No. 830,457. PATENTED SEPT. 4, 1906.

F. L. SESSIONS.

ELECTRIC BRAKE.

APPLICATION FILED JAN. 17, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

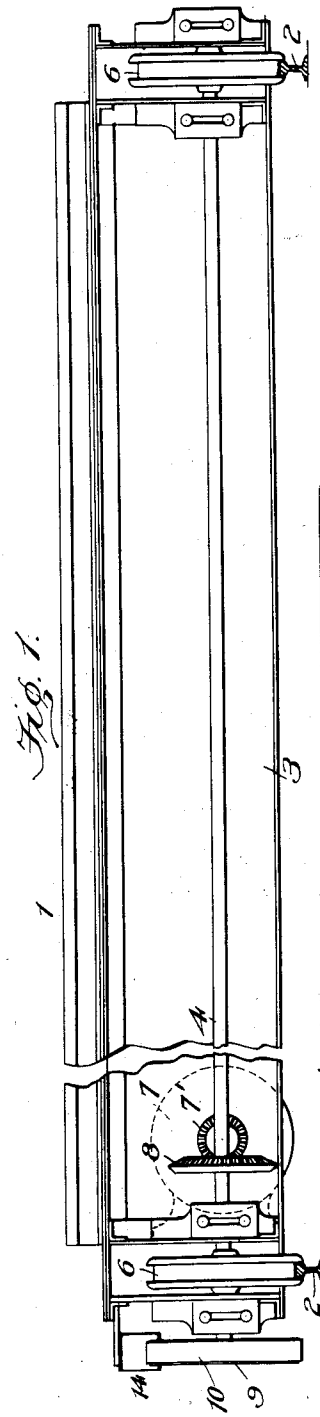
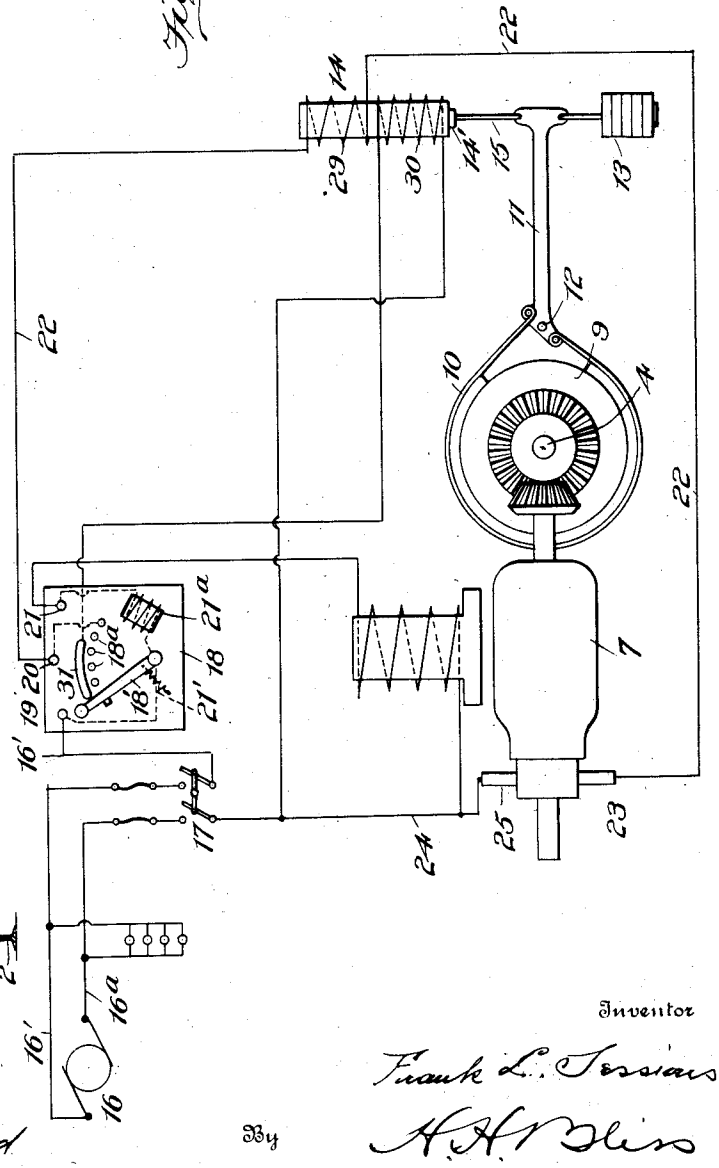


Fig. 3.



Witnesses

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2 SHEETS—SHEET 2.

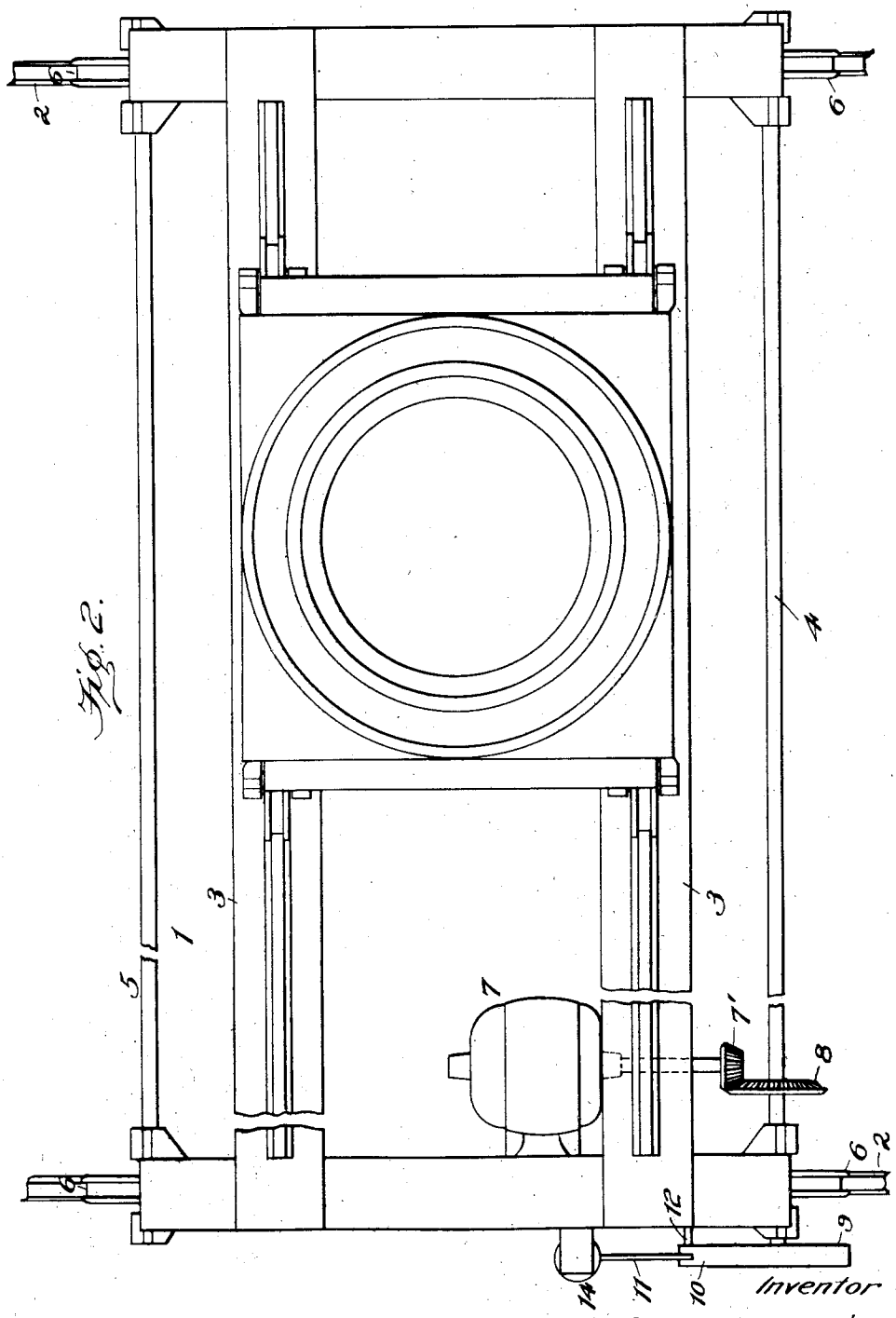

Fig. 2.

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ELECTRIC BRAKE.

No. 830,457. Specification of Letters Patent. Patented Sept. 4, 1906.

Application filed January 17, 1905. Serial No. 241,524.

To all whom it may concern:

Be it known that I, FRANK L. SESSIONS, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Electric Brakes, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an improvement in electromagnetically-operated brakes for cranes, elevators, or other machinery.

In the drawings for the sake of illustration I have shown one of my electromagnetic brakes applied to a motor which is adapted to drive the traveling carriage of a hoisting and conveying apparatus.

Figure 1 is a side elevation of a carriage for a hoisting and conveying apparatus having the driving-motor provided with an electromagnetic brake embodying my improvement. Fig. 2 is a plan view of the said carriage. Fig. 3 is a diagrammatic view of the motor, brake, electromagnet controlling the operation of the brake, and the wiring of the electrical circuit.

1 represents as an entirety a traveling carriage which is adapted to move back and forth upon the elevated trackway 2. The frame 3 of the carriage has mounted in it the axles 4 and 5, upon which are mounted the supporting-wheels 6. 7 is a motor secured in position on the said frame adjacent to the axle 4.

7′ is a motor-pinion which is adapted to engage with a gear-wheel 8, which is secured to the shaft 4, so that power may be applied from the motor-shaft for driving the axle 4 and advancing the carriage.

9 is a brake wheel or pulley rigidly secured to the shaft 4. 10 is a brake-band adapted to engage with the periphery of said wheel, and 11 is a lever having the ends of said band pivotally secured thereto, the lever being mounted on a stationary pivot or shaft 12, about the axis of which it is free to rock, so as to control the brake-band in the well-known manner. From the outer end of the brake-lever is suspended a weight 13, which is adapted to normally hold the brake-band in firm engagement with the periphery of the brake-wheel to prevent the rotation of the axle 4.

14 represents a powerful electromagnet adapted to overcome the force exerted upon the brake by the weight 13 in order to permit the revolution of the axle 4. 14′ represents the core of the said magnet arranged with its axis vertical. 15 is a link or bar pivotally connected to the lower end of said core and to the outer end of the brake-lever 11.

In Fig. 3, 16 represents a generator of any well-known type, 16′ and 16ª being the positive and negative conductors, respectively, leading from the brushes of said generator. 17 is a double-pole single-throw switch arranged in the electrical circuit between the generator and the motor. 18 is a starting-box or controller of any well-known style. It has three binding-posts, (indicated at 19, 20, and 21,) the wire 16′ leading to the post 19 and being secured therein. 22 is a conductor leading from the binding-post 20 to one of the motor-brushes 23. 24 indicates a conductor leading from the motor-brush 25 to the negative pole of the switch 17. 21′ is a conductor leading from the binding-post 19 to the binding-post 21. This conductor preferably has in its circuit electromagnet 21ª, which is adapted to maintain the controller-handle 18′ in any position of adjustment as long as the electromotive force of the motor remains above a certain value. 18ª indicates a series of resistance-controlling contacts arranged on the controller 18 in the well-known manner and adapted to be engaged by the switching-lever 18′ to regulate the supply of the current to the motor. The electromagnet 14 is compound-wound, it having a coil 29 connected in series with the armature of the motor and a coil 30 connected directly across the current-supply line. This latter connection I arrange by means of a contact 31 on the controller-box, which is arranged to be engaged by the controller-lever 18′ prior to its engagement with any of the series of contacts 18ª. In this manner the circuit is made through the shunt-winding of the brake-magnet 14 a little before the motor-circuit is completed. This will effect the lifting of the weight 13 and releasing of the brake-band 10 prior to the beginning of rotation of the armature-shaft of the motor, so that it may start free of the retarding action of the brake. After moving the controller-lever across part of the distance toward the right it leaves the brake shunt-coil contact 31, and the brake is held in the off position,

or out of operation, by the action of the series coil 29 of the brake-magnet. If the armature-circuit in any wise be opened, the weight 13 will at once fall, clamping the brake-band 10 to the brake-pulley, slowing down or stopping the rotation of the armature-shaft, causing the automatic starting-box to open, and thus preventing any accident by runaway to the mechanism or conveyer controlled by the motor. I prefer to arrange the magnet 14 so that a small energizing-current in the series coil 29 will retain the brake in the off position after it has once been drawn to that position by the energizing of the magnet-core by the shunt-coil 30. The series coil 29 of the brake-magnet will consume very little energy and the shunt-coil, used only while the motor is being started, can be designed to exert a very strong force for the short time it is in service without heating excessively and without wasting much energy.

I am aware that heretofore it has been proposed to use electromagnets for actuating brakes for controlling motor-driven mechanism. In some instances—for example, with shunt-wound motors—the magnet-coils have been wound in series with the armature-circuit, or in shunt with the armature-circuit, or in series with the shunt-field, or in the case of series-wound motors in series with both the field and the armature; but all of the foregoing arrangements of brake-controlling electromagnets will fail under certain conditions and the brake will not operate to prevent the running away of the machinery, which will be certain to occur unless there is a worm-gear in the power-transmitting mechanism. The magnet wound in series with the armature of a shunt-wound or series-wound motor will not lift the brake off until considerable current is flowing, thus throwing an unnecessary load upon the motor in starting. With the shunt-motor the rotation of the armature-shaft in the same direction as the direction of rotation as a motor will cause the motor to run as a generator, exciting its shunt-field in the same direction as it was excited by the source of current-supply when operating as a motor, and consequently if there is any tendency of the mechanism controlled by the said motor to run away it will drive the armature-shaft in such direction so as to develop a sufficient electromotive force to keep the magnet excited and to prevent the brake from being applied.

In my construction while the motor is a shunt-wound one and the magnet-coil 30 is in multiple with the motor-field it will be noted that the shunt-coil 30 is not in series with the field when the motor is running normally, as it is cut out after it has performed its purpose of exciting the magnet 14 so as to lift the weight 13. In other words, should the motor start to run as a generator, the coil 29 of the electromagnet being in series with the armature of the motor, the direction of current through the coil would change and in passing to and through zero value the brake would be applied and the motion of the armature retarded. It is evident that whenever the motor changes to become a generator or when operating as a generator it again becomes a motor the brake will be applied and the apparatus retarded, so that no unusual speed can be attained by the apparatus.

In starting the driving-motor the operator will throw the controlling-lever over to the end of the contact, which completes the circuit through the shunt-winding of the electromagnet, and will there hold it until the conveyer or other apparatus has attained sufficient speed and load to require retarding. He will then push the controlling-lever into the running position after the motor has become a generator and break the circuit through the shunt-winding of the electromagnet. In this way will be avoided the application of the brake when the current in the armature changes direction, due to the motor becoming a generator in the first instance; but thereafter the brake will be applied whenever the generator again becomes a motor or the current sent through the series winding of the magnet falls to so small an amount as to reduce the pull of the magnet below that required to hold the brake in an inoperative position.

Many modifications of the manner of completing the electrical circuits and in the use of differently-wound motors will suggest themselves which will contain the spirit of my invention, I having herein described and shown but one of the many uses in which a compound-wound electromagnet may be employed for brake-operating purposes.

What I claim is—

1. The combination with a source of current-supply, a motor electrically connected therewith, a pulley operated by said motor, a brake-band for said pulley, a lever for operating said brake-band and a weight connected to said lever, of a compound-wound electromagnet having its core arranged to lift the said weight to release the said brake-band, and one of its energizing-coils connected in series with the armature of said motor and its other energizing-coil connected directly across the current-supply line, and means for switching the current so as to energize the shunt-coil of said magnet prior to connecting the series coil thereof and the armature of the said motor into the electrical circuit.

2. The combination with a source of current-supply, a motor electrically connected therewith, a pulley operated by said motor, a brake-band for said pulley, a lever for operat-

ing said brake-band and a weight connected to said lever, of a compound-wound electromagnet having its core arranged to lift the said weight to release the said brake-band, and one of its energizing-coils connected in series with the armature of said motor and its other energizing-coil connected directly across the current-supply line, and means for energizing said shunt-coil prior to closing the circuit to the armature and said series coil.

3. The combination with a source of current-supply and a motor electrically connected therewith, of a brake tending normally to prevent the rotation of the armature of said motor, and a compound-wound electromagnet having its core connected with said brake and adapted to release the brake to permit the rotation of the armature-shaft, said electromagnet having one of its energizing-coils in series with the armature of the motor and its other energizing-coil connected directly across the current-supply line, and means for energizing said latter coil prior to closing the circuit to the armature and prior to closing the circuit through said series coil of the electromagnet.

4. The combination with a source of current-supply and a motor electrically connected therewith, of a brake tending normally to prevent the rotation of the armature of said motor, and a compound-wound electromagnet having its core connected with said brake and adapted to release the brake to permit the rotation of the armature-shaft, said electromagnet having one of its energizing-coils in series with the armature of the motor and its other energizing-coil connected directly across the current-supply line, and a current-switching mechanism adapted to connect the said shunt-coil of the electrical circuit with said source of current-supply prior to connecting either the series coil or the armature into said electrical circuit and for cutting out said shunt-coil after the brake has been released and after the motor has been started, whereby the brake is maintained in inoperative position by means of said series coil energizing the said magnet.

5. The combination with a source of current-supply, a motor electrically connected therewith, and a brake for controlling the rotation of the armature-shaft of said motor, of a compound-wound electromagnet for operating said brake, said electromagnet having both its series and its shunt coil connected in the electrical circuit between said source of current-supply and said motor, a current-switching mechanism having the switching-lever 18′, the series of contacts 18ª for controlling the current to the armature on said motor and to the series coil of said magnet, and the switching-contact 31 for controlling the flow of current to said shunt-coil of said magnet.

6. The combination with a rotatable shaft, means for rotating said shaft and a brake for controlling the rotation of said shaft, of a compound-wound electromagnet connected into an electrical circuit and having its shunt-coil adapted to release the said brake to permit the rotation of said shaft and its series coil arranged to maintain the brake in inoperative position as long as the current flowing in the circuit exceeds a predetermined amount.

7. The combination with a rotatable shaft, means for rotating said shaft, and a brake for controlling the rotation of said shaft, of a compound-wound electromagnet arranged to be connected into an electrical circuit and having a shunt-coil adapted to release the said brake to permit the rotation of said shaft and a series coil adapted to maintain the brake in its inoperative position after it has been released and as long as the electromotive force of the circuit exceeds a predetermined amount, and means for first connecting said shunt-coil into the electrical circuit and then connecting said series coil into the electrical circuit.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK L. SESSIONS.

Witnesses:
F. E. VAN SLYKE,
C. L. MCCONKEY.