(No Model.) 2 Sheets—Sheet 1.

S. DE JAGER.

ELECTRIC SIGNALING.

No. 590,398. Patented Sept. 21, 1897.

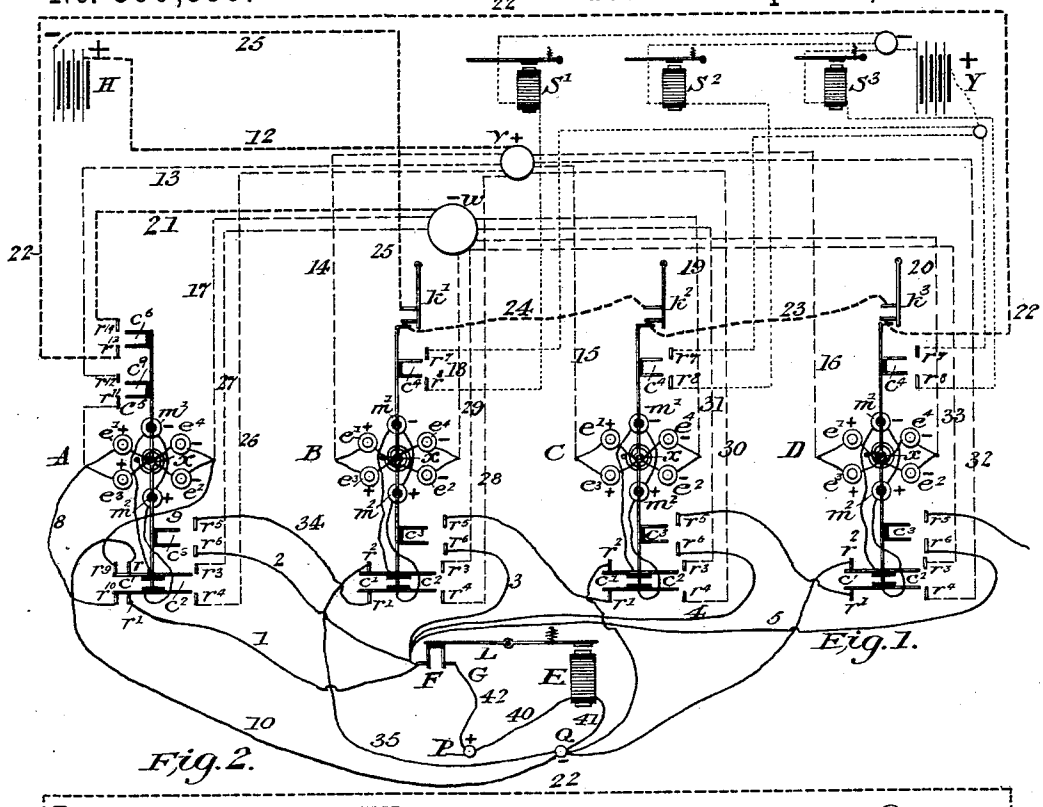
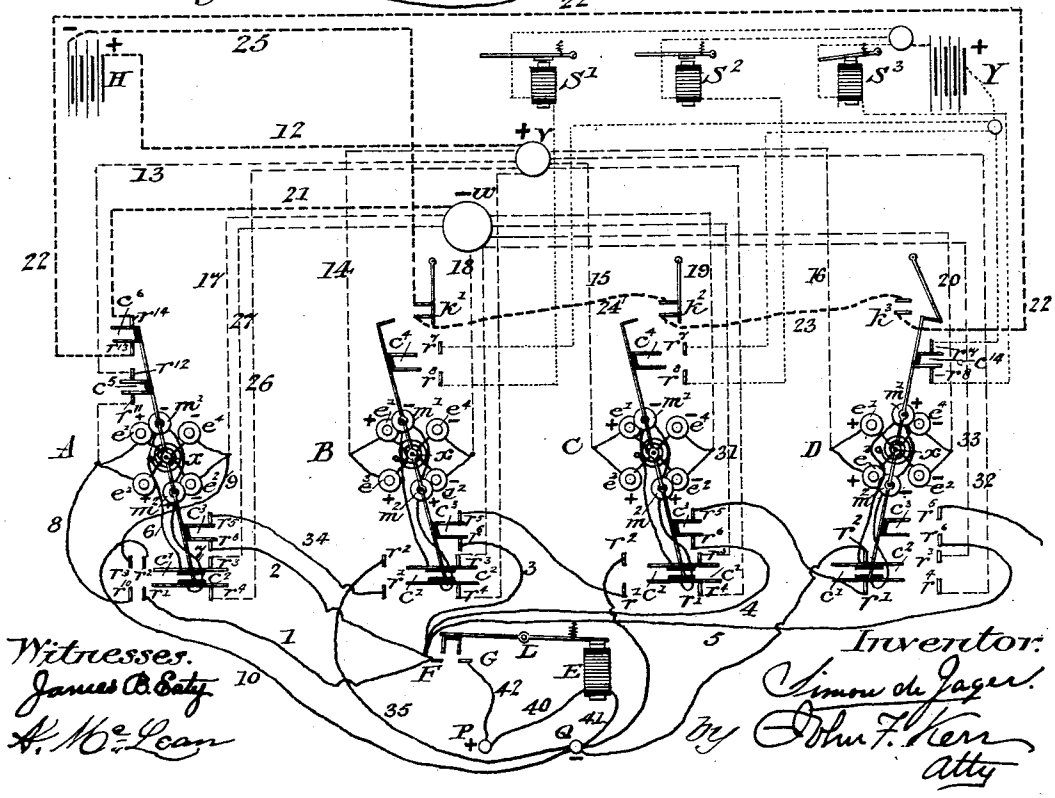


Fig. 1.

Fig. 2.



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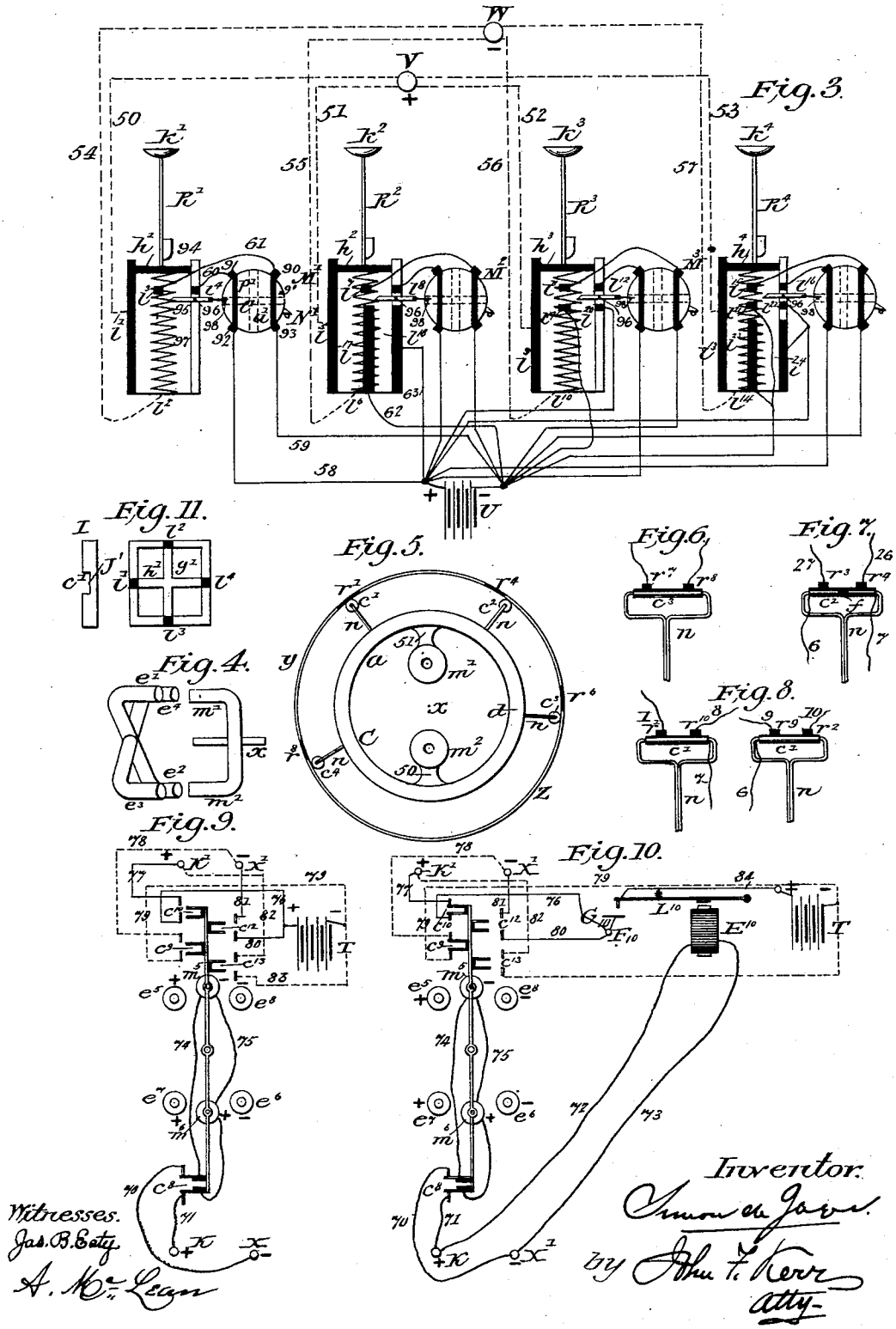

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UNITED STATES PATENT OFFICE.

SIMON DE JAGER, OF PATERSON, NEW JERSEY.

ELECTRIC SIGNALING.

SPECIFICATION forming part of Letters Patent No. 590,393, dated September 21, 1897.

Application filed January 23, 1897. Serial No. 620,501. (No model.)

To all whom it may concern:

Be it known that I, SIMON DE JAGER, a citizen of the United States, residing at Paterson, in the county of Passaic and State of New Jersey, have invented a new and useful Method of and Means for Transmitting Electrical Signals from One Station to Another; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in systems of transmitting electrical signals; and the object of my invention is that if there are a certain number of electrical keys K' K^2 K^3 K^4 at a transmitting-station and a certain number of electrical signals S' S^2 S^3 S^4 at a receiving-station, the transmitting and receiving stations being electrically connected with each other by means of two metallic wires or by one metallic wire and one earth connection at each station, signal S' shall respond to the pressing of key K', signal S^2 shall respond to the pressing of key K^2, &c.

My new system of transmitting signals will be fully understood by reference to the accompanying drawings, in which is illustrated an embodiment of the invention.

In the drawings, Figure 1 is a diagrammatic view of the directien and division of the currents at the receiving-station, with the necessary means and contacts to compel the required signal to respond, the different parts being in rest position. Fig. 2 shows the same arrangement, the different parts being in action. Fig. 3 is a diagrammatic view illustrating the working of the keys, with their necessary attachments, at the transmitting-station. Fig. 4 shows the position of a magnet in side view at the receiving-station. Fig. 5 shows the means by which the contacts are attached to the movable magnets; Figs. 6, 7, and 8 show the different contacts in detail. Figs. 9 and 10 are diagrammatic views of two relays. Fig. 11 shows the way of making contact inside of a key.

In the views, wherein similar reference-characters indicate corresponding parts of the mechanism, let the letters A B C D represent four different groups of magnets at the receiving-station.

e' e^2 e^3 e^4 are stationary electromagnets, and m' m^2 are movable ones. The electromagnet e' e^2 e^3 e^4 consists of two magnets fixed crosswise, as shown in Fig. 4. The wires of the stationary magnets are connected in such a way that when a current goes through them in a certain direction the poles e' and e^3 will be positive and those at e^2 and e^4 negative. If the current reverses, the poles will reverse also. If now a current goes through the wires of the movable electromagnet m' m^2 in such a direction that pole m' is negative and pole m^2 positive, this magnet being movable around an axis x, Figs. 1 and 4, the magnet will turn to the left, and if a current goes through it in opposite direction, by which pole m' will be positive and pole m^2 negative, the movable magnet will turn in opposite direction, (to the right.) A spring working both ways, fixed at the axis x, brings the magnet back to its rest position when the current stops.

Fixed to the movable magnets are several contacts (to be described hereinafter) which are connected with metallic wires fed by an electric battery or other source of electricity in such a way that if from the point P a positive current goes through the electromagnets in group A all the other magnets in B C D are excluded. e' e^2 e^3 e^4 and m' m^2 in group A becoming magnetic, m' m^2 will turn to the left, and as by this motion certain contacts are closed and others are broken (to be described hereinafter) m' m^2 will remain in this position like in A in Fig. 2. If after this a current starts from P for the second time, the current will pass through the group B. m' m^2 will turn here to the left and remain in position as in B in Fig. 2. If a positive current starts for the third time from P, m' m^2 in group C will turn to the left and remain in that position as in C in Fig. 2. In other words, as many times as a positive current starts from P as many magnets m' m^2 will turn to the left. If after a certain number of times a positive current has started from P and an adequate number of magnets have turned to the left a negative current starts from the same point, the next magnet will turn to the right. The positions in Fig. 2

show that a positive current has been through three times and a negative one once. All this is accomplished by a certain number of contacts and wires. The contacts are fixed to the movable magnets in a suitable manner.

Let m' m^2 in Fig. 5 represent one of the movable magnets. A ring a c d is fixed to the magnet at 50 and 51. On the ring are fixed the contacts c' c^2 c^3 c^4 or as many as the case requires. The part n of each contact is directly fixed to the ring and acts as the bearer for the contact proper. The contact proper is a metal roller or trolley (see c^3 in Fig. 6) which is movable around its axis. The ring a d c, with all the contacts on it, will thus move with the movable magnet m' m^2 around the latter's axis x. Outside this ring a d c is another ring y z, fixed stationary. This outside ring is made of insulating matter and in it are fixed small metal strips or rails r^7 r^8 r^3 r^4 in Figs. 6 and 7 or r' r^4 r^6 r^8 in Fig. 5, on which the trolleys run. At the end of the metal rails the insulating matter continues as a rail, so that if the trolley moves the contact is broken; but the trolley cannot jump up and down. To the rails are attached the necessary wires. If thus as shown in Fig. 6 a current goes through the wire of r^7, it will go from this wire to the rail and from there to the trolley, through the trolley to the rail r^8, and to the wire attached there. As soon as the magnet m' m^2 moves a little the trolley will roll from the metal rails to the insulating-rails and the contact is broken. If on the other hand, the magnet being in rest, the trolley rests on the insulating-rails, the current will be closed as soon as the magnet turns and the trolley touches the metal rails. This way of closing and breaking contact is accomplished with very little friction during the motion of the magnet.

Let in Figs. 1 and 2 c' c^2 c^3 c^4 c^5 c^6 represent the trolleys and r' to r^{14} the corresponding rails. Trolleys c' and c^2 are double trolleys. That means that the metal trolley is divided into two metal parts (see Fig. 7) insulated from each other by the insulating part f. Each metal part corresponds separately to a metal rail, and one metal part is electrically connected with one wire and the other with the other wire of the movable magnet (see, also, Figs. 1 and 2) either by pliable wires (6 and 7) or through means of the axis-bearers. If a current goes through wire 26, Fig. 7, it will go from here to rail r^4, to the metal part of trolley c^2, through wire 7 to the electromagnet, back from there through wire 6 to the other part of the trolley, to rail r^3, and to wire 27. At contact c' in Figs. 1 and 2, group A, there are in reality two separate trolleys, though for simplicity's sake it looks in Figs. 1 and 2 as if one trolley runs on four rails. By dividing this trolley in two separate ones each of them will run on two rails, as Fig. 8 shows. If a current goes in by wire I, it will go through r' to the trolley. The current divides here and goes partly to r^{10} and through wire 8 to the magnet e' e^2 e^3 e^4 and partly through wire 7 to the movable magnet m' m^2. From e' e^2 e^3 e^4 the current goes through wire 9 and rail r^{10} to the trolley and the current from m' m^2 through wire 6 to the same trolley. The two parts of the current join here and leave by rail r^2 and wire 10. After describing these contacts it will be easy to explain the working of the system at the receiving-station. For the time being we leave part F G L E out of the description.

Let P and Q be the connection-screws with which the wires of the transmitting-station are connected. Say P receives the positive current. Through G the current goes to F. From F wires 1 2 3 4 5 run, respectively, to groups A B C D. From the contacts to which these wires run only contact c' in group A in Fig. 1 is closed. The current can thus only go through the trolley there. The current will divide here, partly going through wire 7 to m' m^2 and partly through wire 8 to e' e^2 e^3 e^4. From m' m^2 through wire 6 and from e' e^2 e^3 e^4 through wire 9 the two parts of the current will join again in the trolley, and from there it will go through rail r^2 and wire 10 to Q. In this way the current from P Q is completed, and by the magnetizing of the stationary and the movable magnets the movable one m' m^2 in A will turn to the left. By this motion the trolley c' will leave the metallic rails and the contact will be broken here, while the contacts c^2, c^3, c^5, and c^6 will be closed. The contacts are arranged in such a way that c^2, c^5, and c^6 close at the same moment in which c' is opened, while c^3 closes a moment afterward.

Let H be a battery or other source of electricity at the receiving-station. At the moment c' is opened the current from P Q stops in the electromagnets, but by the closing of c^3, c^5, and c^6 the current from H will go through instead and keep m' m^2 in A in the position of m' m^2 in A, Fig. 2. At the same time the current from H will go through all the other stationary magnets (not the movable ones) of B, C, and D, for the current from H will go through wire 12 to the connection-screw V+. From here the current will be divided through wire 13 and contact c^5 to e' e^2 e^3 e^4 in A, through wires 14, 15, and 16, respectively, to e' e^2 e^3 e^4 in B, C, and D, coming back from the stationary magnets, through wires 17, 18, 19, and 20, to the connection-screw w, and from here, through wire 21, contact c^6, wire 22, contact k^3, wire 23, contact k^2, wire 24, contact k', and wire 25, to the negative pole of the battery H. The contacts k', k^2, and k^3 lie in the main wire of H. If any of these contacts is broken, the current of H stops. They are ordinary contacts of any suitable shape. One of them will be opened if a movable magnet turns to the right and touches it. Let there be also wires from the connection-screws v and w to the movable magnets in A, B, C, and D. If contact c^2 is closed, the current from H will go through wire 26, contact c^2, and wire 7 to m' m^2 in A, and back through 6, the other part of contact

c^2, through wire 27, to w. The current from H goes thus through both the stationary and the movable magnets, and will magnetize both and keep the movable one in position. The same arrangement exists in B through wires 28 and 29, in C through wires 30 and 31, and in D through wires 32 and 33. If now, after m' m^2 in A has turned to the left, a second positive impulse comes from P, the current will this time not go to A for the necessary contact c' in A for this action is broken; but contact c^3 in A is closed now and the current from P will go now through wire 2, contact c^3 in A, wire 34, contact c' in B, through the electromagnet m' m^2 in B, and through wire 35 to Q. By the second positive impulse from P the second movable magnet will thus be magnetized, and as the second stationary magnet had been magnetized already before by H the movable magnet in B will turn also to the left. By this motion contact c' in B will be opened and the current from P Q in B will stop; but by the closing of contacts c^2 and c^3 in B to the current from H will go to the movable magnet there and keep m' m^2 in B in position. By every following impulse from P one more magnet will turn to the left and be kept in position. As by the first positive impulse from P the magnet m' m^2 in A will turn to the left and all the other stationary magnets are magnetized, we can call part A the magnetizing part of the system. Fig. 2 shows that there have been three positive impulses from P. The magnetizing part and two other magnets have turned to the left. If now after this a negative current starts from P, the next magnet will turn to the right. What will happen then? Contact c' in D will remain closed and only one other contact will be closed—viz., c^4.

Let the contacts c^4 be arranged in a circuit at the receiving-station, where there is a separate battery or other source of electricity Y, from which wires run to these contacts and to the signals S′, S^2, and S^3 in such a way that on closing contact c^4 in B signal S′, on closing c^4 in C signal S^2, and on closing c^4 in D signal S^3 will respond. It is evident that in turning m' m^2 in B to the right signal S′ will respond, on turning m' m^2 in C signal S^2, and on turning m' m^2 in D signal S^3 will respond; but as soon as one of the magnets m' m^2 turns to the right it will touch one of the contacts k', k^2, or k^3, open one of these contacts, and stop the current from H, and as soon as this current stops all the stationary magnets will lose their magnetism, in consequence whereof all the movable magnets will turn back to their rest position. Therefore when (in Fig. 2) signal S^3 has responded every part of the system at the receiving-station will get back to the condition it was in before the first electrical impulse started from P.

Now we come to the explanation of the part F G L E in Figs. 1 and 2. Let E be an ordinary electromagnet and L be a lever which can move on its axis and which is kept in position by a little spring at the top. At one end of the lever is fixed a contact F and at the other end a piece of soft iron just above the magnet E. This contact might be of any suitable shape, so that it can close and open the connection between F and G. It might be a trolley-contact of the above-mentioned description. Let 42 be the wire that connects P with one side, G, of the contact, while from the other side, F, the wires start which go to the different groups A, B, C, and D. Wires 40 and 41 run, respectively, from P and Q to the electromagnet E. In rest position the contact F G is closed. If a current starts from P Q, the magnet E will attract the piece of soft iron, pull the lever down at that end, and break the contact at F G; but this contact is arranged so that the current from P has a chance to go through it to one of the groups A B, &c., before it is opened. Each time a current starts from P Q this contact F G will thus be opened, and it is totally indifferent how long the current from the transmitting-station lasts. The current at the other side of F G will never last longer than the contact at F G lasts, and this is just long enough to turn m' m^2 and break the contact c'. Without the part F G L E one electrical impulse from P Q, if it only lasted long enough, would turn all the magnets m' m^2.

Herewith is the arrangement at the receiving-station completed. As many more groups B C D can be placed there as desired. Each group merely requires one electrical impulse more from the transmitting-station.

Ordinary magnets of suitable shape can be used instead of the stationary electromagnets or instead of the movable ones. What I mean by "ordinary" magnets is magnets which have a constant magnetism in contradistinction to electromagnets, which acquire and lose their magnetism each time an electrical current acts upon them. My experiments have been made mostly with electromagnets, but I have experimented also with magnetic needles and magnets of horseshoe shape of constant magnetic power. They all work all right in my system and practical demonstrations shall have to decide which will prove to be the better. This somewhat simplifies the arrangement. It is evident that group A is necessary only to magnetize the stationary electromagnets. If ordinary magnets are used instead, group A can be spared with all its contacts and the wires connected with them. Besides these all the wires which run from v and w to the stationary electromagnets of all the other groups can be omitted. After all these are taken away the working of the system is exactly the same as described above.

If movable ordinary magnets of suitable shape are used instead of electromagnets, the stationary electromagnets have to be magnetized each time a current starts from P Q. For

this purpose the wires which go to the contacts of the movable magnets have to be changed to the contacts of the stationary magnets. After this the working is the same as in the case just mentioned.

The arrangement at the transmitting-station has as its object to send out the required number of electrical impulses.

Let $K' K^2 K^3 K^4$ represent a number of keys, Fig. 3. Let $R' R^2 R^3 R^4$ be the rods to which the keys are fixed. Taking only one key to be described, at the lower end of the rod are fixed two metal pieces h' and g'. (See Fig. 11.) These two pieces are fixed crosswise. Each piece has the shape of I in Fig. 11, i being the place where the other piece is fixed in, while here the two pieces are insulated from each other by a layer of insulating matter. These metal pieces run up and down in a shaft of four walls, and each end of each metal piece touches one of the walls of the shaft, Fig. 11. The walls are made of insulating matter and in the walls are fixed the necessary contacts. We can consider these contacts as rails. In fact, if desired, the metal pieces can be replaced by metal trolleys, as described before for the contacts at the receiving-station. In this case two rails are fixed in one wall and two in the other wall of the shaft.

Let in Fig. 3 $l\ l'$ be the rail in the left side wall. This rail is a continuous rail from the top to the bottom of the shaft. There is another continuous rail l^2 in the back wall of the shaft. This rail is not visible in the drawing. In K^2 l^5 and l^6, in K^3 l^9 and l^{10}, and in K^4 l^{13} and l^{14} are similar rails. $l'\ l^5\ l^9\ l^{13}$ are respectively connected with the connecting-screw V by wires 50 51 52 53. The rails $l^2\ l^6\ l^{10}\ l^{14}$ are respectively connected with connection-screw W by wires 54 55 56 57. V and W are connected by wires with the receiving-station. The other two rails—viz., one in the right side wall and one in the front wall—are interrupted rails—viz., partly consisting of metal and partly of insulating matter. These rails have different interruptions in the different keys. In key K' the rails l^3 and l^4 have only a short metal part. If K' is pressed down, the metal pieces h' and g' will glide over the rails, and at the moment l^3 and l^4 are touched contact will be made between l' and l^4 and between l^3 and l^2.

Let U be an electrical battery or other source of electricity at the transmitting-station, and $M' M^2 M^3 M^4$ commutators placed in the circuit of U, so that there is a commutator between the battery and each key. In describing only one commutator, M', let it be made of insulating matter in the shape of a disk, and let it contain four metal strips, all insulated one from another. Two of these metal strips p' and q' run parallel. The other two t' and u', (indicated by dotted lines in the drawings,) run crosswise. At the edge of the disk are fixed four stationary contacts 90, 91, 92, and 93. The disk is movable around its axis and kept in position by a spring inside and a projection at N' leaning against a support. The battery U is connected by wires 58 and 59, respectively, with contacts 92 and 93. Contacts 91 and 90 are respectively connected by wires 60 and 61 with rails l^4 and l^3. In rest position of the disk the positive current of U will go through 58 92 p' 91 60 to l^4, and at the moment h' touches this contact the current will go through it to l' and wire 50 to V. In the same way there is electrical connection between the negative pole of U and the connection-screw W through the strip q' of the disk. By turning the disk to the left the crosswise metal strips will touch the contacts and the positive current through 58 will now go from 92 to 90 and from there to W, while the negative connection from U will now be from 93 to 91 and so to V.

Let 94 represent a catch fixed to the rod R' and 95 a little lever going through the wall of the shaft and turnable on its axis 96. One end of the lever reaches inside the shaft; the other end rests on a little projection 98 of the disk. If the key is pressed down, catch 94 will engage the lever and lift the other end from the projection of the disk without any further action; but if the key goes up again by the action of the spring fixed below it the catch will engage the lever again and this time the other end of the lever will press down the projection 98 of the disk and turn the disk to the left. If the crosswise metal pieces pass over the contacts again, (when the rod R' goes upward,) the disk has turned and the current from U to V W will be reversed. By pressing on K' and releasing it again there will thus be a positive electrical impulse from U to V W at the first contact and a negative one at the second (and last) contact. This same arrangement is made in all the other keys, but every following key has one positive contact more between the first and last contact. In K^2 there is below the small contacts l^7 and l^8 a continuous contact for each metal piece—viz., l^{17} and l^{18}. If the metal pieces touch these contacts, there will not be an interruption (even if the key goes down to the bottom of the shaft) before they reach the top of these contacts. The wires 62 and 63 of the battery U are directly connected with these contacts, so that there is no commutator between them and the battery. K^2 will thus give one positive impulse more than K'. In K^3 the second contact is small, like the first one. The metal pieces passing over them will therefore make two electrical impulses, one in going down and one in going up. Two positive impulses will thus be added between the first (positive) and last (negative) impulse. In K^4 the third contacts are continuous again to the bottom of the shaft and will thus add one more positive impulse. Each following key will thus give one more positive impulse. In this way the required

number of electrical impulses for a signal at the receiving-station is furnished by the corresponding key at the transmitting-station.

In case ordinary magnets are used at the receiving-station either instead of stationary electromagnets or of the movable ones, in which case group A is omitted, the initial positive impulse from the transmitting-station can be omitted. The first impulse must be a negative one. Therefore one key is placed in front of K′, which will give only one negative impulse. This is accomplished by turning the commutator of that key to the left and fixing it stationary in that position, while the contact-rails are all continuous rails. No interruption will then be made and only one negative impulse will be produced.

All that is left is the description of a relay for use in case of long distance between the transmitting and receiving stations.

Let e^5 e^6 e^7 e^8 be an ordinary double magnet and m^5 m^6 a movable electromagnet, (of the same shape as described above,) or let e^5 e^6 e^7 e^8 be a double electromagnet and m^5 m^6 an ordinary one. In the latter case the wires which were necessary for the contacts of the movable magnet have to be changed to the contacts of the stationary magnets. Let X and Z, Figs. 9 and 10, be the connection-screws with which the wires of the transmitting-station are connected, and X′ and Z′ the connection-screws for the wires of the receiving-station. There are trolley-contacts at c^8, c^9, c^{10}, c^{12}, and c^{13} of the shape and working as described above. Let the wires 70 and 71 run from X and Z to the contact c^8. If a positive impulse comes from X, m^5 m^6 will turn to the left and contacts c^9 and c^{10} will be closed. In T there is a battery or other source of electricity. On c^9 and c^{10} being closed the positive current from T will go through wire 76, contact c^{10}, wire 77 to X′, and the connection from the negative pole of T to Z′ is through wire 79, contact c^9, and wire 78. If a negative current comes from X and m^5 m^6 turns to the right by the closing of contacts c^{12} and c^{13}, the positive current from T will now go through wire 80, c^{12}, wire 81 to Z′, and X′ will be connected with the negative pole of T through 82, c^{13}, and 83. Each time a positive current starts from X Z a positive current will go from T (the relay-battery) to X′ Z′, and each time a negative one starts from X Z a negative will go from T to X′ Z′. By a number of keys the magnet m^5 m^6 shall have to move very quick. Therefore I have constructed a relay in which m^5 m^6 will only make the motion to the right. Fig. 10 shows the arrangement. The only difference between this one and the one described above is that the wire from the positive pole of T does not run directly to the double relay. An ordinary relay is placed between this pole and the double relay. From the contact G^{10} of this relay the wires run exactly as in Fig. 9. Further, the contacts c^9 and c^{10} are not open, but closed in rest position of m^5 m^6, and the magnet rests against a support at this side, so that by a positive impulse from X Z m^5 m^6 cannot turn. Only by a negative impulse from X Z will m^5 m^6 turn to the right, open contacts c^9 and c^{10}, and close contacts c^{12} and c^{13}. Besides this there are wires 72 and 73 from X Z to the ordinary relay E^{10}. It is evident that each time a positive impulse comes from X Z m^5 m^6 will not move, but the ordinary relay will make contact each time at G^{10}, and through this contact a positive impulse will be sent each time from T to X′ Z′. If a negative impulse starts from X Z, the ordinary relay will make the same contact at G^{10}, but at the same time m^5 m^6 will have turned to the right and the current from T to X′ Z′ will be reversed.

At last I want to remark that though I have spoken in this specification only of one receiving and one transmitting station the same system can be used by placing the described arrangement at one receiving-station and one or more keys at different transmitting-stations, adding a battery at every transmitting-station.

Though the described system of signaling might be used for different purposes, I want to mention one to which it will be extremely well adapted. Place the ring of a type-writing machine with its machinery and types at a receiving-station, attach to the machinery of each type the lever of an electromagnet S of the herein-described arrangement and a corresponding number of keys at a transmitting-station and we will have, with a slightly-different arrangement of the roller and paper of the type-writing machine, a perfect arrangement to use type-writing in telegraphy.

But whatever use may be made of the herein-described system of signaling, what I claim is—

1. The combination of a transmitting device comprising means for sending a predetermined number of impulses of one polarity followed by an impulse of the opposite polarity, a main line, a source of electricity, a selecting device comprising two or more groups of magnets, contacts controlled thereby and a receiving device controlled by the contacts, substantially as described and for the purpose set forth.

2. The combination of a transmitting device comprising means for sending a predetermined number of impulses of one polarity followed by an impulse of the opposite polarity, a main line, a source of electricity, a selecting device comprising two or more groups of magnets, each group having two stationary magnets and one movable magnet, contacts controlled thereby and a receiving device controlled by the contacts, substantially as described and for the purpose set forth.

3. The combination of a transmitting device comprising means for sending a predetermined number of impulses of one polarity followed by an impulse of the opposite polarity, a main line, a source of electricity, a selecting

device comprising two or more groups of magnets, each group having two stationary magnets and one movable magnet, each movable magnet being turned to one side or the other corresponding to the impulse of the respective polarities, contacts in the main-line circuit, a separate circuit in the selecting device, and contacts therein, a receiving device and contacts controlling it, all contacts controlled by the movable magnets, substantially as described and for the purposes set forth.

4. A system of transmitting electrical signals comprising a source of electricity, a main circuit, a transmitting device with means for sending a predetermined number of impulses of one polarity, followed by an impulse of the opposite polarity, a selecting device comprising two or more groups of magnets, contacts in the main circuit controlled thereby, a separate circuit in the selecting device and contacts therein, also controlled by said magnets, the magnets responding to the main or the separate circuit upon the automatical closing of the corresponding contacts, and a receiving device also controlled by the contacts, substantially as described.

5. A system of transmitting electrical signals comprising a source of electricity, a main circuit, a transmitting device with means for sending a predetermined number of impulses of one polarity followed by an impulse of the opposite polarity, a selecting device comprising two or more groups of magnets, each group having two stationary magnets and one movable magnet, contacts in the main circuit, controlled by the movable magnets, a separate circuit in the selecting device and contacts therein also controlled by the movable magnets and a receiving device controlled by contacts attached to the movable magnets, a certain number of movable magnets responding successively to the corresponding number of impulses of one polarity from the transmitting device, the following impulse of the opposite polarity operating that movable magnet which controls the desired part of the receiving device, substantially as described.

6. A system of transmitting electrical signals comprising a source of electricity, a transmitting device with means for sending a predetermined number of impulses of one polarity followed by an impulse of the opposite polarity, a selecting device comprising two or more groups of magnets, each group having two stationary magnets and one movable magnet, a main-line circuit, contacts therein controlling the action of the successive impulses from the transmitting device on the groups of magnets, a separate circuit in the selecting device and contacts therein controlling the action of this current in succession to the action of the main current, a receiving device controlled by contacts, and contacts controlling the action of the separate current on the magnets after the last impulse in the transmitting device, all contacts being reciprocally controlled by the movable magnets, substantially as described.

7. The combination of a transmitting device comprising means for sending a predetermined number of impulses of one polarity followed by an impulse of the opposite polarity, a source of electricity, a main line, an electromagnet placed in the main-line circuit, a lever operated by said electromagnet, a contact-breaker attached to said lever controlling the duration of the impulses from the transmitting device, a selecting device comprising two or more groups of magnets, contacts controlled thereby and a receiving device controlled by the contacts, substantially as described and for the purpose set forth.

8. In a system of transmitting electric signals having a source of electricity, a main line, a selecting device comprising two or more groups of magnets, contacts controlled thereby and a receiving device controlled by the contacts, a transmitting device comprising two or more keys, each key having a certain number of contacts and a commutator, operated by the key, each contact causing an impulse of one polarity, except the last contact in each key, this one causing an impulse of the opposite polarity, substantially as described.

9. In a system of transmitting electrical signals having a transmitting device with means for sending a predetermined number of impulses of one polarity followed by an impulse of the opposite polarity, a main line and a source of electricity, a selecting device comprising two or more groups of magnets, each group having two stationary magnets and one movable magnet, the movable magnet placed opposite the stationary magnets, each movable magnet being turnable around an axis, contacts controlled by the movable magnets, to switch off the main current and close a separate current in the selecting device, to keep the movable magnets of each group successively in one position, other contacts, controlling a receiving device, also controlled by the movable magnets and operating when a movable magnet turns to the opposite position, and also contacts controlled by the movable magnets to stop the action of the main and separate currents on the magnets, substantially as described.

10. In a system of transmitting electrical signals, the combination of a transmitting device comprising means for sending a predetermined number of impulses of one polarity followed by an impulse of the opposite polarity, a main line, and a source of electricity, with a selecting device comprising two or more groups of magnets, each group having two stationary magnets and one movable magnet, a ring attached to each movable magnet, contact-points fixed to said ring, a second stationary ring outside of the first-mentioned one, contact-points in said outside ring corresponding with the contact-points of the inside ring, and a receiving device

controlled by the contacts, substantially as described.

11. In a system of transmitting electric signals, the combination of a transmitting device comprising means for sending a predetermined number of impulses of one polarity followed by an impulse of the opposite polarity, a main line, a source of electricity, a selecting device comprising two or more groups of magnets, each group having two stationary magnets and one movable magnet, a ring attached to each movable magnet and a stationary ring outside of the first-mentioned ring, contact-points in the first-mentioned ring in the shape of little trolleys, little rails fixed on the inner surface of the outside ring, said rails being partially of metal, and partially of insulating matter, and a receiving device controlled by the contacts, substantially as described.

12. The combination of a transmitting device comprising means for sending a predetermined number of impulses of one polarity followed by an impulse of the opposite polarity, a main line, a source of electricity, a selecting device comprising two or more groups of magnets, each group having stationary and movable magnets, contacts controlled thereby and a receiving device controlled by the contacts, substantially as described and for the purpose set forth.

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Witnesses:
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