T. S. MILLER.

CABLEWAY.

APPLICATION FILED FEB. 28, 1908.

942,038.

Patented Nov. 30, 1909.

2 SHEETS—SHEET 1.

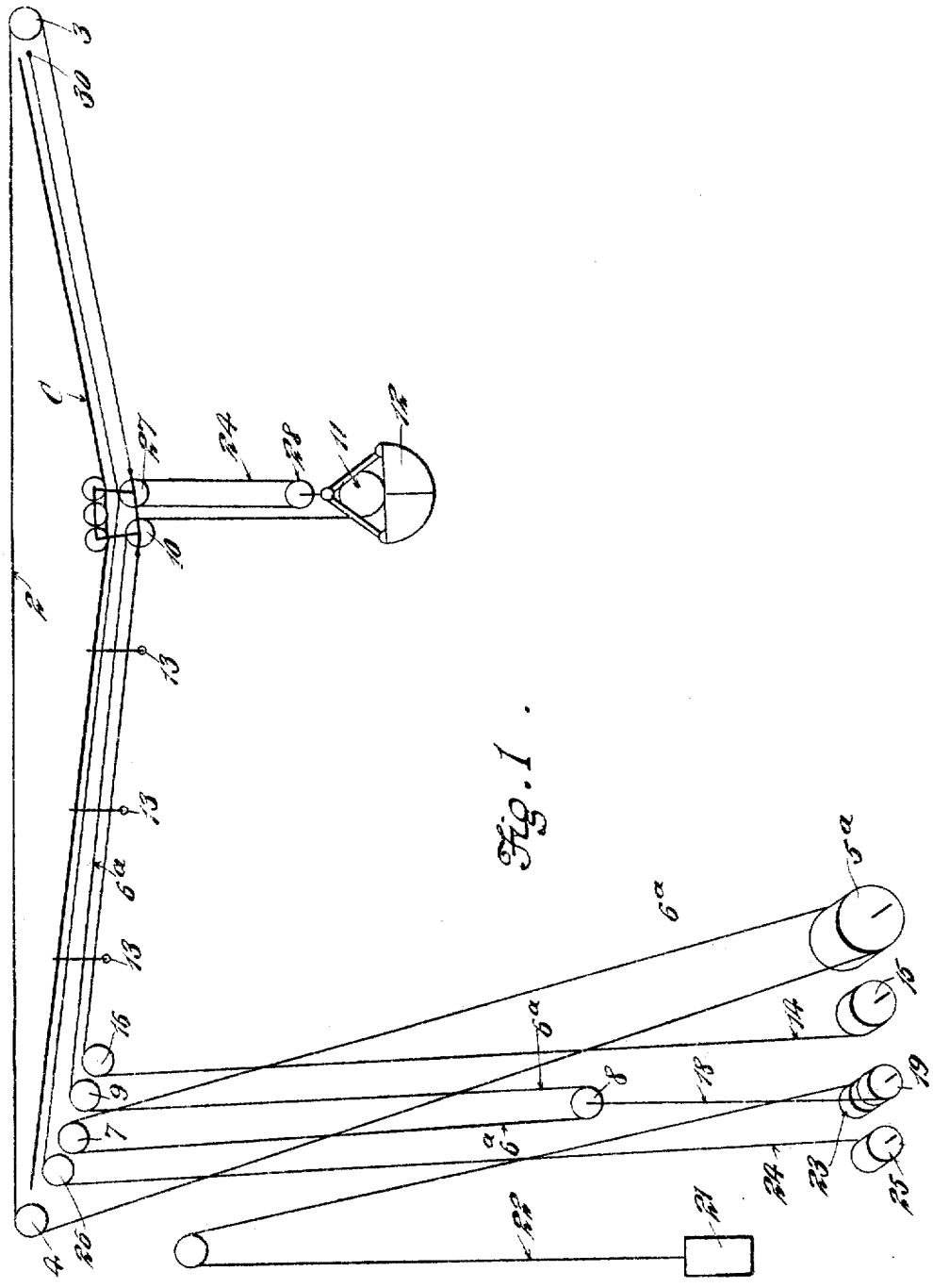

Fig. 1.

Witnesses

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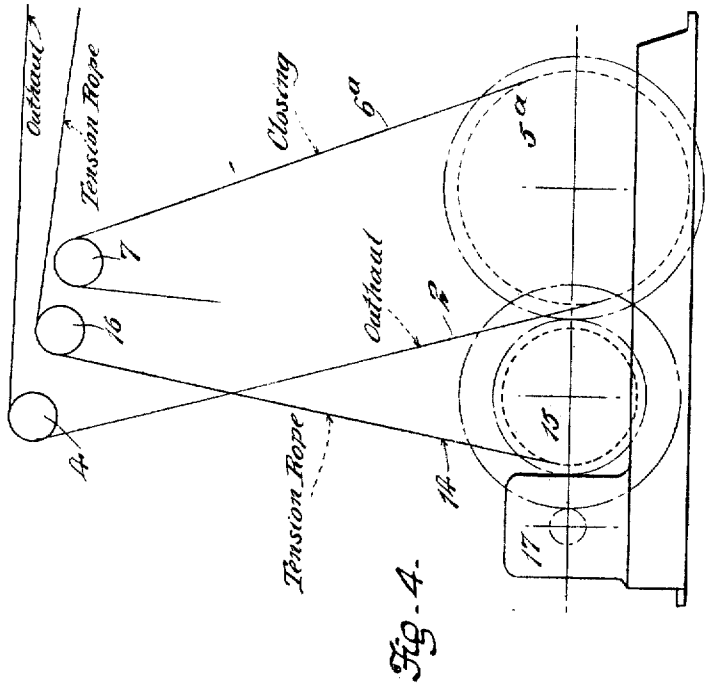

Fig. 4.

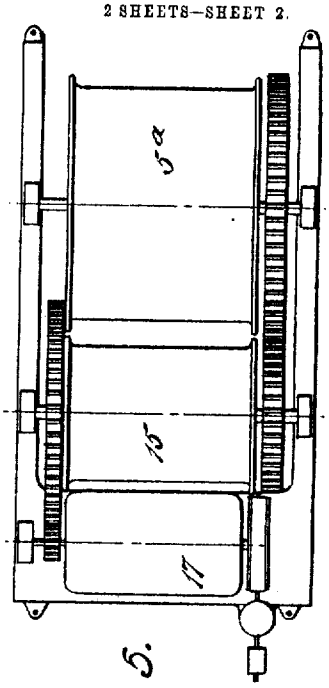

Fig. 5.

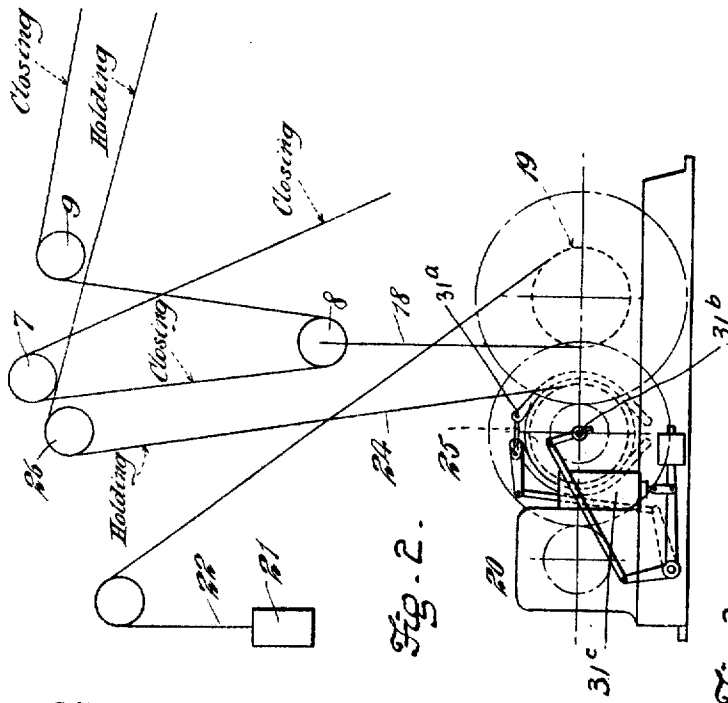

Fig. 2.

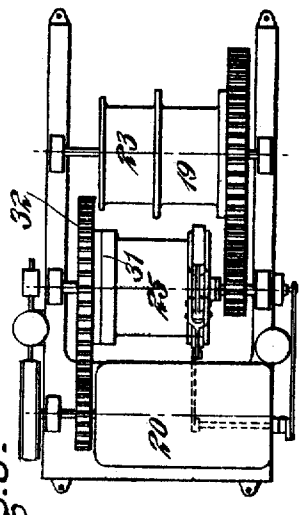

Fig. 3.

Witnesses

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THOMAS SPENCER MILLER, OF SOUTH ORANGE, NEW JERSEY.

CABLEWAY.

942,038. Specification of Letters Patent. Patented Nov. 30, 1909.

Application filed February 28, 1908. Serial No. 418,205.

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 certain new and useful Improvements in Cableways, of which the following is a specification.

Heretofore, friction drums have been considered indispensable to the operation of cableways. It is true that systems have been described operated by two reversing drum engines or motors, such as the system shown in the Saunders patent No. 456640, July 28, 1891, but in practice the application of this character of system has, so far as I know, been limited to bridge tramways or rigid trackways; and, moreover, has been limited to comparatively short trackways where fall-rope-carriers were unnecessary.

One of the objects of my invention is to provide a system of hoisting and conveying apparatus operated by reversing rope-drum-engines or motors which is adapted for practical use on a long span cableway—say from 2000 to 2500 feet in length.

Another object of my invention is to construct a long span cableway apparatus in such a way as to be capable of high speed—say 2500 feet per minute.

Another object of my invention is to construct a long span high speed cableway apparatus which imposes upon the operator the minimum labor, and this is particularly true where the cableway operates a grab-bucket or a dumping-bucket.

Another object of my invention is to construct a high speed long span cableway in which only one series of fall rope carriers is required on one side of the load carriage.

Another object of my invention is to construct a long span high speed cableway in which the hoisting and conveying operations may proceed simultaneously.

In the accompanying drawings, Figure 1 is a side view of a grab-bucket-cableway containing my invention in which for clearness of illustration the representation of the head and tail towers has been omitted, as well as the engines or motors for driving the drums. Fig. 2 is a side view of the rope-drum-engine which actuates the vertical motions and the adjacent portions of the ropes connected therewith. Fig. 3 is a plan view of said engine. Fig. 4 is a side view of the engine which actuates the horizontal motions and the adjacent portions of the ropes connected therewith. Fig. 5 is a plan view of said engine.

The sheaves 4, 26, 7, 9 and 16, are mounted upon the head tower. The sheave 3, upon the tail tower. C is the cable suspended between the two towers. The rope drums 5^a, 15, 19, 23 and 25 are located at or adjacent to the foot of the head tower. The load carriage contains the sheaves 10 and 27 and the grab-bucket 12 contains the sheaves 11 and 28. The rope drums 5^a and 15 are fixed with respect to their gear wheels and are geared together and to the shaft of motor 17 so that the shaft of motor 17 and the drums 15 and 5^a and their gearing constitute a train of mechanism which is reversed by reversing the motor. Although drums 5^a and 15 differ in diameter, their peripheral speed is the same in consequence of the proportioning of the gearing between them, and I do not wish to limit myself to having them separate drums connected by a gearing. 23 and 19 constitute two divisions of the same rope drum which are fixed with respect to their gear wheel and are connected by a positive train of gearing with the shaft of motor 20 so that they are reversed as motor 20 is reversed.

The drum 25 is only required in case a grab or dumping bucket is employed. When drum 25 is employed, it is a friction drum loose upon its shaft and driven through the friction members 31 from the gear wheel 32. It is also provided with the friction brake 31^a and the friction-clutch-thrust-mechanism 31^b, which are herein shown as interconnected and operated by an air motor 31^c. The object of interconnecting the brake mechanism and the clutch-thrust-mechanism is for simplicity of operation and the air motor 31^c is provided to enable them to be operated from a controller located at a distance, if desired. It is, of course, evident that the motors 17 and 20 may likewise be controlled by reversing controllers located at a long distance away where the operator can be in full sight of his bucket. Thus, with a grab-bucket cableway, three controller levers are all that are required for the control of the apparatus and may be located conveniently for the same operator.

The rope 2 made fast to the outer end of the carriage extends over the sheave 3 on the tail tower, thence back again across the span over the sheave 4 on the head tower

and down to the rope drum 5ª to which it is made fast. The rope 6ª made fast to the bucket sheave 11 extends upwardly, over the load carriage sheave 10, thence over the head-tower-sheave 9, down and under the movable sheave 8, up and over the head-tower-sheave 7 and down to the rope-drum 5ª to which it is made fast, being wound inversely thereon to the windings of the rope 2. The ropes 2 and 6ª operate substantially as an endless rope and may be the same rope wrapped around the drum 5ª a sufficient number of times for a frictional hold.

The rope 14, which I call either the carriage-tension or carriage-suspension-rope, is fixed to the inner end of the load carriage and extends thence over the head-tower-sheave 16 and down to the rope drum 15 to which it is made fast; being wound thereon in such direction as to move in time with the rope 2 but in the opposite direction.

To hoist the load, movable sheave 8 has to be pulled down. This is accomplished by the pull-down-rope 18 fixed to the block of sheave 8 and also to rope drum 19. The counterbalance weight 21 is suspended by the rope 22 which is fast to the drum 23 and wound thereon inversely to the winding of the rope 18. The effect of this counterbalance, therefore, is to counterbalance in whole or in part, the weight of the bucket so that the labor of hoisting is reduced and a smaller motor may be employed.

The tail end of the holding rope 24 is fixed to the tail tower at 30. It extends thence over the load-carriage-sheave 27, down and under the bucket sheave 28, up again and over the load-carriage-sheave 27 (which is made double for that purpose) thence over the head-tower-sheave 26 and down to the friction-drum 25, to which it is made fast.

The operation is as follows: Assuming the bucket 12 to be loaded and in the act of being hoisted, the rope-drums 19 and 25 are hauled in, the rope 24 running at four times the speed of 18. At the same time that this hoisting or lowering is in progress, the carriage may be traveling either toward the head or the tail-tower. This is of the utmost importance because it frequently happens that I am thereby enabled in practice to halve the time consumed in raising the load in comparison with the time required where the hoisting and conveying have to be performed in sequence.

To propel the carriage toward the head-tower, the carriage-suspension or tension rope 14 and the rope 6ª are hauled in by the drums 15 and 5ª, and simultaneously the outhaul rope 2 is paid out by the drum 5ª. To propel the carriage toward the tail-tower, the movement of the ropes 14, 6ª and 2 is reversed.

The drum 5ª will propel a load, either inward or outward, in a horizontal path without the hoisting devices moving in the slightest degree. One is independent of the other. They may be moved either simultaneously or successively in the same or in opposite directions and this is true as well during the hoisting and lowering and during the traversing, either inward or outward. For this reason, the bucket may be moved either vertically or horizontally or diagonally at any angle.

When the load-carriage is on a comparatively steep grade of the cable (for example, when near the head tower) and the bucket rests upon the dump pile so as to slacken the ropes 24 and 6ª, the construction would be wholly impracticable in consequence of the tendency of the carriage to run down grade were it not for the presence of the tension or carriage-suspension-rope 14. This tendency of the carriage to run down grade is due not merely to its own weight, but to the pull of the unsupported rope 2 owing to its tendency to sag between the carriage and the tail-tower and also between the tail and head towers.

Through all stages of operation, the tension or carriage-suspension-rope 14 acts in opposition to the outhaul rope 2 and prevents its slacking. Hence the use of fall-rope-carriers for the outhaul rope 2 is obviated and the only rope supports required on the span are the series of fall-rope-carriers 13, 13, 13, shown between the load-carriage and the head-tower whereby the ropes 6ª and 24 are supported. The reason that no rope-carrier-support is required for the rope 24 between the load-carriage and the tail-tower is, because the load is generally taken sufficiently near the tail-tower to make it unnecessary. I, however, do not wish to limit myself to the absence of fall-rope-carriers on that side of the load-carriage if circumstances should be such as to require them.

Heretofore, it has been the practice to handle a grab-bucket on a cableway by placing an operator by the friction-rope-drum-hoisting engine. This operator controlled one drum for conveying the load-carriage; a second drum for closing and hoisting the bucket; a third drum for holding the load and these three drums each ordinarily required a brake and a friction-clutch-lever. Thus, the operator had two levers for each drum, or six levers in all. It was also customary to employ a controlling lever and a reversing lever so that with a three drum construction, it was the usual practice for the operator to operate eight levers. This involved considerable labor on the part of the operator as well as considerable loss of time not only consumed in the actual opera-

tion of the eight levers, but also in the fatigue which that operation imposed upon the operator. By my arrangement, only one lever, and that the controlling lever, is necessary to start the drums of each motor in operation and I have eliminated all friction drums in ordinary cases, and all but one friction drum in cases employing grab or dumping buckets. The interconnection between the brake lever and the friction-clutch-lever of the friction drum and the operation thereof by an air piston further reduces the labor and fatigue of the operator.

Where the bucket is of the grab or dumping type, the hoisting rope consists of a bucket-closing-rope 6ª connected with the bucket sheave 11 and a bucket-holding-rope 24 connected with the bucket support.

To close the bucket, the rope 6ª must be hauled in while the rope 24 remains stationary. This is accomplished by pulling down the pulley 8 in the loop of the rope 6ª by actuating the drum 19 while the drum 25 is held stationary by the brake.

It is well known that a cable suspended between two supports (that is, having its opposite ends fixed to said supports) sags under its own weight between said supports and, therefore, presents to the load-carriage traveling thereon grades increasing as the carriage approaches either support. By my present invention, I am enabled to entirely disregard these grades and to operate the apparatus smoothly, safely and rapidly over great lengths of span. Indeed, the catenary curve of the suspended cable may be taken advantage of by me in the following respect: The load may be taken near one of the towers; the downward grade therefore starts the load and assists in its acceleration so as to impose less work upon the motor. On the other hand, after the carriage has passed the center of the catenary, the subsequent upward grade tends to retard the motor and lessens the brake action necessary. Whenever the weight of the carriage and the pull of the rope 2 exceeds the pull on the carriage in the opposite direction due to the load being carried, so that this excess of weight if unopposed would cause the carriage to run away down the grade, rope 14 (which may therefore be appropriately termed the carriage-suspension-rope) stands ready to prevent this disaster. In other words, the rope 14 although not always called upon to do so during the operation of the apparatus, acts as a carriage-suspender whenever necessary.

Although I have shown the carriage-suspension-rope 14 as moved by an engine, I do not wish to be limited to its means of propulsion since I am well aware that there are many ways in which this may be done. Nor do I wish to be limited to a grab or dumping form of bucket.

Having thus described my invention, what I claim is:

1. In a cableway, in combination, the main cable suspended in a curve between two supports, the load carriage traveling thereon, an outhaul rope, a carriage suspension rope, a hoisting rope running at the same speed but in the opposite direction to the outhaul rope and means whereby a loop is pulled in said hoisting rope to hoist the load.

2. In a cableway, in combination, the main cable suspended in a curve between two supports, the load carriage traveling thereon, an outhaul rope, a carriage suspension rope, a hoisting rope running at the same speed but in the opposite direction to the outhaul rope and means whereby a loop is pulled in said hoisting rope to hoist the load, a reversible motor whereby said outhaul, hoisting and carriage-suspension ropes are driven and another reversible motor actuating said loop pull.

3. In a cableway, in combination, a main cable suspended in a curve between two supports, a load carriage traveling thereon, an outhaul rope, a hoisting rope and a carriage-suspension-rope coöperating in controlling the carriage movement and independent means whereby a loop is pulled in said hoisting rope to hoist the load.

4. In a cableway, in combination, a main cable suspended in a curve between two supports, a load carriage traveling thereon, an outhaul rope, a hoisting rope and a carriage-suspension-rope coöperating in controlling the carriage movement and independent means whereby a loop is pulled in said rope to hoist the load and a counterpoise for the load receptacle connected with said loop pull.

5. In a cableway, in combination, a main cable suspended in a curve between two supports, a load carriage traveling thereon, a dumping bucket, a bucket-closing-rope, a hoisting rope and a carriage-suspension-rope coöperating in controlling the carriage movement and independent means whereby a loop is pulled in bucket-closing-rope to hoist the load, a friction drum and a rope connecting the same with the load receptacle support to hold the same during the dumping operation.

6. In a cableway, in combination, a main cable, suspended in a curve between two supports, a load carriage thereon, two reversible engines, an outhaul, a hoisting and a carriage-suspension-rope moved synchronously by one of said engines, and a pull-down-rope moved by the other of said engines and operating upon a loop of said hoisting rope.

7. In a cableway, in combination, a main cable suspended in a curve between two supports, a load carriage thereon, a dumping bucket, two reversible engines, an outhaul,

a bucket-closing and a carriage-suspension rope moved synchronously by one of said engines, and pull-down and bucket-holding ropes moved by the other of said engines.

8. In a cableway, in combination, a main cable suspended in a curve between two supports, a load-carriage thereon, a dumping bucket, two reversible engines, a friction drum driven by one of the same, an outhaul, a bucket-closing and a carriage-suspension-rope moved synchronously by one of said engines, a bucket-holding-rope operated by the other of said engines and a bucket-holding-rope operated by said friction drum.

9. In a cableway, in combination, a main cable suspended in a curve between two supports, a load-carriage traveling thereon, a dumping bucket, an outhaul rope, a bucket-closing-rope and a carriage-suspension-rope coöperating in controlling the carriage movement, means whereby said ropes are driven synchronously, a down-haul-rope operating a loop of said bucket-closing-rope, a bucket-holding-rope, a reversible drum for operating said down-haul-rope, a friction drum for operating said bucket-closing rope, mechanism whereby said drums may be operated in unison.

10. In a cableway, in combination, a main cable suspended in a curve between two supports, a load-carriage traveling thereon, a dumping-bucket, an outhaul, a bucket-closing and a carriage-suspension-rope coöperating in controlling the carriage movement, means whereby said ropes are driven synchronously, a down-haul-rope operating on a loop of said bucket-closing-rope, a bucket counterpoise rope, a bucket-holding-rope, a reversible drum connected with said bucket-holding and counterpoise ropes, a friction drum connected with said bucket-holding-rope and mechanism whereby said drums may be operated in unison.

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

THOMAS SPENCER MILLER.

Witnesses:

ERNEST PULEFORD,

LOUIS G. RUGGLES.