(No Model.)

3 Sheets—Sheet 1.

E. J. MALLETT.

AUTOMATIC TELEGRAPHY.

No. 384,325. Patented June 12, 1888.

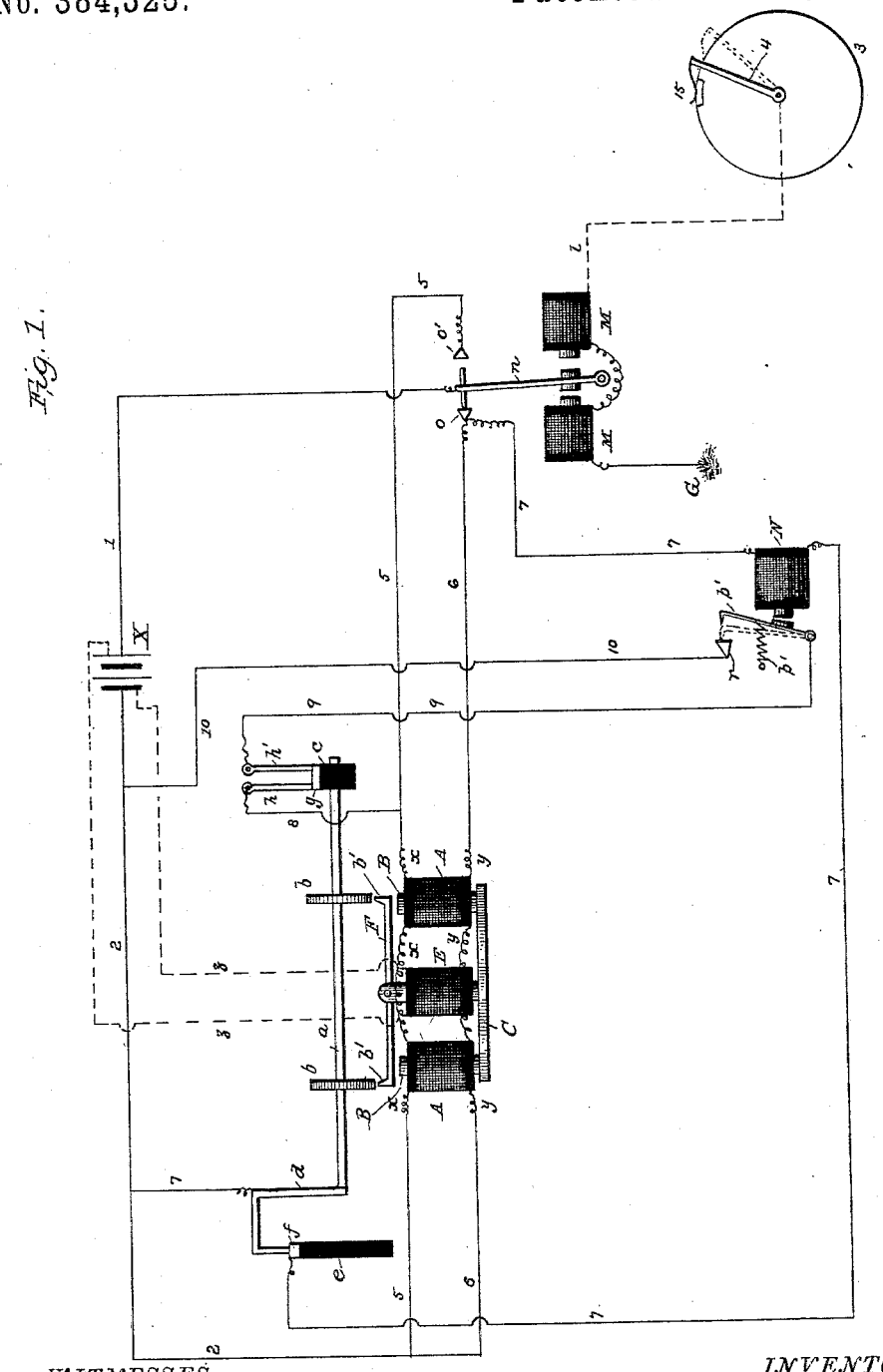

Fig. 1.

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his Attorney.

(No Model.) 3 Sheets—Sheet 2.

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AUTOMATIC TELEGRAPHY.

No. 384,325. Patented June 12, 1888.

Fig. 2.

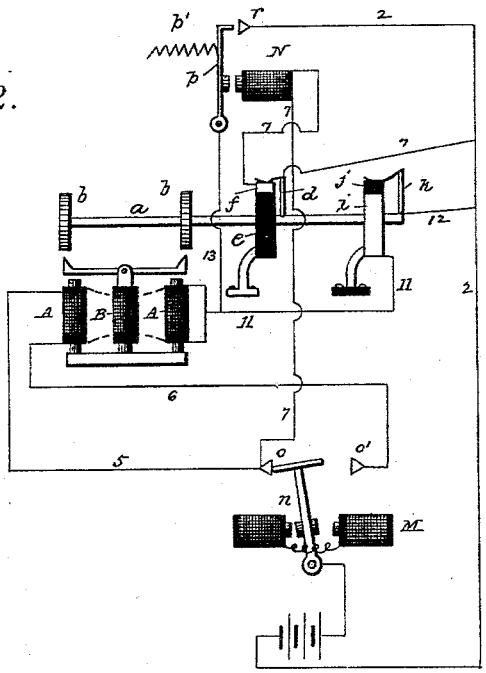
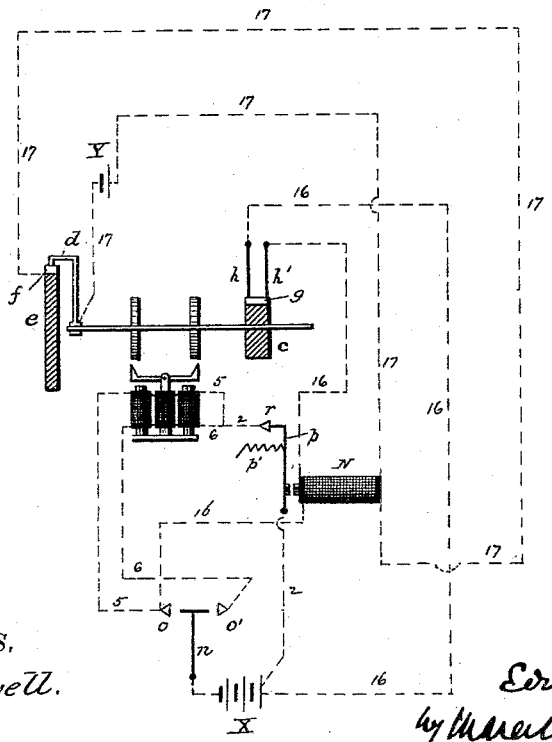


Fig. 3.



WITNESSES,

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(No Model.) 3 Sheets—Sheet 3.

E. J. MALLETT.

AUTOMATIC TELEGRAPHY.

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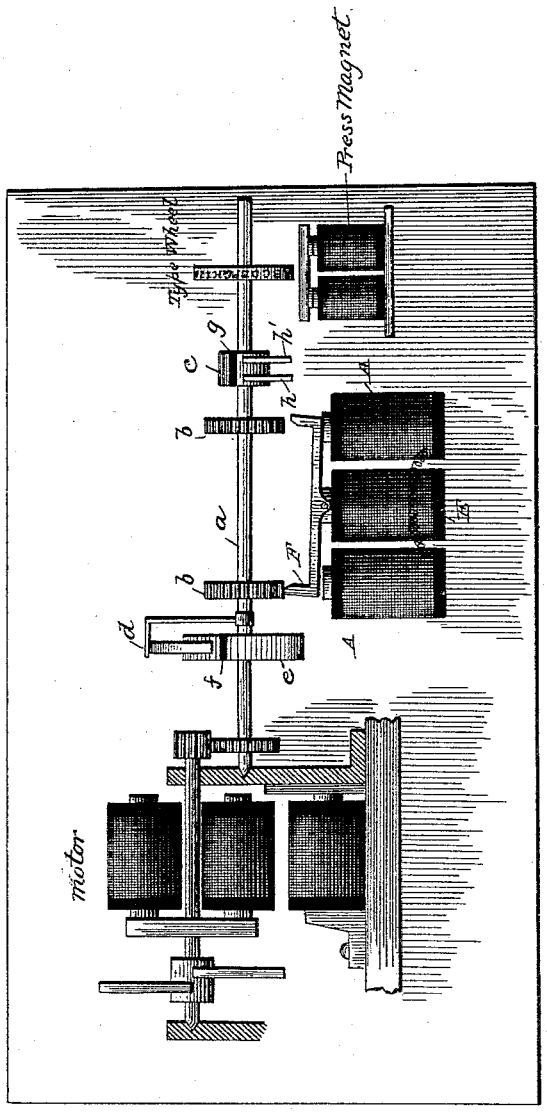

Fig. 4.

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UNITED STATES PATENT OFFICE.

EDWARD J. MALLETT, OF NEW YORK, N. Y.

AUTOMATIC TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 384,325, dated June 12, 1888.

Application filed April 5, 1888. Serial No. 269,687. (No model.)

To all whom it may concern:

Be it known that I, EDWARD J. MALLETT, of the city, county, and State of New York, have invented certain new and useful Improvements in Automatic Telegraphy, of which the following is a specification.

The object of this improvement in automatic telegraphy is to automatically maintain in unison with the transmitting-instrument the printer or other instrument which receives and reproduces the message sent over the line by the operation of the transmitting-instrument.

To this end I combine with the escapement-circuit of the receiving telegraph-instrument, for the purpose of controlling the magnet of the escapement included therein, devices which are brought into action by the receiving-instrument alone and which at regular intervals divert the current from the said magnet, together with other devices responding only to impulses sent from the transmitting-station at corresponding intervals which by their operation prevent the diversion of the current from said magnet.

So long as the two instruments, the receiver and the transmitter, are in unison the two sets of devices above referred to are in unison also and operate synchronously, with the effect of neutralizing each other's action in the sense that complete circuit is afforded through the escapement-magnet; but whenever the two instruments happen to get out of unison then the two sets of devices operate not synchronously, but successively, with the result that the devices actuated from or by the receiver—the "cut-out" devices, as they may be termed—divert the current from the escapement-magnet, thus bringing the receiver to rest at its unison-point, in which condition of rest it remains until the transmitter (which continues to move) comes around to the corresponding point. At this time the devices controlled by the transmitter will act to neutralize the action of the cut-out devices, with the effect of restoring the escapement-circuit through the escapement-magnet, the result being that the receiver will again start in unison with the transmitter. A unison of this character is absolutely automatic and unerring in action, and serves to maintain at all times the receiver in complete accord with the transmitter. This result can be attained in a variety of ways, all of which, however, involve the same general principle, as will be readily understood by reference to the accompanying drawings, in which—

Figure 1 represents, diagrammatically, devices and circuit-connections embodying my invention. Figs. 2 and 3 are diagrammatic representations of modifications or variations (to be hereinafter more specifically described) of the system represented in Fig. 1. Fig. 4 is a view of the receiving-instrument itself which I in practice prefer to use, showing the different parts as they are actually assembled together in the instrument. From this figure I omit the polar relay M and the electro-magnet N of the unison system, as well as the circuit-connections of the various parts.

Like letters in all the figures designate like parts.

My improvement has been devised with more particular reference to the needs of the system of automatic telegraphy described in my Letters Patent No. 343,042, of June 1, 1886, and it is in that connection that I shall describe it.

In the said patented system the transmission is controlled by a perforated or embossed fillet or card carried by a car to which an intermittent feed is imparted, the car being advanced one line or space for each revolution of the transmitting segment or sunflower disk, or, if said disk be stationary, for each revolution of the "trailer-arm" which co-operates with said disk; and upon the said disk, in addition to the segments representing the characters of the code, there is an unconnected segment, (lettered 15 in the drawings annexed to the said Letters Patent,) now termed by me the "car-segment," during the travel over which by the trailer-arm no impulses are sent over the line and the car is fed along one space or interval. This segment may be considered the "unison-point" of the transmitter, and in the receiver segments correspondingly placed with reference to the other or code segment are also provided, so that they may be the unison for the receiver.

Referring to Fig. 1, I have for the most part given merely the conventional representation of the mechanical devices employed in the system, inasmuch as their construction is well known to those acquainted with the art, and in the case of the receiving-instrument, which

in this instance is supposed to be an ordinary printing-telegraph having a type-wheel, &c., as seen in Fig. 4, I have deemed it necessary in Fig. 1 to show only the escapement of such an instrument, together with the shaft *a*, upon which the scape-wheels *b*, as well as the type-wheel, (not shown,) are mounted, and also the wheel *c* and trailer-arm *d*, mounted on and revolving with said shaft, the trailer *d* co-operating with a fixed sunflower disk, *e*, having upon it a conducting-segment, *f*, the location of which corresponds to that of the car-segment 15 upon the transmitting segment-disk 3, so that the trailer-arm *d* in its revolution normally will meet the segment *f* at the same time the transmitting trailer-arm 4 meets the car-segment 15 of the transmitting-disk.

The devices and circuit-connections at the transmitting station for throwing the proper sequence of impulses or reversals, &c., upon the line *l* are or may be of any suitable character. They may, for instance, be substantially the same as those described in my said Letters Patent, and they are therefore only typically represented by the segment-disk 3 with its non-conducting car-segment 15 and the revolving trailer-arm 4, these being parts similar to the like designated parts in the Letters Patent aforesaid. At the receiving-station the line *l* passes through the magnets of a polarized relay, M, and thence to ground. The armature-lever *n* of this polarized relay is in the escapement-circuit, being connected with one pole of the escapement circuit-battery X by wire 1, and it is provided, as usual, with two contacts, so that when in motion it may make contact alternately with one and the other of the stationary contacts *o o'*.

In the particular form of polarized escapement shown in the drawings, A A are the spools of the main electro-magnet. B B are the cores thereof, and C their yoke. To the same yoke and between these two cores is fixed a third core, D, to which is pivoted the armature-lever F, so that its ends will play over the cores B, this lever being provided with teeth *b' b'* at its ends to act as pallets for the scape-wheels *b b*. The center core, D, is surrounded by a coil, E, connected up with the battery X in a comparatively high-resistance derived circuit to that in which the spools A A are included, as indicated by dotted lines *z z*. This feature of the polarized escapement is not here claimed, the same having been made by me the subject of a separate application for Letters Patent of even date herewith, Serial No. 269,684.

The spools A A are wound with two independent and separate wires or coils, whose terminals are shown at *x y*, so wound or connected up that the magnet will have one polarity when the circuit is completed through *x*, and another polarity when the circuit is completed through *y*.

To accommodate the escapement-circuit to magnets A of the construction indicated, the circuit is continued from the opposite pole of the battery by a wire, 2, which, at a point near the polarized escapement, branches, one branch, 5, passing to contact *o'* through the coil or wire *x* of the magnet, and the other branch, 6, passing to contact *o* through the coil or wire *y* of the magnet. This completes the escapement-circuit proper. So long as the tongue or lever *n* continues in vibration, so long, under normal conditions, will the inductively-magnetized armature or escapement-lever be in vibration also.

As hereinbefore indicated, at each revolution of the transmitting trailer-arm 4 there will be a momentary cessation of impulses while it traverses the segment 15, and during this period the lever *n* will stop. Whenever it does thus stop, it always comes to rest against the same contact. In the drawings this contact is supposed to be *o*. I therefore lead from the contact *o* a branch wire, 7, which passes through the coils of a neutral electro-magnet, N, and thence to the conducting-segment *f* on disk *e*. The trailer-arm *d* of this disk is connected by wire 7 with wire 2. Under this arrangement it will be seen that when the lever *n* makes the specified prolonged contact with *o*, (and it is only this prolonged contact which will suffice to energize the comparatively sluggish neutral magnet N,) and when at the same time the trailer-arm *d* contacts with segment *f*, there will be a complete circuit from one pole of battery through wire 1, lever *n*, contact *o*, wire 7, contact *f*, trailer-arm *d*, wires 7 2, back to other pole of battery. When this state of things exists, the magnet N will become energized and will attract its armature *p*. This armature is included in a shunt, 8 9 10, having two points of completion therein, and when not attracted by its magnet is drawn by its spring *p'* against the stationary contact *r*, thus closing one of the points of completion of the shunt. It will be noted therefore that this point of completion must be closed, except for a brief interval, during each revolution of the transmitter and receiver, and that even then the opening of the shunt at this point cannot take place unless the two are in unison—that is to say, unless the two trailers *d* and 4 are upon their respective segments *f* and 15 simultaneously.

The second point of completion of the shunt is at the cut-out wheel *c*, which is a non-conducting wheel mounted upon and revolving with the shaft *a*, as before said, so that its movement may be synchronous with that of the trailer-arm *d*, and provided at one point on its periphery with a conducting-segment, *g*. In connection with this wheel I use two fixed conducting-brushes, *h h'*, insulated from one another, and bearing at their free ends upon the periphery of the wheel *c*, which, as before indicated, has a non-conducting surface, except as to the space occupied by the segment *g*. Consequently the two brushes are never electrically connected except when they meet and contact with this segment. The brushes are so placed with relation to the seg-

ment *g* that they meet it at the same time that the trailer-arm *d* meets the segment *f*. Consequently, so long as the transmitter and receiver are in unison the one point of completion of the shunt will always be open when the other is closed, and vice versa. The shunt-connections are by wire 8 from branch wire 5 to brush *h*, from brush *h'* by wire 9 to armature-lever *p*, and thence by contact *r* and wire 10 to main wire 2.

In the drawings it is supposed that the receiver and transmitter are in unison. Consequently, when the transmitting-trailer 4 reaches the segment 15, as indicated in full lines, the cut-out shunt around the receiver is not complete, because although one point of completion therein is closed by reason of the meeting of the brushes *h h'* with the conducting-segment *g*, yet the other is open by reason of the attraction of the armature *p* by its magnet N, the latter having been energized by the prolonged contact of the lever *n* with contact *o*. So long as these conditions are maintained the parts may continue in operation indefinitely; but suppose that the transmitter has gained a little on the receiver, so that the transmitting trailer 4 will occupy the position shown in dotted lines by the time the trailer-arm *d* contacts with its segment *f*, at which time the brushes *h h'* will also be electrically connected through their segment *g*, the lever *p* will be in contact with the contact *r*, as indicated by dotted lines, and the lever *n* will be in normal vibration. Under these conditions it will be observed that the receiver must unavoidably be short-circuited. For example, in the position indicated lever *n* has contacted with *o* and the magnet A has been energized to tilt the escapement-armature in one direction. When the lever *n* (which is now in vibration) moves to the opposite contact *o'*, the current, however, seeks the low-resistance path offered by the shunt, rather than the path of high resistance through the escapement-magnet, and consequently the circuit is from battery by 1 *n o'* 5 8 *h c h'* 9 *p r* 10 2 back to battery. When the lever *n* moves from *o'* to *o*, the circuit will be again through the escapement-magnet; but this can effect nothing, because the armature is already tilted in the position in which it is brought when the circuit is completed through *o*, and consequently it will remain unmoved. This condition of affairs continues, and the receiver thus is held motionless, with its trailer-arm *d* and cut-out wheel *c* in unison position with respect to the segment *f* and brushes *h h'*, until the transmitting-trailer 4 travels far enough around to reach unison, or, in other words, to reach the interval-segment 15. As soon as this takes place, the shunt is broken, owing to the energizing of magnet N and the consequent movement of its armature *p;* and when the polarized relay M again starts into vibration after its momentary pause the polarized escapement will be actuated and the receiver will start off in unison with the transmitter. The same thing holds true if the receiver, instead of being behind, is ahead of the transmitter. If it (the receiver) reaches unison point first, the shunt will at once be closed and the receiver will be cut out until the transmitter reaches unison. Thus at each and every revolution or complete sequence of movements of the receiver and transmitter the two, if not in unison already, are brought to unison, this operation taking place continuously and automatically so long as the instruments are in action. I have hereinbefore indicated that this result can be attained in other ways without departure from the principle of the invention. This is illustrated in Figs. 2 and 3, in each of which the organizations comprising the system, while differing specifically in some respects from each other and from the organization represented in Fig. 1, none the less are substantially identical with what has hereinbefore been described.

In Fig. 2 I dispense with the cut-out disk *c* and fingers *h h'*, and in lieu thereof I employ a trailer arm, *k*, fixed to and revolving with shaft *a* around and in contact with a solid stationary metal conducting-disk, *i*, supported upon an insulated base and having a hole in its center through which the shaft passes. This disk *i* has upon its periphery at one point a non-conducting segment, *j*, corresponding in location to the segment *f* on the sunflower disk *e*—that is to say, when trailer *d* meets *f* trailer *k* meets *j*.

The circuit-connections are as follows: From one pole of the battery to armature *n* and thence by branch wires 5 and 6 from the contacts *o o'* through the spools A, the branches uniting beyond the spools and leading by a wire, 11, to the metallic conducting-disk *i*, and from trailer-arm *k* by wires 12 2 back to the opposite pole of the battery. From wire 11 leads a branch wire, 13, to armature *p* of magnet N, and this branch circuit thence continued by contact *r* to main wire 2. From contact *o* leads wire 7 to and through magnet N to the segment *f* of sunflower disk *e*, and thence by trailer *d* to wire 2. Armature *p* in this arrangement is held normally away from contact *r*.

The operation is as follows: So long as the receiver is in unison with the transmitter the escapement-circuit during the intervals between the unison pause (which takes place once during each revolution of the transmitter) will be from one pole of the battery through armature *n*, one or the other of contacts *o o'*, and their respective branch wires 5 6, wire 11, disk *i*, trailer *k*, wires 12 2 back to the other pole of the battery. Whenever the transmitter reaches its interval segment 15, (or the equivalent electrically of that segment,) trailer *d* will be on conducting-segment *f*, and trailer *k* will be on non-conducting segment *j*. Under these conditions, were it not for magnet N the escapement-circuit would be interrupted and the receiver would stop; but at this moment the circuit 7, through

magnet N, segment *f*, and trailer *d*, is completed, and magnet N, being energized, attracts its armature *p*, and thus completes a branch escapement-circuit through wire 13, armature *p*, and contact *r*, and consequently the escapement-circuit remains intact; but if the transmitter and receiver be not in unison, then the magnet N will not be energized. Consequently the branch of the escapement-circuit which it controls will remain open, and the other branch controlled by the disk *i* and trailer *k*, being open by reason of the contact between trailer *k* and the non-conducting segment *j*, no current can pass through the escapement-magnet, and the receiver is brought to rest, to so remain until it again comes into unison with the transmitter. Thus, instead of shunting the current around the escapement-magnet when the instruments are out of unison, as in Fig. 1, I in this case break the escapement-circuit, so that no current flows over it. The disk *i*, with its non-conducting segment *j* and the trailer *k*, are the devices actuated from or by the receiving-instrument to divert the current at regular intervals from the actuating-magnet of the escapement, and the magnet N, disk *e*, and trailer *f* are the devices responding only to impulses or influences from the transmitter at corresponding intervals, which by their action prevent the diversion of the current from the said escapement-magnet.

In the example illustrated in Fig. 3 still another variation is indicated. In this illustration I use the trailer *d* and disk *e* and magnet N to break the escapement-circuit once during each revolution, and I employ the same magnet N, together with the wheel *c* and fingers *h h'*, to neutralize the effect of the instrumentalities first above mentioned. Under this arrangement magnet N has two independent windings or coils.

The circuit connections are as follows: From one pole of battery X through armature *n*, contacts *o o'*, and their respective branch wires 5 6, through one or the other of the two windings of escapement-magnet A, thence by wire 2, contact *r*, and armature *p* back to the other pole of battery. This is the escapement-circuit proper. The armature *p* is by its spring *p'* normally held in contact with contact *r*. A branch circuit leads from one pole of battery X through armature *n*, contact *o*, wire 16, one winding of magnet N, fingers *h h'*, and conducting-segment *g* on wheel *c*, back to the other pole of battery. In a separate circuit, 17, from an auxiliary battery, Y, are included the segment *f* on disk *e*, the trailer *d*, and the other winding of magnet N. The two windings of the magnet N are such that when current passes through both the one will neutralize the other. I have shown an auxiliary battery Y simply to avoid obscuring the diagram. Circuit 17 might just as well lead from battery X.

The operation is as follows: When the receiver is in motion, once during each revolution the trailer-arm *d* will meet the segment *f*, closing the circuit 17 and passing a current through one winding of magnet N. The magnet, when energized, will attract its armature *p*, and consequently break the escapement-circuit, and such would be the effect in this case were the receiver out of unison with the transmitter, because the momentary halt of the armature *n* on the contact *o* would not take place when the fingers *h h'* and segment *g* were in contact; but when the two instruments are in unison the parts last named are in contact when the armature *n* thus passes on contact *o*. Consequently, a current is passed over the branch circuit 16, through the opposite winding of magnet N, thus neutralizing the effect of the current through the winding included in circuit 17. Magnet N under these conditions is inactive and the escapement-circuit remains unbroken. In this example the devices which divert at regular intervals the current from the actuating-magnet of the escapement are the sunflower disk *c*, trailer *f*, and one winding of magnet N. Those which respond only to impulses or influences from the transmitting-station at corresponding intervals to prevent by their action this diversion of the current are the disk *c*, fingers *h h'*, and the other winding of the magnet N.

I have for convenience' sake described my new unison system in connection with the transmitter shown in my aforesaid Letters Patent No. 343,042, of June 1, 1886. I remark here, however, that the transmitter which in practice I now employ in this connection is that improvement upon my said patented transmitter which is set out in my application for Letters Patent No. 269,685, of even date herewith.

Having now described my invention, and having indicated some of the various ways in which it can be carried into effect, I state in conclusion that I do not restrict myself to the specific details herein described and illustrated; but

What I believe to be new and of my own invention is as follows:

In a system of telegraphy, the combination, with the escapement-circuit of the receiving-instrument, the escapement-magnet included therein, and a current-diverter for diverting the current from the said escapement-magnet at regular intervals, of a magnet normally influenced at corresponding intervals from the transmitter and contact-points operated by said magnet when thus influenced to neutralize the action of the current-diverter, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 4th day of April, A. D. 1888.

EDWARD J. MALLETT.

Witnesses:

EWELL A. DICK,

MARVIN A. CUSTIS.