

No. 647,240.

Patented Apr. 10, 1900.

F. J. SPRAGUE.  
ELECTRICALLY DRIVEN MECHANISM.

(Application filed Sept. 20, 1899.)

(No Model.)

Fig. 1.

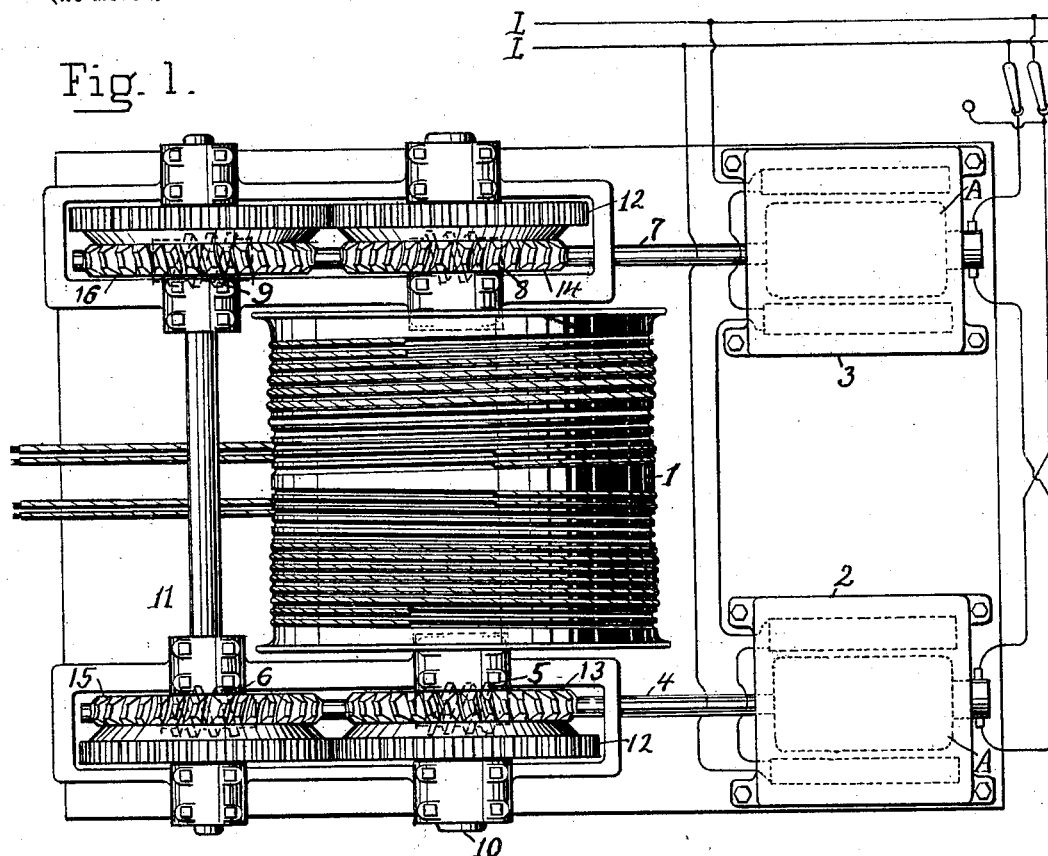
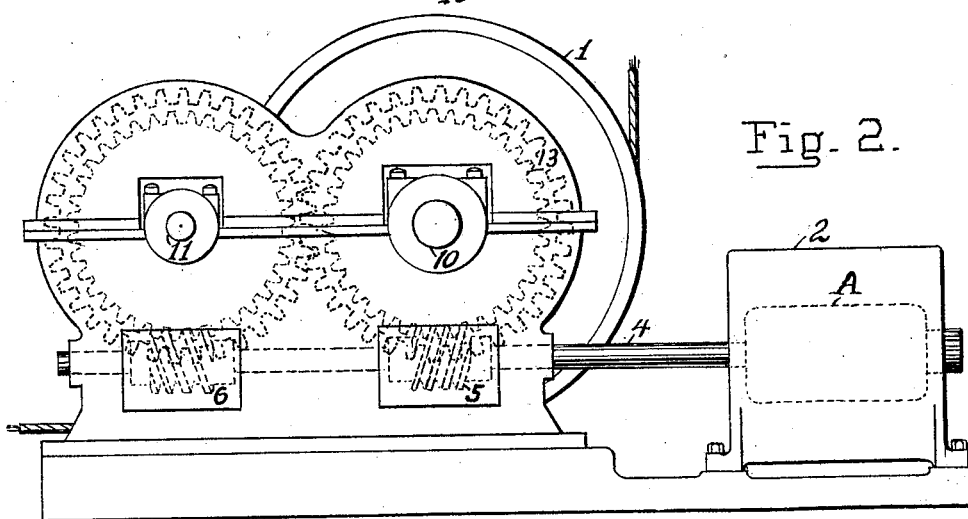


Fig. 2.



Witnesses:

*Samuel W. Balch*  
*Hy H. Whitman*

Inventor,

*Frank J. Sprague,*

*by Thomas Lewis, Jr.,*  
*Attorney.*

# UNITED STATES PATENT OFFICE.

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

## ELECTRICALLY-DRIVEN MECHANISM.

SPECIFICATION forming part of Letters Patent No. 647,240, dated April 10, 1900.

Original application filed July 27, 1898, Serial No. 687,009. Divided and this application filed September 20, 1899. Serial No. 731,102. (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  
5 invented certain new and useful Improvements in Electrically-Driven Mechanism, (for which I have obtained a patent in Great Britain on an application filed December 31, 1897,  
10 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,  
15 for improvements in elevators.

These improvements relate particularly to an electrically-driven mechanism in which  
20 there are two sets of positive driving-gearing with separate electric motors connected to each set. The main element of novelty lies in the connection of the armatures of the two motors in series to the source of electrical  
25 supply. The motors are shunt-wound, and the drawings show the application of the invention to a hoisting mechanism.

In the accompanying sheet of drawings, which form a part of this specification, Figure 1 is a plan view showing a hoisting-machine and two electric motors connected in accordance with my invention, in which the covers for the positive driving-gearing of the  
30 hoisting mechanism are removed. Fig. 2 is a side elevation showing the hoisting-machine and one of the motors.

In its general features the hoisting mechanism consists of a winding-drum 1, suitably mounted and driven by two electric motors  
40 2 3 through the agency of positive gearing consisting of worm-gearing and spur-gearing. There are two driving mechanisms, one located at each side of the hoisting-machine, with the winding-drum between them. The  
45 mechanism to be seen at the lower side of Fig. 1 and in Fig. 2 will be termed the "right-hand" driving mechanism and the mechanism to be seen at the upper side of Fig. 1 will be termed the "left-hand" driving mechanism. The armature-shafts of the motors are  
50

directly coupled to the worm-shafts of the hoisting mechanism. In the right-hand driving mechanism is a worm-shaft 4, which carries a left-hand worm 5 and a right-hand worm 6. In the left-hand driving mechanism is a  
55 worm-shaft 7, which carries a right-hand worm 8 and a left-hand worm 9. The left-hand worm of the right-hand driving mechanism is opposite the right-hand worm of the left-hand driving mechanism, and the other worms are  
60 likewise opposite to each other and of opposite hand. The worms engage with worm-wheels which are mounted on two parallel worm-wheel shafts, one of which is the drum-shaft 10 and the other of which is the gear-shaft 11. The shafts are common to both driving  
65 mechanisms and are geared together by two pairs of spur-gears 12, so that they will run synchronously.

The right-hand and the left-hand driving  
70 mechanisms are positively connected by both the drum-shaft and gear-shaft, and in each driving mechanism these are positively geared together. The motors being positively geared  
75 to the drum are in consequence positively geared to each other and will invariably run at identical speeds.

The worm-wheels are cut right or left hand, according as they are to engage with the right or left hand worms. On the drum-shafts the  
80 worm-wheel 13 is left hand to engage with the left-hand worm 5, and the worm-wheel 14 is right hand to engage with the right-hand worm 8. On the gear-shaft the worm-wheels are also of opposite hand, the worm-  
85 wheel 15 being right hand and the worm-wheel 16 being left hand. Since the corresponding worms and worm-wheels of the two driving mechanisms are of opposite hand, the  
90 motors must drive the worm-shafts in contrary directions.

The armatures A A of the two motors by which this mechanism is driven are connected in series to the leads L L and so that the  
95 current flows oppositely through the two armatures in order that the motors shall run in opposite directions. The fields are in shunt with the armatures. Motors with their armatures in series are difficult to maintain at  
100 equal speeds, since an inequality of field

strength will cause the armature of the motor with the stronger field to respond more quickly and consume the greater part of the electrical energy in the circuit, so that sufficient drop of potential will not be left across the other armature to set it in motion. With the motors positively geared to each other they cannot thus become unbalanced.

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 an electrically-driven mechanism, the combination with leads supplying current, of two sets of positive driving-gearing, electric motors connected to each set of gearing, and series connections between the armatures of the motors and the leads, substantially as described.

2. In an electrically-driven mechanism, the combination with leads supplying current,

two sets of positive driving-gearing, electric motors connected to each set of gearing, series connections between the armatures of the motors and leads, and shunt connections for the fields of the motors, substantially as described.

3. In an electrically-driven hoisting mechanism, the combination with leads supplying current, of a hoisting-drum, two sets of positive driving-gearing, electric motors connected to each set of gearing, and series connections between the armatures of the motors and the leads, substantially as described.

4. In an electrically-driven mechanism, the combination with leads supplying current, of a hoisting-drum, two sets of positive driving-gearing, electric motors connected to each set of gearing, series connections between the armatures of the motors and leads, and shunt connections for the fields of the motors, 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.