they are mounted or carried. Fig. 4 is a longitudinal central section through the gripping mechanisms. Fig. 5 is an end view in elevation taken from the left of Fig. 3, and Fig. 6 is a sectional view in elevation taken on the line 6 6 of Fig. 4.

Referring to the drawings, A designates the inclined railway-track of any of the approved constructions, and B designates the car carried on trucks, as usual, with the body of the car arranged to rest or stand substantially horizontal, as indicated in Fig. 2 of the drawings. To the bottom frame of the car is secured a strong and substantial metal frame adapted to carry the gripping mechanism and strong enough to maintain the pull and strain of the motor-cable. This frame consists of substantial metal girders, plates, or webs 1 2, brace-piece 3, and cross-piece 4. Projected through the web 2 and substantially central therein is a draw-bar 5 provided with screw-threads 6 on its body and having at one end an eye or opening $6^{\times}$, to which is attached the motor-cable 7, leading, as usual, to the motor-drum. (Not shown.) On that part of the web 2 which carries the draw-bar 5 is mounted and secured a frame 8, having flanges 9, on which slides a cross-piece 10, through which the draw-bar is passed and projects through the wall of the web 2, as shown in Fig. 3 of the drawings. Disposed in the space between the faces of the web 2 and the yielding or sliding cross-piece 10, with the draw-bar passing through it, is a spring 11, and on the stem of the draw-bar are adjusting-nuts 12, by which means the draw-bar may be adjusted and then held resiliently against the force of the strong spring 11.

Secured to the webs or plates 1 2 is a casting 13, the ends of which project in both directions beyond the outer walls of the webs and constitue brackets or supports $13^{\times}$, wherein are supported and journaled sheaves 14 $14^{\times}$, carrying and guiding in the grooves thereof the stationary cable 15, attached to the cross-head 16 of the pistons of the air-cylinders located at the head of the incline, as shown in Figs. 1 and 2.

C C designate air-cylinders located at the head of the incline, and provided with piston-rods 17 $17^{\times}$ of the usual construction, and have fastened to their lower ends the cross-head 16, their upper ends projecting from the

open ends of the cylinders, as shown, and are connected to cables 18 18×, running on sheaves 19 19×, mounted on a shaft 20, supported in any suitable manner. To the ends of the cables 18 18× are hung weights 21, sufficient to hold the pistons with the fixed cable 15 in proper position at the head of the incline. A yoke 22 also connects the piston-rods of the cylinders, and to the projecting ends of this yoke are attached cables 23 23×, carried over sheaves 24 24× on the shaft 20, and provided with weights on the ends to act in conjunction with the sheaves and cables of the piston-rods.

D designates a strong metal plate suitably secured against the face of the web 1 by means of bolts 25 25×. The plate D is provided or formed with strong projections or brackets 26 26×, having bearings therein in which the stems of the cam-carriers are disposed. The cam-carriers 27 27× are substantially duplicates in construction and contour, and consist of suitable body-pieces formed with stems 28 28×, fitted in holes in the brackets, the stems being provided with pins 29 engaging in a slot in the brackets and limiting the outer end movement of the cam-carriers. The rear ends of the stems are extended by means of a bar 30 30×, smaller in diameter than the stems and projecting through the outer face of the brackets, as shown in Fig. 3 of the drawings. From the side of each bracket are projected carrying-rods 31 31×, on which is adjustably mounted a cross-piece 32, having the ends of the bars 30 30× projecting through it, and between this cross-piece and the shoulder on the bracket, on the bar extended from the cam-carrier, is a spring 33, the force of which is continually exerted to hold the grippers together.

The cam-carriers are formed with upper and lower plates or leaves 34 34×, between which the hubs of the grippers are placed and held pivotally on strong bearings 35, passing through the leaves and the hub of the gripper. The grippers E E′ are strong cam-shaped sectors, substantially as shown in the drawings, having their gripping edges formed with a groove 36, preferably U-shaped, in which the stationary cable slides and by which it is gripped when the exigency happens which calls into requisition the gripping mechanism. The cam-grippers also are formed with intermeshing teeth 37, whereby they are moved in unison, so that when the grip is released both cams are carried free from the cable at the same time.

The gripping-faces of the gripper-cams are provided with a facing of suitable metal 44, of Babbitt metal or other metallic material adapted for the purpose and which will relieve the wearing action of the grippers on the cable without deteriorating the gripping function and at the same time protecting the cable from injury. The body of these gripping-cams is strengthened by ribs 45, running radially from the hub, as shown.

To strengthen the plate carrying the brackets and cams, so that it will withstand the end-thrust of the gripping-cams, I use two strong bolts 46 46×, secured in lugs on the brackets, the lower bolt, 46×, being so arranged or disposed that the lower faces of the cams will rest thereon, and thus relieve the strain on the bearings of the cam and also on the cam-carrier stems.

A lever-bar 38 has one end pivotally secured to the web 1, as at 39, and to the lever 38 is pivotally connected a bar 40, having the other end pivotally connected to the gripper-cam E′, the connection being made to a lug on the cam, substantially as shown in the drawings. To the free end of the lever 38 is fastened one end of a light cable or rope 41, having the other end fixed to any suitable means on the web 1 or other portion of the frame, and to the free end of the lever 38 is also fastened one end of a trip-cable 42, which is led or arranged over guide-sheaves and about or around a drum or sheave 43 stationed at the head of the incline.

In the illustrations in the drawings I have shown the invention as applied to a single line of inclined railway; but it is readily perceived that it may be applied to a double-track incline, and in such application the cable 42 instead of being wound up on and paid out from a drum is connected to the lever 38 on each car and guided about sheaves located at the head of the incline. The cable or rope 41 should not be more than one-half the strength of the trip-cable 42, so that the stay-cable 41 will break before the latter when the strain comes on them.

F designates an auxiliary hand-gripping mechanism operated through the instrumentality of levers and a hand-wheel, and is brought into operation to hold the car while the main automatic grip is being released, and then to so grip the stationary cable that the car may be slowly and gradually run down the incline.

Referring to the drawings in illustration of the auxiliary gripping device or mechanism, 47 designates the upper and stationary jaw of the gripper, which is made fast and rigid between the webs 1 2 and formed with downward-extending end pieces 48 48×, between which the lower and movable jaw 49 slides up and down and is guided.

To the stationary jaw 47 is fulcrumed the end of a lever 50, carrying a cross-bar 51, to which are pivotally connected the links 52 52×, having their lower ends pivotally connected to the movable jaw 49. The lever 50 is operated preferably by means of a rope or chain connection 53 with a hand-wheel and staff 54, located at any convenient place on the car. The jaws of this grip mechanism may be provided with rollers 55, or the gripping-surfaces may be faced with wood, or otherwise equipped to furnish a frictional grip upon the stationary cable.

The operation of the described mechanism

is as follows: If applied to a double-inclined track, it will be premised that the construction carried by each car is duplicated, and that the only difference in cable connection is that in the instance of two cars, wherein the trip-cable is connected at its respective ends to the trip-levers on both cars, while on a single track the trip-cable is wound around on and paid out from a drum, as indicated in the drawings. In case of the double track and two cars being operated together, one ascending and the other descending, if an accident to the motor cable or machinery, either by break or slack of the motor-cable or break or loss of control of the motor mechanism, the safety mechanism will be brought into operation, as follows: The trip-cable 42, being attached to the trip-levers 38 on the respective cars, will travel with them, so that should the cars tend to separate a strain is thrown on the cable 42. When this strain is sufficient to break the stay-rope 41 on either car, the lever 38 will bring the grip-cams into action and the stationary cable will be gripped between the cams. The weight of the car and the action of the trip-cable 42, pulling on the lever 38, unite in increasing the force of the grip until the shoulders of the cam-holders become lodged against the faces of the brackets. The cam-holders being thus seated, any further rotation of the grippers will effect a stronger grip upon the cable, and the descending car thus be held stationary against backward movement, except the limited movement permitted by the gradual yielding of the pistons of the air-cylinders. The ascending car will be brought to rest by its own weight, after which it will start back, thus imposing a strain upon the trip-cable and causing the trip to act, and thus be held by the stationary cable. The trip-cable may be controlled by any appliances placed under the control of the engineer. In the instance of a single-track incline the trip-cable is, as heretofore specified, wound upon a drum or paid out therefrom, according to the direction of movement of the car. Then if from any cause the car breaks away from the motor-cable the strain on the trip-cable will break the stay-rope and bring the grippers into action. The car being brought to a stop, then the hand-gripper is brought into action by means of the hand-wheel and its connection to the operating-lever and this gripper closed on the stationary cable with sufficient force to hold the car, while the gripping-cams are being released from the stationary cable, which is done by inserting a bar in the front opening between them and forcing them open. The hand-gripper can then be eased a little and the car allowed to descend gradually to the foot of the incline.

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

1. In a safety-grip for inclined railways, gripping-cams formed with grooves in their opposing faces, and intermeshing teeth on their edges, whereby the cams are moved in unison, substantially as shown and described.

2. In a safety-grip for inclined railways, gripping-cams formed with grooves in their opposing faces, a soft-metal facing in the grooves, and intermeshing teeth on their edges, whereby the cams will hold the cable without injury thereto and be moved in unison, substantially as described.

3. In a safety-grip for inclined railways, supports formed with bearings, cam-carriers formed with stems to fit the bearings of the supports, oppositely-arranged cam-grippers pivotally mounted in the bearings and formed with grooves in their gripping-faces, and intermeshing teeth, and springs to push the stems of the cam-carriers inward, substantially as specified.

4. In a safety-grip for inclined railways, the combination of suitable supports formed with bearings, cam-carriers yieldingly or resiliently held in the bearings, gripping-cams pivotally mounted in the cam-carriers and arranged to grip a cable between their adjacent faces, a trip-lever, a connecting-bar between the trip-lever and one of the cams, a stay-cord to hold the trip-lever from operating the cams, and a trip-cable stronger than the stay-cord, substantially as and for the purpose specified.

5. In a safety-grip for inclined railways, the combination of suitably-supported brackets formed with bearings, and having slots opening into the bearings, cam-carriers formed with stems to fit in the bearings of the cam-carriers and provided with studs to engage in the slots thereof, bars projecting from the ends of the stems of the cam-carriers, springs on the bars, adjustable cross-pieces against which the springs abut, and cam-grippers pivotally mounted in the cam-carriers and adapted to automatically seize and grip a cable between their adjacent faces, substantially as described.

6. In a safety-grip for inclined railways, the combination of suitably-supported brackets, upper and lower bars between the brackets, cam-carriers adjustably and yieldingly held in the brackets, cam-grippers in the cam-carriers, a stationary cable, and guide-sheaves to direct the cable between the cams, substantially as described.

7. The combination with an automatic safety-grip, and a stationary cable arranged to be automatically seized thereby, of the webs 1, 2, the plate D laterally secured to the web 1 and adapted to support the said safety-grip, an auxiliary gripping mechanism F having a stationary jaw, the end pieces of which are rigidly secured to and between the said webs, and a movable jaw guided in its up and down movements by the said end pieces, substantially as shown and described.

8. The combination with an automatic safety-grip for inclined railways, and a stationary cable arranged to be automatically seized by the safety-grip, of the webs 1 2, the plate

D secured to web 1 and serving to support the safety-grip, a casting 13 secured to said webs 1 and 2, and adapted to carry and support the sheaves 14, $14^{\times}$, and an auxiliary gripping mechanism secured between said webs, and serving to grip and hold the stationary cable so as to permit the car to be moved gradually down the incline, substantially as described.

9. In an automatic safety-grip for inclined railways, the combination with the webs, 1, 2, of the auxiliary gripping device comprising an upper stationary jaw formed with downward-extended end pieces, a movable jaw arranged to move between the end pieces of the stationary jaw, and a lever to move the movable jaw, substantially as described.

10. In an automatic safety-grip for inclined railways, the combination with the stationary cable, of air-cylinders, pistons in the cylinders, a yoke connecting the pistons of the cylinders, cables fastened to the projecting end of the yoke, a shaft, a grooved pulley on the shaft, a cable having one end connected with the piston, and a weight to act in conjunction with the sheaves and cables of the piston-rods, substantially as described.

11. The combination with the stationary cable, of air-cylinders, pistons in the cylinders, having connection to the stationary cable, a cross-head connecting the pistons, a shaft, grooved pulleys on the shaft, cables connected to the ends of the cross-head of the pistons, and arranged over the pulleys, cables connected to the upper ends of the pistons, and arranged over the pulleys, and weights on the cables, as and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

ORISON M. SMITH.

Witnesses:
F. W. HEATH,
HENRY SIEGRIST.