No. 809,387. PATENTED JAN. 9, 1906.

T. S. MILLER.

CABLEWAY.

APPLICATION FILED DEC. 15, 1902.

8 SHEETS—SHEET 1.

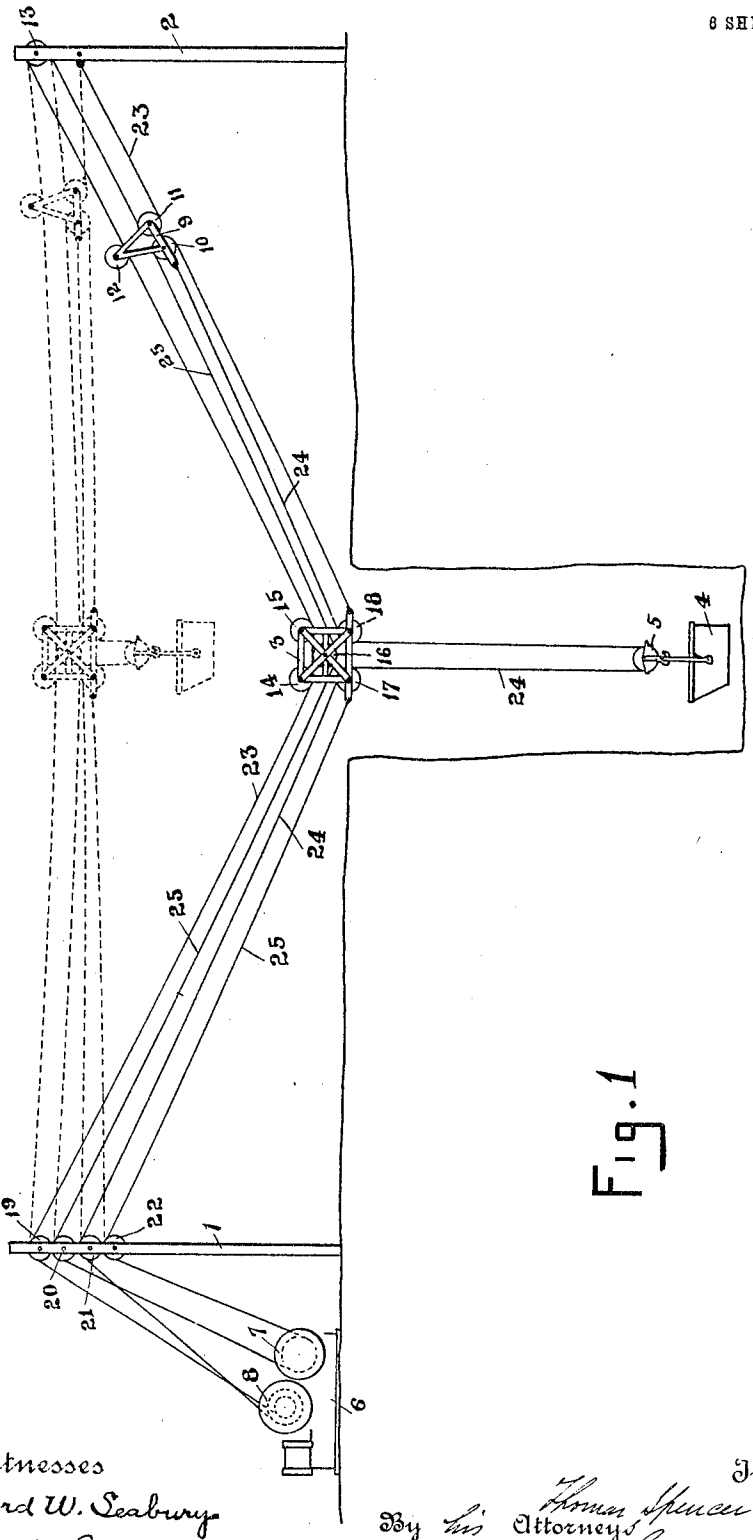

Fig. 1

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6 SHEETS—SHEET 2.

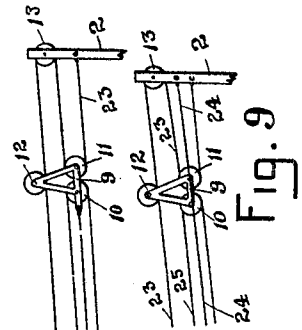

Fig. 9

Fig. 4

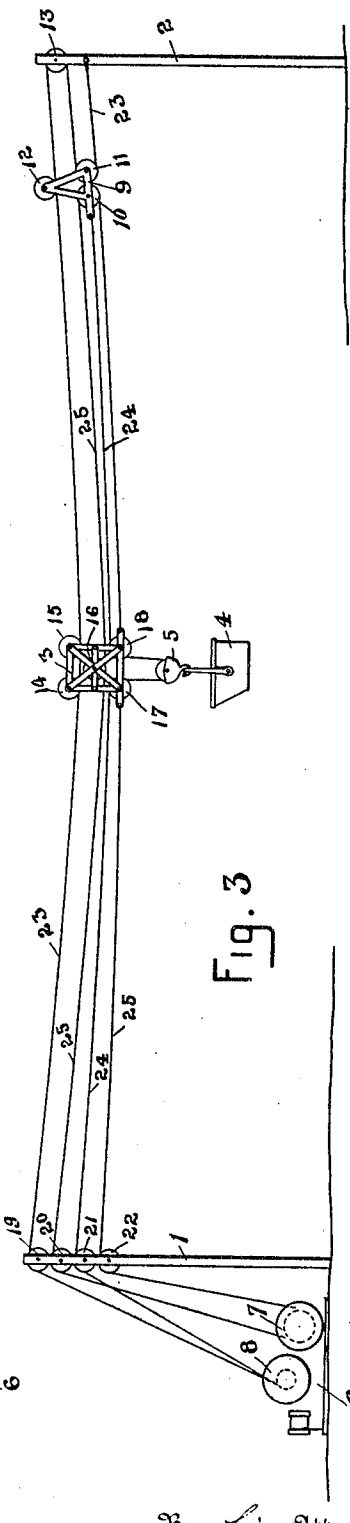

Fig. 3

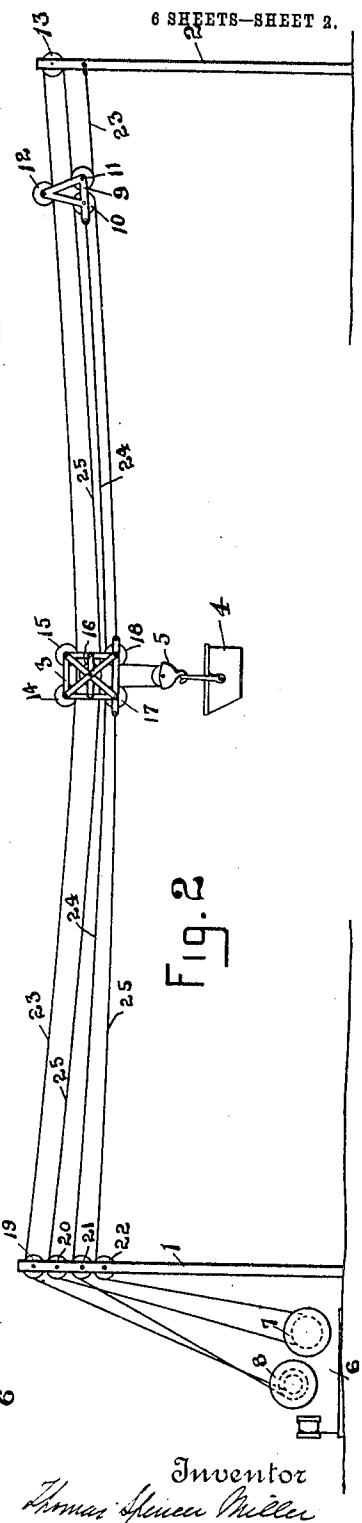

Fig. 2

Witnesses

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6 SHEETS—SHEET 3.

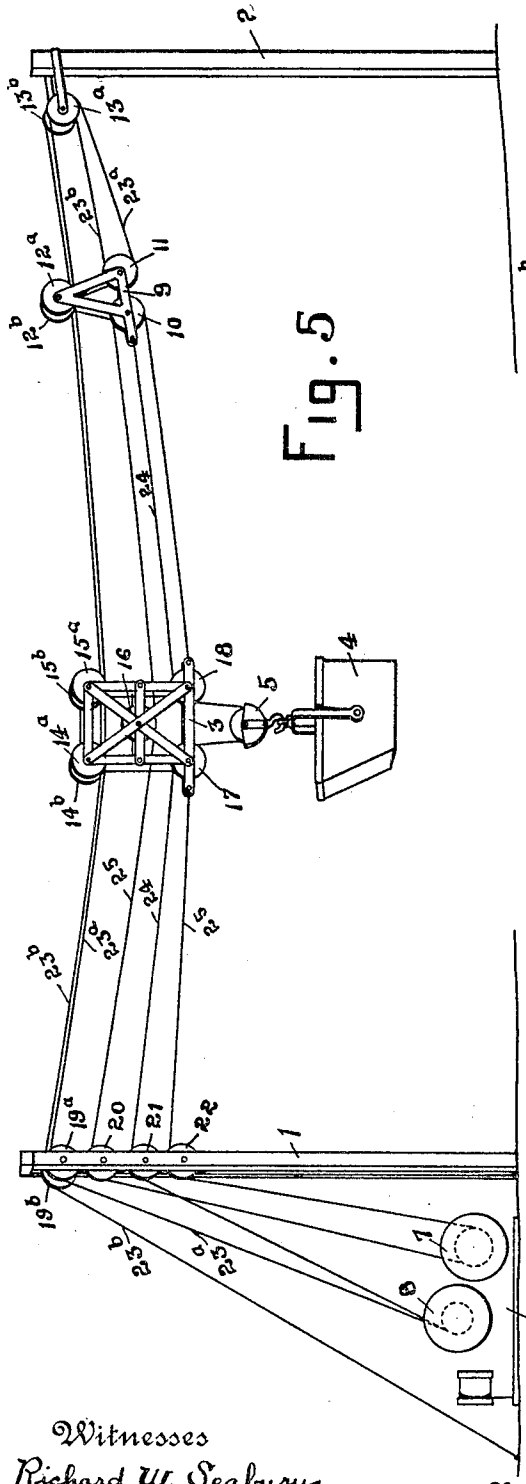

Fig. 5

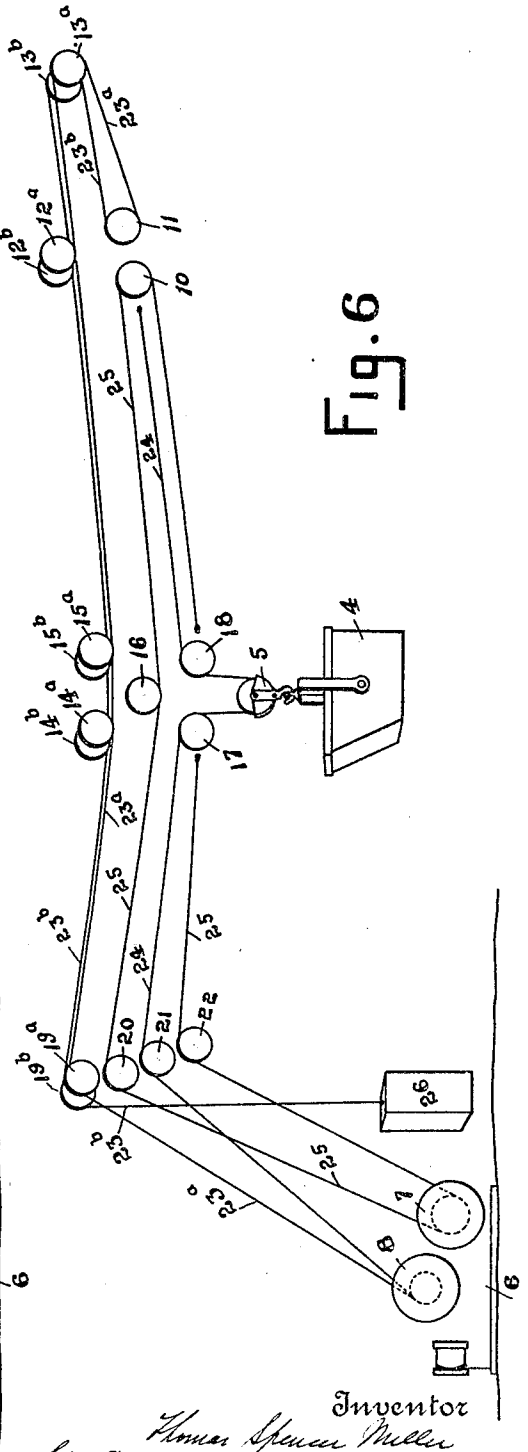

Fig. 6

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6 SHEETS—SHEET 4.

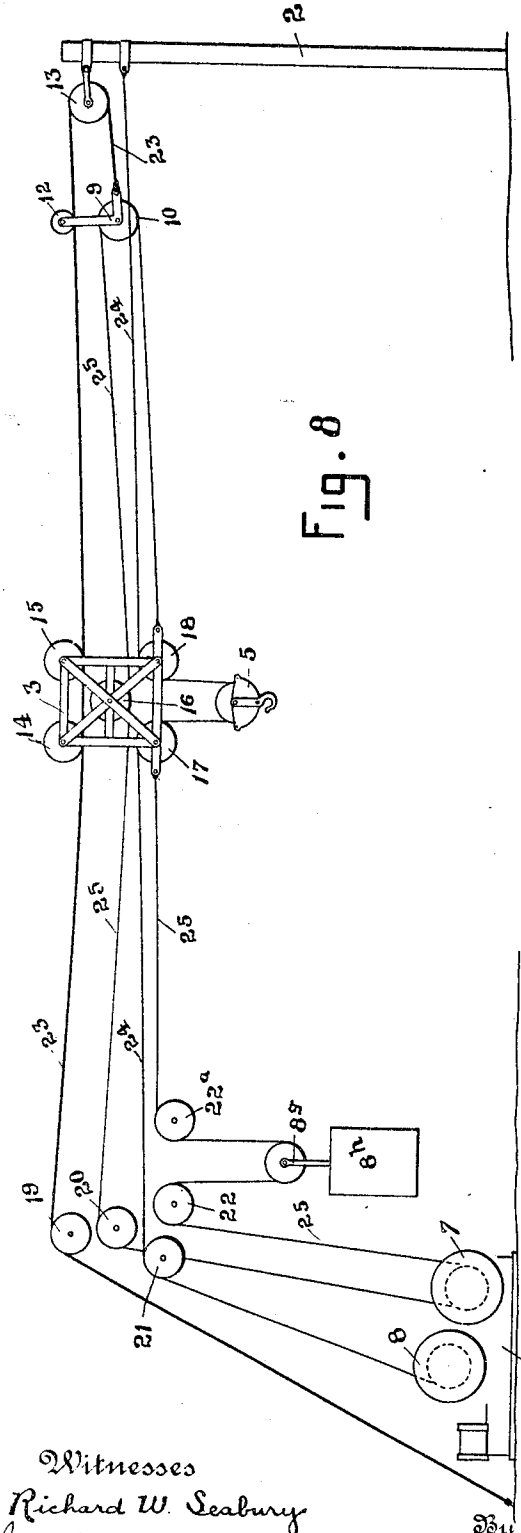

Fig. 8

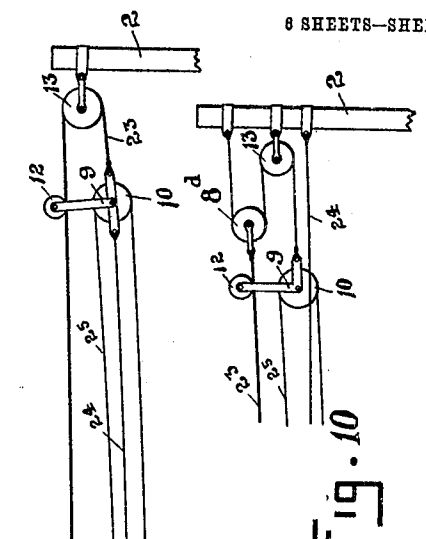

Fig. 10

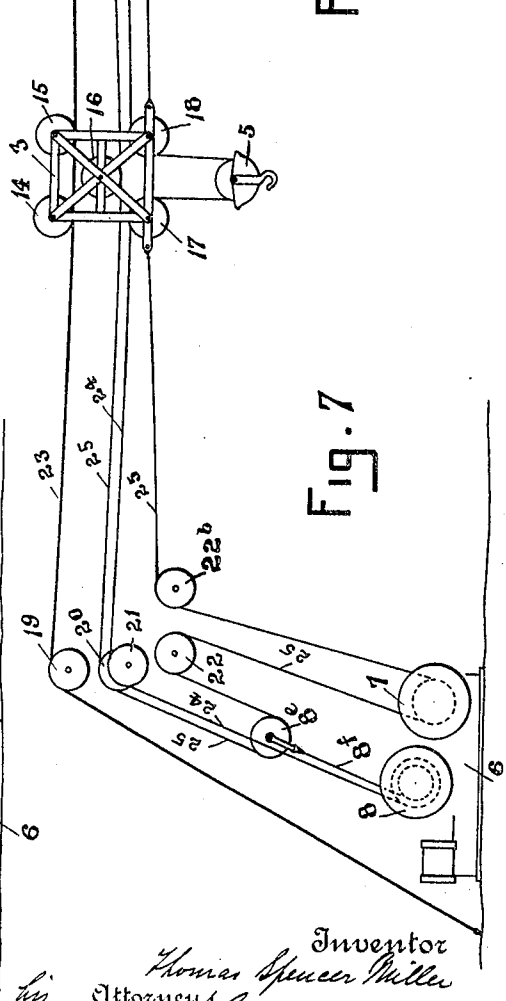

Fig. 7

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6 SHEETS—SHEET 5.

Fig. 11

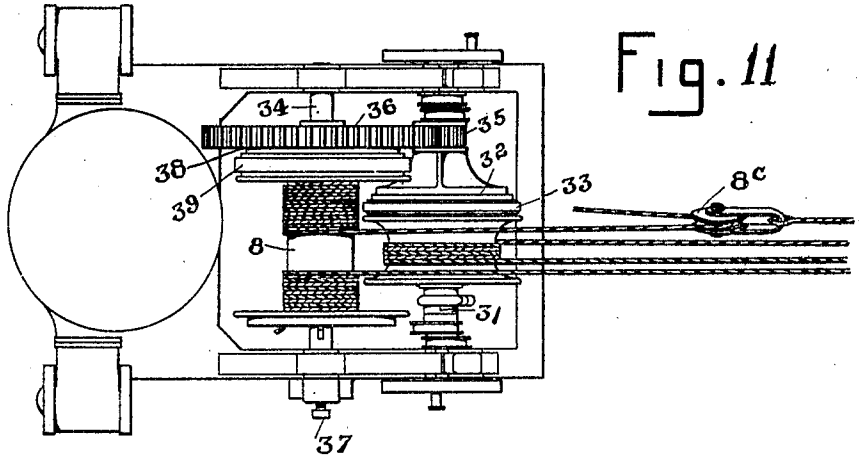


Fig. 12

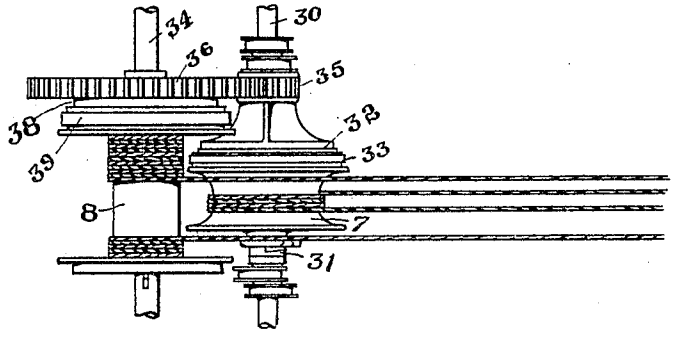
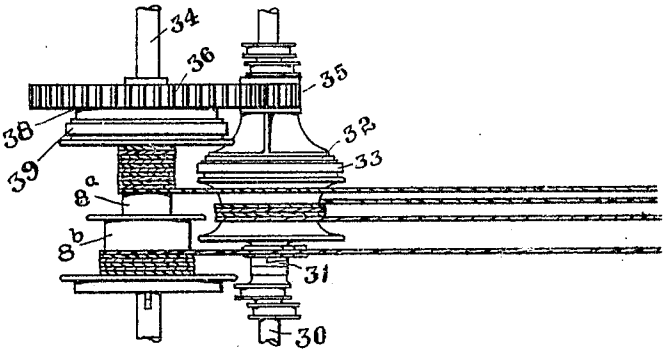


Fig. 13



Witnesses
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CABLEWAY.

APPLICATION FILED DEC. 15, 1902.

6 SHEETS—SHEET 6.

Fig. 14.

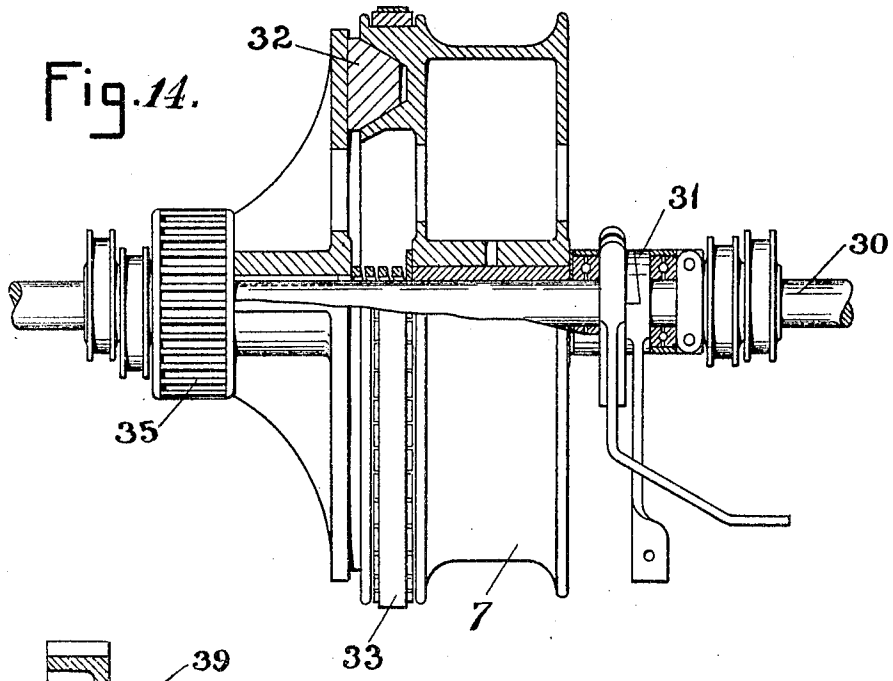
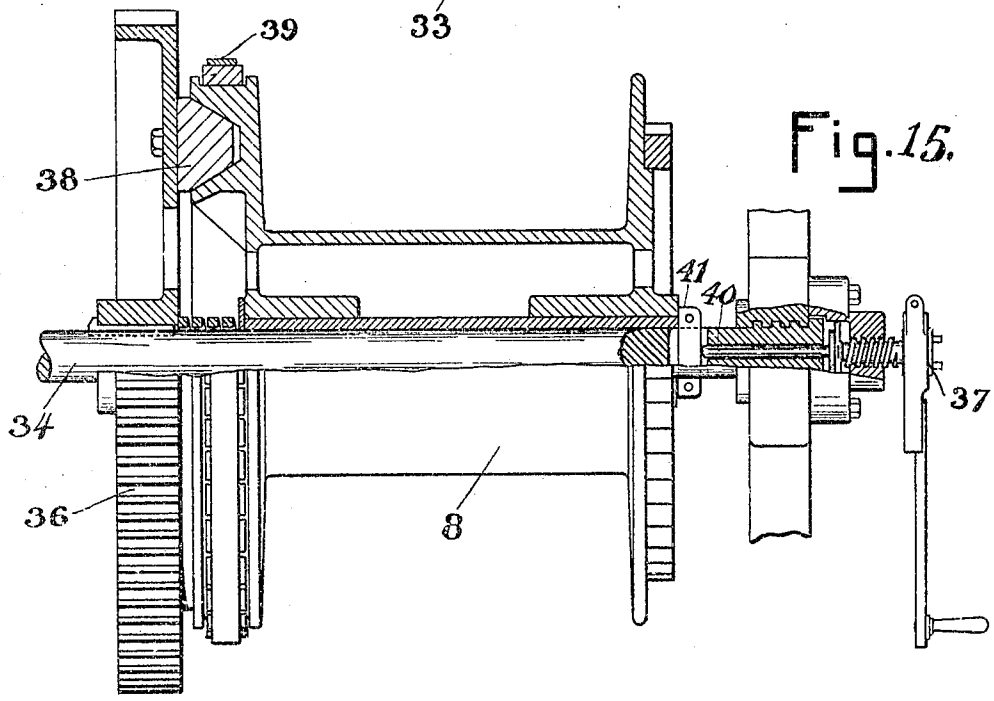


Fig. 15.



Witnesses
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Walter A. Fielding

Inventor
Thomas Spencer Miller
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UNITED STATES PATENT OFFICE.

THOMAS SPENCER MILLER, OF SOUTH ORANGE, NEW JERSEY.

CABLEWAY.

No. 809,387. Specification of Letters Patent. Patented Jan. 9, 1906.

Application filed December 15, 1902. Serial No. 135,243.

To all whom it may concern:

Be it known that I, THOMAS SPENCER MILLER, a citizen of the United States, and a resident of South Orange, county of Essex, and State of New Jersey, have invented a new and useful Improvement in Cableways, of which the following is a specification.

The present invention is a further and exceedingly-important advance in the same general line of improvement to which my applications Serial No. 683,843, filed June 18, 1898, Serial No. 85,056, filed December 7, 1901, and Serial No. 45,233, filed January 29, 1901, relate and utilize many features covered by those applications.

In the accompanying drawings, Figure 1 is an elevation of a cableway containing my present inventions, representing the parts in position when the load is lowered and also in dotted lines the position when the load is raised. Fig. 2 is an elevation of the same apparatus, showing the load in raised position. Figs. 3, 4, 5, 6, 7, and 8 are respectively elevations of other forms of apparatus embodying my inventions. Fig. 9 is a detail of a modification in which the tail end of the hoisting-rope is attached to the tail-support. Fig. 10 is a detail of a modification in which the power of the main rope is multiplied at the tail end. Fig. 11 is a plan view of an engine adapted for use with the form of apparatus shown in Fig. 4. Fig. 12 is a detail showing how the engine is used in the apparatus shown in Figs. 3, 5, and 6. Fig. 13 is a detail of a modification of the engine suitable for use in the apparatus shown in Figs. 1, 2, or 7. Figs. 14 and 15 are respectively details of the parts on the shafts 30 and 34, partly in section.

1 is the head-support; 2, the tail-support; 3, the load-carriage; 4, the load; 5, the fall-block; 6, the rope-drum engine containing the traction-rope drum 7 and the hoisting-rope drum 8, which hoisting-rope drum in Figs. 1, 2, 7, and 13 is shown as consisting of the two parts of different diameter 8^a and 8^b. This engine contains the driven shaft 30, upon which the traction-rope drum 7 is revolubly free excepting when it is forced by the cam 31 against the friction-disk 32, which is fixed to the shaft. 33 is a band-brake by which the drum 7 can be stopped and held. The shaft 34 is driven from the shaft 30 by the speed-reducing gears 35 36. The drum 8 is revolubly free excepting when it is forced by the screw 37 against the friction-disk 38, which is fixed to the shaft, the thrust of the screw being transmitted through the pin 40 and cross-key 41.

39 is a band-brake by which the drum 8 can be stopped and held.

9 is a movable pulley-block carrying a sheave 10, around which the traction-rope passes, and which pulley-block also may carry a sheave 11, around which the main rope 23 passes, and which pulley-block may also carry a wheel 12, resting on said main rope. In Figs. 7, 8, and 10 the main rope is fastened directly to the movable pulley-block 9, the sheave 11 being dispensed with.

13 is a sheave on the tail-support.

14 and 15 are load-carriage wheels that run on the main rope.

16 is a load-carriage wheel that runs on one branch of the traction-rope.

17 and 18 are load-carriage sheaves over which the hoisting-rope passes.

19, 20, 21, and 22 are sheaves on the head-support over which the various ropes pass.

23 I will call the "main" rope. It may extend from the rope-drum 8 over the head-support sheave, under the wheels of the carriage and of the movable pulley 9, around the tail-support sheave, and engage with the movable pulley-block 9 either by being secured directly thereto, as shown in Figs. 7, 8, and 10, or by passing around the sheave 11 thereof and thence back to a point of attachment on the tail-support, as shown in Figs. 1, 2, 3, 4, and 9.

In Figs. 5 and 6 the main rope is doubled, so as to contain the outward run 23^a and the inward run 23^b. The head and tail support sheaves for this rope and the wheels on load-carriage 3 and on movable pulley-block 9 are correspondingly doubled. The return end of the rope may be attached to a fixed support, as in Fig. 5, or to a take-up mechanism, such as the weight 26 of Fig. 6.

The power of the main rope may be multiplied in various ways. In Figs. 1, 2, and 13 this is done by making the drum portion 8^a of smaller diameter than the drum portion 8^b. In Figs. 4 and 11 it is done by interposing a tackle 8^c between its head end and the drum 8. In Figs. 1, 2, 3, 4, and 9 it is done by extending the main rope around the sheave 11, on the block 9, and thence back to the tail-support. In Fig. 10 it is done by interposing a tackle 8^d between the tail end of the main rope and the block 9. In Figs. 7 and 8

the head end of the main rope is fixed, the power being applied to it through the traction-rope, as hereinafter described.

24, which I will call the "hoisting-rope," may extend from the rope-drum 8, over the head-support sheave, over the sheave 17 of the load-carriage, under the fall-block sheave, over the sheave 18 of the load-carriage, and is made fast to the movable pulley-block 9, as shown in Figs. 1, 2, 3, 4, 5, 6, 7, or to the tail-support, as shown in Figs. 8, 9, 10. The portion of the hoisting-rope pendent from the load-carriage I will call the "fall."

25, which I will call the "traction-rope," may be substantially endless because having both ends fast to the load-carriage. It may be coiled around the rope-drum 7, from which one branch extends over the head-support sheave to the load-carriage. The other branch extends from the rope-drum 7 over the head-support sheave, under the wheel 16 of the load-carriage, around the sheave 10 of movable pulley-block 9, and thence back to the load-carriage. In Fig. 7 a movable pulley 8^e is placed in a loop of the traction-rope and is connected with the lesser diameter of drum 8 by the rope 8^f. In Fig. 8 the movable pulley 8^g is placed in a loop of the traction-rope and is connected with a take-up, such as the weight 8^h.

In the operation of the apparatus shown in all the figures the lowered position of the load is due both to the lowered position of the load-carriage or deflection of the ropeway and to the lowered position of the fall-block below the load-carriage, as indicated in Fig. 1. The hoisting of the load therefore is shared between the hoisting of the load-carriage and the hoisting of the fall-block toward the load-carriage, and, conversely, the lowering of the load is shared between the lowering of the load-carriage and the lowering of the fall-block below the load-carriage. The elevation of the load-carriage is dependent upon the length of the traction-rope 25 and main rope 23 upon the span. If they are lengthened, the load-carriage sags downward, as shown in full lines in Fig. 1. If they be shortened, the load carriage is lifted, as shown by dotted lines in Fig. 1. In other words, the deflection of the cableway is substantially dependent upon the length of these two ropes on the span. The connection through the movable sheave-block 9 between the endless traction-rope 24 and the main rope 23 produces a give-and-take or complemental motion whereby the length of the two ropes on the span is automatically adjusted between them, so that any lengthening or shortening operation applied to the span of either of said ropes is substantially shared between them by being in part transmitted from one to the other. Thus also the strain of supporting the load-carriage may be automatically equalized between said ropes.

In Figs. 1, 2, 3, 4, 5, 6 the power for this lengthening or shortening is primarily applied to the main rope 23, while in Figs. 7 and 8 it is primarily applied to that branch of the traction-rope 25 relative to which the carriage is movable, being transmitted therefrom not only to the main rope, but also to the other branch of the traction-rope. In both cases this power is taken substantially from the same drum that operates the hoisting-rope. As the span length of the ropes 23 and 25 is shortened or lengthened the hoisting-rope 24 is correlatively hauled in or paid out by the drum 8, and since the apparatus gives out or takes in slack on the hoisting-rope faster than on the other two ropes the fall of the hoisting-rope will be shortened or lengthened as the load-carriage is raised or lowered. Thus the ascent of the load is the resultant of the raising of the load-carriage and the shortening of the fall. The raising and lowering of the load are accomplished by the concurrence of the cableway-deflection movement and the length-of-fall movement, which movements preferably have a determined correlationship, due to the operative connection between their respective actuators—as, for example, between the two parts of the drum 8, whether of the same or different diameter. Since the traction-rope is controlled by a drum having an independent clutch-and-brake mechanism, the load-carriage may be held by it from any objectionable longitudinal movement, so as to confine its raising and lowering to approximately a vertical direction. When the drum 7 is disengaged from its clutch and held by its brake, it, acting through the traction-rope, may propel the load-carriage back or forth on the cableway without affecting substantially the elevation of the load. This is permitted by the running connection between the carriage and the hoisting-rope 24 and main rope 23. The engine for operating this cableway should have a hoisting power not greater than will produce a safe strain put upon the ropes of the cableway.

Heretofore in general cableway practice several different sizes of wire rope were employed to constitute a cableway. The main cable was the largest rope, since it was depended upon to support practically the whole of the load. The endless or traversing or traction rope, which was employed for propelling the carriage along the cable, was the next in size. The hoisting-rope, which in some instances was the same size as the traversing-rope, was smaller than the main cable. A button-rope employed for spacing the fall-rope carriers was generally the smallest. The guy-ropes for staying the towers were generally of the same size as one of the others, but of a different quality. In consequence of this a cableway shipment contained also innumerable parts, like clips, clamps, &c. The sheave-wheels employed in the system were also of a great many different diameters and

different widths in the score to suit the various sizes of ropes employed.

One of the advantages which may be attained by my new form of cableway is that various ropes employed may be of the same diameter, and sheave-pulleys may be of the same diameter, the same weight, and same width in the score. The practical advantages of this interchangeability of the parts are very great. The cableway is more easily erected, and when taken down in one place and set up in another its span can be altered more readily than would be the case with cables of different diameters.

Another advantage which may be attained by this cableway lies in the fact that when a heavy load is handled the cableway will automatically operate at a greater deflection than would be the case if the load were lighter.

It will be observed that when the loaded fall-block is in its lowest position the load-carriage is also in its lowest position and the deflection in the cableway is maximum. If now the engine is started, the slack on all the cables is taken up, and the deflection in the cableway is thereby reduced. The work of the engine, therefore, is minimum when the load has just started, and the higher the load is hoisted the greater is the work required of the engine and the greater is the strain on all the cables, the reason being that the deflection is being reduced. When the limit of the hoisting capacity of the engine is reached, the cableway will show the minimum deflection for that particular load. Thus by employing an engine having a proper maximum power it will be incapable of overstraining the ropes, because the heavier the load the less will the engine be able to reduce the deflection. In other words, when the engine has reduced the deflection to the extent of its power the degree of deflection remaining will be directly proportional to the load. If a heavy load is handled, the deflection at its minimum will be great; but the strain on the cable will be the same. If a light load is handled, the deflection at its minimum will be less; but the maximum strain on the cables will still be the same. The deflection of the cable at the maximum draft of the engine thus constitutes an automatic safety against overstraining the ropes. In this form of cableway if a load be raised slowly enough to disregard the inertia of the load the strain upon the entire cableway and engine will be minimum upon starting. In other cableways it is maximum on starting. Thus it will appear that it will be safer and more economical to start a load suddenly upon this cableway than upon the ordinary type.

Another advantage which may be attained by the use of this cableway consists in dispensing with one of the three drums employed in my application Serial No. 85,056 for controlling, respectively, the fall, the traction, and the deflection and causing one drum, as 8 or 8^a 8^b, to perform the dual function of controlling both the fall and the deflection.

While I have above pointed out various features of my invention and various advantages resulting therefrom, either collectively or severally, when the apparatus is used in the best form herein shown, I nevertheless do not wish to be understood as thereby limiting myself, since I am aware that the apparatus is susceptible of wide variation without departure from one or more features of my invention.

I claim—

1. In a ropeway in combination, a carriage-supporting rope, a load-carriage supported therefrom, a hoisting-rope having a loop pendent from the load-carriage and extending therefrom toward the head and tail, a traction-rope having a loop extending toward the tail-support, a movable block to which one end of the hoisting-rope is secured, and a winding mechanism controlling the other end of said hoisting-rope, said movable block forming a connection between the loop of the traction-rope and the main rope.

2. In a ropeway, in combination, two winding mechanisms having independent clutches and brakes, a traction-rope connected with one, a load-carriage having both a traction and a supporting engagement with said traction-rope, two ropes connected with the other winding mechanism, one being the hoisting-rope and the other controlling the deflection of said traction-rope.

3. In a ropeway, in combination, a load-carriage, a rope participating both in its traction and support, a movable pulley in a loop of said rope, winding mechanism, a rope whereby the tension of said winding mechanism is applied to said movable pulley and a hoisting-rope extending from the same winding mechanism to the fall.

4. In a ropeway, in combination, a load-carriage, a rope participating both in its traction and support, a movable pulley in a loop of said rope, winding mechanism, a rope whereby the tension of said winding mechanism is applied to said movable pulley, and a hoisting-rope extending from the same winding mechanism over load-carriage sheaves and forming a loop at the fall.

5. In a ropeway, in combination, a load-carriage, a rope participating both in its traction and support, a movable pulley in a loop of said rope, winding mechanism, a rope whereby the tension of said winding mechanism is applied to said movable pulley and a hoisting-rope extending from the same winding mechanism to the same movable pulley and forming a loop at the fall.

6. In a ropeway, in combination, a main rope, a traction-rope, means for controlling the deflection of the same, means whereby the deflection is automatically transmitted from

one to the other, a load-carriage containing a running supporting engagement with said main rope and with one run of said traction-rope and a traction engagement with the other run of said traction-rope and a hoisting-rope having a running connection with said carriage and extending thence toward the head and tail.

7. In a ropeway, in combination, a load-carriage, ropes supporting the same, means whereby the deflection of the same is controlled, a winding mechanism and a hoisting-rope having one end connected with said winding mechanism and the other end with said supporting-ropes.

8. In a ropeway, in combination, a load-carriage, a traction-rope containing a loop at the tail end, a main rope extending between the head and tail supports, and a movable sheave-block extending between the loop and the main rope and coupling said loop with said main rope.

9. In a ropeway, in combination, a load-carriage, ropes whereby it is supported, a fall-rope and operatively-connected means whereby the deflection of said supporting-ropes and the length of the fall are correlatively controlled.

10. In a ropeway, in combination, a load-carriage, ropes whereby it is supported, a hoisting-rope, a prime mover and means whereby the deflection of all of said ropes is correlatively controlled by the power of said prime mover.

11. In a ropeway, in combination, a load-carriage, a hoisting-rope and means whereby the deflection of said hoisting-rope and the length of the fall are concurrently controlled.

12. In a ropeway, in combination, a load-carriage, ropes by which it is supported, a fall and means whereby said supporting and fall ropes are concurrently moved at a differential speed to control the deflection of the supporting-ropes and the length of the fall.

13. In a ropeway, in combination, a load-carriage, ropes by which it is supported, a fall and means whereby the elevation of the load is controlled by a concurrence of ropeway deflection and the length of fall-rope movements.

14. In a ropeway, in combination, a load-carriage, ropes by which it is supported, an actuator whereby the deflection of said ropes is controlled; the maximum power of said actuator being less than that which will produce a breaking strain on said ropes.

15. In a ropeway, in combination, a load-carriage, two drums, a rope operated by each of said drums participating in the support of said carriage and a fall-rope operated by one of said drums.

16. In a ropeway, in combination, a load-carriage, a fall-block, ropes by which said load-carriage is supported, a fall-rope and a rope-drum by which both the elevation of the load-carriage and the length of the fall are concurrently controlled.

17. In a ropeway, in combination, a load-carriage, a fall-block, ropes whereby the load-carriage is supported and traversed, a fall-rope and two rope-drums one of which controls the traverse and the other of which concurrently controls both the elevation of the load-carriage and the length of the fall.

18. In a ropeway, in combination, a load-carriage, ropes by which it is supported, a hoisting-rope, operatively-connected means whereby the deflection of said supporting-ropes and the length of fall are concurrently controlled and means whereby the speed of operating said supporting-ropes is reduced below that of operating said hoisting-rope.

19. In a ropeway, in combination, a load-carriage, a hoisting-rope having a loop suspended from the carriage and extending thence toward the head and tail, winding mechanism for one end of said hoisting-rope, a rope-support for the other end thereof between the head and tail of the ropeway, means whereby the position of said rope-support may be controlled and means whereby the deflection of said ropeway may be controlled.

20. In a ropeway, in combination, a load-carriage, two drums one of which contains parts of different diameters, a rope operated by each of said drums participating in the support of said carriage and a fall-rope operated by one of said drums at a different diameter.

21. In a ropeway, in combination, a load-carriage, a rope-drum containing parts of different diameters, a carriage-supporting rope operated at one diameter of said drum and a fall-rope operated by the other diameter thereof.

22. In a ropeway, in combination, a load-carriage, a rope-drum, a carriage-supporting rope operated by said drum and a fall-rope also operated by said drum.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

THOMAS SPENCER MILLER.

Witnesses:
CHAS. G. MUNIER,
JOHN J. DERRICK.