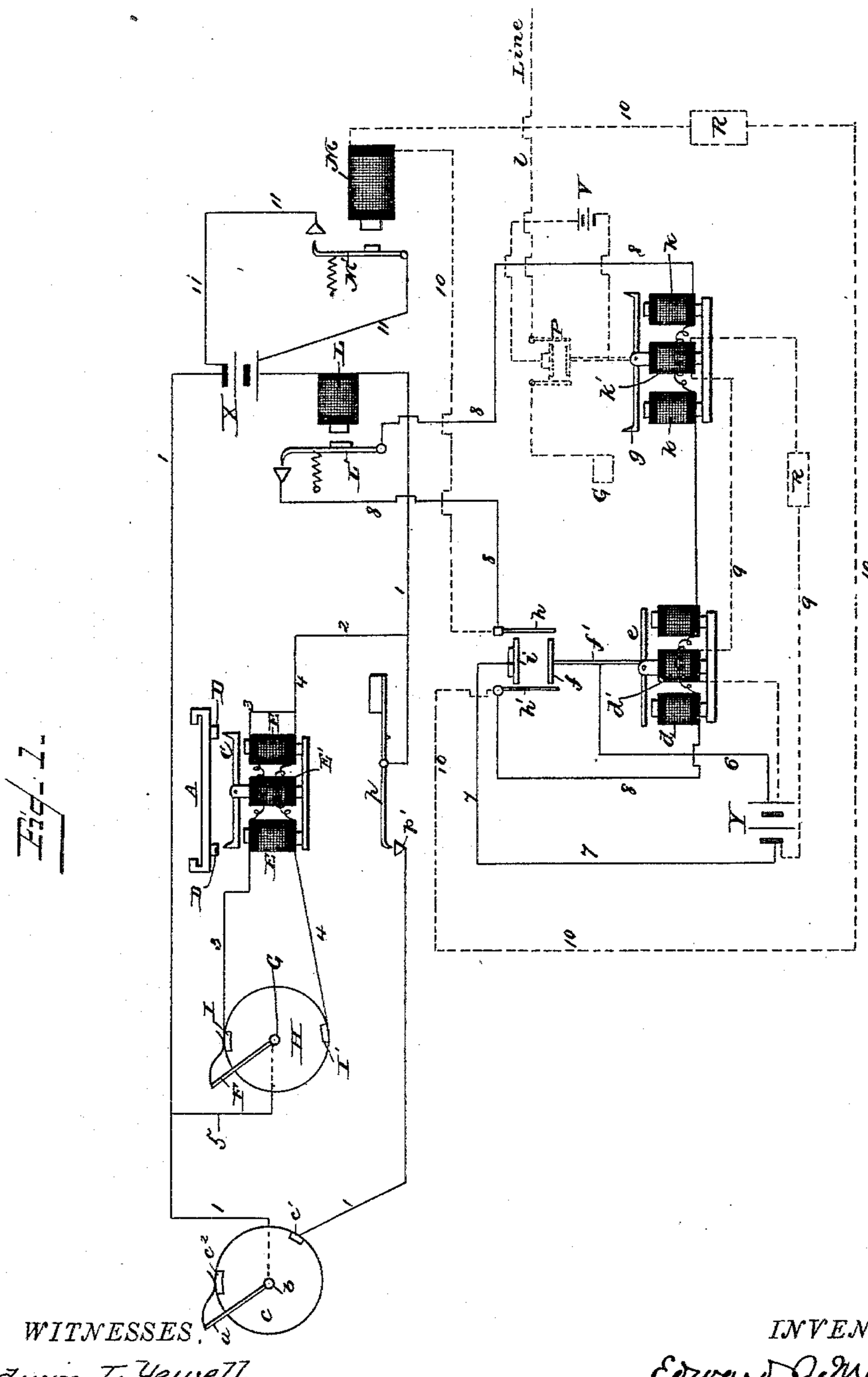
(No Model.)

4 Sheets—Sheet 1.

E. J. MALLETT.

AUTOMATIC TELEGRAPHY.

No. 384,324. Patented June 12, 1888.



WITNESSES.

Edwin I. Yewell.

Wells A. Dick.

INVENTOR.

Edward J. Mallett

by Marcellus Bailey

his Attorney

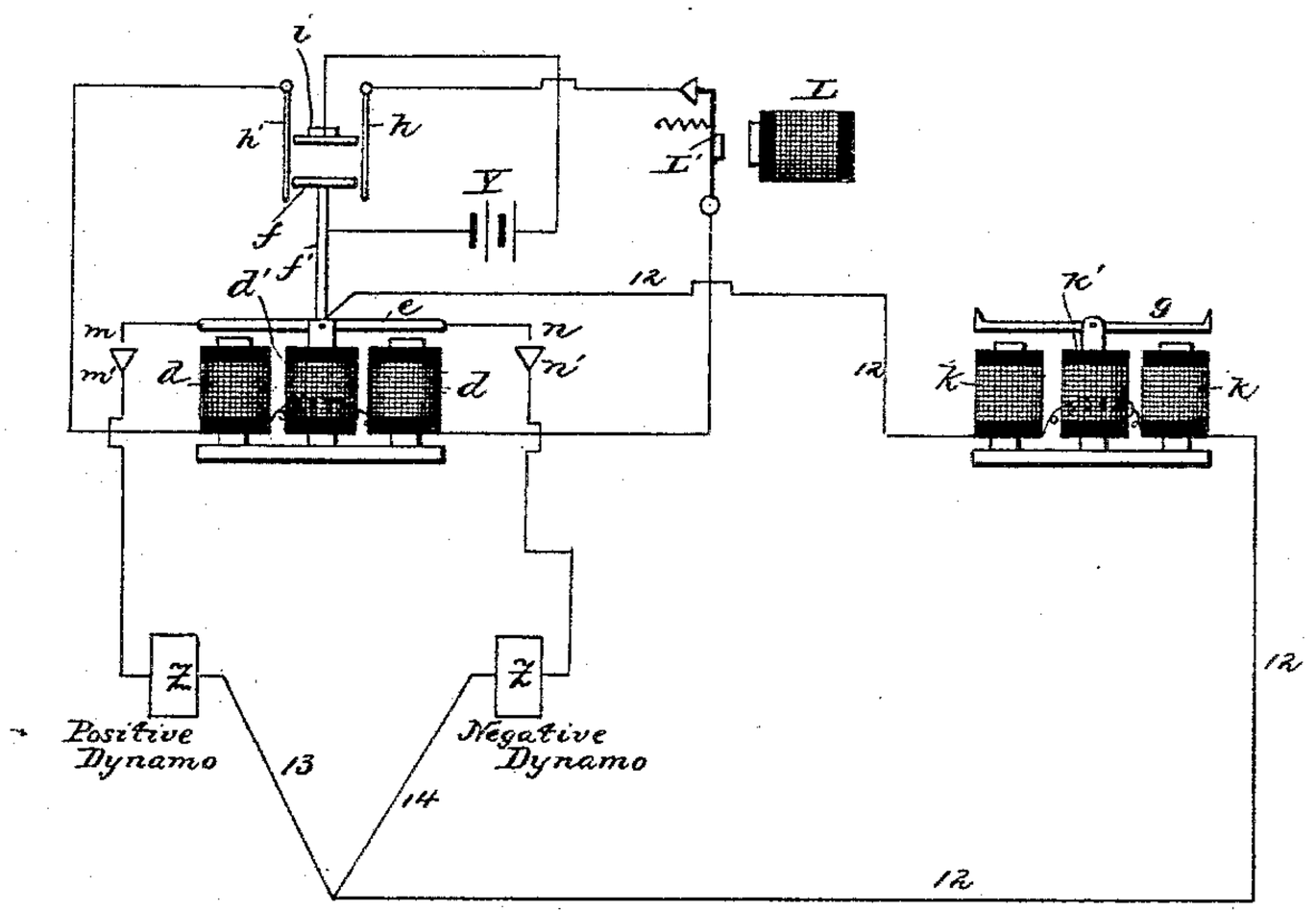
(No Model.) 4 Sheets—Sheet 2.

E. J. MALLETT.

AUTOMATIC TELEGRAPHY.

No. 384,324. Patented June 12, 1888.

Fig. 2.



WITNESSES:

Edwin L. Yewell.

Ewell A. Dirk.

INVENTOR.

Edward J. Mallett.

by Marcellus Bailey.

His Attorney.

(No Model.)

4 Sheets—Sheet 3.

E. J. MALLETT.

AUTOMATIC TELEGRAPHY.

No. 384,324. Patented June 12, 1888.

Fig. 3.

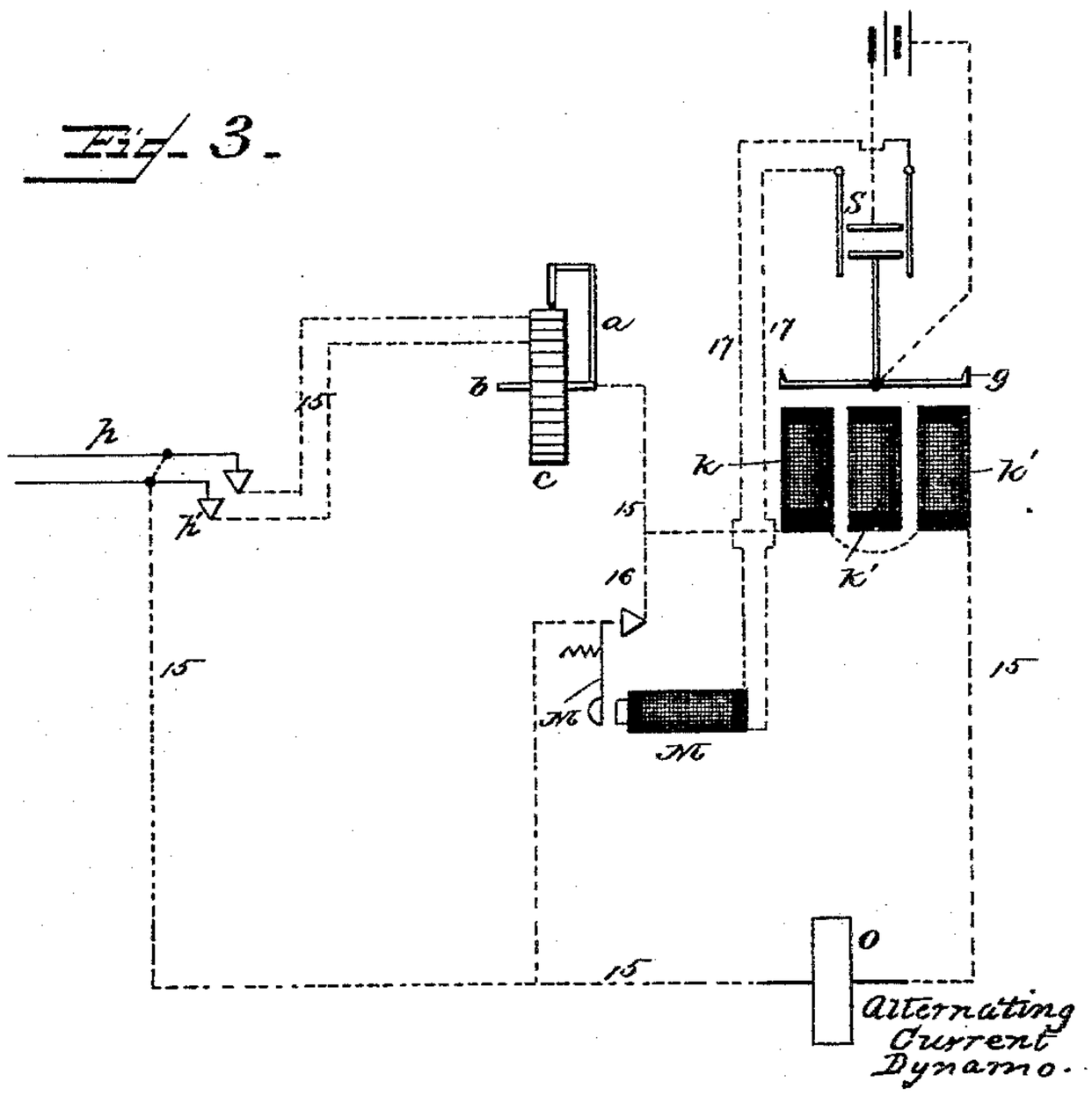
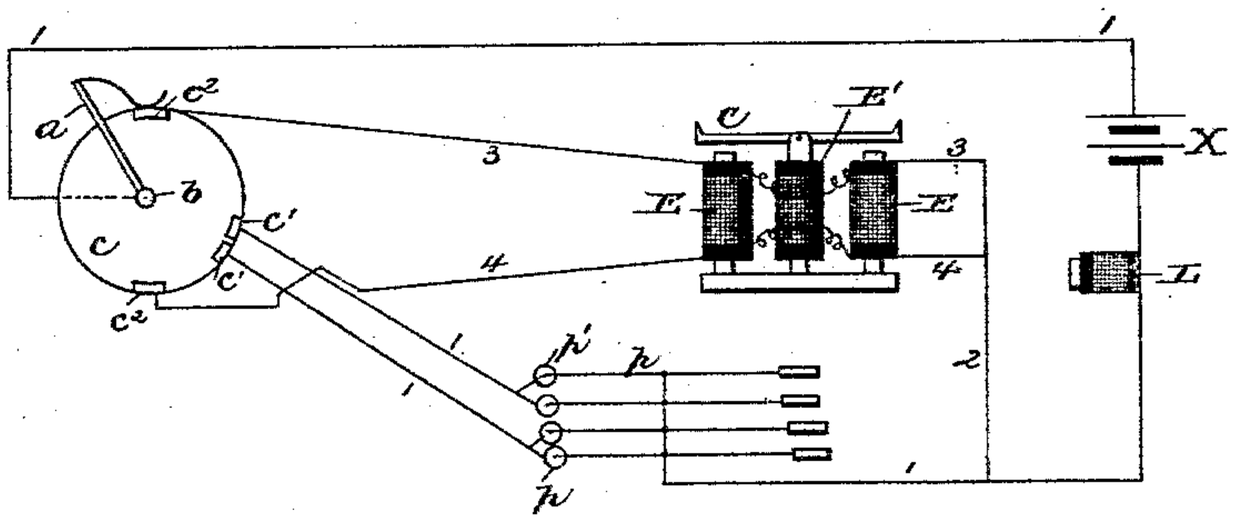


Fig. 4.



WITNESSES.

Edwin L. Yewell.

Wallace Dick.

INVENTOR.

Edward J. Mallett.

by Marcellus Bailey

his Attorney.

(No Model.)

4 Sheets—Sheet 4.

E. J. MALLETT.

AUTOMATIC TELEGRAPHY.

No. 384,324. Patented June 12, 1888.

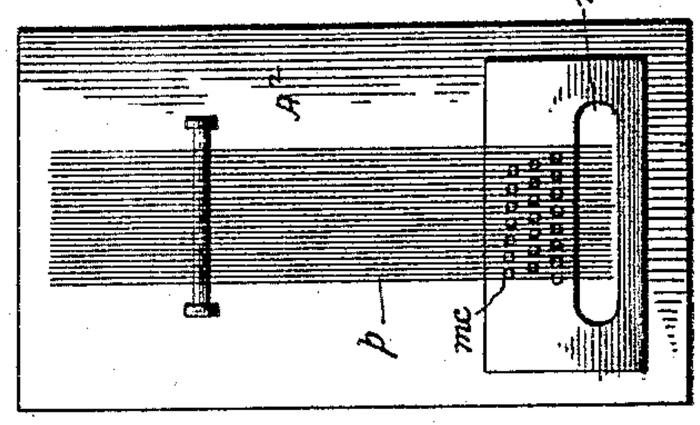


Fig. 5.

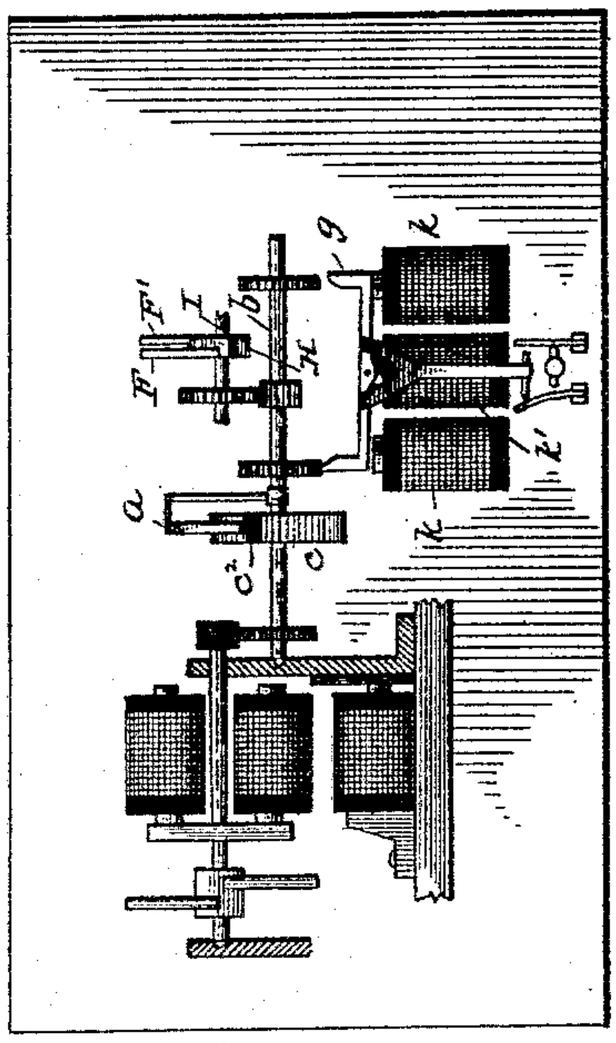


Fig. 6.

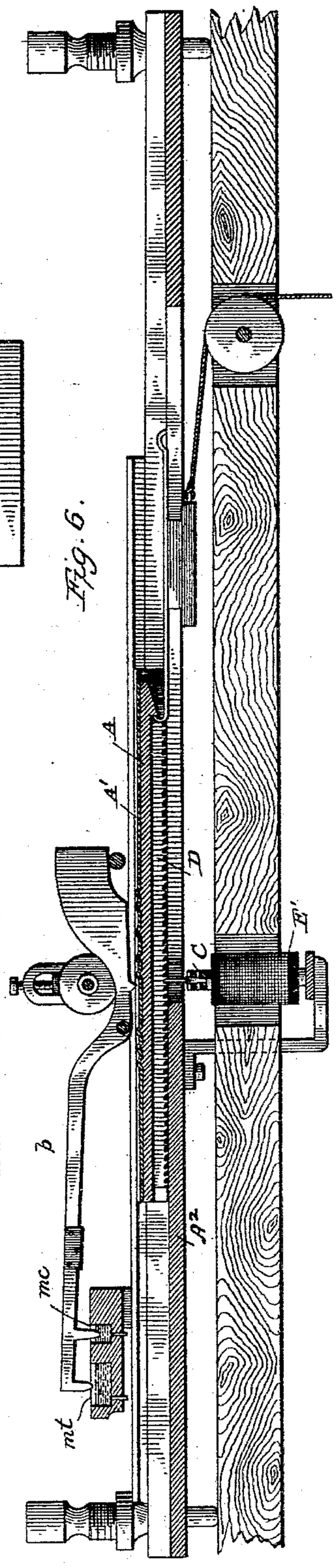
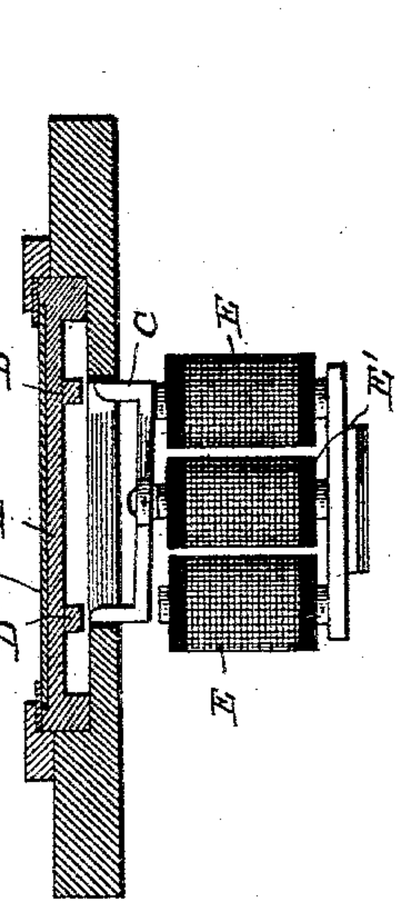


Fig. 7.



WITNESSES.

Edwin I. Yewell

Wellington Dick

INVENTOR,

Edward J. Mallett.

by Munn & Co

his Attorney.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

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

AUTOMATIC TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 384,324, dated June 12, 1888.

Application filed April 5, 1888. Serial No. 269,685. (No mo'el.)

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.

In my Letters Patent No. 343,042, of June 1, 1886, I have described a system of automatic telegraphy involving, among other things, an automatic transmitter containing stopping mechanism, together with releasing devices, brought into action by the operation of the stopping mechanism and automatically operating when thus brought into action to release the transmitter from the control of the stopping mechanism. The stopping mechanism in said patented system is controlled by a fillet or card having the code signals or indications thereon in transverse lines, and the car or holder for said card is intermittently fed once for each revolution of the trailer and in the interval between the use of any two successive transverse lines on the card.

My present invention involves these same general features, and is an improvement upon the organization described in my said Letters Patent in illustration of the said system. It is directed to simplifying and rendering more efficient the means for automatically stopping the transmitter, for automatically starting the transmitter, or, in other words, releasing it from the control of the stopping mechanism, and for effecting or controlling the feed of the car or holder which contains the prepared card. The feed of the car or holder is controlled by a polarized escapement included in the trailer-circuit—that is to say, the circuit in which are placed the trailer-arm, its co operating sunflower-disk, and the transmitting-keys that are operated by the prepared card—which escapement permits the car to feed a distance of one tooth on the completion of a revolution of the trailer arm, and while the latter is passing over the interval-segment or "car-segment," as it may be termed, on the sunflower-disk. The car-escapement armature must thus vibrate slowly, with intervals between successive vibrations corresponding to successive revolutions of the trailer—that is to say, when the trailer completes one revolution the car-escapement armature moves in one direction, and when the trailer completes the next revolution the armature moves in the opposite direction, and so on. The transmitter in the organization shown by me is stopped by a stopping-magnet included in the trailer-circuit, which, when energized, attracts its armature, and thus breaks contacts controlled by said armature and included in the circuit of an automatic pole-changer, which throws reversals upon or causes reversals in the circuit which includes the magnet for actuating or controlling the escapement of the transmitter. The effect of this action is to stop the transmitter. In order to automatically release it from the control of the stopping mechanism, I provide for short circuiting the stopping magnet by forming a normally-open shunt around the said magnet, the contacts of which are controlled by the armature of an electro-magnet, which I term the "starting-magnet," included in a high-resistance circuit in derivation to that of the automatic pole-changer. Thus when the circuit of the automatic pole-changer is broken by the stopping-magnet sufficient current will pass over the circuit in derivation thereto to energize the starting-magnet, the result of which will be to close the shunt around the stopping-magnet, and, the latter being thus short-circuited, loses its energy and permits its armature to reclose the pole-changer circuit.

The nature of my invention and the manner in which the same is or may be carried into effect will be readily understood by reference to the accompanying drawings, in which—

Figure 1 is a view in the main diagrammatic of the general system in which my improvements are involved, showing the card holder or car in vertical cross-section. Fig. 2 is a diagram representing a modification of the system which may be used whenever it is found desirable to actuate one or more escapements, each from its own automatic pole-changer, without having the latter in circuit with the escapement-magnet. Fig. 3 is a diagram illustrative of the application of the starting-magnet to a system in which an alternating current is used to actuate the pole-changer. Fig. 4 is a diagram illustrative of a way of effecting the feed of the card-holder without the use of an extra disk and trailer-arm. Fig. 5 is a view of the parts of the transmitter (omitting

the circuit-connections) as they are actually assembled together on the transmitting-table. In this figure I omit from the card-carrier the car which holds the prepared card and the guides therefor. Fig. 6 is a longitudinal vertical central section of the card-carrier. Fig. 7 is a transverse section of the same in the plane of the escapement, omitting the needles and the press-roll.

The stationary sunflower or segment disk of the transmitter is shown at *c*. It has as many segments as there are keys in Fig. 1 or pivoted needles *p*. Each needle has its own anvil, *p'*, and each anvil is connected to its appropriate segment, *c'*, of disk *c*. I have shown only one of these segments, anvils, and keys. Their construction, arrangement, and mode of operation are well known and require no further explanation. In addition to the needle-segments *c'*, the disk *c* carries also the unconnected interval or "car" segment c^2. During the passage of the trailer-arm *a* over this last-named segment the feed of the card car or holder takes place. The trailer-arm *a* is attached to and revolves with a shaft, *b*, driven by any suitable motor, and governed in its movement by a polarized escapement of any known or suitable construction. In the present instance the scape-fork of this escapement is shown at *g* attached to a polarized armature, the controlling or actuating magnet of which is shown at *k*. This magnet consists of three cores mounted on a common yoke and surrounded each by its own spool. The armature *g* is pivoted on the core of the middle magnet, *k'*. The scape-fork *g* is to engage scape-wheels on the shaft *b*, as will be understood without further explanation. I have placed it in the present instance some distance from the trailer-shaft *b* simply to avoid the obscurity which would arise from superposing and intermingling the circuits. The actual relation in which the parts just referred to stand to one another in the instrument is shown plainly in Fig. 5.

Any suitable automatic pole-changer can be employed to cause reversals in the circuit in which the escapement-magnet *k* is included. That which is shown in the drawings is a three-spool magnet, *d d'*, similar to *k k'*, having its armature *e* pivoted to the central core. Armature *e* has centrally affixed to it an upright arm, *f'*, provided with a contact, *f*, which plays between the two spring-contacts *h h'*, fixed to some suitable part of the instrument. Above the contact *f* is the stationary contact *i*, placed between the same spring-strip contacts *h h'*.

The car A, Figs. 6, and 7, for the prepared card A', which operates the needles, is supported to slide in guides on a suitable base, A^2, and is actuated to move by gravity or other suitable means—in this instance by means of a weight and cord, B. Its movement is controlled by any suitable form of escapement. That escapement in the present instance consists of the scape-fork C, which in its vibration engages first one and then the other of scape-teeth racks D on the under side of the car, in this way permitting the car to have the necessary intermittent movement of progression. In the instrument shown in Figs. 5 and 6 the needles dip always each into its individual mercury-cup *mc*, while such of them as are from time to time tilted by the embossments on the prepared card A' dip when thus tilted into the mercury-trough *mt*, which is common to all the needles. The scape-fork C is on or forms part of an armature which is pivoted to the center core of a three-spool polarized magnet, E E'. The energizing of this magnet and the consequent vibration of the armature is governed by a trailer-arm, F, fixed to a rotary shaft, G, and revolving around a fixed non-conducting disk, H, provided with two diametrically-opposite conducting-segments, I I'.

The trailer-arm F, for reasons hereinafter indicated, revolves at half the speed of trailer-arm *a*, and the relations of these two trailer-arms and their respective disks are such that when *a*, after one revolution, has reached segment c^2, F, by a half-revolution, will have reached segment I, and when *a*, after the next succeeding revolution, has again reached segment c^2, F, by another half-revolution, will have reached segment I', and so on. The two trailer-arms can readily be thus speeded in the manner indicated in Fig. 5, where the power-driven shaft *b* of trailer *a* is represented as provided with a pinion, J, of twelve teeth, which gears with a spur-wheel, K, of twenty-four teeth, on the shaft G of trailer F.

Referring now to Fig. 1, the circuit-connections of the devices thus far described are as follows: X is the battery of the trailer-circuit, the circuit including the transmitting-trailer-arm *a*, &c., being as follows: From one pole of battery by wire 1 to trailer-arm *a*, thence to disk *c*, and from there by wire 1 to anvil *p'*, needle *p*, wire 1, through magnet L, back to the other pole of battery. Magnet L is the stopping-magnet, and controls contacts in the pole-changer circuit, as will be hereinafter described. The polarized magnet of the car-escapement has its two outer spools, E, doubly wound. Each winding is independent of the other, and they are of such character that when a current is passed through one winding it will impart to the magnet an opposite polarity to that which it would impart if passed through the other winding. The center electro-magnet, E', which inductively magnetizes the armature C, is excited from any suitable source. From wire 1 on one side of the battery X is taken a branch wire, 2, which at a point near the magnet E divides, one branch, 3, passing through one winding and the other branch, 4, passing through the other winding of the magnet. Thence the branches 3 4 continue, being connected the one to one segment, I, and the other to the other segment, I'. From the trailer F extends a wire, 5, to the wire 1 on the opposite side of the battery from 2. The controlling devices of the car-escapement are thus in-

cluded in a derived circuit to that in which the transmitting-trailer *a* is included. Under this arrangement it will be noted that when trailer *a* is on the interval or non-conducting segment c^2 the trailer F will be on one or the other of the segments I I'. If it be on the segment I, then the car-escapement circuit will be completed through the branch 3 and the magnet E will have the polarity due to the winding included in that branch, and the armature C will be tilted in a corresponding direction, thus allowing the car to feed one tooth—that is, the distance which separates one transverse line of symbols on the card from the next. This takes place while the trailer *a* is passing over interval-segment c^2. When the trailer *a* completes its next revolution and again meets its segment c^2, the trailer F (revolving only half as fast as trailer *a*) will, by meeting segment I', complete the car-escapement circuit through the branch 4 and the winding connected with that branch, thus imparting opposite polarity to magnet E and tilting the armature C in the opposite direction, and consequently effecting the feed of the car, as before. Thus the car-escapement circuit, as the transmitting-trailer contacts with its interval-segment, is completed through alternately-opposite windings of the escapement-magnet, with the result of imparting the proper intermittent feed to the car.

It is manifest that in lieu of having two segments I I', in connection with a single trailer, the same result can be attained by having only one segment in connection with two diametrically-opposite trailers, as shown in Fig. 5, where F F' are the two trailers and I the single segment. In such event the obvious modification of the circuit-connections would be to connect up the two trailers in the same way as the two segments I I' are now connected, and to shift to the single segment the present connection of the single trailer F.

The circuit-connections of the automatic pole-changer and the escapement-magnet of the transmitter are as follows: In the particular arrangement shown in Fig. 1 the pole-changer is in the same circuit with the escapement-magnet. Under these conditions the connections are as follows: Starting from the + pole of battery Y, this circuit extends by wire 6 to the contact-tongue *f* of the pole-changer, and from the — pole of battery Y extends a wire, 7, to the fixed contact *i*. From one of the spring-contact strips *h* extends a wire, 8, through the normally-closed contacts controlled by armature L' of stopping-magnet L, thence through the two spools *k* of the escapement-magnet, thence to and through the two spools *d* of the pole changer, and thence back to the other spring-contact strip, *h'*. In practice I connect up the center spools, *d'* and *k'*, of the two magnets in a derived circuit, 9, of comparatively high resistance with a view to obtaining an ascertained division of the current between these spools (which act with permanent induction upon their armatures) and those through which reversals pass. This feature, however, is not here claimed, but is made by me the subject of a separate application for Letters Patent of even date herewith. The contact-strips *h* *h'* normally press toward the contacts *f* and *i*, and each is alternately separate from the fixed contact *i* by the contact-tongue *f*, which plays between them. The arrangement of contacts and the winding of the pole-changer is such that the direction in which the current flows when the tongue *f* vibrates to one side will impart such polarity to the magnet *d* as to cause its armature to move the tongue to the other side. Thus a rapid sequence of reversals will be thrown over the circuit so long as the contacts controlled by armature L' remain closed. Whenever, however, the trailer-circuit is closed, whether by the action of a key and anvil or by the action of the trailer F, magnet L will be excited, and will attract its armature L', consequently breaking the pole-changer circuit and bringing the instruments therein to a standstill. Thus, whenever the trailer-circuit is closed this closure will effect the stoppage of the automatic pole changer, and of the devices for operating or controlling the escapement of the transmitter. With the stoppage of the automatic pole-changer occurs, also, that of the pole-changer ordinarily employed to send reversals over the main line or working-circuit, for the purpose of operating the printing or other receiving-instruments. This will be understood by reference to Fig. 1, where, for convenience sake, I have connected this line-pole changer to the fork of the transmitter-escapement. The line-pole changer is lettered P. It, together with the line-battery V, line *l*, and circuit-connections, are represented by dotted lines, and require no further description.

With respect to the automatic pole-changer, it will be noted that it is one in which the electro-magnet, which controls by an induced magnetic armature the contact-points through which reversals are sent, is in the same circuit with said contact-points. This feature is not here claimed, the same having been made by me the subject of a separate application for Letters Patent, Serial No. 183,264, filed November 19, 1885, renewed April 5, 1888, Serial No. 269,659.

I have now indicated the manner in which the transmitter is stopped. Manifestly, however, in order to render it automatic some means must be provided by which it shall when thus stopped be automatically restarted. This result, as hereinbefore indicated, I obtain by the employment of releasing devices brought into action by the operation of the stopping mechanism and automatically operating, when thus brought into action, to release the transmitter from the control of the stopping mechanism.

The releasing devices now employed by me are simple and entirely effective. In a circuit, 10, in derivation to that in which the automatic

pole-changer is included, I place an electro-magnet, M, which I term the "starting-magnet." The armature M′ of this magnet controls normally-separated contact-points in a low-resistance shunt-circuit, 11, from the trailer-circuit battery X. The resistance of the circuit 10 is high, there being a resistance, R, interposed in it of, say, one hundred ohms, while the starting-magnet M itself has a resistance of seventy-five ohms. The object of this is that there shall not be sufficient current on circuit 10 to energize the starting-magnet M so long as the contacts controlled by the stopping-magnet armature L′ are closed and the circuit through the magnet of the automatic pole-changer is consequently completed; but whenever the circuit therethrough is broken by the action of the stopping-magnet L, then sufficient current will flow over the branch or derived circuit 10 to energize the starting-magnet M. This latter magnet M, under these conditions, will attract its armature M′, the shunt 11 will thereby be closed, the stopping-magnet, being short circuited, will be deprived of its energy and will release its armature, the circuit through the automatic pole-changer will be restored, and the transmitter will at once start again in movement. As soon as the automatic pole-changer circuit is again completed, the starting-magnet of course is cut out by the high resistance in its branch circuit, and consequently the shunt 11 is restored to its normally-open condition.

In diagram, Fig. 1, the automatic pole-changer is included in the same circuit with the escapement-magnet of the transmitter.

It may be desirable, however, at times (for instance, if it is wished to use a dynamo-current for the transmitting escapement-magnet) not to have the automatic pole-changer and the escapement-magnet in the same circuit. Such a modification is represented in Fig. 2, from which I have omitted the representation of any circuits other than the pole-changer circuit and the escapement-circuit. In this case the pole-changer is in its own independent circuit, which is broken by the stopping-magnet and then automatically restored, as hereinbefore provided. The pole-changer controls two sets of contacts, *m m′ n n′*, in the dynamo-circuit of the escapement-magnet *k k*. The movable contacts *m n* of these sets can be attached to any suitable vibrating arm, which is actuated from or by the pole-changer. For convenience sake I have in the present case represented them as carried by the armature of the pole-changer.

For convenience sake I have also shown two dynamos, Z, one positive, the other negative. One pole of the positive dynamo is connected to fixed contact *m′*, and one pole of the negative dynamo is connected to the other fixed contact, *n′*. From the common connection of the two movable contacts *m n* extends a wire, 12, to and through the magnets *k*, and thence back to the dynamos Z, where it branches, one branch, 13, going to the other pole of the positive dynamo, and the other branch, 14, going to the other pole of the negative dynamo.

In lieu of two dynamos, manifestly one only might be used.

In Fig. 3 I have illustrated the application of the starting-magnet to a system in which the escapement of the transmitter is actuated by an alternating current. Such an alternating current can be produced, for instance, by an alternating-current dynamo, O, which is in a circuit, 15, with the escapement-magnet *k* of the transmitter, the circuit continuing from the magnet *k* to the trailer-arm *a*, the sunflower-disk *c*, the keys and anvils *p p′*, back to the other pole of the dynamo. In this circuit the keys are supposed normally to be in contact with their anvils. In a branch, 16, of this circuit are included normally open or separated contact-points controlled by the armature M′ of the starting electro-magnet M, which is included in a circuit, 17, that passes through the contacts of a pole-changer, S, which vibrates with the escapement-magnet armature *g*. For convenience sake I have shown this pole-changer attached to the escapement-armature. So long as the escapement-armature is in vibration rapid reversals are sent over the circuit 17, and consequently the starting-magnet is unexcited. So soon, however, as circuit 15 is broken by the lifting of that one of the keys whose segment on the sunflower-disk *c* is met by the trailer the escapement-armature stops, thus bringing to rest the pole-changer, and consequently sending a prolonged impulse of one polarity through the starting-magnet M. The effect of this is to energize the starting-magnet, which attracts its armature, thereby closing the shunt or branch 16 and restoring the circuit through the escapement-magnet, with the result of again putting the escapement armature in vibration. As soon as this takes place, the magnet M loses its energy and the contacts in the shunt again open.

With reference to the devices for feeding the car, I remark that they have been devised with reference to the needs of a system in which the sunflower-disk contains only one complete set of code-segments; but when the sunflower-disk contains two complete sets of code-segments, each occupying one-half of the periphery of the disk, then I may dispense with the extra segment-disk H and trailer I, and may use for this purpose the transmitter-trailer *a* and sunflower-disk *c*. This modification is illustrated in Fig. 4.

The sunflower-disk *c* is supposed to have two complete sets of code-segments, *c′*—one on each half of its periphery. All of the needles have a common electrical connection with one pole of battery X. Their contacts are electrically coupled in pairs, and each pair is connected to its own segment of the sunflower-disk *c*. The circuit thence continues through the trailer back to battery. On the sunflower-disk are two diametrically-opposite conducting-segments, *c²*, placed in the intervals between the two sets of code-segments. In de-

rived circuit to the needles or keys and their anvils and segments (just as in Fig. 1) is included the doubly and oppositely wound escapement-magnet E, the two branches 3 4 therefrom extending to and connecting electrically with the respective segments c^2. Thus at each half-revolution of the trailer *a* the circuit will be completed through wire 2 and one and the other of the branches 3 4 alternately, with the effect of imparting the requisite feed movement to the armature C.

I have described what I believe to be the most desirable ways on the whole of carrying out my improvements; but manifestly the details of the several organizations which constitute the automatic transmitting system hereinbefore described can be considerably varied without departure from the principle of my invention. I therefore wish it to be understood that I do not restrict myself to these details; but

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

1. The combination, with the trailer-circuit and trailer included therein, of the scape-fork circuit, escapement operating or controlling devices therein, an automatic pole-changer for throwing reversals upon the scape-fork circuit, and a stopping-magnet in the trailer-circuit controlling contacts in the scape-fork circuit, whereby the closing of the trailer-circuit shall operate the stopping mechanism to effect the stoppage of said automatic pole-changer and escapement operating or controlling devices, substantially as and for the purposes hereinbefore set forth.

2. The combination, with an automatic telegraph-transmitter, means for actuating the same, and a stopping-magnet in the trailer-circuit of the transmitter controlling contacts in the scape-fork circuit of the transmitter, of a starting-magnet in the scape-fork circuit controlling contacts in the trailer-circuit, said starting-magnet being brought into action by the stoppage of the transmitter, and when thus called into action automatically operating to release the transmitter from the control of the stopping mechanism, substantially as hereinbefore set forth.

3. The combination of the trailer-circuit and trailer included therein, the scape-fork circuit and escapement operating or controlling devices included therein, an automatic pole-changer for throwing reversals upon the scape-fork circuit, a stopping-magnet in the trailer-circuit controlling contacts in the circuit in which the automatic pole-changer is included, and a starting-magnet controlling contacts in the stopping-magnet circuit brought into action by the operation of the stopping mechanism, and operating when thus brought into action to release the automatic pole-changer from the control of the stopping mechanism, substantially as hereinbefore set forth.

4. The trailer-circuit, including the anvils and keys, together with the doubly and oppositely wound car-escapement magnet having its two windings respectively connected with the two branches of a circuit in derivation to that which includes the keys, said branches being connected to separate segments, through one and the other of which alternately the derived circuit is completed at the times and in the manner substantially as and for the purposes hereinbefore set forth.

5. The trailer-circuit, including the transmitting-keys or needles and anvils, and the transmitting-trailer and sunflower-disk provided with an interval or car-segment, together with the doubly-wound car-escapement magnet, and the two-segment car-disk and trailer included in a branch of said circuit, the car-trailer revolving at half the speed of the transmitting-trailer and operating to close the branch circuit alternately through opposite segments of the car-disk, 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.