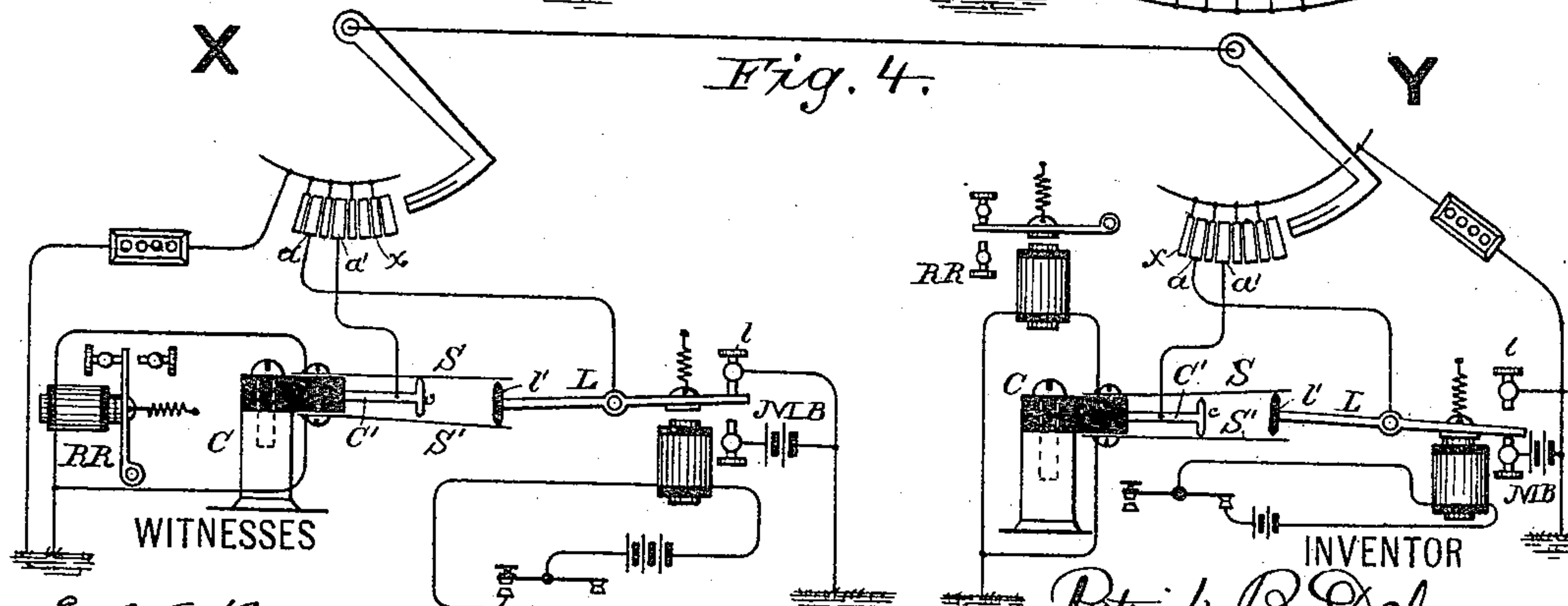
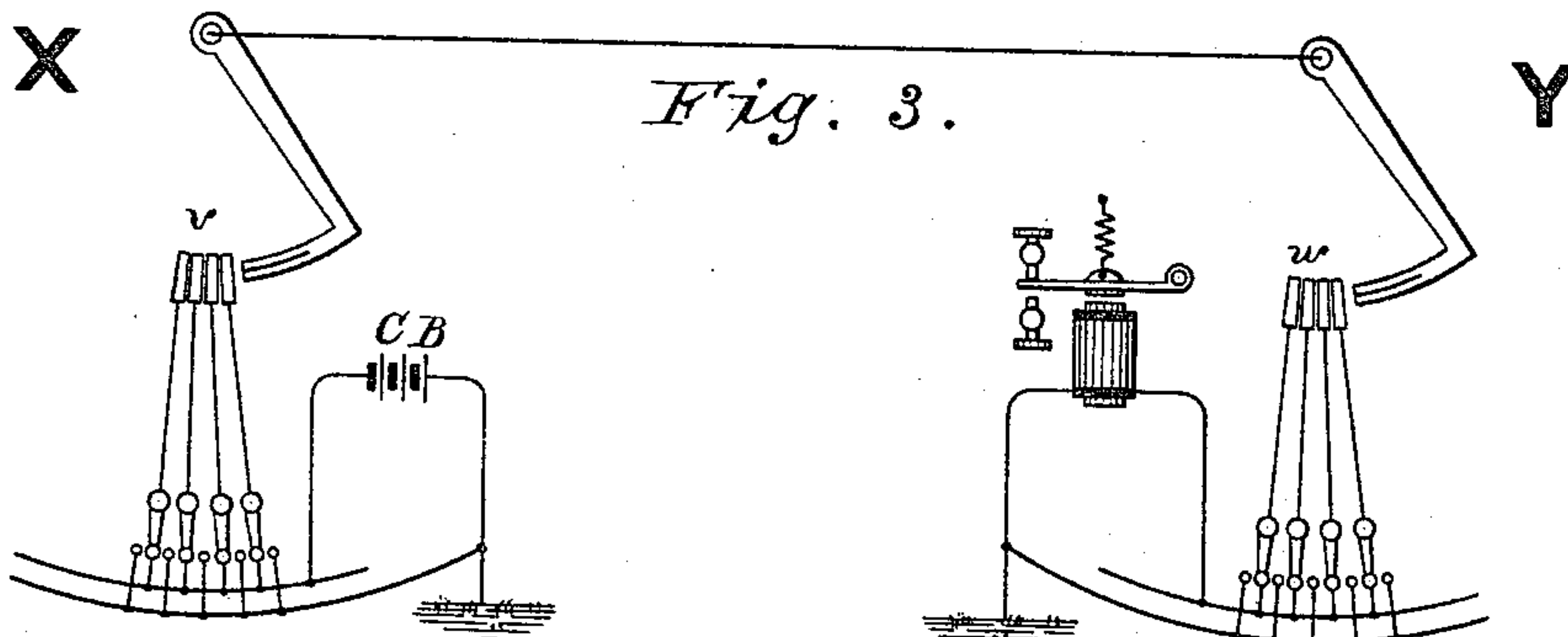
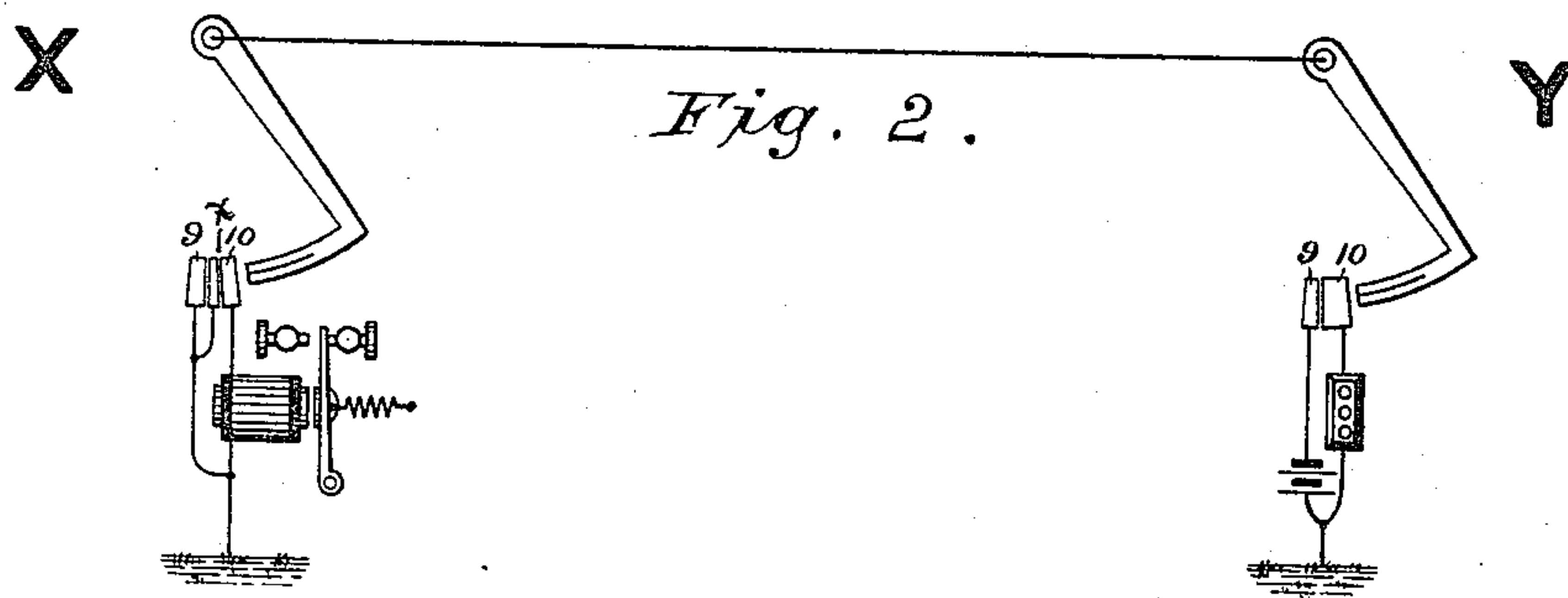
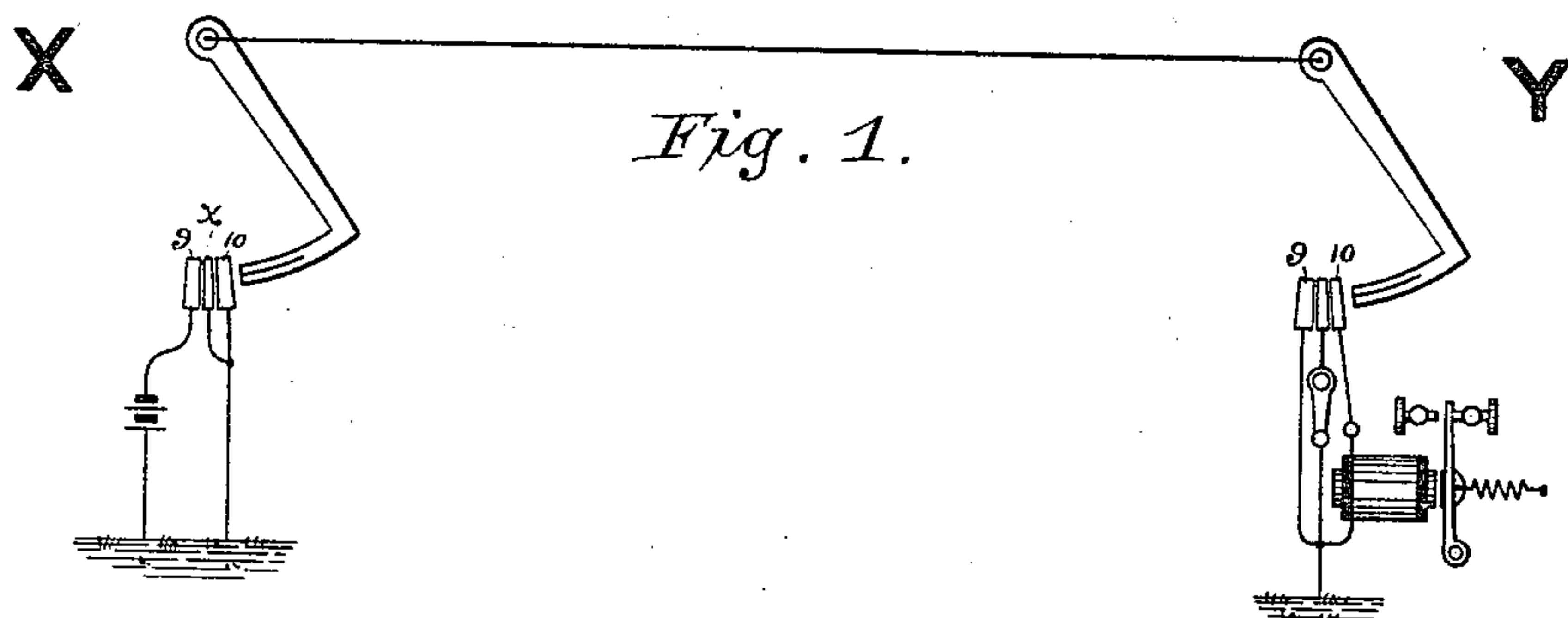


(No Model.)

P. B. DELANY.
TELEGRAPHY.

No. 440,766.

Patented Nov. 18, 1890.



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Patrick B. Delany
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UNITED STATES PATENT OFFICE.

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TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 440,766, dated November 18, 1890.

Application filed May 11, 1886. Serial No. 201,840. (No model.)

To all whom it may concern:

Be it known that I, PATRICK B. DELANY, a citizen of the United States, and a resident of the city, county, and State of New York, temporarily residing at Brussels, in the Kingdom of Belgium, have invented certain new and useful Improvements in Telegraphy, of which the following is a specification.

My invention relates to synchronous multiplex telegraphs of the general kind shown in various patents heretofore granted to me. In that system of telegraphy a number of segments are arranged in a circle at each end of a main line, and some are used for maintaining the synchronism of the apparatus, and others are divided between several pairs of operators, so as to split up the line for multiplex transmission, the segments being traversed by a synchronously rotated and controlled trailers, as is well understood.

As set forth in my prior patents, the synchronism of the apparatus is maintained by corresponding pairs of adjoining segments at each station placed at equal intervals around each table of segments. As illustrating this arrangement of my apparatus, reference is made to my patents, Nos. 286,274 and 286,273, of October 9, 1883. As fully described in those patents, the pairs of correcting-segments, which are there numbered 9 and 10, are connected in the following manner: At one station a 9 segment or contact is connected with a correcting-battery, while the adjoining 10 segment is left unconnected. At the other station the corresponding 9 segment is left unconnected, while the 10 segment is connected through the coil of a correcting-relay. If, therefore, the controlling circuit-completer at the last-mentioned station is running more rapidly than the one at the other station, it will come upon the 10 segment connected with the correcting-relay while the finger at the other station is yet upon the 9 segment connected with the battery. A correcting-impulse will therefore be sent over the line to correct the speed of the apparatus. In order to provide for variations of less than the ordinary space between the segments, the segment connected with the correcting-relay was, as shown in the patents mentioned, extended toward the adjoining dead or unconnected 9 segment. Thus a very minute variation was immediately

corrected and the apparatus maintained in synchronism. The correct operation of such an organization was described in my prior patents as being dependent upon the trailer at one station resting upon a given segment, while the trailer at the other station was upon a corresponding segment, and that a battery should be connected with one of the segments. For short lines, or lines of small capacity or retardation, such an arrangement is entirely satisfactory; but on longer lines, or where by reasons of sections of cable or underground or submarine wires in the line the electric discharge or current from the line is retarded to such an extent as not to be delivered into the proper segment at the receiving-station, the operation is defective. In other words, the transmitted current, whether it be a correcting-current or a message-current, requires a period of time to manifest itself at the receiving end, which period is proportional to the capacity or amount of retardation of the line, and during the time required for the transmission or manifestation of the current at the receiving end, the trailers at both stations will have passed from one pair of corresponding segments to the adjoining pair of corresponding segments.

The object of my present invention is to obviate this difficulty and adapt the system for use upon long lines. This I accomplish, generally speaking, by sending an impulse into the line upon one segment and receiving it upon a segment at the other end of the line which is displaced in position relatively to the sending-segment, according to the amount of retardation of the line. Thus the time in which the synchronously-moving trailers are passing into proper position to deliver the transmitted impulse upon the proper segment at the receiving end is allowed for the electric current or discharge to manifest itself at the receiving-station. In other words, the time or retardation of a line must be considered and the segments so arranged that the current transmitted at one end shall be delivered into the proper segment at the other end. This will appear more fully from the following description.

I will now refer to several ways illustrated in the accompanying drawings of carrying out my invention, and will first specifically de-

scribe the application of my improvements to the correcting or synchronizing segments.

In the accompanying drawings, Figure 1 is a diagram view illustrating groups of correcting-segments occupying corresponding positions at two stations. Fig. 2 is a similar view showing a modification. Both of these figures show arrangements which make allowance for the time or retardation of the line, though in other respects they closely resemble the arrangement shown in my prior patents. Fig. 3 illustrates another arrangement of correcting-segments, and Fig. 4 is a diagram view illustrating two connected stations with operators' instruments at each station.

In Fig. 1 the arrangement shown is identical with that illustrated in my patent, No. 286,273, except that the extended 10 segment connected with the relay is divided into two parts, the section farthest removed from the adjoining 9 being permanently connected through a correcting coil or relay to earth, while the section of the segment adjoining the 9 is connected with the switch, so that it may be connected through the correcting coil or relay or not, as desired. The switch may normally rest against a ground-contact, if wished, so that the section of the 10 segment adjoining the 9 may be either to ground or through the correcting-coil. The purpose of this arrangement is, on short lines, to let the correcting-impulse from the line enter the relay or coil through the first half of the 10 segment. On longer lines, where more time is required for the impulse to manifest itself, the first section of the 10 segment may be disconnected from the correcting-coil and the impulse be received on the second section of the segment. In this figure the intermediate segment (marked x) at station X is a ground-segment, the purpose of which is fully described in my patent, No. 286,273. The 9's and 10's, unconnected with the correcting battery or coil, may be grounded as shown, if desired. This arrangement is suitable for some lines, but is not the arrangement which I prefer. It is, however, illustrated as one way of providing or allowing for the "time" or retardation of a line.

In Fig. 2 an arrangement of correcting-segments identical with that shown in my patent, No. 286,273, is shown; but they are connected differently. The 9 and 10, which in the patent and also in Fig. 1 of the drawings, are shown as respectively connected to a correcting-battery and correcting-coil, are grounded, and the correcting-battery is connected with the 9 segment at station Y, while the correcting-coil is connected with the 10 segment at station X, thus reversing the direction of the transmitted impulse. The impulse sent in from the 9 segment at Y will have the time occupied by the trailer at X in passing over the ground-segment x to reach and manifest itself in the coil or relay connected with the 10 segment. It will therefore be seen that

this arrangement also provides or allows for the time or retardation of a line. As shown, the unused 9 and 10 may be grounded, the latter preferably through a resistance to prevent sparking.

In Fig. 3 is shown an arrangement which I prefer to those just described, especially as it allows for the adjustment of connections to suit the particular conditions of the circuit.

As in my prior patents, I prefer to use three sets or groups of segments placed at equal intervals around the circle at one station, through which correcting-impulses are sent to the distant station, and at such distant station to arrange three similar groups or sets of segments through which impulses are sent from that station, the groups being arranged alternately with reference to each other. This is fully described in my prior patents, is well understood, and needs no illustration here.

In the arrangement shown in Fig. 3 each group v of correction-segments may consist of several—say four or more—insulated segments, which are preferably smaller than the message-segments. In corresponding position to the group of correction-sending segments there is at the other station a similar group of correction-receiving segments w . The correcting-battery CB may be connected to the first segment in each group v , while the correcting coil or relay may be connected to the last segment in each group w . The other segments in each group can, if desired, be grounded. As before remarked, I may employ a greater number of correcting-segments in each group, and whether I do or not the correcting-battery may be connected to the first one or two or more of such segments, and the correcting-relay be connected with such segment or segments of the other groups as are properly located relatively to the sending-segments, according to the time or retardation of the line. A fewer number of correcting-segments might be used in each group, and they might be adjustable to accommodate them to the retardation of any particular line. As the corrections maintaining synchronism are reciprocal between the two stations, the trailers will be kept in approximately perfect synchronism.

Referring to Fig. 4, and assuming that the trailers at the two stations are maintained in synchronism by any suitable means, the pairs of corresponding operators' instruments are shown as connected each with two of the adjacent message-segments $a a'$. The instruments represented may be connected with any desired number of pairs of segments taken at equal intervals around the circle of segments and other corresponding operators may be connected in a similar manner, as fully set forth in my prior patents. The first segment a is connected with a pivoted transmitting-lever L , shown as normally grounded through its upper stop l . This lever is operated by a magnet in a local circuit, which is opened and

closed by an ordinary Morse key, and when the lever is upon its lower stop the main battery MB is sent into the line through the segment a and trailer. The opposite end of the lever L has a cross-bar l' of insulating material, which plays between two plate-springs S S', which tend constantly to make contact with a cross-piece on an arm C', which projects between the springs from a post or block C. The second segment a' of the pair is permanently connected with the arm C'. The upper spring S normally rests upon the cross-piece c of the arm C', thus normally connecting the receiving-segment a' through the receiving-relay R R to earth. The lower spring S', which at this time is pressed by the cross-bar l' out of contact with the cross-piece of the arm C', is connected directly with the earth. The relations of the parts just described are such that as the cross-piece l' moves up and down, alternately making contact with the springs S S', the spring S is permitted to make contact with the cross-piece of the arm C', the spring S is lifted from the cross-piece, and the lever L then makes contact with the battery-stop.

Between the segments I place other, preferably smaller, segments x , of metal or other material, to prevent the trailer from bridging from one contact to another, and thus short-circuiting the battery. These separating segments or strips are, however, preferably of metal. Under some circumstances I prefer to ground them.

When an operator is transmitting, the insulated arm l' on the transmitting-lever L as it is moved up and down alternately lifts the springs S S' out of contact with the arm on the block C. When the operator's key is closed, the lever L puts the main battery in connection with segment a , and segment a' is disconnected from the receiving-relay R R at S and connected to earth through spring S'. If the key is opened, the lever L disconnects the main battery from segment a and puts that segment to earth at the top post l . A transmitted impulse from the main battery will start into the line when the operator's key is depressed. If the line is of such a length or capacity that the current does not reach the receiving-station until the trailers at both stations have passed upon the corresponding segments a' , then the current thus sent into the line will discharge itself through the segment a' and coil of relay to earth, thus giving the required signal at the receiving-station. At the sending-station the return-current from the line is grounded through segment a' , arm C', and lower spring S'. If this apparatus were used upon a line of such length as to permit of the current sent in on the battery-segments a reaching the receiving-station, while the trailer at that station was still upon the corresponding segments a , the battery would find a ground through the transmitting-lever and its upper post, and no effect would be produced upon the receiving-

relay until the trailers had passed from the segments a and come upon the corresponding segments a' , when the operation would be precisely the same as that above described. The extra contacts x , between the sending and receiving segments belonging to the same operator, are arranged flush with said segments, and may, if desired, be connected with the earth. In that event they would under some circumstances—for instance, on a line having a sufficiently small capacity or amount of retardation—ground part of the discharge from the line before the trailers came upon the segments a' ; but, as they are smaller than the message-segments, only a portion of the current would thus be grounded and the remainder would operate in the manner above described. The other supplemental contacts are arranged between the battery-segment of one operator, and the receiving-segments of the preceding operator—*i. e.*, between the pairs of segments—are also arranged flush with the surfaces of the segments, and are intended, as before remarked, to prevent the trailers from bridging and also to ground the line at each end as it passes from one operator's segments to those of another to completely discharge the line. As the levers L of the operators are normally grounded, the receiving-segments of that operator are further protected from any current that might still be found in the line, such current being discharged through the segment a and armature-lever L to earth, and should any current or charge remain in the line when the trailer came upon a segment through which an operator was transmitting at the moment such residual current would be met by the battery and completely wiped out. With this arrangement it is unnecessary to ground the intermediate segments, which may be used for separation only. The receiver can, as will be obvious, break the sender with the arrangement shown.

It is obviously immaterial whether the main-line circuit be unbroken, as shown, or whether a condenser be placed therein.

The circles of segments may contain any suitable number of message-segments—for instance, there may be eighty-four, more or less, according to the requirements in each case—and the size of the segments will be properly proportioned to the speed of rotation of the trailers.

Printers may be used in connection with my present invention, as well as with the arrangements shown in other patents heretofore granted to me.

I make no claim, broadly, to the arrangement of segments side by side—one for transmission and the other for reception—nor to the method of operation incident thereto and involving transmission of messages in both directions, as such matters are the invention of Robert G. Brown; but other organizations for sending messages according to my invention may be used—as, for instance, that shown

in my pending application, Serial No. 209,557, filed July 30, 1886.

I claim as my invention—

1. The combination of a main line, the trailers, a battery-connected correcting-segment over which one of the trailers traverses, and a correction-receiving segment traversed by the other trailer and located according to the time of the line with reference to the said battery-connected segment, substantially as and for the purpose set forth.

2. The combination of a line, synchronously-rotating trailers, a circle of segments over which they travel, a group of two or more correction-sending segments, the first one of which is connected with a battery and the remainder to earth, and a group of two or more correction-receiving segments, the first one or more of which is grounded and the remainder connected with the correcting-coil, substantially as set forth.

3. The combination of the line and rotating trailers, the group *v* of correction-sending segments, a correcting-battery, circuit-connections by means of which said segments may be connected with said battery or put to earth, the group *w* of correction-receiving segments, a correcting coil or relay, and circuit-connections by means of which said last-named segments may be connected with said coil or put to earth.

4. The combination of the line, rotating trailers, the group *v* of correction-sending segments, a correcting-battery, circuit-connections by means of which the first one or more of said segments may be connected with said battery, the group *w* of correction-receiving segments, a correcting coil or relay, and circuit-connections by means of which the last one or more of said segments may be connected with the correcting-coil.

5. The combination of a main line, synchronously-traveling circuit-completers at each end of the main line, a segment or contact at one end of the line through which a current from a transmitting-battery may be sent to line at the will of the transmitting-operator, and a receiving-segment at the other end of the line with which the corresponding operator's receiving-relay is connected, the latter segment occupying a displaced position relatively to the position of the battery-contact at the other station, for the purpose set forth.

6. The combination of the pairs of segments, operators' instruments connected therewith, the transmitting devices of one operator con-

nected with the first segment in the pair or pairs devoted to his use, his receiving devices connected with the second segment, and the intermediate segments arranged between the pairs of segments.

7. The combination of the pairs of segments, operators' instruments connected therewith, the transmitting devices of one operator connected with the first segment in the pair or pairs devoted to his use, his receiving devices connected with the second segment, and the intermediate segments of conducting material connected to earth and arranged between the pairs of segments.

8. The combination of the synchronously-moving apparatus at each end of the main line, the message-transmitting segments, and the message-receiving segments displaced in position relatively to the sending-segments, such advanced position being proportioned to the time or retardation of the line, as set forth.

9. In a synchronous multiplex-telegraph system in which the line is split up by means of series of insulated segments at each end of the line which are distributed among different operators, and over which synchronously-actuated trailers connected with the line traverse, the improved method of operating on long lines, which consists in sending impulses of electricity through a segment or segments and receiving said impulses at the other station through a segment or segments displaced according to the time of the line relatively to the sending segment or segments.

10. In a system of multiplex telegraphy in which the line is split up by means of series of insulated segments at each end of the line distributed among different operators, over which synchronously-actuated trailers connected with the line traverse, the improved method of operating on long lines, which consists in sending an impulse of electricity into the line at one station through a segment and receiving said impulse at the other station through a segment so located according to the time or length of the line that when the trailer reaches said segment the arrived current will be discharged into it irrespective of the position of the sending-trailer, substantially as and for the purpose set forth.

In testimony whereof I have hereunto subscribed my name.

PATRICK B. DELANY.

Witnesses:

CHARLES MOURLON,
G. FORTENATH.