No. 647,242. Patented Apr. 10, 1900.

F. J. SPRAGUE.

CABLE WINDING SAFETY DEVICE.

(Application filed Sept. 20, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

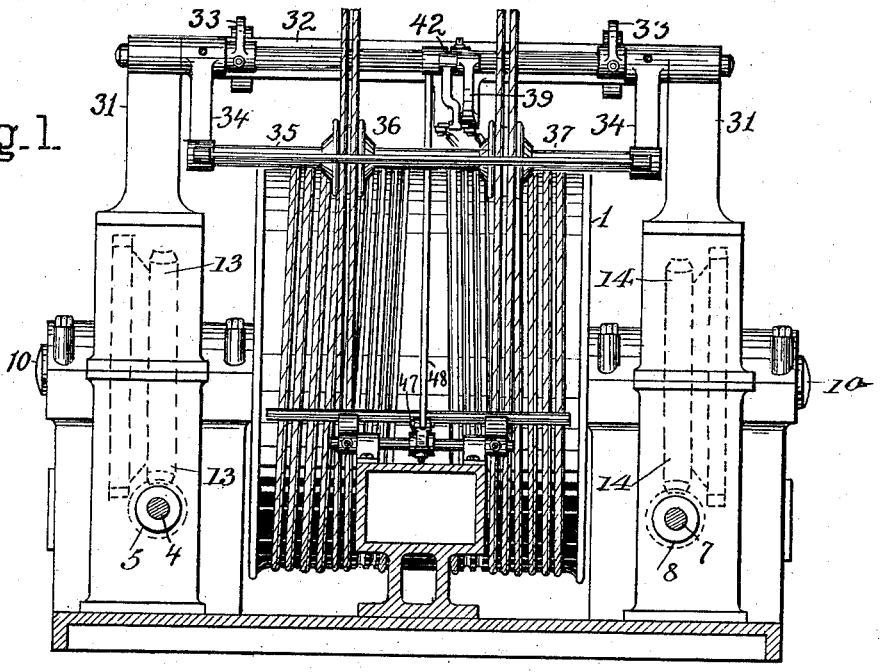


Fig. 3.

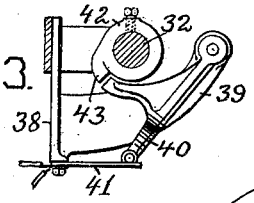


Fig. 2

Fig. 4.

Fig. 5.

Witnesses:
Samuel W. Balch
Hy. H. Whitman

Inventor,
Frank J. Sprague,
By Thomas Ewing, Jr.,
Attorney.

No. 647,242. Patented Apr. 10, 1900.

F. J. SPRAGUE.

CABLE WINDING SAFETY DEVICE.

(Application filed Sept. 20, 1899.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 6.

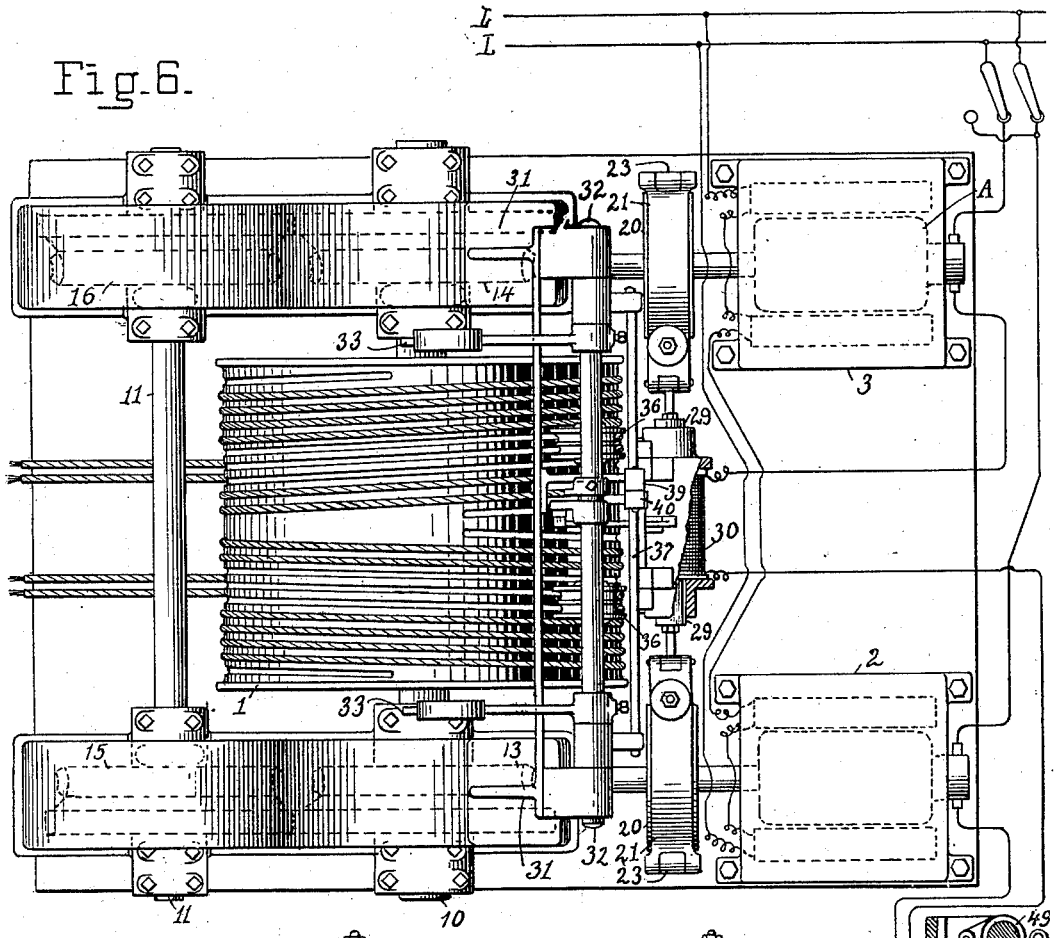
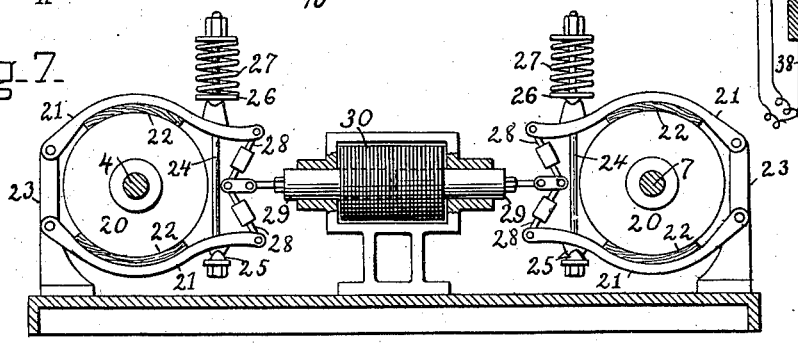


Fig. 7.



Witnesses

Samuel W. Balch

Wy H. Whitman

Inventor

Frank J. Sprague.

by Thomas Ewing, Jr.

Attorney

UNITED STATES PATENT OFFICE.

FRANK J. SPRAGUE, OF NEW YORK, N. Y., ASSIGNOR TO THE SPRAGUE ELECTRIC COMPANY, OF NEW JERSEY.

CABLE-WINDING SAFETY DEVICE.

SPECIFICATION forming part of Letters Patent No. 647,242, dated April 10, 1900.

Original application filed July 27, 1898, Serial No. 687,009. Divided and this application filed September 20, 1899. Serial No. 731,104. (No model.)

To all whom it may concern:

Be it known that I, FRANK J. SPRAGUE, a citizen of the United States of America, and a resident of the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Cable-Winding Safety Devices, (for which I have obtained a patent in Great Britain on an application filed December 31, 1897, No. 30,923, and sealed March 7, 1899, and a patent in France on an application filed March 3, 1898, and issued June 13, 1898, No. 275,549,) of which the following is a specification.

This application is filed as a division of application for Letters Patent of the United States filed July 27, 1898, Serial No. 687,009, for improvements in elevators.

These improvements relate to a cable-climbing device, applicable to a drum or other sheave over which a cable is run or wound, whereby the displacement of the cable from the groove in which it is intended to wind, so that it lies across the ridges between grooves or on top of other convolutions of the cable, will effect the prompt stoppage of the driving mechanism. This cable-climbing safety device is shown in conjunction with a slack-cable safety device; and a further element of the invention consists in so combining them that they operate the same stopping mechanism. They are illustrated in connection with a winding-drum of a hoisting mechanism. The stopping is effected by opening an electric switch, which cuts off the current for driving the machines and releases springs which apply the brakes.

In the accompanying sheet of drawings, which form a part of this specification, Figure 1 is an elevation of the end of a hoisting-machine with the safety devices arranged in accordance with my invention, the base of the machine being in section and the motors and brake mechanism being removed. Fig. 2 is a side elevation showing the safety devices and the motors. Fig. 3 is an enlarged detail view showing the connection between the slack-cable safety and the switch. Fig. 4 is an enlarged view showing the connections between the cable-climbing safety and the switch. Fig. 5 is an enlarged detail view of the cable-climbing safety device. Fig. 6 is a top view of the hoisting-machine, showing the safety devices, brake mechanism, motors, and electrical connections. Fig. 7 is a vertical section on the line $x^7 x^7$ of Fig. 6, showing the brake mechanism, the other parts being removed.

In its general features the hoisting mechanism consists of a winding-drum 1, suitably mounted and driven through the agency of positive gearing, consisting of worm-gearing and spur-gearing, by two electric motors, the motor 2 being shown in Fig. 2. There are two driving mechanisms, one located at each side of the hoisting-machine, with the winding-drum between them. The driving-shafts 4 and 7 of both driving mechanisms appear in section in Fig. 1, and one of the driving mechanisms is shown in Fig. 2 in dotted lines. On the shaft 4 is a left-hand worm 5, which engages the left-hand worm-wheel 13, and on the shaft 7 is a right-hand worm 8, which engages the right-hand worm-wheel 14. The two worm-wheels are mounted on a drum-shaft 10. A gear-shaft 11, with worm-wheels meshing with worms of opposite hands on the driving-shafts to the other worms on the driving-shafts, may be added to balance the end thrusts of the worms, as set forth in my original patent application above named.

On each driving-shaft is a brake-wheel 20, and adjoining each brake-wheel is a pair of brake-levers 21, which carry suitable brake-shoes 22. The brake-levers are fulcrumed to standards 23, which are bolted to the bed-plate of the machine. Near the opposite ends of each pair of levers are holes through which a brake-applying rod 24 is loosely passed. A head 25 at the lower end of the rod bears against the lower brake-lever, and a washer 26 bears against the upper brake-lever. The head of the rod and the washer are each so shaped in conjunction with the brake-lever against which it bears that each can rock slightly. A brake-applying spring 27 lies between the washer against the upper brake-lever and a washer which lies under nuts at the upper end of the brake-applying rod. The spring which is compressed between the two washers draws the ends of the brake-levers

together and applies the brake-shoes to the brake-wheels. Toggles 28 are attached to the ends of the brake-levers, and these when straightened separate the brake-levers and hold off the brake-shoes. The links of each set of toggles are connected to a soft-iron plunger 29, and the two plungers operate in opposite ends of the solenoid 30. This solenoid when energized attracts both plungers and simultaneously releases the brakes from both driving-shafts. When the circuit through the coil is broken, the attraction of the plungers ceases and the springs simultaneously apply the brakes to both driving-shafts.

A slack-cable safety device operating in conjunction with the hoisting-cables is carried by brackets 31 on the top of the machine. To a rock-shaft 32, journaled in these brackets, weighted levers 33 and arms 34 are attached. The ends of the arms carry the ends of a shaft 35, on which flanged idler-wheels 36 are loosely mounted. By reason of the weighted levers tending to rock the rock-shaft these idler-wheels are constantly pressed against the hoisting-cables and in event of these cables becoming slack will press them outward and allow the rock-shaft to rock. A guard-bar 37 is also supported by the arms and lies in front of the idler-wheels and prevents the cables from leaving the grooves in the wheels. Attached to a bar between the brackets which carry the slack-cable device is a plate 38, with a bracket 39, which supports an electric switch-arm 40 and contact-pieces 41. Attached to the rock-shaft is a sleeve 42, with a lug 43, which contacts with the switch-arm when the rock-shaft is rocked and throws open the switch. The switch-arm is so hinged that it will fall open by gravity sufficiently to break any arc after it has been pushed open sufficiently to clear the contacts.

The armatures A A of the two motors by which the hoisting-machine is driven are connected in series to the leads L L, and the fields are in shunt with the armatures. The brake-solenoid 30 and the contact-pieces 41 of the safety device are also connected with the circuit through the armatures either directly, as shown, or through relays, so that the motors will be stopped and the brakes applied by the breaking of the circuit by the switch-arm.

A cable-climbing safety device is also provided, which operates in conjunction with the drum, in event of any of the cables climbing out of their grooves, in which it is intended that they should wind, and either lying across the ridges between the grooves, or on top of other convolutions of cables on the drum. This device is a bar 44, which lies parallel with and close to the face of the drum, so that the space between the cables and the bar will be considerably less than the height of the ridges on the drum or the thickness of the cables. In event of the cables climbing out of their grooves the bar is forced back. It is supported by short arms 45 on the ends of a short rock-shaft 46, which is journaled in brackets on the top of the stand which carries the brake-solenoid. An arm 47 on this rock-shaft is connected, through a connecting-rod 48, with a loose sleeve 49 on the rock-shaft of the slack-cable safety device. Whenever the bar of the cable-climbing safety device is pushed away from the drum by the climbing of any of the cables, the loose sleeve is rocked and its lug 50 contacts with the switch-arm above described and opens the switch. The same switch-arm serves for both the slack-cable and the cable-climbing safety devices.

In practice the circuits through the armatures and fields are led through suitable control apparatus, not shown or claimed in this application, but which is described and claimed in my United States patent application filed September 22, 1898, Serial No. 691,627, for improvements in systems of electrical control.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a hoisting mechanism, the combination with a winding-drum and cables thereon, of a cable-climbing safety device consisting of a bar parallel with the face of the drum and distant from the cables on the drum by an amount less than the depth of the grooves on the drum or the thickness of the cables, and means connected with the bar to effect the stoppage of the hoisting mechanism on the bar being moved away from the face of the drum, substantially as described.

2. In a hoisting mechanism, the combination of an electric switch, a slack-cable safety device, and a cable-climbing safety device, both of which devices are operatively connected with the switch, substantially as described.

Signed by me in New York city, New York, this 13th day of July, 1899.

FRANK J. SPRAGUE.

Witnesses:
SAMUEL W. BALCH,
HUGH PATTISON.