(No Model.) 3 Sheets—Sheet 1.

C. E. PEARSON.

ELECTRICAL BRAKE.

No. 538,275. Patented Apr. 30, 1895.

Fig. 1.

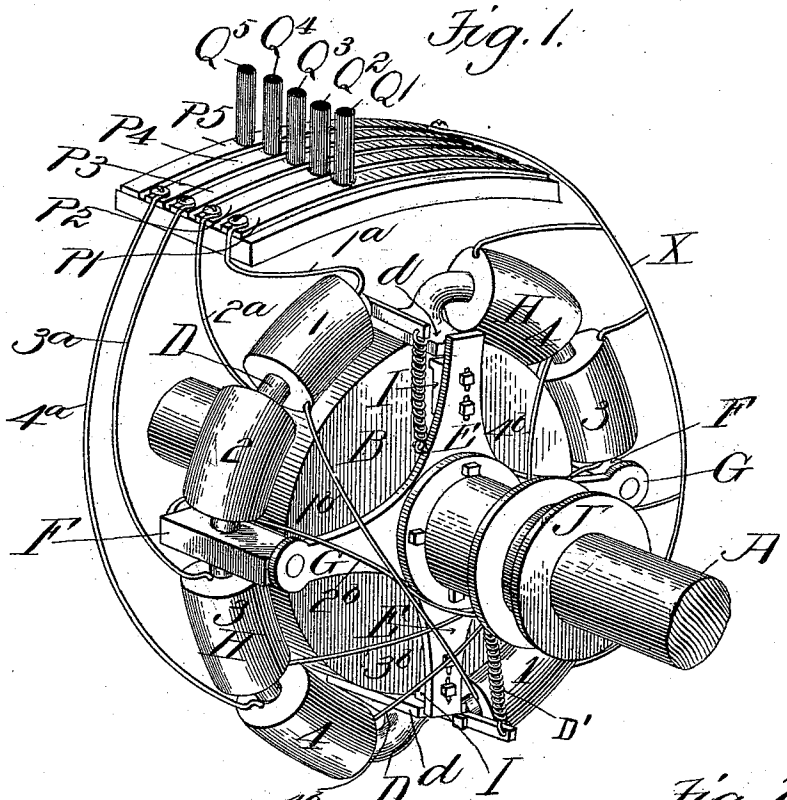


Fig. 6

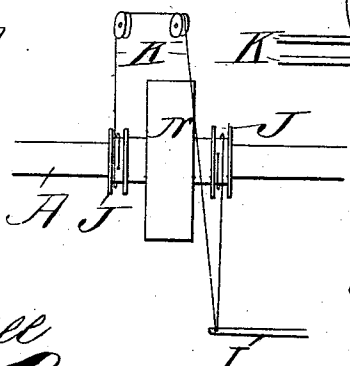


Fig. 7

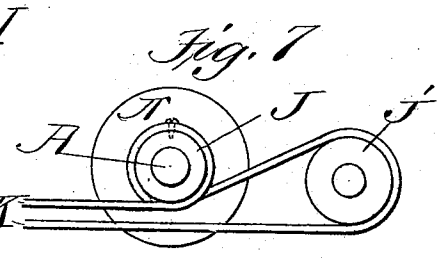
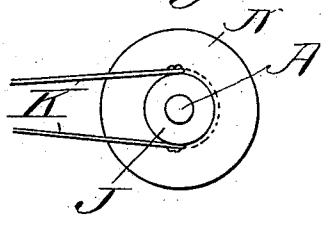


Fig. 8.



Witnesses
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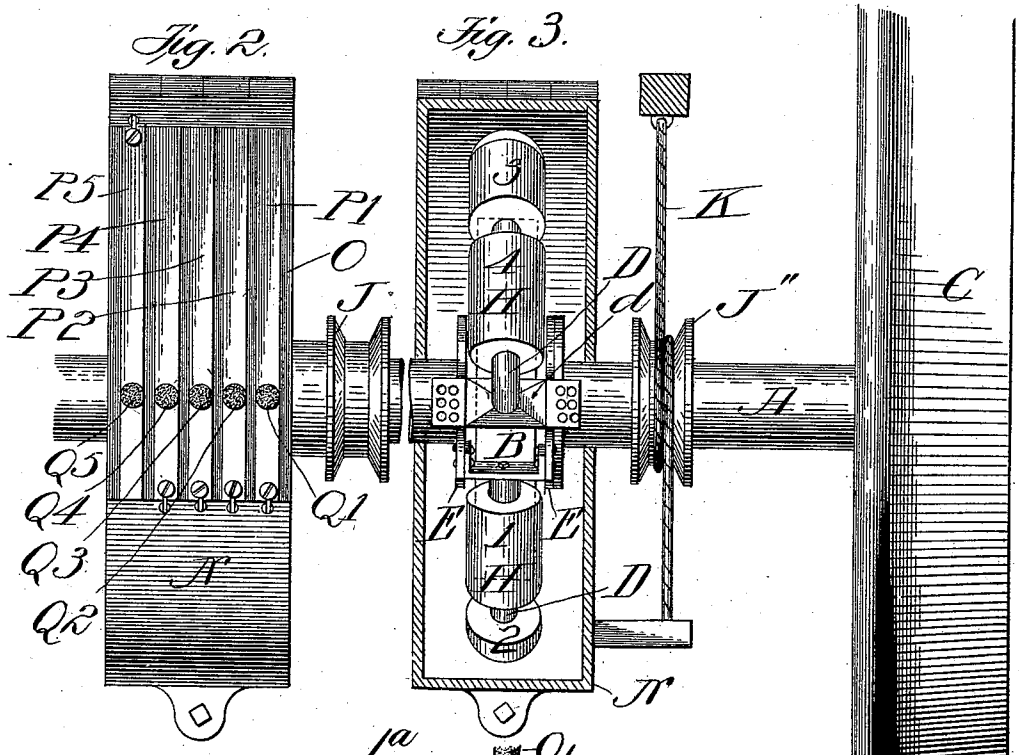
(No Model.)

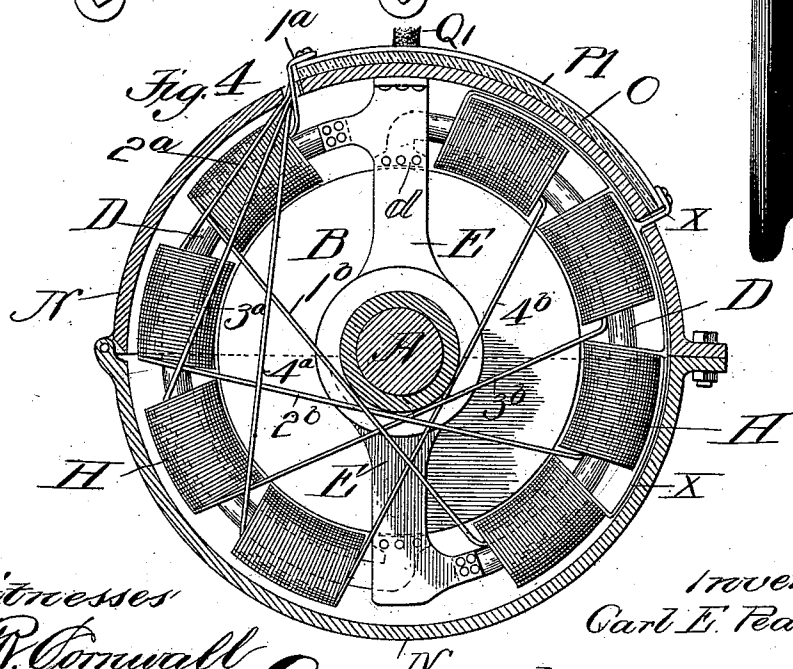
3 Sheets—Sheet 2.

C. E. PEARSON.

ELECTRICAL BRAKE.

No. 538,275. Patented Apr. 30, 1895.





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(No Model.)

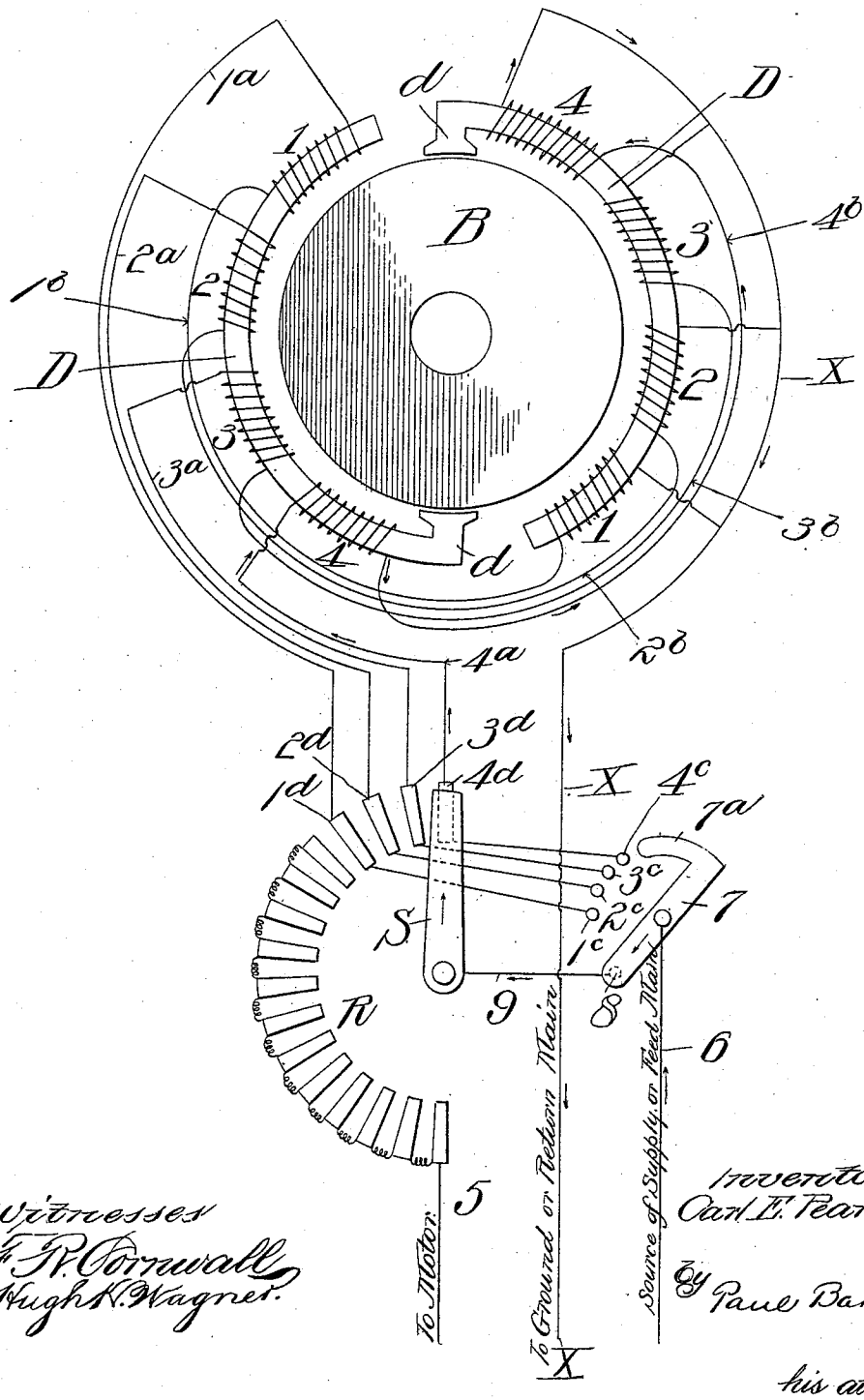
3 Sheets—Sheet 3.

C. E. PEARSON.

ELECTRICAL BRAKE.

No. 538,275. Patented Apr. 30, 1895.

Fig. 5



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UNITED STATES PATENT OFFICE.

CARL E. PEARSON, OF ST. LOUIS, MISSOURI, ASSIGNOR OF TWO-THIRDS TO ERNEST G. BRUCKMAN AND SAMUEL E. BRUCKMAN, OF SAME PLACE.

ELECTRICAL BRAKE.

SPECIFICATION forming part of Letters Patent No. 538,275, dated April 30, 1895.

Application filed April 2, 1894. Serial No. 506,043. (No model.)

To all whom it may concern:

Be it known that I, CARL E. PEARSON, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Electrical Brakes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which like letters and figures of reference denote like parts wherever they occur, and in which—

Figure 1 is a detailed view of my improved brake. Fig. 2 is a top plan-view of the casing which incloses the brake proper, showing the method of making the contact with the electro-magnets. Fig. 3 is a top plan-view of another form of brake, applied to a car-axle, the casing being in section. Fig. 4 is a side elevation of the form shown in Fig. 3. Fig. 5 is a schematic view of the brake and its controlling switches. Fig. 6 is an illustrative view of a means for converting the power to a given direction when the shaft upon which the brake is mounted is revolving in either direction. Fig. 7 is a similar view of another form. Fig. 8 is a similar view of another form.

My invention relates to a new and useful improvement in electro-magnetic brakes, and consists in so locating electro-magnets that when the same are energized, they attract, or are attracted to a moving element, and by this attraction create a resistance, either magnetically, or by friction, which resistance tends to retard the moving element and, at the same time, develop a power which is converted to operate a brake mechanism.

Another feature resides in the conversion to a given direction of pull of the independent braking mechanism from an initial source moving in either direction.

Another feature resides in the peculiar construction of the magnet core and in the location of the electro-magnets thereon, whereby a magnetic force of different intensity is generated at the polar-extension of the core.

Other minor features of invention reside in the peculiar construction, arrangement, and combination of the several parts, all as will hereinafter be described and afterward pointed out in the claims.

In the drawings, A indicates a shaft upon which is mounted so as to revolve therewith a disk B, composed of some magnetic material, which will not become permanently magnetized. Motion is communicated to shaft A, by any suitable means, as by a belt or otherwise, but I have illustrated in Fig. 3 a car-wheel C as the moving power of the shaft. Surrounding the disk B, are cores D, composed of soft iron as is usual, and at one end of said cores are formed polar extensions *d*, which are, preferably, extended beyond the sides of the disk B, so as to engage suitable guides or supports E, which are preferably loosely mounted upon the axle. The cores D are preferably pivoted through the medium of the insulation blocks F, which are strung thereon, in arms G, whereby, when the coils H are energized, the polar extensions of the cores will be attracted to the disk B, the cores moving on their pivots, so that the brake shoes or polar extensions will frictionally contact with the disk, tending to retard its movement. The arms E and G preferably form a spider frame, which is mounted loosely on the shaft A, one being on each side of the disk.

On the arms E, which are in line with the polar extensions or brake shoes, I mount an adjustable stop I, with which the brake-shoes may, if desired, contact on their inner movement, and, in this way, be arrested so as not to form a close connection with the disk B, but retard its movement by being in close proximity thereto, as by a magnetic lag. By the adjustment of the stop I, the proximity of the polar extensions toward or from the disk or moving element may be regulated. The closer the polar extensions are to the disk, the greater will be the retardation of the moving element, and, should the stops I be so adjusted inwardly that the polar extensions will come in contact with periphery of the disk, the retardation of the moving element will be greatly increased, due to the friction of the polar-extensions or brake-shoes thereon.

In order to hold the brake-shoes or polar extensions normally away from the periphery of the disk, I arrange springs D′, at the rear end of the cores which have a tendency to pull said rear end inwardly, the pivot acting as a fulcrum.

In order to communicate the power derived

by the magnetic attraction between the shoes and the disk, I preferably conjoin to the spider frame which supports the parts, a pulley or pulleys J, over which are wound chains or ropes K, the ends of said chains or ropes either being connected to the brake operating lever, only, or to the brake operating lever and to the pulley, as shown in Fig. 6. In this figure, the pulleys are located on each side of the spider frame, and run loosely on the shaft A, the ropes K leading either in opposite directions therefrom, or being connected to opposite sides of the pulley, as shown in Fig. 8. By having two ropes, as in Figs. 6 and 8, when the frame upon which the magnets are mounted is revolved in either direction by the attraction of the magnet core to the moving element, the pulleys J will be likewise revolved, and, by the arrangement of the ropes or chains, which are operated by the pulleys, a brake-lever L will be actuated to operate an independent braking mechanism, said initial lever L being actuated to pull in one direction, notwithstanding the direction of rotation of the shaft A, or the pulleys J.

In Fig. 7, I have shown a continuous rope, co-operating with one pulley, one end of which passes over an idler J′ and back again to the initial brake-lever to effect a pull in a single direction, regardless of the rotation of the primary pulley J.

In Fig. 3, I have illustrated another brake-mechanism, which can be very easily and conveniently operated by an electro-magnetic brake, as above described, which consists in looping the chain K once around the pulley J″, said pulley, in this instance, being attached directly to shaft A, one end of the rope or chain K being connected to the frame surrounding the magnets and disk, and the other end attached to a fixed point. By this construction, when the electro-magnets are caused to revolve by attraction to the moving element, that end of the rope or chain which is attached to said parts will wind the rope or chain on the pulley J, tightening the loop, and, by friction, the rope or chain will retard the rotation of the shaft A. If desired, a similar construction as just set forth can be used on both sides of the brake, so as to retard the rotation of the shaft while it is moving in either direction.

The disk and electro-magnets are preferably inclosed in a casing N, which is preferably divided as shown. Mounted upon this casing, is an insulation piece O, extending somewhat around the same, upon which insulation is attached terminals for the magnets, these terminals being lettered P', P^2, &c. Contacting with these terminals, are suitable brushes or contact points Q', Q^2, &c. This casing N preferably bears a fixed relation to the electro-magnets and their supporting frame, so as to move therewith and not disturb the interior connection of the magnets. When casing N is caused to be partially rotated, by reason of its attachment to the frame carrying the cores D and the pulley wheels J, or the brake operating chain K, shown in Fig. 3, it will be understood that the contact plates P', P^2, &c., are of sufficient length to make contact with their respective brushes Q', Q^2, &c., in all rotary positions the casing would assume, and I have found that this rotary movement, to accomplish this result, may be included within a quarter of a rotation in such a construction as shown in the drawings. If it is desired to increase the amount of rotary movement, the contacts P', P^2, &c., should be made correspondingly longer.

I will now describe the method of energizing the magnets and their connections, whereby two opposite magnets may be energized at the same time, so as to develop a magnetism of equal intensity in the two oppositely-located polar extensions.

Referring to Fig. 5,—1, 2, 3, and 4 indicate the coils surrounding the core D, 1 being farthest from the polar-extension *d*, and 4 being nearest thereto. There are two cores D and four coils on each core, but it will be noted that instead of two cores being employed, three or more can be as advantageously used, each core having as many coils wound thereabout as is desired. I have illustrated a rheostat R, which co-operates with a swinging arm S, to turn the current on to a motor through a wire 5, said current being supplied by a main 6, which passes through a switch 7, contact 8, and wire 9, to switch-arm S. Intermediate contact points 1^d, 2^d, &c., of the in-lead wires 1^a, 2^a, &c., for the coils 1, 2, &c., on one of the cores D, are arranged in the path of the switch-arm S, so that said switch-arm will not only turn the current on to the motor, but will, also, make and break the connection between the source of supply and the several electro-magnetic coils. By the arrangement illustrated, it is possible to cut out the current to the motor entirely after increasing the rheostatic resistance, and cut in coils 1, placed farthest from the polar-extensions of the cores D, which will magnetize them but slightly, and by a continued movement cut in the coils 2, 3, and 4, each in succession developing a greater magnetism in the polar-extensions. The oppositely-placed coils, 1, 2, 3, and 4, are preferably connected in series, respectively, by the wires 1^b, 2^b, &c., the last coil of the series being connected to a common ground or return wire X. The switch-arm 7 is provided with a concentric extension 7^a, which is adapted to make contact with the terminals 4^c, 3^c, &c., of the first of the series of coils, 4, 3, 2, and 1. By the presence of this switch and its interposition in the main line between the source of supply and the swinging arm S, it is possible, in cases of emergency, especially when the arm S is in a position where the rheostatic resistance is the least in the circuit to the motor, to entirely cut out the motor by one member of the switch 7 leaving the contact 8, when the

switch is turned, and cutting in the coils 4, 3, 2, and 1, in succession, as occasion demands, coil 4 being cut in first, and by a continued movement of the switch 7 coil 3 being also cut in, and so on, until all the coils are energized. By this arrangement, the polar extensions are magnetized to a great degree when the switch 7 first makes contact with the terminal 4^c, and as terminals 3^c, 2^c, and 1^c, are successively cut in, terminal 4^c still remaining in contact, will energize all the coils 4, 3, 2 and 1, which will magnetize the polar extensions to their greatest extent.

By preference, I make the switch-arm S of a width sufficient to more than cover the distance between the intermediate contact 1^d, 2^d, &c., to prevent the formation of heavy sparks.

I am aware that many minor changes in the construction, arrangement, and combination of the several parts of my device can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

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

1. In an electro-magnetic brake, the combination with a moving element, of a core provided with a polar-extension, coils on the core at different points from said polar-extension, means for cutting-in the coil farthest from the polar-extension, and each coil thereafter in succession, substantially as described.

2. In an electro-magnetic brake, the combination with a moving element, of a core provided with a polar-extension, coils on said core, each of which magnetizes the polar-extension to different degrees, means for energizing the coils separately and in succession to magnetize the polar-extension to a lesser degree, at first, and increasing the intensity as the coils are successively cut in, and means for cutting-in the current to all of the coils at once, substantially as described.

3. In an electro-magnetic brake, the combination with a disk rigidly mounted on a shaft, of a spider-frame loosely mounted on the shaft, magnet cores pivoted on the spider-frame, polar extensions carried by the magnet cores, coils on the cores, and means for energizing the coils so as to magnetize the polar-extensions thereof, so that said polar extensions will be attracted to the revolving disk, substantially as described.

4. In an electro-magnetic brake, the combination with a revolving shaft, of a disk which is adapted to revolve therewith, cores pivoted in a frame loosely mounted on the shaft and provided with brake-shoes forming polar-extensions, and coils on the cores for magnetizing the brake-shoes, substantially as described.

5. In an electro-magnetic brake, the combination with a revolving shaft, of a disk which is adapted to revolve therewith, a spider-frame loosely mounted on the shaft, electro-magnets disposed around the disk, the cores of which are formed into brake-shoes, an adjustable stop on the spider-frame to limit the inward movement of the brake-shoes or polar-extensions, insulation-blocks in which said electro-magnets are pivoted, and springs for returning the brake-shoes from the disk, substantially as described.

6. In an electro-magnetic brake, the combination with a moving element, and electro-magnets, the cores of which form brake-shoes to co-operate with the moving element when the electro-magnets are energized, of a casing for surrounding said parts and adapted to move therewith, said casing having mounted thereon suitable terminal plates for the several magnets, substantially as described.

In testimony whereof I hereunto affix my signature, in presence of two witnesses, this 22d day of March, 1894.

CARL E. PEARSON.

Witnesses:
F. R. CORNWALL,
HUGH K. WAGNER.