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J. T. WILLIAMS.

ELECTRO MAGNETIC TRANSMITTER.

No. 405,194. Patented June 11, 1889.

Fig. 1.

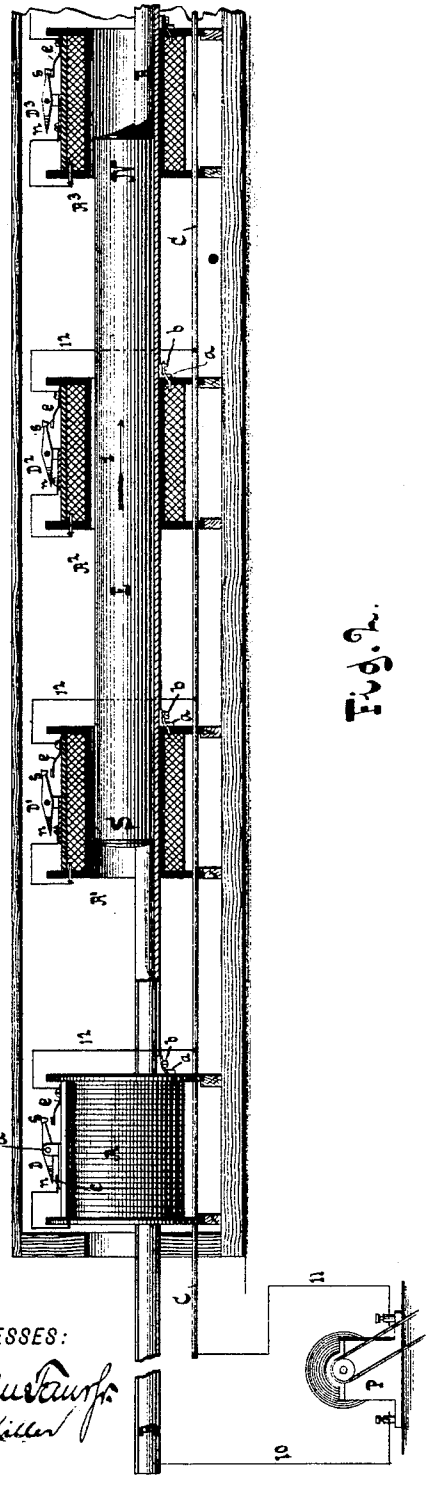
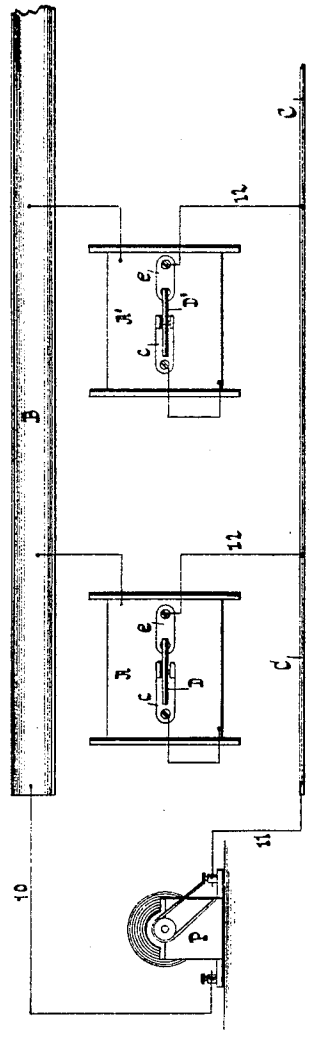


Fig. 2.



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J. T. WILLIAMS.

ELECTRO MAGNETIC TRANSMITTER.

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Fig. 3.

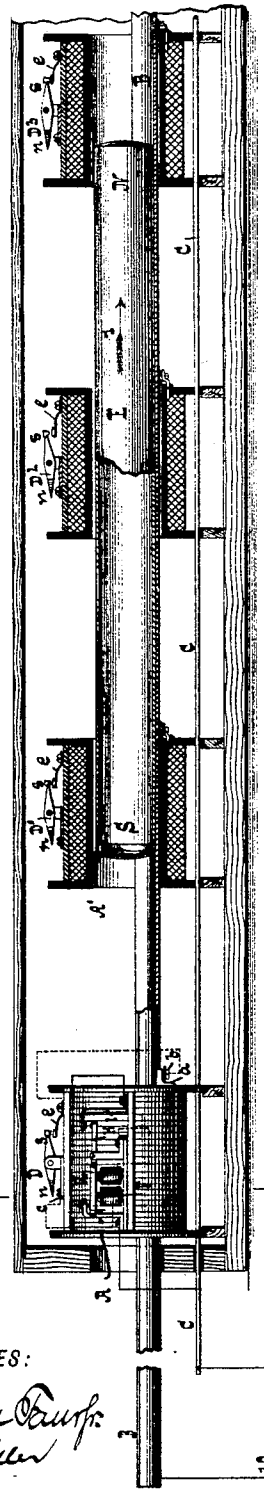


Fig. 5.

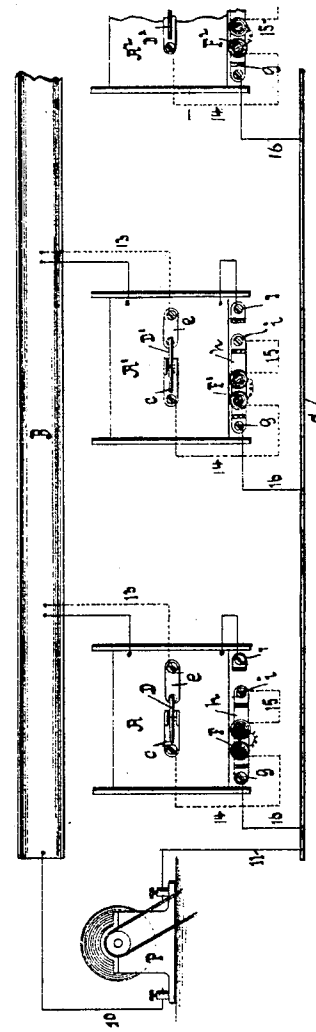
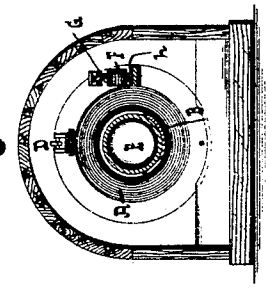


Fig. 4.



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ELECTRO MAGNETIC TRANSMITTER.

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Fig. 6.

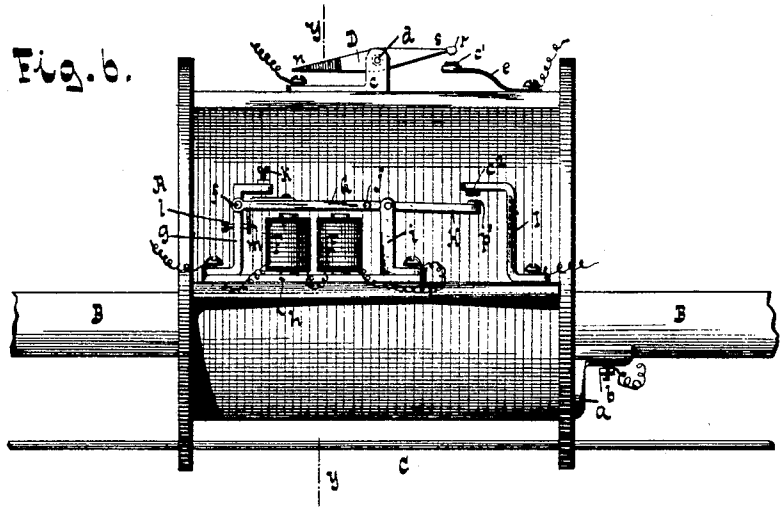


Fig. 7.

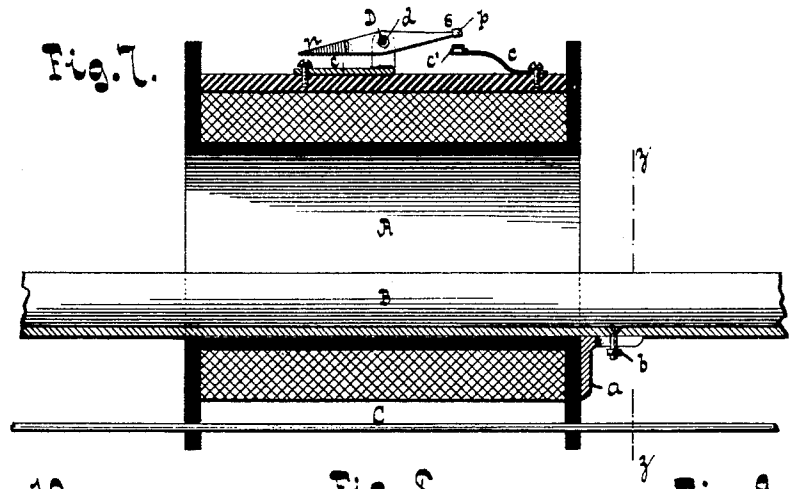


Fig. 10.

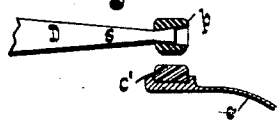


Fig. 8.

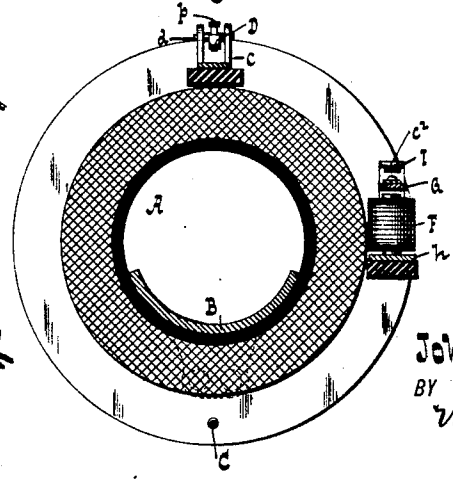
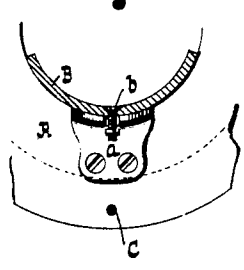


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN T. WILLIAMS, OF MOUNT VERNON, ASSIGNOR TO THE INTERNATIONAL PORTELECTRIC COMPANY, OF NEW YORK, N. Y.

ELECTRO-MAGNETIC TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 405,194, dated June 11, 1889.

Application filed December 27, 1888. Serial No. 294,761. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. WILLIAMS, a citizen of the United States, residing at Mount Vernon, State of New York, have invented new and useful Improvements in Electro-Magnetic Transmitters, (Portelectric,) of which the following is a specification.

This invention relates to electro-magnetic transmitters or portelectrics; and it consists in a series of helices arranged in line with each other, a track extending through said helices for the support and guidance of the carriage, and a magnet arranged lengthwise upon each helix and adapted to be actuated by the magnetic influence of the carriage to close the electric circuit through the helices, and subsequently to break said circuit. In connection with this circuit-closing device I make use of a supplementary circuit-closer and a shunt-current of a comparatively high resistance for vitalizing an electro-magnet that actuates the latter circuit-closer, whereby a prompt closing and breaking of the main circuit through the helix is accomplished, all of which is more fully pointed out in the following specification and claims and illustrated in the accompanying drawings, in which—

Figure 1 represents a sectional side elevation of an apparatus constructed and operated without the use of a supplementary circuit-closer and a shunt-current. Fig. 2 is a diagram showing the electrical connections of Fig. 1, the track being placed at the side of the helices to be able to more clearly show said connections. Fig. 3 is a sectional side elevation of an apparatus constructed with a supplementary circuit-clearer and a shunt-circuit. Fig. 4 is a transverse section in the plane *x x*, Fig. 3. Fig. 5 is a diagram which shows the electrical connections of Fig. 3, the track being placed to one side of the helices to more clearly show said connections. Fig. 6 is a side view, on a larger scale than the preceding figures, of one of the helices illustrated in Fig. 3. Fig. 7 is a longitudinal central section of the same. Fig. 8 is a transverse section in the plane *y y*, Fig. 6. Fig. 9 is a section in the plane *z z*, Fig. 7. Fig. 10 is a sectional side elevation of a portion of the magnet and its contact-piece.

Similar letters indicate corresponding parts.

In the drawings, referring at present to Fig. 1, the letters A A′ A^2 A^3 designate helices, which are wound upon spools of wood or other non-conductor of electricity.

B is a track, which extends through the several helices, and is made of brass or any other suitable non-magnetic substance. The helices are firmly mounted at intervals apart upon a suitable bed, and the track is secured to each helix by a bracket *a*, which is affixed to the flange of the helix and to the track. (See Figs. 7 and 9.) Said bracket is provided with a slot, through which extends the bolt securing it to the trough. The arrangement of the helices apart from each other enables me to construct my apparatus in curved as well as in straight lines. It also lessens the cost of construction, and furthermore allows the carriage to move freely on its track without material resistance from the air, as the air can freely escape between the helices. The track B has one end of each helix attached thereto in any suitable manner. In the example shown in the drawings, Figs. 1, 5, and 7, I have shown each of the said ends affixed to the track by the screw *b*, which attaches the track to the bracket *a*. However, it could be brazed or soldered or otherwise metallically connected thereto. The other end of each helix is connected, respectively, to a metallic base-piece *c*, Fig. 1, to be hereinafter more fully described.

Through the flanges of the spools containing thereon the helices A A′, &c., extends an electric conductor C, which is insulated from the track B and the helices. The end of this conductor is connected by a wire 11 with one pole of a dynamo P, or other source or generator of electricity, and the end of the track B is connected by a wire 10 with the opposite pole of the said dynamo.

On each of the helices A A′, &c., is mounted a magnet D D′, &c., which extends in the direction of the length of the helix, and can swing freely about a pivot *d*, arranged in the metallic base *c*, previously referred to, which is supported on a non-conducting cross-bar or base secured to the helix. In the example shown in the drawings (especially in Figs. 6 and 7) the magnet is in the form usually

given to magnetic needles; but it may be made in the form of a simple rectilinear bar.

In proximity to the extremity of one arm of the magnet D—for instance, that marked *s* in the drawings—is located a contact-piece *e*. This contact-piece may consist of a spring-arm secured to the cross-bar or to the flange of the helix.

The magnet D can be perfectly balanced, so as to lie in a horizontal position, to which latter it will return whenever disturbed; but in order to insure a more prompt and quick action of the magnet I weight the opposite arm *n* of the magnet, or make it of sufficient length to overbalance the arm *s*, so that the magnet is in an inclined position and the arm *s* is normally out of contact with the contact-piece *e*. The same effect can be produced by subjecting one arm of the magnet to the action of a spring. The base *c* of the magnet D is connected with one end of the helix, the opposite end of said helix being connected to the track, as previously described, and the contact *e* is connected by a wire 12 with the electric conductor C, whereby a current is established through the respective helix to vitalize the same whenever the magnet D closes the circuit at the contact *e*.

The carriage E, Figs. 1 and 3, which is moved on the track B by the attraction of the helices A A′, &c., is in this example cylindrical in form and is permanently magnetic, it being made of hard steel for this purpose. The opposite poles of this carriage are marked N and S, respectively, and it is intended in this example to move in the direction of arrow 1, (marked thereon in Fig. 1.) When the end of the carriage enters one of the helices—say helix A—it acts upon the corresponding magnet, thereby causing the said magnet to turn about its pivot and to close the circuit at the contact-piece *e*. A circuit is thus closed through wire 11, conductor C, wire 12, contact-piece *e*, magnet D, helix A, track B, and wire 10 back to the dynamo. The corresponding helix is vitalized, and by the axial magnetism the carriage E is drawn forward and into the helix. When the carriage is about centrally within the helix, the magnetic induction on the magnet D causes it to turn about its pivot to break the circuit at the contact-piece *e*. When the carriage reaches the next succeeding helix A′, the same action is repeated and a fresh impetus is imparted to the carriage, and so on by every helix which the carriage reaches.

By having the magnet D arranged lengthwise with the helix the carriage can influence it to turn about its pivot very readily, as there is no lateral strain upon the circuit-making magnet, as the case would be if the magnets were located at right angles to the axis of the helix, and the polarization is maintained at a high point by its frequent subjection to the inductive influence of the helix and carriage, thus avoiding the liability of depolarization.

By having the said magnet in a state of unstable equilibrium the circuit through the helix, if not too powerful, is broken at least as soon, as both poles of the carriage are acting upon both poles of the magnet with about equal force, as shown in Fig. 1, (position of carriage as to helix A².) In the use of contacts both of which are metallic it frequently occurs that the heavy currents passing or the spark resulting from the make and break of such circuit fuses the said contacts and they adhere to each other. This I propose to prevent by making one of such contacts of a metal which will not readily fuse or oxidize—such, for instance, as platinum—and the opposite contact of an infusible mass—such as carbon, preferably such as is usually termed "retort carbon."

In the example shown in the drawings I make the contact *p* of the magnet D, Fig. 10, of platinum and the contact *c′* of the contact-piece *e* of carbon. The carbon may be fitted into a suitable socket in the contact-piece *e*, and it is firmly united to the said contact-piece by coating its under surface with a hard solder or metal and then brazing it to the same, or by clamping it in a split socket. It is evident that the contact *p* could be made of carbon and the contact *c′* of metal, or both of carbon.

In Figs. 3 to 8 I have illustrated an apparatus in which is used a supplementary circuit-closer that is actuated by an electro-magnet that is vitalized by a shunt-current. In the operation of this supplementary device the circuit is closed through the shunt by the magnet D, whereby the electro-magnet is caused to close the circuit through the helix.

Referring at present to Figs. 6 and 8, the letter F designates an electro-magnet, which can be conveniently placed on one side of the helix. The armature-lever G thereof is connected with and actuates a contact-piece H, that is arranged opposite a contact-piece I, so that when the electro-magnet is vitalized the armature is moved to cause the contacts to meet. The shunt is made of such a resistance that but a comparatively small portion of the current will pass through the same when the circuits through the helix and the shunt are both closed.

In the example shown in the drawings I have pivoted the armature G at *f* to a post *g*, secured to a metallic binding-plate *h*, that is supported by a suitable cross-bar secured to the flange of the helix D. A second post *i*, secured to the binding-plate, forms a fulcrum for the contact-piece H, one end of which is connected at *j* with the armature G. The longer arm of the contact-piece H carries the contact-point and the shorter arm is connected to the armature G, so that the contact-point will move rapidly on its passage back and forth.

A screw *k* in the post *g* can be used to regulate the movement of the armature, and a screw *l*, bearing against a flat spring *m* on the

armature, can be used to regulate the tension. Referring to Fig. 5, the electrical connections of each helix A A′, &c., are made as follows: One end of the helix A is connected with the trough, and the opposite end is connected with the contact-piece I. The trough B has an additional connection with the contact-piece *e* of the magnet D by a wire 13. A wire 14 connects the base-piece *c* of the magnet D with the bobbins of the electro-magnet F, the opposite end of said bobbins being connected by wire 15 with the post *i*. The trough B and the conductor C are connected by the wires 10 and 11, respectively, with the dynamo P, as before, and the conductor C is also connected by a wire 16 with the post *g*. When the carriage E enters the helix, the magnet D is deflected to close the circuit at the contact-piece *e*. The course of the current from the dynamo P, first to vitalize the shunt-current, is as follows: wire 10 to the track B, through wire 13 to contact-piece *e*, magnet D, base-piece *c*, wire 14, the bobbins of electro-magnet F, wire 15 to the post *i*, frame-work of magnet F, wire 16 to the conductor C, and wire 11 back to the dynamo. The current passing through the bobbins of the electro-magnet F vitalizes the same, and the armature G thereof is attracted, thereby establishing a second circuit through the medium of the contact-pieces H and I, as follows: from the dynamo P, wire 10, track B, through the helix A, contact-piece I, frame-work of magnet F, wire 16, conductor C, and wire 11 back to the dynamo P, whereby the helix A is vitalized and the carriage is moved. When the carriage acts so as to cause the magnet D to take up a position in a horizontal plane, the contact is broken at the contact-piece *e*, which is immediately followed by the prompt breaking of the circuit at the contacts H and I.

In dealing with powerful currents of electricity there is a necessity for having a quick and powerful make-and-break contact, for, if the circuit is not broken promptly when the carriage is in a central position with the helix A or a trifle before it is in this position, the said helix exerts a retarding force upon the carriage.

By the use of the supplementary circuit-closer and the shunt-circuit it will be readily seen that the main current will necessarily be promptly closed or broken, as the case may be, since the action of the electro-magnet is powerful enough to overcome any resistance at the contacts H and I in closing the circuit, and the spring *m*, which returns the armature G, can be made strong enough to insure a prompt action. The contacts of the contact-pieces H and I are constructed similar to those of the magnet D and contact *e* and for a similar purpose. For feeble currents the couple of the magnet D is sufficient, as before described, to separate the contacts.

If the carriage is to contain the articles to be transported, it is made hollow and of a size suitable for the purpose for which it is designed, and one head thereof must be made removable to permit the insertion of said articles, but when used for pushing any articles or things before it or for hauling them after it, it may be made solid, or, if made hollow, may be permanently closed, and it can be provided with suitable means whereby such articles or things to be moved or propelled by it along the track can be attached thereto.

The track B can be made circular or of any other desired cross-section, its construction being such that the carriage will be safely guided thereby.

It is obvious that when a supplementary circuit-closer is used the primary circuit-closer, instead of being magnetic and actuated by the magnetic influence of the carriage, may be non-magnetic and caused to close the circuit by any known mechanical means.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a helix, a magnet arranged lengthwise with said helix and constructed to close the circuit through said helix, and a magnetic carriage constructed to pass through said helix and to actuate said magnet, substantially as shown and described.

2. The combination of a helix, a pivoted magnet arranged lengthwise with said helix and having one of its arms weighted, and a magnetic carriage constructed to pass through said helix and to actuate said magnet to close the circuit, substantially as shown and described.

3. The combination, with a series of helices and a track, of a carriage, a circuit-closer for each helix, a supplementary circuit-closer, and a shunt-circuit, in connection with the primary circuit-closer, operating the supplementary circuit-closer, substantially as shown and described.

4. The combination, with a series of helices and a track, of a carriage, a magnetic circuit-closer for each helix actuated by the magnetic influence of the carriage, and a supplementary circuit-closer containing an electro-magnet which is vitalized by the closing of the shunt-circuit, substantially as shown and described.

5. The combination, with a series of helices and a track, of a magnetic carriage, pivoted magnets arranged lengthwise with the helices and actuated by the carriage to close the circuit, an electro-magnet, a supplementary circuit-closer, and a shunt-circuit passing through the bobbins of the electro-magnet, substantially as shown and described.

6. The combination, with the helices and the track, of contact-pieces *e*, having the carbon contacts *e′*, and the swinging magnets D, having contacts *p*, of metal—such as platinum—to make and break the circuit, substantially as described.

7. The combination, with the helices and a track, of a primary circuit-closer, a shunt-circuit, and a secondary or supplemental cir-

cuit-closer for the helices, substantially as described.

8. The combination, with a helix and a track extending through the same, of a bracket having one part attached to the end of the helix and another part attached to the track, substantially as described.

9. The combination, with a helix and a track extending through said helix, of a bracket attached to the helix and having a slotted portion for the passage of a bolt into the track, substantially as described.

10. The combination, with a helix and a track extending through said helix, of a fastening device for attaching the track to the helix, said device being provided with means for attaching a wire from the helix thereto, substantially as described.

11. The combination, with the helix, the stationary contact I, an electro-magnet, and its armature, of the lever H, having its longer arm provided with a contact and its shorter arm connected with the armature, substantially as described.

In testimony whereof I have hereunto set my hand and seal in the presence of two subscribing witnesses.

JOHN T. WILLIAMS. [L. S.]

Witnesses:
WILLIAM C. HAUFF,
W. HAUFF.