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J. S. LOCKWOOD.

METHOD OF CONTROLLING ELECTRIC RAILROAD BRAKES.

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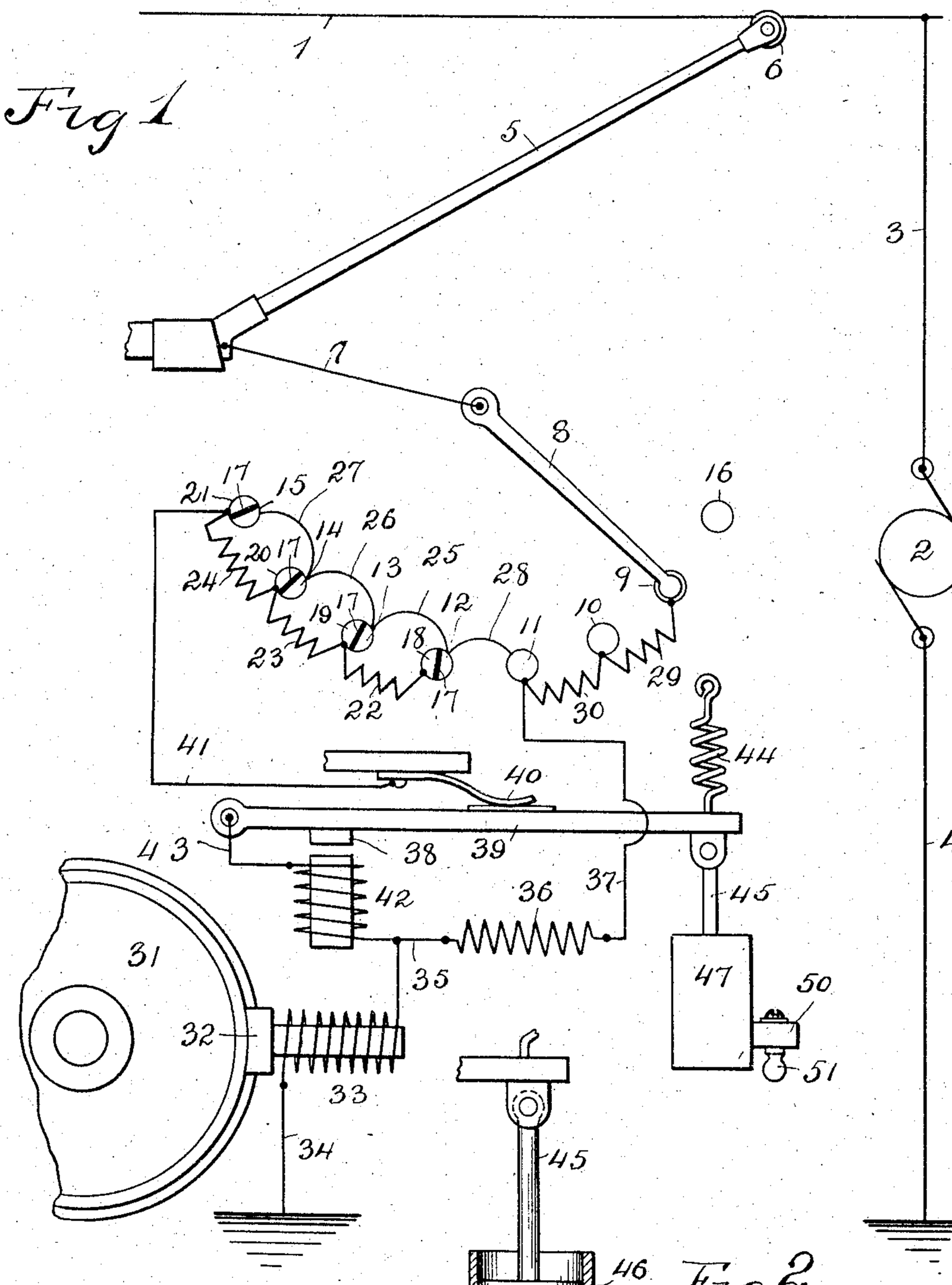
Fig 1



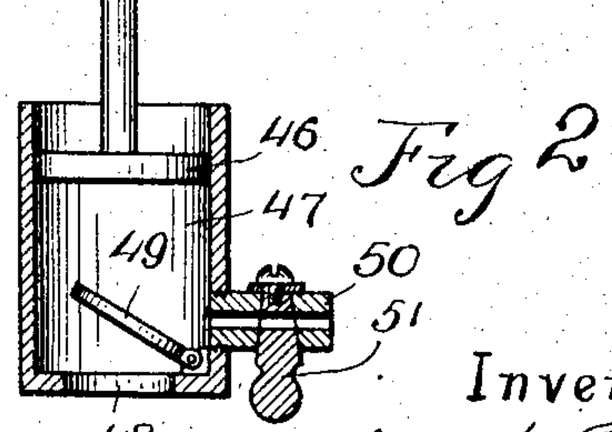


Fig 2

Witnesses:

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UNITED STATES PATENT OFFICE.

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METHOD OF CONTROLLING ELECTRIC RAILROAD-BRAKES.

SPECIFICATION forming part of Letters Patent No. 780,568, dated January 24, 1905.

Application filed April 16, 1903. Serial No. 152,957.

To all whom it may concern:

Be it known that I, JOHN S. LOCKWOOD, a citizen of the United States of America, residing in Kansas City, in the county of Jackson and State of Missouri, have invented a new and useful Improvement in Methods of Controlling Electric Railroad-Brakes, of which the following is a specification, reference being had therein to the accompanying drawings, forming a part thereof.

My invention relates to improvements in electric railroad-brakes.

It relates particularly to a new method of controlling the braking action of an electromagnetically-controlled brake-shoe.

The object of my invention is to provide a method of controlling the braking action of a brake-shoe which will permit great pressure to be applied to the brake-shoe during the braking action without causing the shoe to become locked with the device upon which the shoe is exerting the braking pressure.

With the use of my improved method locking of the brake-shoe with the wheel of the vehicle is prevented, and slipping of the wheel upon the track, thus causing flattening of the wheel, is prevented.

My improved method consists in rapidly and successively increasing and decreasing the strength of the electromagnetic field the attractive force of which controls the application of the brake-shoe. By this method, although the magnetic pressure may be very great, the shoe does not lock with the wheel, owing to the short duration of time that the magnetic field continuously exerts excessive pressure upon the shoe.

My improved method provides, further, the establishing of an electromagnetic field of a strength sufficient for the braking purpose, but not excessive enough to cause locking of the wheel with the brake-shoe, and making additions at intervals to the strength of the magnetic field, the field remaining between the said intervals at substantially the original strength.

My improved method provides, further, the gradual increase of the strength of the magnetic field controlling the brake-shoe to a predetermined degree and then making additions at intervals to the strength of the field, which between the intervals remains at substantially its predetermined strength.

In the accompanying drawings I have shown means by which my improved method may be practiced.

Figure 1 is a diagrammatic representation of circuits and apparatuses by which the current employed to energize the helix controlling the braking action of the brake-shoe may be gradually increased from zero to a predetermined degree sufficient for braking purposes, but not excessive enough to cause locking of the brake-shoe, and after the predetermined degree of strength has been attained a portion of the current is broken into a series of impulses, the constant current between the impulses remaining at the predetermined strength. Fig. 2 is a vertical sectional view of the dash-pot used to retard the movement of the armature employed to break the circuit and produce the series of successive impulses.

Similar characters of reference indicate similar parts.

1 indicates the trolley-wire, connected with the generator 2 by a wire 3, the generator being connected by a wire 4 with the ground.

5 indicates the trolley-pole, adapted to be connected, by means of the wheel 6, rotatably mounted thereon, with the trolley-wire 1.

7 indicates a wire connecting the trolley-pole 5 with the pivoted contact-lever 8, adapted when rotated to make electrical contact with a series of contacts 9, 10, 11, 12, 13, 14, and 15, which form part of a rheostat or controller for graduating the strength of the current supplied to the energizing-helix controlling the brake-shoe.

16 indicates the neutral contact of the rheostat.

Each of the contacts 12, 13, 14, and 15 comprises two parts insulated each from the other, the insulation being indicated by 17.

18, 19, 20, and 21 indicate, respectively, parts of the contacts 12, 13, 14, and 15. These parts are connected, respectively, in series by the resistance-coils 22, 23, and 24, respectively.

The opposite parts of the contacts 12, 13, 14, and 15 are connected in series, respectively, by the wires 25, 26, and 27.

28 indicates a wire connecting contact 11 with the adjacent side of contact 12.

29 and 30 indicate, respectively, resistance-coils inserted between contacts 9 and 10 and 10 and 11.

31 indicates the car-wheel to which is adapted to be applied with a braking pressure the brake-shoe 32, which is magnetized by the helix 33, one end of which is connected by a wire 34 with the ground, the other end being connected by a wire 35 with a resistance-coil 36, which is connected by a wire 37 with the contact 11.

38 indicates an armature mounted upon a pivoted lever 39, adapted to have electrical contact with a spring 40, which is connected by a wire 41 with the contact part 21. The armature 38 is located in the field of a helix 42, one end of which is connected with the wire 35, and the other end is connected by a wire 43 with the lever 39, which is of conductive material and forms part of the loop around the resistance-coil 36. A retracting-spring 44 is connected to the lever 39 and serves to cause the said lever to make contact with the conducting-spring 40. Upon the opposite side from the spring 44 a piston-rod 45 is connected to the lever 39, the other end of the rod being connected to the piston 46, reciprocatively mounted in a cylinder 47, one end of which is open and the other provided with a hole 48, adapted to be closed by a valve 49, hinged so as to swing inwardly in the cylinder. Above the valve 49 in the side of the cylinder is provided an opening in which is secured a pipe 50, having mounted therein a valve 51 for regulating the passage in the said pipe.

In operating my invention when it is not desired to apply the brakes the contact-lever 8 normally rests upon the contact 16. When it is desired to apply the brake, the lever 8 is moved successively from one contact to the other until the proper volume of current is being supplied for the braking purposes. The resistance 36 is sufficient to reduce the volume of the current passing therethrough when the lever is on contact 11 to an amount sufficient to properly magnetize the shoe 32 by means of the helix 33. The current permitted to pass by the resistance 36 through the helix 33 is not excessive enough, however, to lock the shoe 32 with the wheel 31, and slippage of the wheel on the track is thus prevented. When the lever 8 is turned so as to cover contacts 12 and 18, the current from the generator 2 will pass by means of wires 3 and 1, trolley 5, wire 7, lever 8 to contacts 12 and 18, a portion of the current passing by means of wire 28 to contact 11, wire 37, through resistance 36 to wire 35, thence through the helix 33 and wire 34 to ground, the circuit being completed through the ground and wire 4 to the generator 2. The portion of the current passing through the circuit just described is the predetermined amount sufficient to actuate the brake-shoe 32 without causing locking therewith of the wheel 31. While the lever is on contacts 12 and 18 a portion of the current passes by means of contact 18, resistances 22, 23, and 24, contact 21, wire 41, spring 40, lever 39, wire 43, and helix 42, from which it passes by wire 35 through helix 33, wire 34 to ground. A loop or shunt is thus formed around the resistance 36, which conveys a portion of the current through the helix 42. The helix 42 being thus energized attracts the armature 38 and swings the lever 39 out of contact with the spring 40, thus breaking the switch or shunt circuit. After the said circuit is broken the helix 42 being deënergized ceases to attract the magnet 38, and the spring 44 again retracts the lever 39 into contact with the spring 40, thus reëstablishing the circuit. A portion of the current passes through the loop in which is located the helix 42 and is thus broken into a series of impulses which are added to or superposed upon the current passing through the resistance 36. The current passing through the helix 33 during the time that the lever 39 is separated from the spring 30 remains at the predetermined degree necessary for the braking action without locking the brake-shoe with the wheel. During the time that the impulses passing through the shunt or loop are superposed upon the regular continuous current an intense magnetization of the brake-shoe 32 is produced; but owing to the breaking of the shunt-circuit at frequent intervals the shoe is not caused to lock with the wheel. In order that the impulses passing through the shunt may be long enough for effective work, movement away from the spring 40 of the lever 39 is retarded by the dash-pot mechanism, the operation of which I will now describe. As the lever 39 moves away from the spring 40 the piston 46 will be forced inwardly in the cylinder 47, thus closing the opening 48 by means of the valve 49 and preventing escape of the air within the cylinder, excepting through the pipe 50, past the valve 51. The air in the cylinder thus becomes compressed and prevents rapid inward movement of the piston 46. By regulating the valve 51 the orifice in the pipe 50 may be so regulated as to permit the desired speed of movement of the piston 46 of the lever 39. When the spring 44 retracts the lever 39, the valve 49 opens, permitting the free outward movement of the piston 46. By swinging the lever 8 upon the different contacts 12, 13, 14, and 15 the strength of the current passing through the helix 42 and caused to be broken may be varied to the braking effect required. When the lever has

been moved to the contact 15, covering also the contact 21, all of the current passing from the lever 8 except that passing by means of wires 27 26 25 28 37 and resistance 36 will be broken into a series of impulses which, with the current passing through the resistance 36, will constitute the full force of the current which can be applied.

In the drawings I have represented the brake-shoe as forming the pole-piece of the magnet of which the helix 33 is a part. The energizing of the magnet by the passage of the current through the helix 33 causes the shoe 32 to be attracted to and rub against the magnetizable wheel 31. The automatically and successively rapid increasing and decreasing the strength of the electromagnetic field controlling the brake-shoe prevents the shoe locking with the wheel. Slippage of the wheel on the track by reason of the wheel locking with the brake-shoe being prevented, the flattening of the wheel due to such cause is thereby prevented.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In electric railroad-brakes, the method of controlling the brake-shoe, consisting in creating an electromagnetic field between a magnetizable brake-shoe and a magnetizable rotatable wheel disposed adjacent each other and adapted to be brought together, and rapidly increasing and decreasing the strength of said field.

2. In electric railroad-brakes, the method of controlling the brake-shoe consisting in creating an electromagnetic field between a magnetizable brake-shoe and a magnetizable rotatable wheel disposed adjacent to and adapted to be brought in contact with each other, and making additions at intervals to the strength of the field, the field during the intervals remaining at substantially the original strength.

3. In electric railroad-brakes, the method of controlling the brake-shoe consisting in creating an electromagnetic field between a magnetizable brake-shoe and a magnetizable rotatable wheel disposed adjacent to and adapted to be brought in contact with each other, gradually increasing the strength of the field to a certain degree, and making thereafter at intervals additions to the strength of the field, the field remaining during the intervals at substantially the original strength.

4. In electric railroad-brakes, the method of controlling the brake-shoe consisting in rapidly energizing and deënergizing a helix in the magnetic field of which is located one of two magnetizable devices, one of which is rotatable and the other disposed adjacent thereto and adapted to be brought into contact with said rotatable device.

5. In electric railroad-brakes, the method of controlling a brake-shoe consisting in rapidly energizing and deënergizing a helix in the magnetic field of which the magnetizable brake-shoe is located, the said shoe being disposed adjacent to and adapted to be brought in contact with a magnetizable wheel.

6. In electric railroad-brakes, the method of controlling a brake-shoe consisting in generating in an electric circuit a current for energizing a helix located in said circuit and in the field of which is located a magnetizable brake-shoe, and superposing on said current a series of separate electric impulses.

7. In electric railroad-brakes, the method of controlling the brake-shoe consisting in generating in an electric circuit a current for energizing a helix located in said circuit and in the field of which is located a magnetizable brake-shoe, gradually increasing the strength of said electric current to a certain degree, and superposing on said current a series of additional impulses, the current between impulses remaining at substantially the said certain degree.

8. In electric railroad-brakes, the method of controlling the brake-shoe consisting in generating in an electric circuit a current for energizing a helix located in said circuit and in the field of which is located a magnetizable brake-shoe, interposing in the circuit a resistance to the passage therethrough of the current, shunting a portion of the current into a branch circuit leading around said resistance, and varying the amount of current passing through the shunted portion.

9. In electric railroad-brakes, the method of controlling the brake-shoe consisting in generating in an electric circuit a current for energizing a helix located in said circuit and in the field of which is located a magnetizable brake-shoe, interposing on the circuit a resistance to the passage therethrough of the current, shunting a portion of the current through a branch circuit leading around the said resistance, and separating the shunted portion of the current into a series of impulses.

10. In electric railroad-brakes, the method of controlling the brake-shoe consisting in generating in an electric circuit a current, dividing the current, separating one portion of the divided current into a series of separate impulses, and then passing both divisions of the current through a helix located in the circuit and in the magnetic field of which is located a magnetizable brake-shoe.

11. In electric railroad-brakes, the method of controlling a brake-shoe consisting in generating in an electric circuit a current, gradually increasing the current to a certain degree of strength, dividing the current into two portions, separating one portion into a series of separate impulses, and then passing both portions through a helix in the magnetic field of which is located a magnetizable brake-shoe.

12. In electric railroad-brakes, the method of controlling a brake-shoe consisting in gen-

erating in an electric circuit a current, dividing said current into two portions, one portion of which is retained at substantially a uniform strength, varying the strength of the other portion, and passing the two portions through a helix in the magnetic field of which is located a magnetizable brake-shoe.

In testimony whereof I have signed my name to this specification in presence of two subscribing witnesses.

JOHN S. LOCKWOOD.

Witnesses:

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HENRY F. ROSE.