No. 670,420. Patented Mar. 26, 1901.

A. DUPPLER.

RAILWAY BRAKE.

(Application filed June 12, 1900.)

(No Model.) 2 Sheets—Sheet 1.

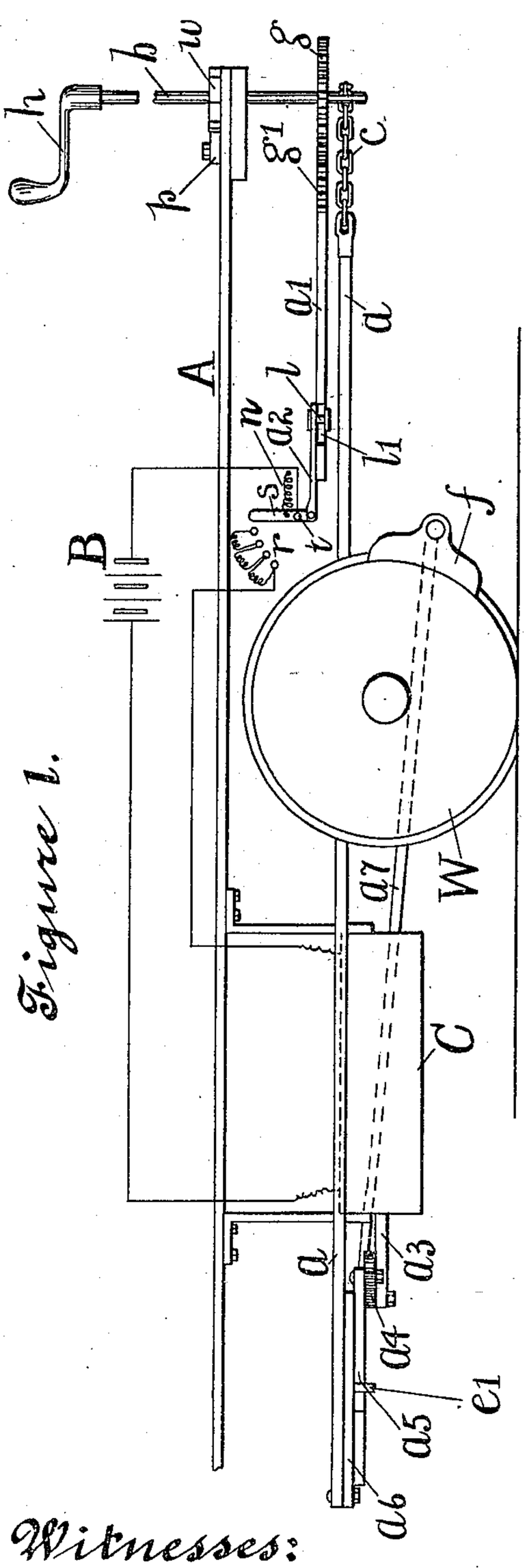

Figure 1.

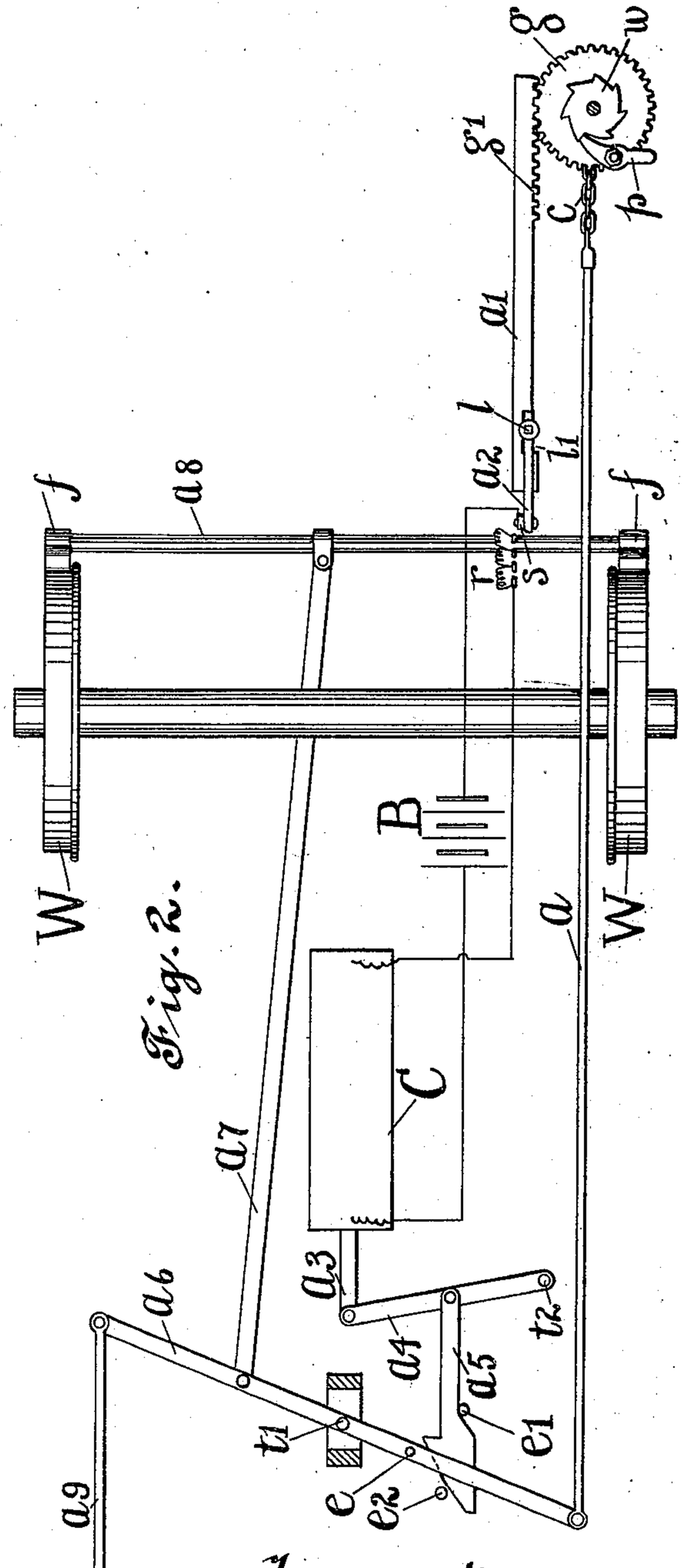

Fig. 2.

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Fig. 3.

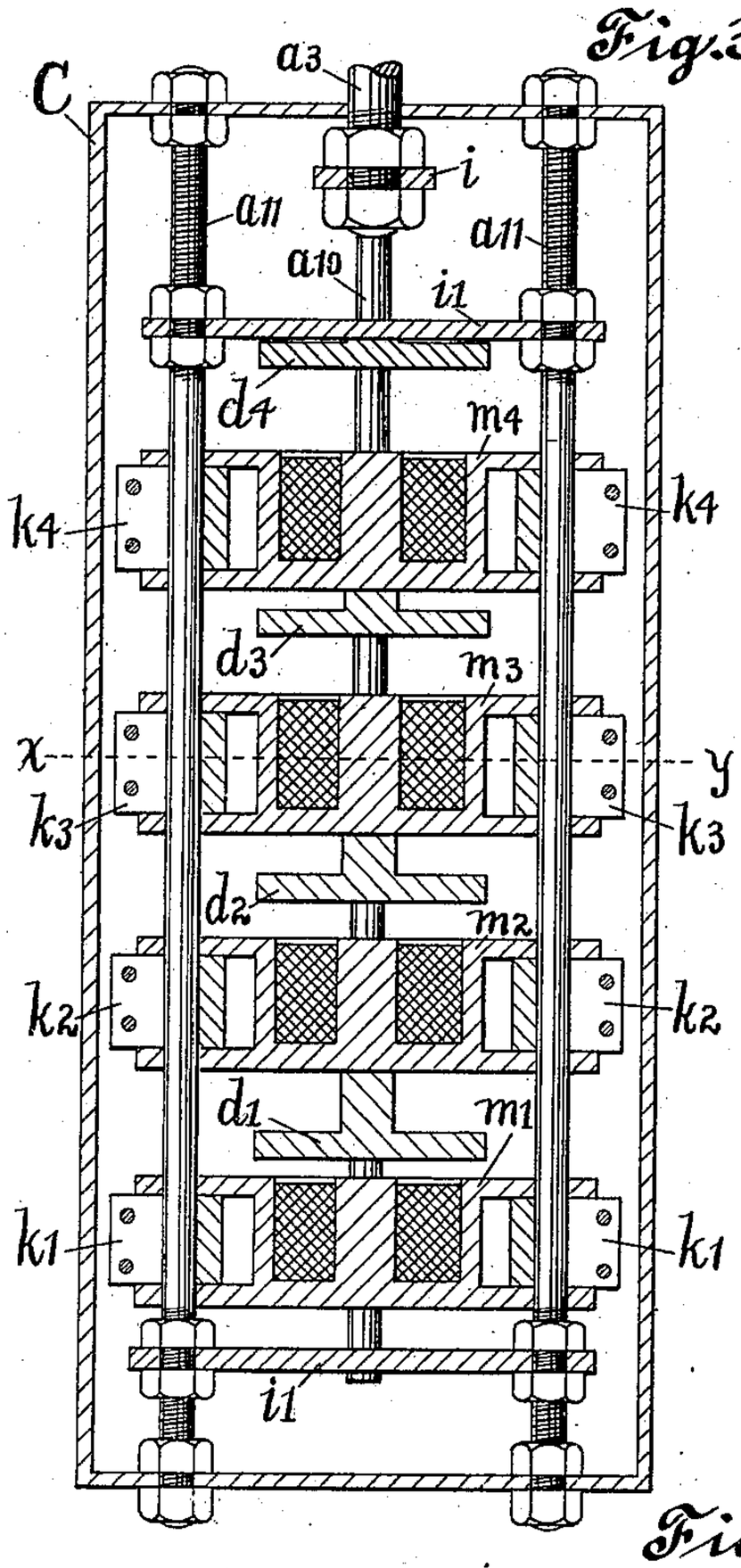


Fig. 4.

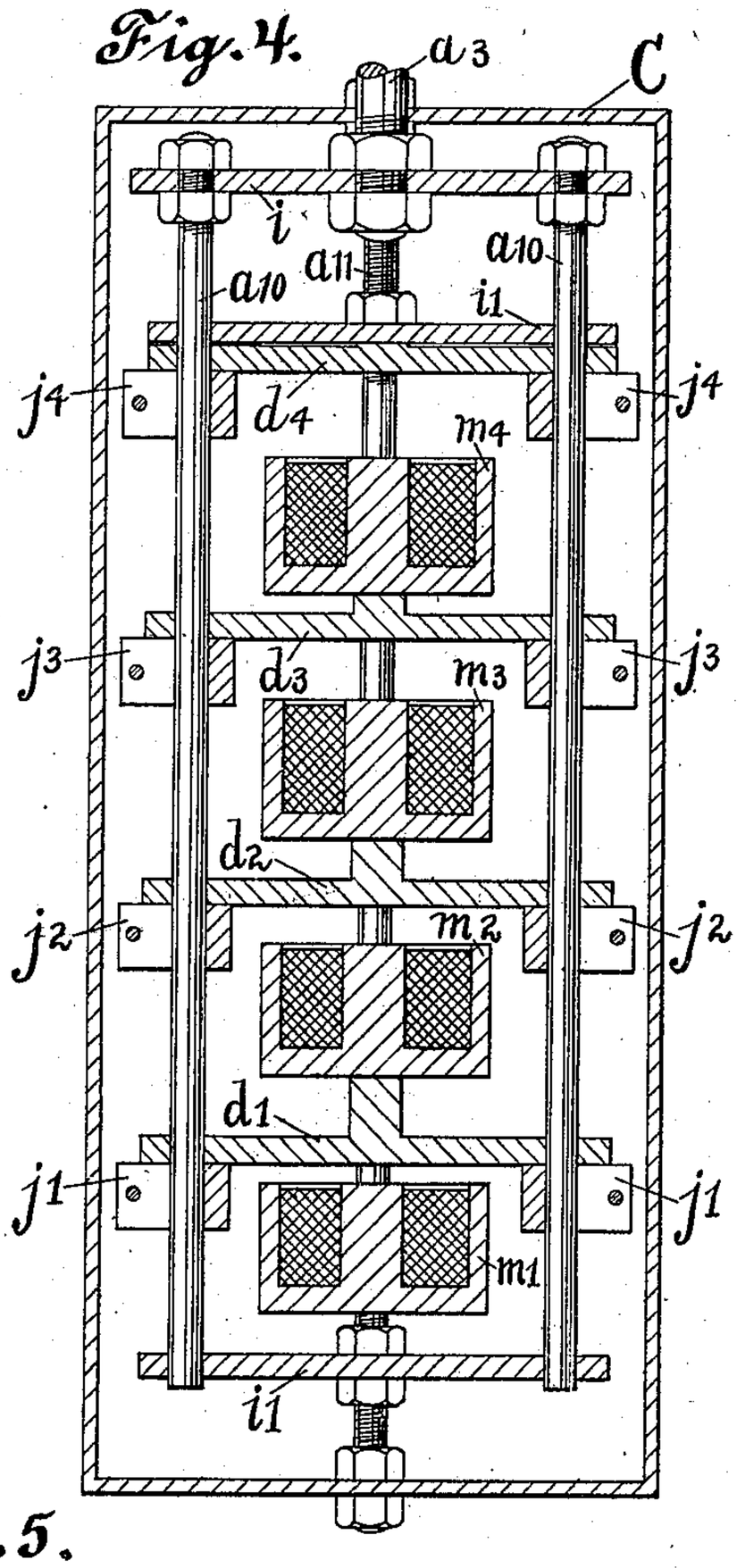
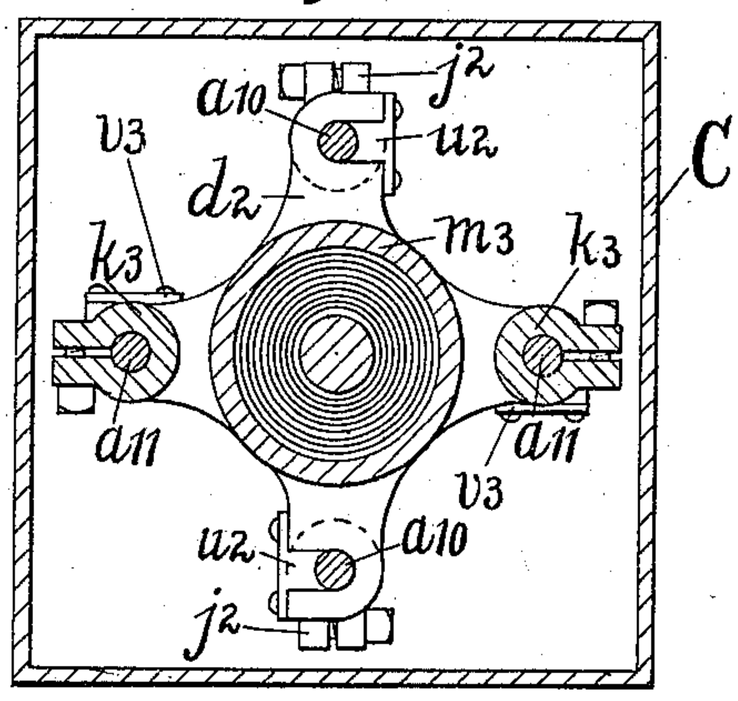


Fig. 5.



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UNITED STATES PATENT OFFICE.

ANTON DUPPLER, OF JERSEY CITY, NEW JERSEY, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO PHOEBUS H. ALEXANDER, OF NEW YORK, N. Y., AND COMPOUND MAGNET BRAKE COMPANY, OF NEW JERSEY.

RAILWAY-BRAKE.

SPECIFICATION forming part of Letters Patent No. 670,420, dated March 26, 1901.

Application filed June 12, 1900. Serial No. 20,053. (No model.)

To all whom it may concern:

Be it known that I, ANTON DUPPLER, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented an Improvement in Railway-Brakes, of which the following is a specification.

The object of my invention is to provide for the application upon a car or series of cars of a manually-operated braking mechanism arranged to coöperate with an electrically-operated braking mechanism in the following way—that is to say, a movement of the common handle for controlling both systems applies a moderate braking effort through the hand-operated mechanism, and a further movement of such handle increases the braking effort thus applied by the hand-operated mechanism and first cuts into operative circuit a series of electromagnets and then increases the potential of the current supplied to the terminals of the energizing-coils of such electrically-operated mechanism. It is of course immaterial whether the effort applied by both mechanisms be exerted upon the same or upon different braking-shoes, and while in the accompanying drawings I have shown both systems as applied to a common set of braking-shoes I do not, however, limit myself to that arrangement. I have found that in the use of a series of magnets with their armatures normally spaced at unequal distances from such magnets and operating in such a way that such armatures contact with their magnets *seriatim* in the application of the braking effort the use of a mechanical pawl for holding the brakes at any point to which they have been applied may be dispensed with, as the very nearly closed magnetic circuit between the armature and its magnet last to come in contact tends to maintain such brakes at the point to which they have been thus applied, the great effort which is required to rupture the nearly-closed magnetic circuit operating to maintain such brakes at that point in their application where the last armature has contacted with its magnet. I have also found it desirable in arranging such armatures and their magnets to so assemble them and connect them to a common support and to a common actuating device that any one of such armatures or any one of such magnets may be removed from the system without disturbing any of the remaining armatures or magnets or their operative connections. By this arrangement inoperative or defective parts may be readily replaced without disturbing the other operative features of the mechanism.

The accompanying drawings, illustrating my invention, are as follows:

Figure 1 is a side view, and Fig. 2 a plan view, of a portion of a car with my braking system applied to a single pair of wheels on such car. In each of such figures only such parts are shown as are necessary to indicate in diagrammatic relation the essential features of my invention. Figs. 3 and 4 are respectively horizontal and vertical longitudinal sections through the axis of the system of magnets which I make use of in the electrically-operated mechanism as viewed from the top and side of the car, while Fig. 5 is a vertical transverse section taken along the line $x\,y$ of Fig. 3.

Similar letters refer to similar parts throughout the several views.

Referring to the drawings, A represents the platform of a car, from which there may be suspended in any suitable way the case C, containing the electrically-operated mechanism consisting in a series of magnets and armatures.

W W are the wheels of the car, to which the brake-shoes are applied in the manner yet to be explained for producing the braking effort. These brake-shoes f are secured to a brake-beam a^8, which may receive any suitable support of the character found in brakes generally. From a point near the center of this brake-beam a^8 and pivoted thereto there extends a connecting-link a^7, which in turn is pivotally connected with the lever a^6. This lever a^6 is pivotally supported at t' from the under side of the car by means of any suitable mechanism, so as to swing in a practically horizontal plane. From this lever a^6 there extends a rod a, pivotally connected therewith and connected at its right-

hand end to a chain c, arranged in the usual way to be wound upon the lower end of the brake-staff b, which may be rotated by means of the handle h. In case of a failure of the electrically-operated system it is desirable to provide this brake-staff b with a ratchet-wheel w, rigidly connected thereto, and a suitable pawl p, coöperating with such ratchet-wheel w in the well-known way. Upon this brake-staff b there is also rigidly secured a gear g, engaging a rack g' on the bar a'. A notch l' is seen in the left-hand end of this bar a' to admit of a longitudinal movement of this bar a' over a short space without engaging the bolt l. The construction is such, however, as will at once be understood, that a motion of such bar a' longitudinally in either direction over an extent greater than the length of such slot l' serves to impart motion to the connecting-link a^2, to which this bolt l is secured. This link a^2 is pivotally connected with the lever s, pivoted in turn at t and constituting the operating-switch of a rheostat r. This switch s is normally returned to and held in the position shown in Fig. 1 by means of a spring n.

Any suitable source of electricity may be provided for supplying current to the coils of the electrically-operated mechanism shown in the case C. I have shown in the drawings such a source of electricity as constituting a battery B, the circuit connections being such, as clearly indicated, that a motion of the handle h sufficient to impart to the bar a' a longitudinal motion equal to the length of the notch l' less the diameter of the bolt l serves to operate the switch s, first cutting in the coils contained within the case C in series with all the resistance contained in the rheostat. Such resistance is gradually cut out, as clearly indicated, by the further operation of the handle h in the manner clearly indicated by moving the switch s successively over the contacts of the rheostat r. A rod a^3 is arranged to be actuated by means of the magnets and armatures in the case C in the manner to be explained and is connected with the lever a^4, pivoted at t^2. Pivotally connected to this link a^4 is seen a link a^5 of such a conformation that when the rod a^3 is moved to the right by means of the mechanism in the case C this link a^5 is moved first upward by sliding upon the fixed pin e' and then to the right, all as seen in Fig. 2. As already described, the lever a^6 is moved over to the left on the pivot t' during the first part of the motion of the handle h and before the mechanism in the case C is actuated, which results in the pin e being moved just to the right of the hook formed on the upper surface of the link a^5 before this link a^5 is operated. Thus by means of the normal operation of the link a^5 the lever a^6 is engaged, and as the rod a^3 is moved to the right a braking effort is applied to the wheels of the car through the mechanism already described. The result of this construction, it will at once be seen, is that when the electrically-operated mechanism is not operating it is entirely detached from the braking mechanism of the car, and the amount of motion to be provided for in the electrically-operated mechanism is thereby greatly lessened. Upon the return of the braking mechanisms to their normal positions (indicated in Figs. 1 and 2) the link a^5 is returned to the position shown in Fig. 2 by engaging the fixed pin e^2. (Seen at the left-hand end thereof.)

I will now describe the system of magnets and armatures contained in the case C, reference being had to Figs. 3, 4, and 5. A series of cup-shaped magnets m' m^2 m^3 m^4 are provided with ears extending to the right and to the left from their upper and lower ends. These ears are so formed upon the magnets m' m^2 m^3 m^4, as indicated partially in the case of the magnet in Fig. 5, that such magnets may be first inserted between either of the rods a^{10} and adjacent rod a^{11} and then turned slightly, so that the notches in the ears will engage the rods a^{11}, when the openings in such notches may be closed by means of the plates, as indicated at v^3 in Fig. 5, whereby the magnets m' m^2 m^3 m^4 are securely held upon the rods a^{11}. For securing these magnets m' m^2 m^3 m^4 in any desired position longitudinally upon the rods a^{11} I make use of split clamping-pieces k' k^2 k^3 k^4, arranged by means of screws to be rigidly clamped in the manner indicated to such rods a^{11}. These clamping-pieces k' k^2 k^3 k^4 are arranged to fit nicely between the ears on the magnets m' m^2 m^3 m^4, respectively, whereby such magnets are held in any desired position longitudinally on the rods a^{11}. A similar means for supporting the armatures d' d^2 d^3 d^4 from the rods a^{10} is noted in Fig. 4. It is desirable, however, that these armatures d' d^2 d^3 d^4 shall be capable of longitudinal movement upon the rods a^{10}. For that reason clamping-pieces j' j^2 j^3 j^4 are provided on one side only of the armatures d' d^2 d^3 d^4 in such a way, as clearly indicated also, that while each armature is being operated by its corresponding magnet it forces the rods a^{10} through the openings in the ears on the armature or armatures of the preceding or lower magnet or magnets. Each armature, however, as it is drawn toward its magnet serves to move the rods a^{10} a short distance downward in Figs. 3 and 4 or to the right in Figs. 1 and 2, whereby there is successively applied to the rods a^{10} the motion of each of the armatures d' d^2 d^3 d^4, acting *seriatim*, the maximum movement of the rods a^{10} being that required to bring the armature d^4 from the position indicated in Figs. 3 and 4 into contact with its corresponding magnet. The rods a^{11} are suitable secured to the ends of the case C. Suitably secured upon these rods a^{11} and within the case C are seen two plates i', through which holes are provided for the longitudinal movement of the rods a^{10} in such a way that such rods a^{10} are guided in their longitudinal movement

by these plates i'. These rods a^{10} are connected together at their upper ends by means of a bar i, to which in turn there is rigidly secured, by means of threads and nuts, in the manner indicated in Figs. 3 and 4, the right-hand end of the rod a^3, by means of which the movement of the armatures d' d^2 d^3 d^4 is imparted to the system of levers already described, and finally therethrough to the brake-beam a^8, in the manner already fully described. A rod a^9 leads to the other end of the car for performing the same functions as are performed by the rod a.

In operating my braking mechanism the handle h, as will at once be understood, first applies a braking effort through the chain c, connected to the lower end of the brake-staff b, and the rod a, connected to such chain, and also to the lever a^6, the motion of which in turn by means of the connecting-link a^7 is imparted to the brake-beam a^8. The arrangements and proportions are such that by the time the bar a' has been advanced by means of the coöperation between the gear g and the rack g' on such bar, so that the left-hand end of the notch l' engages the bolt l on the connecting-link a^2, there has been applied to the wheels W a moderate braking effort through the hand-operated mechanism in the manner already described. This braking effort may be sufficient under ordinary circumstances to bring the car to a standstill within the desired time for an ordinary stop. In case of an emergency the motorman will move the handle h still farther, which will result in an increased braking effort being applied through the hand-operated mechanism, and at the same time, as already mentioned, there will be applied a braking effort resulting from the attraction of magnets m' m^2 m^3 m^4 for their armatures d' d^2 d^3 d^4, operated successively, as already described, and that this braking effort applied through the system of magnets and their corresponding armatures is increased directly with the potential of the current supplied to the energizing-coils of such magnets contained within the case C. The potential of such current is increased with the further movement of such handle h in such a way that when the maximum braking effort has been applied by the hand-operated mechanism either the whole or any desired part of the resistance in the rheostat r may be cut out of circuit, so that the maximum safe potential from the source of electricity is then supplied to the coils in the case C. The energizing-coils of the several magnets may be connected together in parallel or series, either one, as desired.

I do not in this application claim the long-pull electromagnet apart from a brake system, as it is already claimed in my application, Serial No. 728,683, filed August 28, 1899, and renewed April 27, 1900, with Serial No. 14,641.

What I claim is—

1. In combination with a manually-applied braking mechanism and a handle or lever for operating the same, an electrically-operated braking mechanism, and means whereby the movement of such handle first applies a moderate braking effort by means of the manually-applied braking mechanism, and then cuts into operative circuit the energizing-coils of the electrically-operated braking mechanism, and means whereby the further movement of such handle or lever increases the braking effort applied from each of such braking mechanisms.

2. In a braking system, a manually-operated braking mechanism and an electrically-operated braking mechanism, both under the control of a single operating-handle, means whereby a movement of such handle applies first a moderate braking effort from the manually-operated mechanism, and means whereby the further movement of such handle increases the braking effort applied by such hand-operated braking mechanism, and also first cuts into operative circuit the energizing-coils of the electrically-operated braking mechanism and then adds to the potential of the current supplied to such energizing-coils, whereby such electrically-operated braking mechanism coöperates addatively with the hand-operated mechanism during that time when the greatest braking effort is applied by means of such hand-operated mechanism.

3. In combination with a hand-operated braking mechanism on a car, a series of magnets and their armatures arranged at increasing distances from their corresponding magnets, and means whereby the efforts exerted between such magnets and their armatures are applied to the brakes on such car, means whereby, as the brakes are moved under the influence of the attraction of such magnets for their armatures, such armatures contact with their corresponding magnets *seriatim* in a way to constitute a magnetic ratchet, whereby there is opposed to the return of the braking mechanism to the zero-point the effort tending to maintain the practically-closed magnetic circuit between such armatures and their corresponding magnets as are in contact, and with their energizing-coils in operative circuit.

4. In a braking system, a series of magnets and their armatures arranged at increasing distances from their corresponding magnets, and means whereby the efforts exerted between such magnets and their armatures are applied to the brakes, means whereby, as the brakes are moved under the influence of the attraction of such magnets for their armatures, such armatures contact with their corresponding magnets *seriatim* in a way to constitute a magnetic ratchet, whereby there is opposed to the return of the braking mechanism to the zero-point the effort tending to maintain the practically-closed magnetic circuit between such armatures and their corresponding magnets as are in contact, and with their energizing-coils in operative circuit.

5. In combination with a braking mechanism a series of magnets, having a common support, and a corresponding series of armatures arranged to contact with their corresponding magnets *seriatim*, means whereby the effort exerted between each armature and its magnet is applied to such braking mechanism, and means whereby each one of such armatures may be removed independently from such braking mechanism.

6. In combination with a braking mechanism a series of magnets, having a common support, and a corresponding series of armatures arranged to contact with their corresponding magnets *seriatim*, means whereby the effort exerted between each armature and its magnet is applied to such braking mechanism, and means whereby each one of such magnets may be removed independently from such common support.

7. In combination with a braking mechanism a series of magnets having a common support, and a corresponding series of armatures arranged to contact with their corresponding magnets *seriatim*, means whereby the effort exerted between each armature and its magnet is applied to such braking mechanism, and means whereby an energizing-coil of each one of such magnets may be removed independently from such common support.

8. In combination with a braking mechanism a series of magnets, having a common support, and a corresponding series of armatures arranged to contact with their corresponding magnets *seriatim*, means whereby the effort exerted between each armature and its magnet is applied to such braking mechanism, means whereby each one of such armatures may be removed independently from such braking mechanism, and means whereby each one of such magnets may be removed independently from such common support.

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