(No Model.) 3 Sheets—Sheet 1.

J. T. WILLIAMS.

ELECTRO MAGNETIC TRANSMITTER.

No. 342,666. Patented May 25, 1886.

Fig. 2.

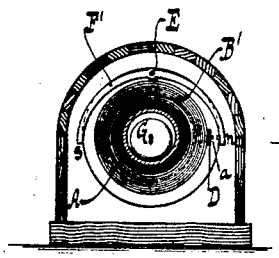

Fig. 1.

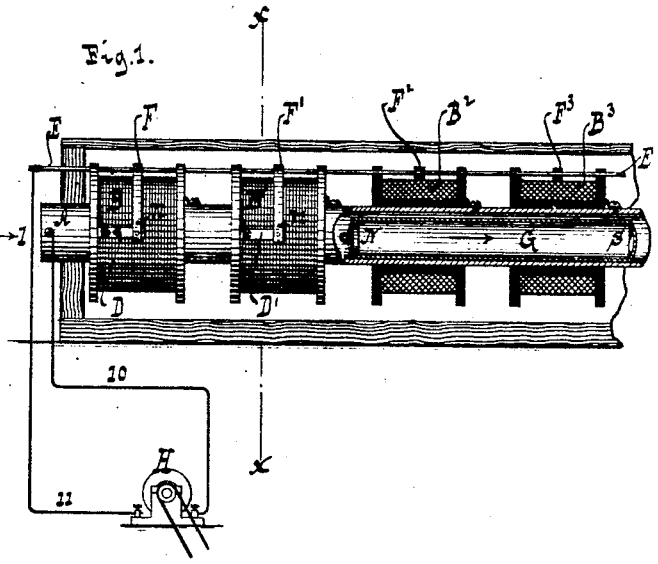

Fig. 3

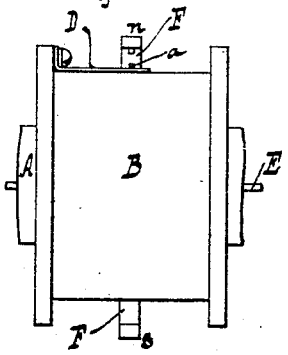

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Fig. 4

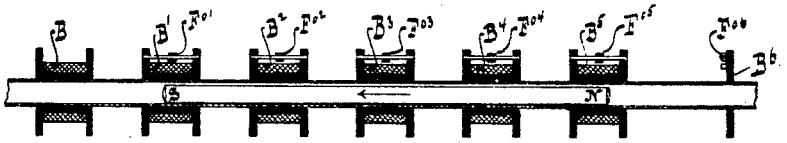


Fig. 5

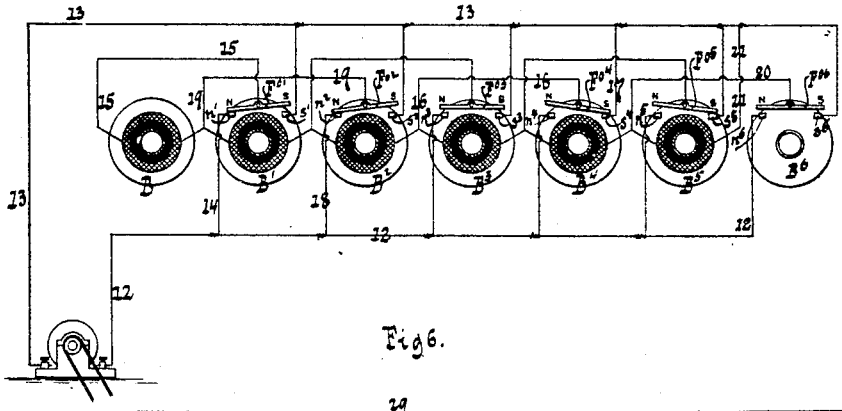
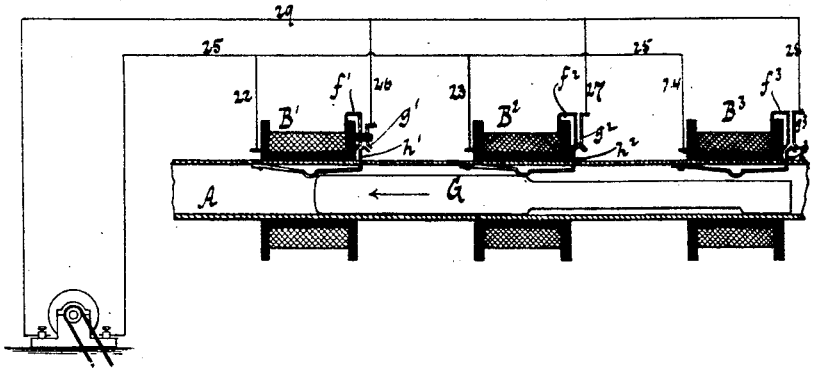


Fig 6.



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ELECTRO MAGNETIC TRANSMITTER.

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Fig. 8

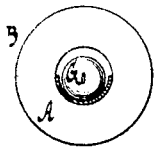


Fig. 7

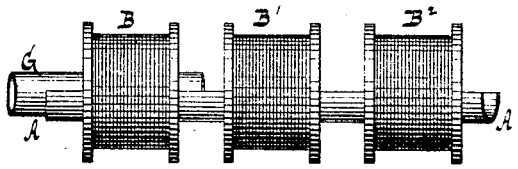


Fig. 10

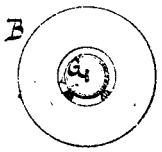
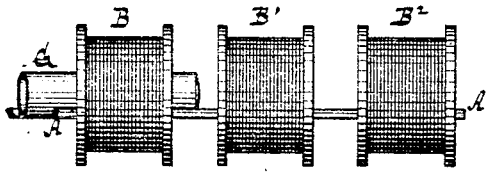


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN T. WILLIAMS, OF MOUNT VERNON, NEW YORK.

ELECTRO-MAGNETIC TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 342,666, dated May 25, 1886.

Application filed April 16, 1885. Serial No. 162,486. (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, in the county of Westchester and State of New York, have invented new and useful Improvements in Electro-Magnetic Transmitters, of which the following is a specification.

This invention relates to electro-magnetic conveyances or transmitters; and it consists in the novel combination of devices hereinafter described and claimed, reference being made to the accompanying drawings, illustrating my invention, in which—

Figure 1 represents a sectional side view. Fig. 2 is a transverse section in the plane $x\,x$, Fig. 1. Fig. 3 is an inverted plan of one of the helices on a larger scale than the previous figures. Fig. 4 is a longitudinal section when the core extends through more than two helices. Fig. 5 is a diagram showing the connections Fig. 4, the several helices being placed in a position parallel to each other, instead of their true position in line with each other, in order to be able to show said connections. Fig. 6 is a sectional view of a modification of the means for introducing the helices successively into an electric circuit. Fig. 7 is an elevation showing the guide through the helices on which the core or carriage travels, made in the form of a trough, and which may be made of any desired cross-section. Fig. 8 is a transverse section of Fig. 7. Fig. 9 shows the guide made in the form of a skeleton track and which may consist of two or more rails. Fig. 10 is a transverse section of Fig. 9.

Similar letters indicate corresponding parts.

In the drawings, the letter A designates a tube of brass or any other suitable non-magnetic substance. Upon this tube are mounted at stated intervals, a greater or less distance from one another, a series of helices, B B' B² B³, wound upon spools of wood, or other non-conductor of electricity.

The arrangement of the helices apart from each other enables me to construct my apparatus in curved as well as straight lines. My arrangement also lessens the cost of construction, as less wire is required than when the helices are in juxtaposition, and by lessening the number of contact-points, which I accomplish by thus arranging the helices apart from each other the expense of maintaining the apparatus is reduced. It furthermore allows the carriage to move freely in its track without material resistance from the air, as the air is free to pass out between the helices.

In the example shown in Figs. 1, 2, and 3 the tube A is made of brass, having one end of the wire from each helix brazed or soldered or otherwise metallically connected thereto, while the other end of each helix is connected respectively to a contact-piece, D D', which has a contact-point, *a*, of platinum attached thereto. (Best seen in Figs. 2 and 3.)

Through the flanges of the spools containing the helices B B' B² B³ extends an electric conductor, E, which is insulated from the tube A and from the helices, and on this conductor are mounted a series of magnets, F F' F² F³, which, in the example shown in Figs. 1, 2, and 3, have the form of horseshoes, and which embrace the helices B B' B² B³, respectively. These magnets are so constructed that they can swing a limited distance upon the conductor in a plane at right angles to the axis of the tube A.

G is the body or carriage, which fits the tube A, and to which motion is to be imparted. In the example shown in the drawings this carriage is made in the form of a permanent magnet; or a carriage of soft iron may be used, as hereinafter described. The opposite poles of this magnetic carriage are marked N and S in Fig. 1, while the opposite poles of the magnets F F' F² F³ are marked *n* and *s*. (See Figs. 2 and 3.) The tube A connects by a wire, 10, with one pole of a generator of electricity—for example, a dynamo-electric machine, H—and the conductor E connects by a wire, 11, with the opposite pole of said dynamo-machine. When the carriage G is introduced into the tube A in the direction of arrow 1, the north pole *n* of magnet F is attracted by the south pole S of said carriage as soon as the same comes approximately opposite to the magnet, and it is brought in contact with the platinum point of the contact-piece D. A circuit is closed through wire 11, conductor E, magnet F, contact-piece D, helix B, tube A, and wire 10 back to the dynamo-machine. The helix B is vitalized, and by the axial magnetism the carriage G is moved forward in the tube A. As soon as the south pole S comes opposite to the north pole *n* of the magnet F', the helix B' is vitalized, and a fresh im-

pulse is imparted to the carriage, and so on by every helix through which the carriage passes. At the same time, whenever the center or neutral point of the carriage passes the north pole of one of the magnets F F' F² F³ the contact previously made between said magnet and the corresponding helix is broken, and the vitalization of this helix stops.

In order to impart to the carriage a continuous motion through the tube A, it is necessary that the length of the carriage and the distance between the several helices shall be so proportioned that the successive helices are vitalized in time to keep up the motion of the carriage; or, in other words, the length of the carriage must at least be equal to the distance between the magnets F F² of the helices B B² in order to insure its start. After starting, the helices may be farther apart; but I prefer the proportions above mentioned, in order that there may be no dead or neutral point in the apparatus; or, in other words, the carriage should be of at least such length that, should the circuit become broken through accident or otherwise, and the core or carriage come to rest, it cannot come to rest at any point but that, when the circuit is again completed, it will be in position to be acted upon by the helices, and will resume its movement. If desired, the carriage can be made of any desired greater length.

In Figs. 4 and 5 I have substituted for the horseshoe-magnets F F' F² F³ the steel-bar magnets F F^{01} F^{02} F^{03} F^{04} F^{05} F^{06}. When the carriage is introduced at B^6, the magnet F^{06} is attracted against contact n^6, Fig. 5, and a circuit is closed through wire 12, contact n^6, magnet F^{06}, wire 20, helix B^5, and wires 21 13 back to the dynamo-machine, the helix B^5 is vitalized and causes the carriage to move in the direction of the arrow marked thereon in Fig. 4. When the carriage has reached the position shown in Fig. 4, the south poles of the magnets F^{05} and F^{04} are attracted against the contacts s^5 and s^4, respectively, Fig. 5, while the north poles of the magnets F^{02} and F^{01} are attracted against their contacts n^2 and n', respectively. A circuit passes from the dynamo-machine through wires 12 and 18, contact n^2, magnet F^{02}, wire 19, helices B' B^2, wire 16, magnet F^{04}, contact s^4, and wires 17 and 13 back to the dynamo-machine, and a small portion of the current also passes from the dynamo-machine through wires 12 and 14 to contact n', thence through magnet F^{01} and wire 15 to the helices B B' B^2, and through wire 16, magnet F^{04}, contact s^4, wires 17 and 13 back to the dynamo-machine, and the carriage keeps moving in the direction of the arrow marked on it in Fig. 4. As the movement of the carriage proceeds, the magnets F^{03} F^{02} F^{01} are successively changed until the carriage finally stops. In this case the tube A can be dispensed with, but the helices B B' B^2 B^3 B^4 B^5 are vitalized and devitalized by the action of the carriage, the same as in the example shown in Figs. 1, 2, and 3.

In Fig. 6 I have shown an example of my apparatus with a carriage of soft iron and with circuit-closers actuated by said carriage.

B' B^2 B^3 are the helices, which are supported upon the tube A in the same manner as in the apparatus shown in Figs. 1, 2, and 3. The helices connect at one end by wires 22 23 24 with a wire, 25, which connects with one pole of the dynamo-machine, while the other ends of said helices connect with contact-pieces f' f^2 f^3. Close to these contact-pieces, but insulated from the same, are contact-pieces g' g^2 g^3, which connect by wires 26 27 28 with a wire, 29, leading to the second pole of the dynamo-machine. In the interior of the tube are spring-tappets h' h^2 h^3, one for each helix, and the free ends of these tappets extend through tube A, and are situated opposite the contact-pieces f' g' f^2 g^2 f^3 g^3, respectively. The carriage G is supposed to move in the direction of the arrow shown on it in Fig. 6. In the position which the carriage occupies in this figure a circuit is closed through wires 25 23, helix B^2, contacts f^2 g^2, (the tappet h^2 being raised,) and wires 27 29, and as the carriage moves on, the tappet h' is raised and the tappet h^2 is released, so that the helix B' is vitalized while the helix B^2 becomes devitalized.

If the apparatus is to be used for transporting purposes, the carriage must be made hollow and of a size suitable for the purpose for which it is designed, so as to be able to contain the articles to be transported; but when used for pushing any article or thing before it or for hauling them after it, it may be solid; or, if made hollow, may be closed, and it may be provided with suitable means for enabling one to attach to it such articles or bodies as are to be moved or propelled by it through or along the tube or track.

The tube A can be made circular or of any other desired cross-section, or a trough or a track may be substituted for the tube, the construction being such that the carriage will be safely guided and kept therein while permitted to move along and through it.

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

1. The combination, with a series of three or more helices placed at suitable distances apart, and with a tube, trough, or track extending through said helices, of a hollow core or carriage which can freely pass through said helices, and a series of circuit-closers, one for each helix, detached from said carriage and their connections with a dynamo-machine or other source of electricity, said circuit-closers being actuated by the passing carriage and serving to close and to break the circuits through the successive helices in the series, substantially as described.

2. The combination, substantially as herein shown and described, with a series of helices placed in line with each other, and with a magnetic core or carriage which can freely pass through all the helices, of a series of circuit-closers actuated by the magnetic influence of

the core or carriage, contacts for said circuit-closers, and the connections of these contacts and of the helices with a dynamo-machine or other source of electricity.

3. The combination, substantially as herein shown and described, of a tube, trough, or track, a series of surrounding helices, a magnetic carriage constructed to move upon the track through the helices, a series of circuit-closers actuated by the magnetic influence of the carriage, and their connections with a dynamo-machine or other source of electricity.

4. The combination, of a metallic tube, trough, or track connected to one pole of a generator of electricity, a series of helices which surround said tube or track, and one end of each of which connects with said tube or track, a series of contacts, one for each helix and connected to the other end thereof, a series of magnetic circuit-closers, one for each helix, and all connected to the second pole of the generator of electricity, and a magnetic carriage constructed to pass through the successive helices, said circuit-closers being operated by the magnetic carriage, substantially as described.

5. The combination, with a series of helices, three or more, provided with a series of circuit-closers, one for each helix, and a tube, trough, or track extending through the helices, of a magnetic core or carriage arranged to pass through said helices in said tube, trough, or track, said circuit-closers being actuated by the magnetic influence of the carriage, substantially as described.

6. The combination of a series of helices, two or more, surrounding a tube, trough, or track, and a magnetizable core or carriage free and detached from the other parts of the apparatus and extending at least from the inside of one helix to the inside of the second succeeding helix, together with circuit-closers for introducing the said helices into an electric circuit, substantially as described.

7. The combination of a helix, a magnet constructed to close the circuit through said helix, and a core or carriage constructed to pass through said helix and to actuate said magnet, 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:
W. HAUFF,
E. F. KASTENHUBER.