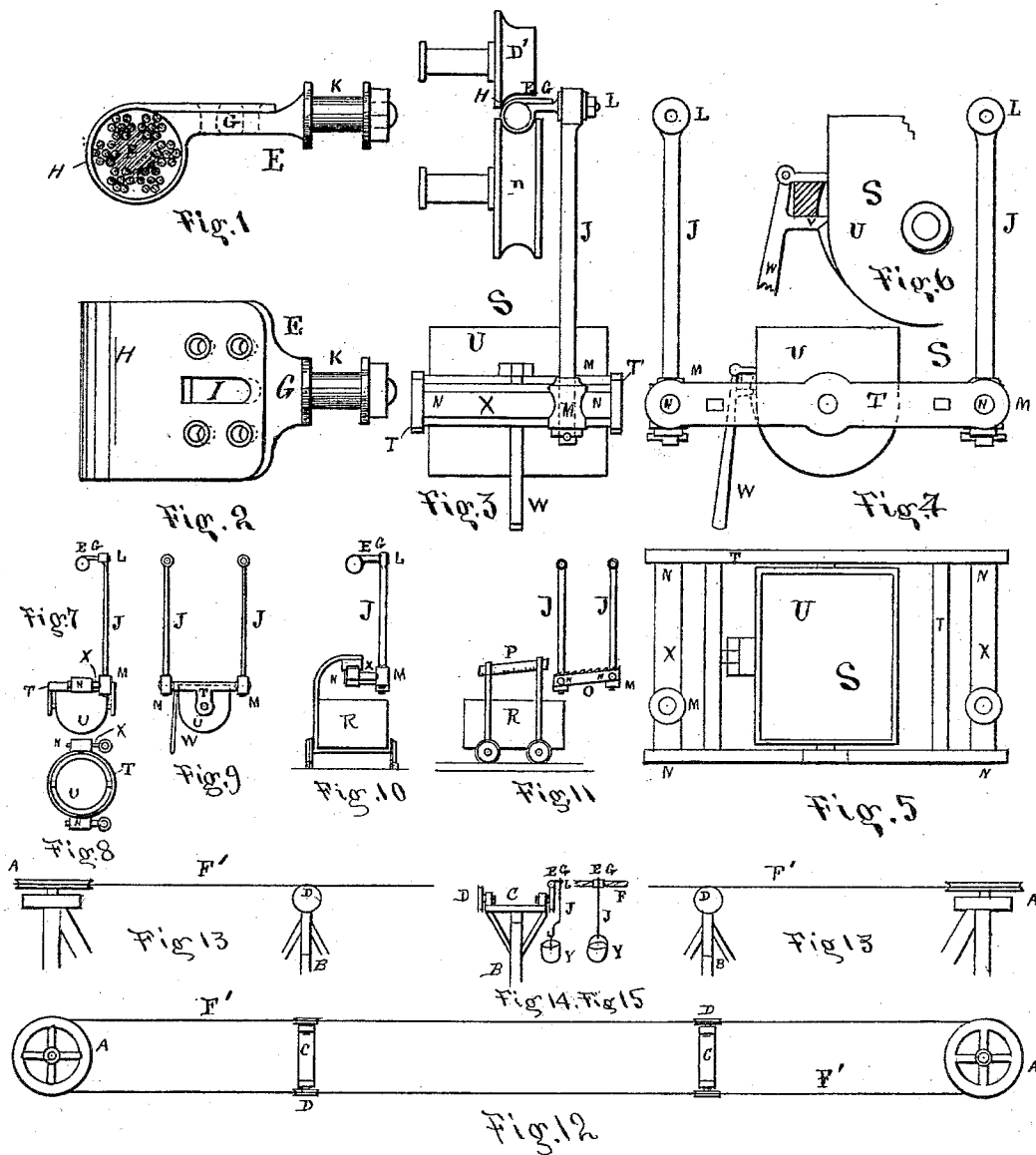


A. S. HALLIDIE.  
 ENDLESS WIRE ROPEWAY.

No. 110,971.

Patented Jan. 17, 1871.



Witnesses

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN ENDLESS-WIRE-ROPE WAYS.

Specification forming part of Letters Patent No. 110,971, dated January 17, 1871.

*To all whom it may concern:*

Be it known that I, ANDREW SMITH HALLIDIE, of San Francisco, in the county of San Francisco, and in the State of California, have invented an Improved Endless-Wire-Rope Way, of which the following is a specification, reference being had to the accompanying drawing.

My invention relates to an improved method of obtaining power from weights carried in buckets, sacks, or cars attached to an endless wire-rope moving over or around sheaves or pulleys, and to the transportation of ores or other materials in said buckets, sacks, or cars.

In endless wire-rope ways or "wire tramways," as they are sometimes called, hitherto constructed, it has been necessary to detach the cars or buckets from the rope before passing the end pulleys, because no suitable hanger or attachment has been known or used that could pass the end pulleys without difficulty.

Another difficulty that has been hitherto considered as perhaps insurmountable has arisen from the tendency of the well-known wave motion that is frequently communicated to the rope to throw said rope out of the groove in the bearing-pulleys.

The object of my invention is, first, to provide a hanger or device for carrying the suspension-rods that can remain permanently attached to the rope, and will readily and without difficulty pass all the pulleys around or over which the rope may lead, and admit of the placing of a pulley or other guard over the bearing-sheaves, to prevent the escape of the rope from the groove of said bearing-sheaves.

The second object of my invention is to provide an improved method or system of constructing and operating the cars, buckets, and other apparatus to be used in the connection with my improved hanger; and

My invention consists, first, of permanently attaching the suspension-rods to the rope by means of a hanger consisting of a horizontal arm permanently secured to the upper and outer quarter of a rope, in a manner hereinafter more fully described.

The second part of my invention consists of the employment, in connection with a hanger

permanently attached to the rope, of an automatic dump-car, as hereinafter described.

The third part of my invention consists of providing the car, suspension-rods, and hangers with joints, as hereinafter described, for the purpose of enabling the car to pass angles, curves, or inclines without difficulty.

In the accompanying drawing, Figure 1 is a side elevation of the hanger; Fig. 2, a plan of the same; Fig. 3, an end elevation of a car, suspension-rods, hanger, and bearing-pulley; Fig. 4, a side elevation of same car and rods; Fig. 5, a plan of said car; Fig. 6, details of same. Figs. 7, 8, and 9 represent a circular car, similar in its operation and principle of construction to the above. Figs. 10 and 11 represent a car that may be attached and detached automatically. Figs. 12 and 13 represent the general arrangement of the endless wire-rope way. Figs. 14 and 15 show the arrangement of the bearing-pulleys and a hooked suspension-rod, to which buckets or sacks may be suspended.

Each part is distinguished by the same letter wherever it appears in the drawing.

The end pulleys, A, will usually revolve on vertical or nearly vertical axes, and may be simply grooved in the ordinary manner, or may be of that class known as "gripe-pulleys" or "clip-pulleys."

Along the line, at suitable distances from each other and from the end pulleys, are placed well-braced posts B, having transverse arms C securely fixed to their tops.

To the transverse arms C the sheaves or bearing-pulleys D are attached, overhanging the arms C, as shown in Figs. 12, 13, and 14, and free to revolve on their axes.

It will be seen by reference to Fig. 3 that the depth of the groove in the sheaves D should be about half the diameter of the rope, and that the radius of said groove should be equal to half the diameter of the rope, increased by the thickness of that part of the hanger E surrounding the lower part of the rope.

The axis of each sheave or pulley should always be perpendicular to the plane in which the rope approaches and recedes from the sheave or pulley. When the line is straight

all the bearing-sheaves on either side of the way will be in the same vertical plane; but when an angle occurs in the line the sheaves must be inclined to correspond to the rule above given. A guard of some kind should be placed over each bearing-pulley to prevent the escape of the rope from the groove of said pulley.

In Fig. 3 a pulley, D', of a suitable form for this purpose, is shown.

F is the rope. The lines F' represent the rope in Figs. 12 and 13.

It is evident that any brakes or any apparatus or gearing required for communicating or transmitting power may be attached to either of the end pulleys, A, or to their axles.

The hangers E are permanently attached to the rope at suitable distances.

The hangers E consist, essentially, of an arm, G, and its fastenings, the arm G being always retained in a horizontal position by the weight of the car or suspension-rods, or both, and secured to the rope in such a manner that its upper surface shall be on a tangent, or nearly on a tangent, to the upper part of the circumference of the rope, and its lower surface horizontal, or nearly so, while its vertical thickness is only sufficient to secure the required strength and stiffness, and said thickness should never exceed one-half the diameter of the rope. The fastenings of the hanger by which the arm is secured to the rope should increase the diameter of the rope as little as possible. A hanger constructed and secured to the rope in this manner will pass readily over the bearing-pulleys and around the end pulleys.

The arm G, Figs. 1, 2, and 3, is formed in one piece with the band H. To place this hanger the band may be heated, or may be made of steel and so thin as not to require heating, and bent around the rope and secured by rivets, as shown.

The rivet-holes may be made in the shop with the aid of a gage or mandrel, so that when made to coincide by means of a key driven through the keyway I, the rope will be so tightly compressed as to prevent the hanger from slipping along the rope.

The arm G may be secured to the rope by thin steel clasps passing through between the strands of the rope and turned back and clinched. The suspension-rods J swing freely on the journal K of the hanger.

When no cars are used, and buckets or sacks Y, Figs. 14 and 15, are hooked on and off the lower ends of the suspension-rods, said lower ends should have sufficient weight to retain the arm G in a horizontal position even when the sacks are removed.

When cars are employed they should be suspended by rods and hangers in pairs, and jointed in a manner substantially as shown at L, M, and N, Figs. 3, 4, 5, 7, 8, 9, 10, and 11, in order that the cars may pass readily around

the end pulleys or around the sheaves or bearing-pulleys at any angles in the line.

Figs. 10 and 11 represent an arrangement by which removable cars may be employed.

O is an inclined bar or beam, attached to the suspension-rods, and having suitable teeth or projections on its upper surface. P is a beam, inclined to the same angle and rigidly attached to the car, having corresponding teeth or recesses on its under side. The rope carrying the hangers, rods, and the bar O along in the direction of the car, the bar O will pass under and engage the bar P, carrying the car R with it.

It is evident that floors or tracks can be so arranged as to lift the car off at any desired point, and place it in a position to be engaged again at any other desired point.

The car S has a frame, T, in which is pivoted the dump-bucket U. The axle of the bucket U is so situated as to be below and at one side of the center of gravity when the bucket is full, and above the center of gravity when the bucket is empty, so that the bucket will turn on its axle and empty itself when released from the catch V and right itself when empty.

The catch V is attached to the lever W in such a manner that when the car is in motion, if the lever W comes in contact with any suitable stop or projection placed for that purpose, the bucket will be released and the weight of the lower end of the lever will cause the catch to re-engage the bucket when it rights itself, and hold it in its proper position until its return to the place at which it is desirable to deposit the load.

The suspension-rods of the cars, besides swinging freely on the journal K, forming the joint L, are free to turn in the sockets M, forming the joints N.

The horizontal arm X, to which the socket M is attached, is free to oscillate in the frame T, forming the joint N.

As the center of gravity of whatever depends from the arm G will always seek a position in a vertical plane passing through the center of the rope in the hanger, it is necessary to so proportion the parts of the car that the axle of the buckets will always be found in a horizontal position when said center of gravity has attained its said position in said plane.

The construction of the car represented in Figs. 7, 8, 9, and 10 is exactly the same in principle as the car represented in Figs. 3, 4, 5, and 6, only the forms of the buckets and frames vary, those of the former being circular and of the latter rectangular.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The method herein described of attaching the suspension-rods to the rope, by means of a hanger proceeding or projecting horizon-

tally from the upper and outer quarter of the rope, in a manner substantially as hereinbefore described, and for the purpose hereinbefore set forth.

2. The hanger E, substantially as and for the purposes set forth.

3. The hanger E, in combination with the rods J and frame T, having the joints L M N, or their equivalents, substantially as described, and for the purposes set forth.

4. The dump-car S, constructed and oper-

ated substantially as described, in combination with the rods J and hanger E, substantially as and for the purposes set forth.

In testimony whereof I have hereunto set my hand this 22d day of November, A. D. 1870.

ANDREW SMITH HALLIDIE.

Witnesses:

F. J. THIBAUT,  
DAVID R. SMITH.