V. DURBIN.

SELECTIVE SIGNALING SYSTEM.

APPLICATION FILED MAY 16, 1910.

1,008,452.

Patented Nov. 14, 1911.

6 SHEETS—SHEET 1.

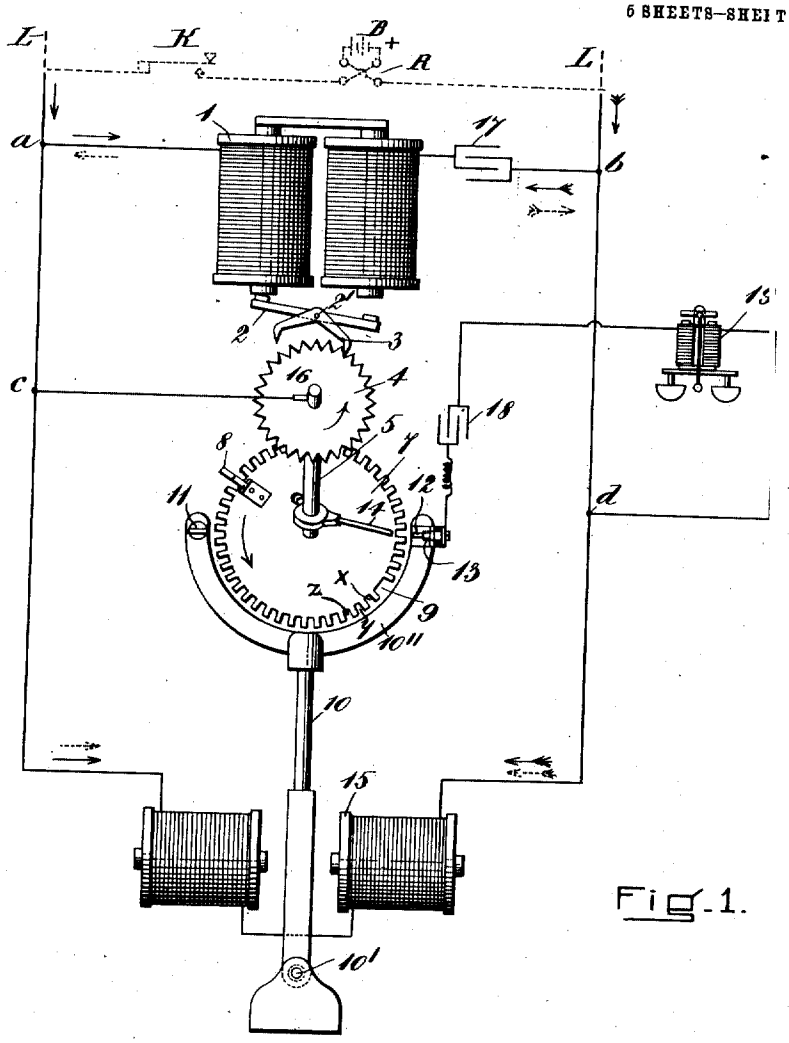

Fig. 1.

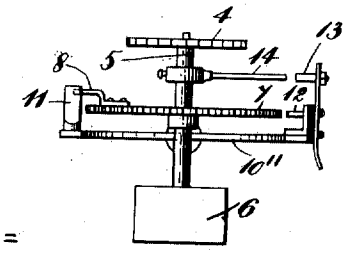

Fig. 2.

WITNESSES:

E. B. Tomlinson

Patrick J. Conroy.

INVENTOR:

Vernon H. Durbin

by Browne & Woodworth—

Atty's.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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5 SHEETS—SHEET 2.

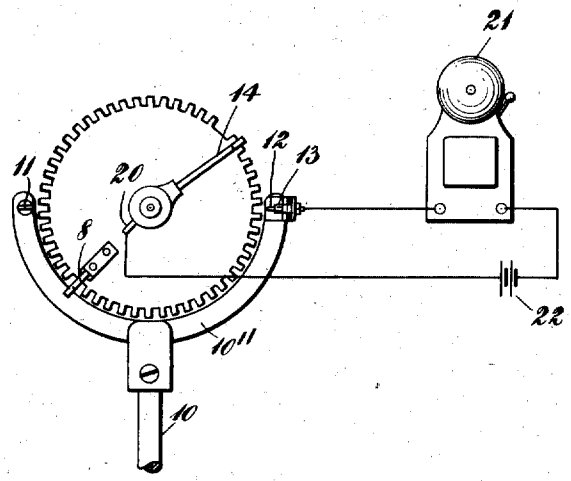

Fig. 3.

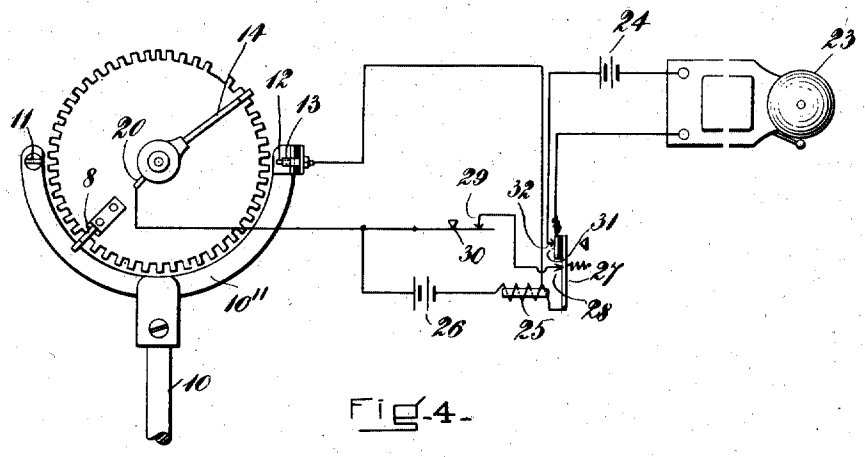

Fig. 4.

WITNESSES:

E. B. Tomlinson

Patrick J. Conroy.

INVENTOR:

Vernon L. Durbin

by Browne & Woodworth

Atty's.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

V. DURBIN.

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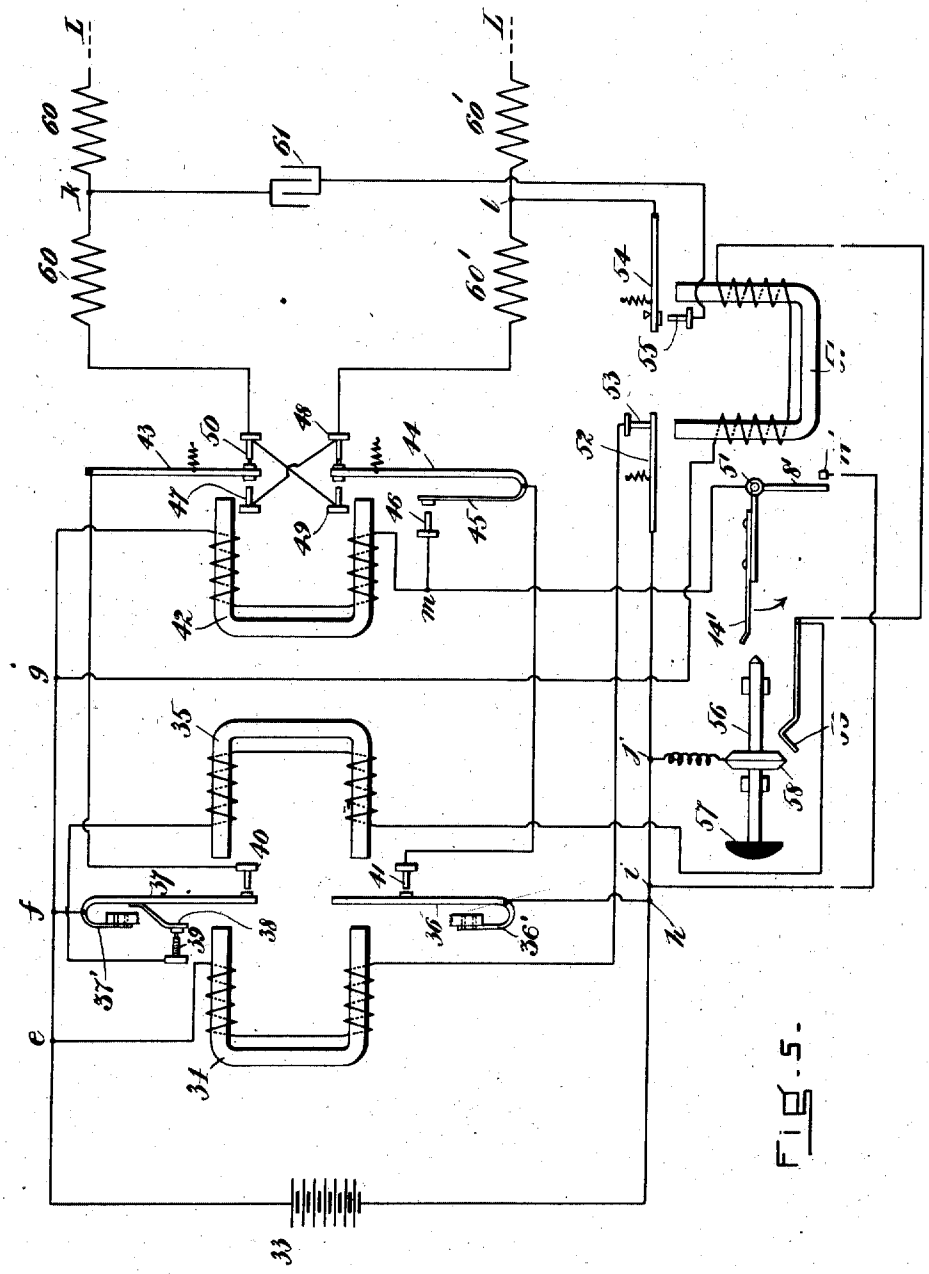

FIG. 5.

WITNESSES:

E. B. Tomlinson

Patrick J. Conroy

INVENTOR:

Vernon Durbin

by Browne & Woodworth

Attys.

V. DURBIN.

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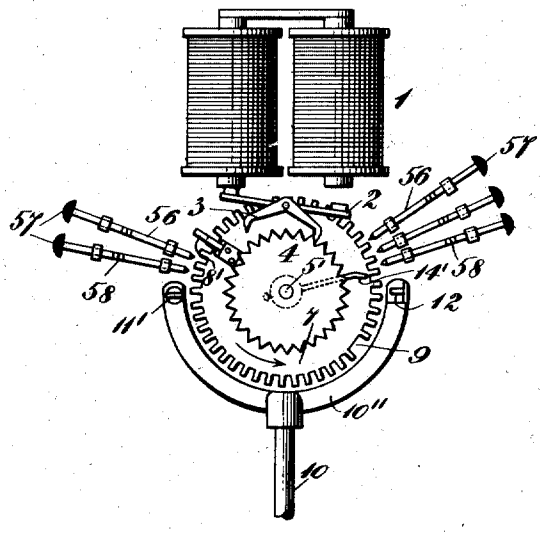

Fig. 7.

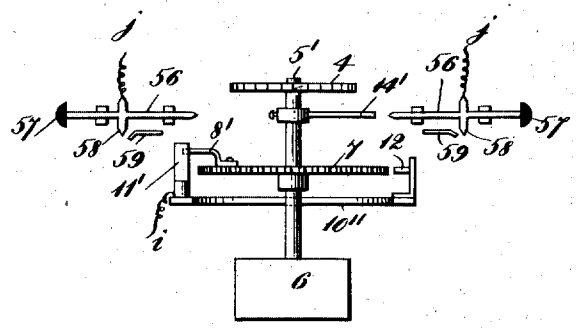

Fig. 6.

WITNESSES:

E. B. Tomlinson

Patrick J. Conroy.

INVENTOR:

Vernon Lburbin

by Browne & Woodworth

attys.

V. DURBIN.

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5 SHEETS-SHEET 5.

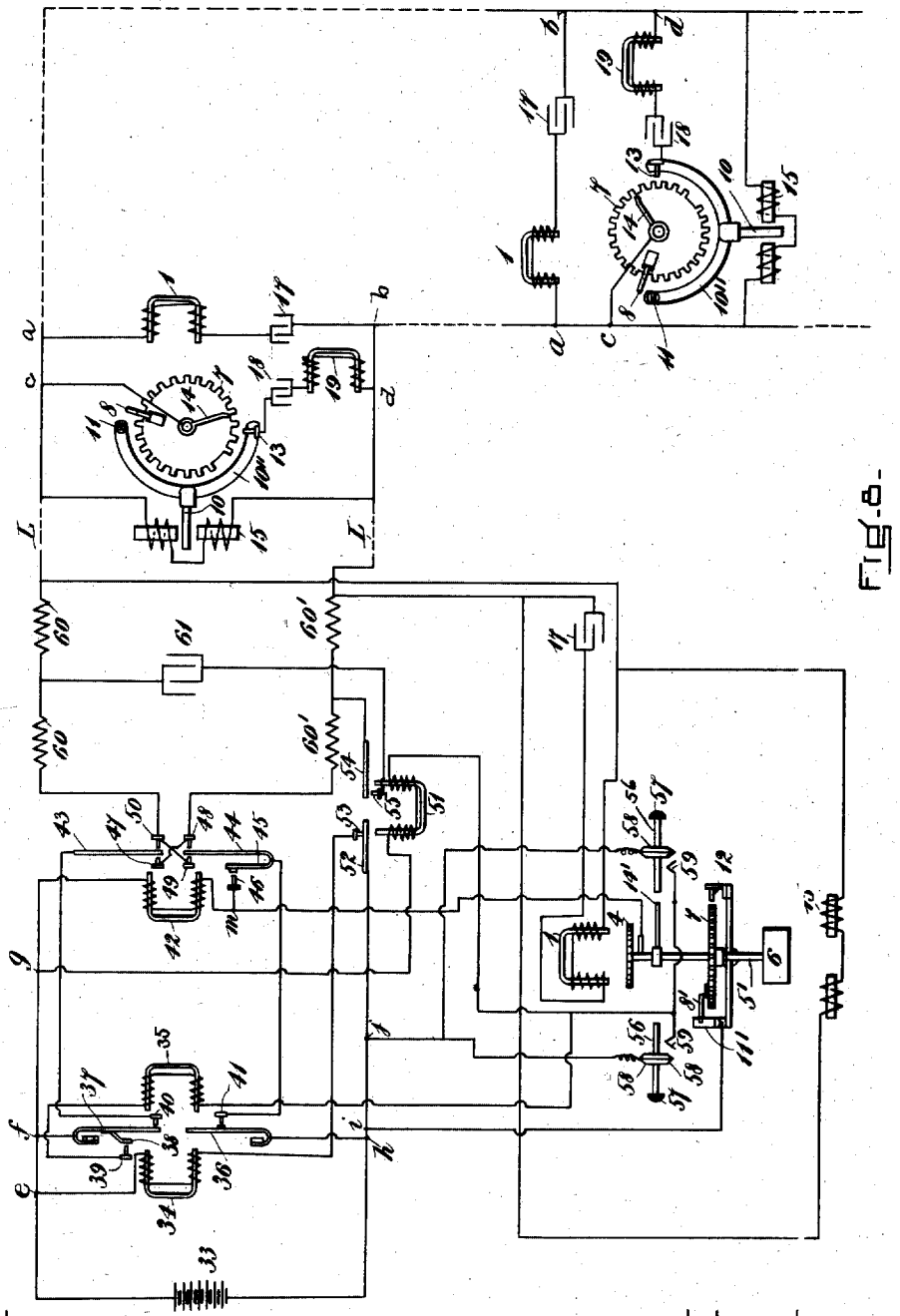

FIG. 5.

WITNESSES:

E. B. Tomlinson.

Patrick J. Conroy.

INVENTOR:

Vernon Durbin

by Brown & Woodworth

attys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

VERNON DURBIN, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR TO HOLTZER-CABOT ELECTRIC COMPANY, OF BROOKLINE, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

SELECTIVE SIGNALING SYSTEM.

1,008,452. Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed May 16, 1910. Serial No. 561,645.

To all whom it may concern:

Be it known that I, VERNON DURBIN, a citizen of the United States, and a resident of Brookline, in the county of Norfolk and State of Massachusetts, have invented a new and useful Improvement in Selective Signaling Systems, of which the following is a specification.

My invention relates to selective signaling systems adapted for use more especially in train-despatching telephone-systems.

The primary object of my invention is to provide a system whereby an operator at a transmitting station can send a signal to any one of a number of receiving stations to the exclusion of the others.

A secondary object is to provide means whereby the rotating parts at the several receiving stations and at the transmitting station are automatically synchronized or kept in step during the usual operation of the apparatus without any special act of the operator, although said rotating parts may, if desired, be all set to zero position, or synchronized by a special operation as hereinafter more fully described.

In the drawings which accompany and form a part of this specification, I have shown several forms of apparatus and circuit arrangements whereby the foregoing objects may be effected; although it will be understood that many modifications may be made by those skilled in the art both in the apparatus and in the circuit arrangements without departing from the principle of my invention.

In the drawings, Figure 1 is a diagram representing a receiving station; Fig. 2 is an elevation of a portion of the apparatus shown in Fig. 1; Figs. 3 and 4 are diagrams illustrating modifications of the local signaling circuit; Fig. 5 is a diagram of one form of transmitting system that may be employed with the receiving system illustrated in Fig. 1; Fig. 6 is an elevation of a portion of the apparatus at the transmitting station; Fig. 7 is a plan view of the apparatus shown in Fig. 6, and Fig. 8 is a diagram showing the circuits of a complete system.

In the particular drawing selected for more fully disclosing my invention, 1 represents a polarized magnet bridged across the line L, L, between the points *a*, *b* and arranged to actuate the armature 2 provided at 2′ and carrying the escapement 3. The shaft 5 which may be driven by any suitable motor, such as the spring motor 6, carries the escapement wheel 4 with which the escapement 3 coöperates, the toothed wheel 7, and the contact arm 14. The escapement wheel has one more tooth than the wheel 7, one of the teeth of the latter having been omitted, as shown at 9, at a point diametrically opposite the stop-arm 8 which is carried by said wheel. The armature 10 which is pivoted at 10′ and provided with the yoke 10″, is arranged to be oscillated by the polarized magnet 15 and carries at one end of its yoke a wheel-arresting device such as the post 11, and at the other a wheel-locking device, such as the tooth 12 arranged to cooperate with the notches between the teeth of the wheel 7. The contact point 13 may also be carried by and insulated from the yoke and is arranged to coöperate with the contact arm 14.

The contact arm 14 is connected with one side of the line at the point *c* in any suitable manner, as for example by the brush 16 which makes contact with the shaft 5, as shown in the present case, although it will be understood in practice that the frame which carries the said shaft will be conductively connected to one side of the line, as at the point *c*. The circuit containing the receiving station signaling apparatus may be connected between the other side of the line as at the point *d* and the contact point 13. In Fig. 1 said signal apparatus is shown as a polarized bell connected between the point *d* and the contact point 13 through the condenser 18.

The operation of the receiving system is as follows: Each receiving station will be provided with apparatus identical with that shown in Fig. 1 and the contact arms 14 will be arranged in successive positions around the circumference of the toothed wheel 7 so that each arm is arranged opposite a different one of the notches, that is to say, station No. 1, for example, may have its arm 14 arranged opposite the first notch *x* from the double notch 9, station No. 2 may have its arm 14 arranged opposite the next notch *y* and station No. 3 may have its arm 14 arranged opposite the next notch *z*, etc., no station having its arm 14 arranged opposite the double notch 9. If the central station desires to call one of the receiving stations,

a series of current pulsations equal in number to the number of the station to be called will be sent over the line and will actuate the polarized magnet 1 so as to oscillate the escapement and permit a step by step rotation of the wheel 7 until the arm 14, rigidly carried by the shaft to which said wheel is connected, comes opposite the contact point 13, whereupon a pulsation of current opposite in polarity to those which effected the rotation of the wheel 7, is transmitted to energize the magnet 15 thereby bringing the point 13 into contact with the arm 14 to close the circuit between the points *c* and *d* and actuate the local signaling apparatus 19, and placing the tooth 12 in one of the notches to lock the wheel against further rotation.

It will be understood of course that a great many different kinds of apparatus may be employed to effect the transmission of current impulses in the manner above set forth. For instance, as shown in dotted lines at the top of Fig. 1, the key K may be used to open and close the circuit of battery B and thereby transmit the desired number of current pulsations for effecting the step by step rotation of the wheel 7 and any simple form of reversing switch R may be used to send the pulsations of opposite polarity for making the contact between 13 and 14. Assuming that said key is open and the armature 2 is in the position shown, the closure of the key will cause current to flow through the magnet 1 and thereby attract the righthand end of the armature, and at the same time charge the condenser 17. Simultaneously, the current flowing when said key is closed will energize the polarized magnet 15 and cause the armature 10 to take the position shown, the contact point 13 being out of contact with the arm 14 and the post 11 being in its wheel-arresting position in the path of the stop-arm 8. As soon as the key is opened again, the condenser discharges through the magnets 1 and 15, such discharge through the magnet 1 being opposite to the original direction of current flowing therethrough, so that the left-hand side of the armature 2 is again attracted. However, the direction of the condenser discharge through the magnet 15 is the same as that of the original current flow therethrough so that the position of the armature 10 is not altered.

The solid arrows in Fig. 1 indicate the direction of current flow from the battery B through the magnets and the dotted arrows the direction of the condenser discharge therethrough. The signal impulse transmitted by closing and opening the key causes the wheel 7 to rotate past the tooth 12 to the extent of one notch, said tooth always being opposite a notch when the key is open, or in other words, when the armature 2 is in the position shown. Thus, if the train-despatcher desires to call the station numbered five, he will close and open the key five times (assuming of course that each wheel has been "set to zero") so as to bring the contact arm 14 at station 5 but at no other station, opposite the tooth 12 and contact point 13. He will then reverse the polarity of the battery B and close the key K with the result that the current flowing through the magnet 1 will not cause the armature 2 to be moved because this reverse impulse is in the same direction as the original condenser discharge, which as above explained, caused the armature to take the position shown. This pulsation of reverse current, however, flowing through the magnet 15, will cause the armature 10 to move to the left so that the tooth 12 engages a notch in the wheel 7 and locks the same against further rotation and the contact point 13 closes on the contact arm 14. The operator may now open and close the key a number of times for the purpose of actuating the polarized bell 19 or other local signal device. It will be understood of course that each magnet 15 at all the stations will operate the armatures 10 in the manner above set forth and that the teeth 12 will arrest the further rotation of all the wheels 7; but inasmuch as the contact arms 14 are arranged as above described, none of the local signaling apparatus will be actuated at the other stations. Upon the reversal of the polarity of the battery B and the sending of an impulse or impulses in the original direction, the armature 10 is again moved to the position shown in Fig. 1 by the energization of the magnet 15, the tooth 12 is thereby disengaged from its locking position, and the armature 2 is again oscillated in the manner set forth.

To set the toothed wheel 7 at zero with the center of the notch 9 opposite the tooth 12 and the stop-arm 8 against the post 11, the operator at the transmitting station will send over the line pulsations in the original direction (shown by the solid arrow) equal in number to the number of teeth on the wheel 7, thereby bringing every stop-arm against its coöperating stop-post. He will then reverse the battery and send over the line one pulsation in the direction of the solid feathered arrows, whereupon each stop-arm will be released in the following manner: The closure of the key whereby said reversed pulsation is transmitted will cause current to pass through the magnets 1 in the direction of the solid feathered arrow when the armature is in the position shown in Fig. 1, so that said armature will not be oscillated, and said pulsation will pass through the magnet 15 in the direction of the solid feathered arrow so that the armature 10 will be attracted to the left,

thereby moving the post 11 to its releasing position out of the path of the stop-arm and the tooth 12 into the notch 9. As the key is opened, the condenser 17 discharges in the direction of the dotted feathered arrow (which direction is the same as the original current impulse) so that the armature 2 is oscillated and the wheel 7 stepped around a space equal to one notch, thereby bringing the stop-arm directly opposite the post, this movement of the wheel being permitted by the double notch 9. The condenser discharge passes through the magnet 15 in the same direction as the reversed impulse sent by closing the key, so that the armature 10 is not moved back to the right. The battery is then reversed, so that the closure of the key will send an impulse over the line in the original direction, oscillating the armature 2 and throwing the armature 10 over to the right in the position shown in Fig. 1. The opening of the key will then cause the wheel to move a half a notch farther, so that one pulsation will now cause the contact arm 14 of station 1 to come opposite the contact point 13, two pulsations will cause said arm to come opposite said point at station 2, and so on.

The transmitting station will be provided with an apparatus identical with that shown in Fig. 1, so that the operator in the use of the apparatus may always know just when it is necessary, in the use of the apparatus for signaling, to send a reversed current impulse over the line for the purpose of placing each post 11 in its releasing position and enabling each stop-arm to pass the same. For instance, with the apparatus set in the position shown in Fig. 1, in which the arm 14 of station 46 is opposite the contact point 13, it will be obvious that four pulsations of current will cause all the stop-arms 8 to come in contact with their respective posts, so that were a reversed current impulse not sent at the end of four direct current impulses, the motion of all the wheels would be arrested. The sending of this reversed current impulse will not actuate any local signal apparatus, for the reason, as above explained, that no contact arm 14 is located opposite the notch 9. Thus if any wheel or wheels is out of step with the rest, the ordinary operation of the apparatus for signaling will automatically effect the synchronization of the step-by-step rotating parts once during every revolution and a small fraction thereof,—in other words, the stop-arm 8 at the transmitting station cannot pass the post 11 at said station twice successively without effecting the complete synchronization or the setting to zero of all the wheels 7.

In apparatus of this kind where a number of widely separated step-by-step mechanisms are employed, it is of course necessary to employ synchronizers, and so far as I am aware, the synchronization of such parts has heretofore always been effected by a special apparatus requiring a special operation on the part of an attendant. It will therefore be seen that the automatic synchronization of the several toothed wheels forms a salient feature of my invention.

The present system is intended for use over a relatively long line, about two hundred miles in length comprising a number of receiving stations (shown in the present instance as forty-eight) and therefore I prefer to employ polarized magnets in all instances because of the well known sensitiveness of such apparatus. However, as shown in Fig. 3, the polarized bell 19 may be replaced by an ordinary electric bell 21 actuated by the battery 22, which is connected with the contact arm through the brush 20. In some cases it may be desirable to arrange the local signaling system so that the bell will ring until the attendant breaks the circuit thereof, or performs some other operation. The modification shown in Fig. 4 is designed to accomplish this result. In this case, when the contact point 13 is brought against the contact arm 14, the circuit of the relay 25 and battery 26 is closed, so that the armature 27 is brought against the contact point 28, whereupon the circuit 26 30 29 28 27 25 is closed and the armature held in position until by the key 30 or otherwise said circuit is broken thereby releasing said armature. The attraction of said armature will close the circuit of the bell 23 and battery 24 at the contact point 32, and accordingly the bell 23 will ring until the circuit of the relay 25 is broken. The tooth 12 need not be used in this instance.

In the commercial use of the receiving system shown in Fig. 1, it is desirable for obvious reasons that means be employed whereby the various operations heretofore described as effected by the key K, battery B and reversing switch R, shall be automatic.

In Fig. 5 I have illustrated diagrammatically one arrangement of automatic transmitting apparatus, although it will be understood of course that the receiving system is not limited to use in connection therewith.

In Fig. 5, 33 represents a suitable source of electric energy connected normally through the hold-back magnet 34, contact 53, and armature 52, so that the armatures 36, 37 of the vibrator magnet 35 which by their spring-supports 36′, 37′ are held away from their coöperating contacts 40, 41 are attracted and held back against vibration until the magnet 34 is deënergized. 56 represents a manually-operated contact member or plunger provided with an insulated head 57 and carrying the contact 58 which is connected to one side of the battery at *j*. It

will be understood that the transmitting apparatus will be provided with as many plungers as there are receiving stations, although for convenience, only one has been shown in Fig. 5. When the plunger is pushed inward, the contact piece 58 engages the spring contact member 59, thereby closing the circuit of the vibrator magnet 35 through the battery by way of the point *f*, through the spring 38, contact 39, windings of the magnet 35, spring 59 contact piece 58, point *j*, thence back to the battery, and also closing the circuit of the starting magnet 51 through the battery by way of the point *g*, windings of the magnet 51, spring 59, contact piece 58, point *j*, thence back to the battery. The energization of the starting magnet closes the circuit of the condenser 61, bridged across the line L L between the points *k* and *l*, through the armature 54 and contact 55, and at the same time opens the circuit of the hold-back magnet 34 between the armature 52 and its coöperating contact 53. The armatures 36 and 37, which may be mechanically connected, are now set in vibration and pulsating currents are sent over the line by way of contact 40, armature 43 of the reversing relay 42, contact 50, against which said armature normally is held, impedance coils 60, to the line, and back through the impedance coils 60′, contact 48, against which the armature 44 normally is held, contact 41, and armature 36, the circuit being completed through the battery by way of the point *h* and thence to the armature 37 of the vibrator magnet and contact 40 by way of point *f*. The shaft 5′ at the transmitting station carries apparatus identical except for the omission of the contact point 13, with that carried by the shaft 5 at each receiving station, and is governed by a magnetically operated escapement in the same way as the receiving station apparatus, the control magnets for said escapement being connected across the line. The contact arm 14′ at the transmitting station is arranged to make contact with, and to have its motion arrested by, a plunger 56 when the same is completely depressed, and the post 11′ carried by a yoke identical with the receiving station yoke 10′ is connected to one side of the battery at the point *i*. It will be understood of course that at the transmitting station the contact point 13 is removed from the yoke and there is no apparatus corresponding to the signaling device 19.

When any one of the plungers 57 (see Fig. 7) is depressed sufficiently to bring the contact piece 58 into engagement with the spring 59, but not sufficiently to cause the end of the plunger to engage the contact arm 14′, the pulsating currents which are sent out over the line in the direction of the solid arrow shown in Fig. 1, cause all the wheels 7 to rotate until the movement thereof is arrested by the stop-arms 8 coming into contact with their respective posts 11. As soon as the stop-arm 8′ at the transmitting station engages the post 11′, the circuit through the reversing relay is closed through the battery by way of points *e f*, windings of magnet 42, point *m*, shaft 5′, arm 8′, post 11′, and thence back to the battery by way of the point *i*. The energization of the magnet 42 causes the armatures 43, 44 to be thrown over to current-reversing position against the contacts 47, 49, respectively, thereby sending one pulsation of reversed current over the line, which actuates all the magnets 15 including the one at the transmitting station, so that, as above described in connection with Fig. 1, each post is moved to the left to its releasing position so as to permit the stop-arms to move past the posts. After the contact between 8′ and 11′ is broken, the reversing relay is held in current-reversing position by the by-path *m* 46 45 41 36 *h*, and is not deënergized by the opening of the contact between the post 41 and the armature 36 until shortly after the breaking of the contact between 8′ and 11′. The magnets 1 of the step-by-step apparatus which carry the arms 8 8′ are energized by intermittent currents. When the armature 37 makes contact with the post 40, a current impulse is sent to line and causes the armature 2 to take a certain position. When the armature 37 is in the position shown in Fig. 3, the flow of current to the line is interrupted and the discharge of the condenser 17 causes the armature 2 to take its other position. The armature 36 vibrates synchronously with armature 37 and the apparatus is so arranged that when armature 37 is out of contact with post 40, the arm 8′ is in contact with post 11′. As the armatures 36 and 37 vibrate synchronously, it follows that when armature 37 is out of contact with post 40, armature 36 is out of contact with post 41. The next impulse sent to line by armature 37 contacting with post 40 will cause arm 8′ to leave the post 11′, and inasmuch as the armatures 36 and 37 vibrate synchronously, it follows that the armature 36 is in contact with the post 41 when the arm 8′ leaves the post 11′. Therefore the reversing relay is held in current-reversing-position by said by-path and is not deënergized by the opening of said by-path between the armature 36 and post 41 until shortly after the breaking of the contact between arm 8′ and post 11′, so that a complete current impulse is transmitted. (If the circuit of the reversing relay were broken instantaneously by 8′ passing 11′, the contacts between 43, 47 and 44, 49 would not remain closed long enough to permit a complete pulsation of reversed current to pass to the line.) When the reversing re-

lay has been deënergized, current pulsations in the original direction are again sent over the line, thereby causing the wheels 7 to continue their step-by-step rotation. To set all the wheels at zero, the transmitting operator will therefore depress any one of the plungers 56 until the contact arm 8′ has twice passed the post 11′ and the wheel 7 at his station has made a revolution and a fraction thereof. In view of what has heretofore been said in regard to automatic synchronization, it will be understood that the special synchronizing operation just described will be but rarely necessary.

To call any given receiving station, the operator depresses the corresponding plunger 56 to its full extent, the contact piece 58 passing over, but still remaining in contact with, the spring 59, so that without breaking contact with the spring 59, its inner end is in the path of the arm 14′. As soon as the motion of the wheel 7 at the transmitting station is arrested by the arm 14′ striking the end of the plunger 56, the circuit of the reversing relay is closed through the battery by way of the points *e f*, winding of magnet 42, point *m*, shaft 5′, arm 14′, plunger 56, point *j*, and thence back to the battery whereupon reversed current pulsations are sent over the line until the plunger is withdrawn with the result that every armature 10 at every receiving station is thrown over to the left (from the position shown in Fig. 1) and the contact point 13 at the particular station called is brought against the contact arm 14 at said station, thereby actuating the local signal apparatus in the manner heretofore described. It will be noted that when the wheels 7 are all in step, all the stop-arms 8 will come against their respective posts 11 at the same instant, and that the reversed current impulse sent out as above described by the contact formed between 8′ and 11′ will move each post out of the path of its cooperating stop-arm, so that the movement of the wheels is never more than momentarily arrested; but in cases where a wheel is out of step with the other wheels, the movement of the wheel in question is arrested one or more times until it is brought into step with the others.

When the reversing relay is energized and the armature 44 thrown over against its contact point 49, the spring contact 45 is brought against the post 46, thereby closing the by-path above referred to which completes the circuit of the reversing relay by way of the contact 41 and armature 36, and keeps said relay energized for the exceedingly short interval of time between the breaking of the contact of the plunger with the arm 14′ and the breaking of the contact of the contact piece 58 with the spring 59, so that every time a plunger is withdrawn, the last impulse sent over the line will be a reversed current impulse and the armature 2 at every station will be in the position shown in Fig. 1. If this by-path were not formed, the reversing relay would be deenergized as soon as the plunger broke contact with the arm 14, and a partial direct impulse would be transmitted to the line before the contact piece 58 was withdrawn from engagement with the spring 59.

It will be noted that by means of the transmitting apparatus shown in Fig. 5, the step-by-step rotating parts of all the stations automatically are synchronized during the operation of the apparatus in its intended manner without requiring any special synchronizing operation on the part of the operator.

The function of the condenser 31, bridged across the line by the energization of the starting relay 51, is merely the usual function of such condenser to prevent sparking at the contacts between 37 and 40 and 38 and 39. When a station has been called and the plunger withdrawn, the magnet 51 is deenergized and the condenser disconnected so as not to reduce the efficiency of the line for the transmission of telephone currents. The impedance coils 60, 61′, which may be employed, perform the usual function of "smoothing out" the pulsations.

In Figs. 6 and 7 I have shown the step-by-step mechanism for the transmitting station which has been indicated diagrammatically in Fig. 5, it being understood of course that there will be one plunger 56 for every receiving station associated with the system. With the exception of the contact point 13 and the connection of the stop post 11′ to the battery at the point *i*, the step-by-step mechanism at the transmitting station is identical with those at the receiving station.

In Fig. 8 I have shown the circuits of a complete system including the transmitting station and two receiving stations bridged across the main line, the same reference characters as in the other figures being employed so that Fig. 8 will readily be understood from the detailed description of the other figures.

Although I have described my invention with some particularity as applied to a telephone system, it will readily be understood that it is not limited to such application and that it may be applied to any system wherein the selective control of rotating members by a distantly-located transmitter is required.

I claim:

1. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting step-by-step rotation thereto, a cooperating contact member, means for lock-

ing said rotatable contact member against further rotation and means actuated by current impulses of the opposite polarity for controlling said locking means and closing the contact between said contact members, and by current impulses of said given polarity for separating said contact members.

2. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a cooperating contact member, means for locking said rotatable contact member against further rotation and means actuated by current impulses of opposite polarity for controlling said locking means and holding said coöperating contact member against said rotatable contact member and by current impulses of said given polarity for separating said contact members.

3. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting step-by-step rotation thereto, a cooperating contact member, means for locking said rotatable contact member against further rotation, means actuated by current impulses of the opposite polarity for controlling said locking means and closing the contact between said contact members, and by current impulses of said given polarity for separating said contact members, a circuit connected to said contact members, and an electroresponsive device associated with said circuit.

4. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a cooperating contact member, means for locking said rotatable contact member against further rotation, means actuated by current impulses of opposite polarity for controlling said locking means and holding said cooperating contact member against said rotatable contact member and by current impulses of said given polarity for separating said contact members, a circuit connected to said contact members and an electroresponsive device associated with said circuit.

5. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a cooperating contact member, means for locking said rotatable contact member against further rotation, means actuated by current impulses of the opposite polarity for controlling said locking means and closing the contact between said contact members, and by current impulses of said given polarity for separating said contact members, a circuit connected to said contact members, and a signal device associated with said circuit.

6. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a cooperating contact member, means for locking said rotatable contact member against further rotation, means actuated by current impulses of the opposite polarity for controlling said locking means and holding said coöperating contact member against said rotatable contact member and by current impulses of said given polarity for separating said contact members, a circuit connected to said contact members, and a signal device associated with said circuit.

7. In a selective signaling system, a main line, a receiving apparatus bridged across said main line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a cooperating contact member, means for locking said rotatable contact member against further rotation, means actuated by current impulses of the opposite polarity for controlling said locking means and closing the contact between said contact members, and by current impulses of said given polarity for separating said contact members, a circuit bridged across said line and connected to said contact members, and an electroresponsive device associated with said circuit.

8. In a selective signaling system, a main line, a receiving apparatus bridged across said line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a cooperating contact member, means for locking said rotatable contact member against further rotation, means actuated by current impulses of the opposite polarity for controlling said locking means and holding said coöperating contact member against said rotatable contact member, and by current impulses of said given polarity for separating said contact members, a circuit bridged across said line and connected to said contact members, and an electroresponsive device associated with said circuit.

9. In a selective signaling system, a main line, a receiving apparatus bridged across said main line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a coöperating contact member, means for locking said rotatable contact member against further rotation, means actuated by current impulses of the opposite polarity for controlling said locking means and closing the con-

tact between said contact members, and by current impulses of said given polarity for separating said contact members, a circuit bridged across said line and connected to said contact members, and a signal device associated with said circuit.

10. In a selective signaling system, a main line, a receiving apparatus bridged across said line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a coöperating contact member, means for locking said rotatable contact member against further rotation, means actuated by current impulses of the opposite polarity for controlling said locking means and holding said coöperating contact member against said rotatable contact member and by current impulses of said given polarity for separating said contact members, a circuit bridged across said line and connected to said contact members, and a signal device associated with said circuit.

11. In a selective signaling system, a main line, a receiving apparatus bridged across said main line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a cooperating contact member, means actuated by current impulses of the opposite polarity for locking said rotatable contact member against further rotation, a circuit bridged across said line and connected to said contact members, and a polarized bell and condenser serially included in said circuit whereby the last mentioned current impulses will actuate said bell.

12. In a selective signaling system, a main line, a receiving apparatus bridged across said line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a coöperating contact member, means actuated by current impulses of the opposite polarity for bringing said coöperating contact member against said rotatable contact member, a circuit bridged across said line and connected to said contact members, and a polarized bell and condenser serially included in said circuit whereby the last mentioned current impulses will actuate said bell.

13. In a selective signaling system, a main line, a receiving apparatus bridged across said line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a coöperating contact member, means actuated by current impulses of the opposite polarity for locking said rotatable contact member against further rotation and holding said coöperating contact member against the same, a circuit bridged across said line and connected to said contact members, and a polarized bell and condenser serially included in said circuit whereby the last mentioned current impulses will actuate said bell.

14. In a selective signaling system, a receiving apparatus comprising a shaft carrying a rotatable contact member and a rotatable locking member, means controlled by current impulses of a given polarity for imparting step-by-step rotation to said shaft, a coöperating locking member, an armature carrying said coöperating locking member and a magnetic control device for said armature, said magnetic control device being so constructed and arranged that a current impulse of the opposite polarity will effect the coöperation of said locking members and another current impulse of said given polarity will effect the separation thereof.

15. In a selective signaling system, a receiving apparatus comprising a shaft carrying a rotatable contact member and a rotatable locking member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation to the said shaft, a magnetically-controlled coöperating locking member, a coöperating contact member, an armature carrying said coöperating contact member and a magnetic control device for said armature, said magnetic control device being so constructed and arranged that a current impulse of the opposite polarity will effect the coöperation of said contact members and a current impulse of said given polarity will effect the separation thereof.

16. In a selective signaling system, a receiving apparatus comprising a shaft carrying a rotatable contact member and a rotatable locking member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation to said shaft, a coöperating locking member, a cooperating contact member, an armature carrying said coöperating locking and contact members and a magnetic control device for said armature, said magnetic control device being so constructed and arranged that a current impulse of the opposite polarity will effect the coöperation of said locking members and said contact members, and a current impulse of said given polarity will effect the separation of said locking members and said contact members.

17. In a selective signaling system, a receiving apparatus comprising a shaft carrying a rotatable contact member and a rotatable locking member, means controlled by current impulses of a given polarity for imparting step-by-step rotation to said shaft, a coöperating locking member, an armature carrying said coöperating locking member and a polarized magnet for said armature, said polarized magnet being so con-

structed and arranged that a current impulse of the opposite polarity will effect the coöperation of said locking members and a current impulse of said given polarity will effect the separation thereof.

18. In a selective signaling system, a receiving apparatus comprising a shaft carrying a rotatable contact member and a rotatable locking member rigidly connected therewith, means controlled by current impulses of a given polarity for imparting a step-by-step rotation to said shaft, a coöperating contact member, an armature carrying said coöperating contact member and a polarized magnet for said armature, said polarized magnet being so constructed and arranged that a current impulse of the opposite polarity will effect the coöperation of said contact members and a current impulse of the said given polarity will effect the separation thereof.

19. In a selective signaling system, a receiving apparatus comprising a shaft carrying a rotatable contact member and a rotatable locking member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation to said shaft, a coöperating locking member, a coöperating contact member, an armature carrying said coöperating locking and contact members and a polarized magnet for said armature, said polarized magnet being so constructed and arranged that a current impulse of the opposite polarity will effect the coöperation of said locking members and contact members and a current impulse of the said given polarity will effect the separation of said locking members and said contact members.

20. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, an escapement mechanism associated therewith, a main line, a bipolar polarized magnet and condenser bridged across said line, and an armature pivoted to coöperate with both poles of said magnet, said armature being arranged to control said escapement mechanism for imparting step-by-step rotation to said contact member.

21. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, an escapement mechanism associated therewith, a main line, a bipolar polarized magnet and condenser bridged across said line, an armature pivoted to cooperate with both poles of said magnet, said magnet being constructed and arranged to be actuated by current impulses of a given polarity to control said escapement for imparting a step-by-step rotation to said contact member, a coöperating contact member, and means actuated by current impulses of the opposite polarity for locking said rotatable contact member against further rotation.

22. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, an escapement mechanism associated therewith, a main line, a bipolar polarized magnet and condenser bridged across said line, an armature pivoted to cooperate with both poles of said magnet, said magnet being constructed and arranged to be actuated by current impulses of a given polarity to control said escapement for imparting step-by-step rotation to said contact member, a coöperating contact member and means actuated by current impulses of the opposite polarity for bringing said coöperating contact member against said rotatable contact member.

23. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, an escapement mechanism associated therewith, a main line, a bipolar polarized magnet and condenser bridged across said line, an armature pivoted to cooperate with both poles of said magnet, said magnet being constructed and arranged to be actuated by current impulses of a given polarity to control said escapement for imparting step-by-step rotation to said contact member, a coöperating contact member and means actuated by current impulses of the opposite polarity for locking said rotatable contact member against further rotation and holding said coöperating contact member against the same.

24. In a selective signaling system, a receiving apparatus comprising a rotatable contact and a rotatable locking member, an escapement mechanism associated therewith, a main line, a polarized magnet and condenser bridged across said line, said magnet being constructed and arranged to be actuated by current impulses of a given polarity to control said escapement for imparting step-by-step rotation to said contact and locking members, a coöperating locking member, an armature carrying said coöperating locking member and a polarized magnet for said armature, the last mentioned polarized magnet being so constructed and arranged that a current impulse of the opposite polarity will effect the coöperation of said locking members, the discharge of said condenser through said polarized magnet upon the cessation of the said impulse of opposite polarity will effect the continuation of such coöperation, and a current impulse of the said given polarity will effect the separation of said locking members.

25. In a selective signaling system, a receiving apparatus comprising a rotatable contact member and a rotatable locking member, an escapement mechanism associated therewith, a main line, a polarized

magnet and condenser bridged across said line, said magnet being constructed and arranged to be actuated by current impulses of a given polarity to control said escapement for imparting step-by-step rotation to said contact and locking members, a coöperating contact member, an armature carrying said coöperating contact member and a polarized magnet for said armature, said last mentioned polarized magnet being so constructed and arranged that a current impulse of the opposite polarity will effect the coöperation of said contact members, the discharge of said condenser through said polarized magnet upon the cessation of said impulse of opposite polarity will effect the continuation of such coöperation, and a current impulse of the said given polarity will effect the separation of said contact members.

26. In a selective signaling system, a receiving apparatus comprising a rotatable contact member and a rotatable locking member, an escapement mechanism associated therewith, a main line, a polarized magnet and condenser bridged across said line, said magnet being constructed and arranged to be actuated by current impulses of a given polarity to control said escapement for imparting step-by-step rotation to said contact and locking members, a coöperating locking member, a coöperating contact member, an armature carrying said coöperating locking and contact members, and a polarized magnet for said armature, said last mentioned polarized magnet being so constructed and arranged that a current impulse of opposite polarity will effect the cooperation of said locking members and contact members, the discharge of said condenser through said polarized magnet upon the cessation of said impulse of opposite polarity will effect the continuation of such coöperation and a current impulse of the said given polarity will effect the separation of said locking members and said contact members.

27. In a selective signaling system, a main line, a receiving apparatus comprising a rotatable member and means for imparting a step-by-step rotation to said rotatable member, said means comprising a bipolar polarized magnet and a condenser bridged across said main line, and an armature pivoted to coöperate with both poles of said magnet.

28. In a selective signaling system, a main line, a receiving apparatus comprising a rotatable member, means for imparting a step-by-step rotation to said rotatable member, said means comprising a bipolar polarized magnet and a condenser bridged across said main line, and an armature pivoted to cooperate with both poles of said magnet, a second polarized magnet also bridged across said main line, an armature for said second polarized magnet, and means actuated by said armature and arranged to coöperate with said rotatable member.

29. In a selective signaling system, a main line, a receiving apparatus comprising a rotatable member, means for imparting a step-by-step rotation to said rotatable member, said means comprising a bipolar polarized magnet and a condenser bridged across said main line, an armature for said polarized magnet, said armature being pivoted to cooperate with both poles of said magnet, a second polarized magnet also bridged across said main line, an armature for said second polarized magnet and means actuated by the last mentioned armature and arranged to coöperate with said rotatable member; said polarized magnets being so constructed and arranged that a current impulse of a given polarity will cause the armature of the first polarized magnet to take a given position and the armature of said second polarized magnet to take such position that said means is out of coöperation with said rotatable member, and the discharge of said condenser through said magnets upon the cessation of said impulse will cause the armature of said first polarized magnet to take its original position and the armature of said second polarized magnet to remain in the position in which it was placed by said impulse.

30. In a selective signaling system, a main line, a receiving apparatus comprising a rotatable member, means for imparting a step-by-step rotation to said rotatable member, said means comprising a bipolar polarized magnet and a condenser bridged across said main line, an armature for said polarized magnet, said armature being pivoted to cooperate with both poles of said magnet, a second polarized magnet also bridged across said main line, an armature for said second polarized magnet and means actuated by the last mentioned armature and arranged to cooperate with and lock said rotatable member against further rotation; said polarized magnets being so constructed and arranged that a current impulse of a given polarity will cause the armature of the first polarized magnet to take a given position and the armature of the second polarized magnet to take such position that said means is out of coöperation with said rotatable member, and the discharge of said condenser through said magnets upon the cessation of said impulse will cause the armature of said first polarized magnet to take its original position and the armature of said second polarized magnet to remain in the position in which it was placed by said impulse; and an impulse of opposite polarity will cause the first polarized magnet to remain in its original position and the armature of the second po-

larized magnet to take such position that said means is in coöperation with and thereby locks said rotatable member against further rotation, and the discharge of said condenser upon the cessation of said impulse of opposite polarity will cause the armature of said second polarized magnet to remain in the position in which it was placed by said impulse of opposite polarity.

31. In a selective signaling system, a receiving apparatus comprising a rotatable member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, arresting means for stopping the step-by-step rotation of said rotatable member at a given point and a magnetic control device independent of the first mentioned means for said arresting means, said magnetic control device being constructed and arranged to be actuated by a current impulse of said given polarity to place said arresting means in arresting-position and by a current impulse of the opposite polarity to place said arresting-means in releasing-position.

32. In a selective signaling system, a receiving apparatus comprising a rotatable member, means controlled by current impulses of a given polarity for imparting step-by-step rotation thereto, arresting means for stopping the step-by-step rotation of said rotatable member at a given point, an armature carrying said arresting means and a polarized magnet independent of the first mentioned means for said armature, said polarized magnet being constructed and arranged to be actuated by a current impulse of said given polarity to place said arresting means in arresting-position and by a current impulse of the opposite polarity to place said arresting means in releasing-position.

33. In a selective signaling system, a main line, a receiving apparatus comprising a rotatable member, a polarized magnet and condenser bridged across said main line, said polarized magnet being constructed and arranged to be actuated by current impulses of a given polarity for imparting a step-by-step rotation to said rotatable member, arresting means for stopping the step-by-step rotation of said rotatable member at a given point, an armature carrying said arresting means and a second polarized magnet also bridged across said main line for said armature; said second polarized magnet being so constructed and arranged that a current impulse of said given polarity will place said arresting means in arresting-position, the discharge of said condenser through said second polarized magnet upon the cessation of said impulse of said given polarity will cause said arresting means to remain in arresting-position, and an impulse of the opposite polarity will place said arresting means in releasing-position.

34. In a selective signaling system, a receiving apparatus comprising a rotatable member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a stop-arm fixed to rotate with said rotatable member, a polarized magnet independent of the first mentioned means, an armature operated thereby and a post on said armature, said polarized magnet being constructed and arranged to be actuated by a current impulse of said given polarity to move said post into the path of said stop-arm for arresting the rotation of said rotatable member at a given point and by a current impulse of the opposite polarity to move said post out of the path of said stop-arm.

35. In a selective signaling system, a receiving apparatus comprising a wheel provided with a plurality of peripheral notches, one notch being wider than the others, means actuated by current impulses of a given polarity for imparting a step-by-step rotation to said wheel, a stop-arm fixed to said wheel at a point diametrically opposite the wider notch, an armature, a post and a tooth carried by said armature and arranged adjacent opposite sides of said wheel, said tooth being adapted to enter said notches, and a polarized magnet for said armature; said polarized magnet being constructed and arranged to be actuated by a current impulse of said given polarity to move said post into the path of said stop-arm for arresting the rotation of said wheel at a given point and said tooth out of said notches, and to be actuated by a current impulse of the opposite polarity to simultaneously move said post out of the path of said stop-arm and said tooth into the wider notch.

36. In a selective signaling system, a receiving apparatus comprising a wheel provided with a plurality of peripheral notches, one notch being wider than the others, means actuated by current impulses of a given polarity for imparting a step-by-step rotation to said wheel, a stop-arm fixed to said wheel at a point diametrically opposite the wider notch, a contact member fixed to rotate with said wheel and arranged radially with respect to one of the narrower notches, an armature, a post and a tooth carried by said armature and arranged adjacent opposite sides of said wheel, said tooth being adapted to enter said notches, a coöperating contact member also carried by said armature, and a polarized magnet for said armature; said polarized magnet being constructed and arranged to be actuated by current impulses of said given polarity to move said post into the path of said stop-arm for arresting the rotation of said wheel at a given point and said tooth out of said notches, and to be actuated by a current impulse of the opposite polarity

to simultaneously move said post out of the path of said stop-arm and said tooth into the wider notch.

37. In a selective signaling system, a receiving apparatus comprising a wheel provided with a plurality of peripheral notches, means actuated by current impulses of a given polarity for imparting a step-by-step rotation to said wheel, a contact member fixed to rotate with said wheel and arranged radially with respect to one of said notches, an armature, a coöperating contact member and a tooth carried by said armature, said tooth being adapted to enter said notches, and a polarized magnet for said armature, said polarized magnet being constructed and arranged to be actuated by current impulses of the opposite polarity to move said tooth into one of said notches and said coöperating contact member against said contact member.

38. In a selective signaling system, a receiving apparatus comprising a rotatable member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, and means independent of said means actuated by a current impulse of the opposite polarity for locking the same against further rotation.

39. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a coöperating contact member and means independent of the first mentioned means actuated by current impulses of the opposite polarity for effecting the coöperation of said contact members.

40. In a selective signaling system, a receiving apparatus comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting step-by-step rotation thereto, a coöperating contact member and means independent of the first mentioned means actuated by current impulses of the opposite polarity for locking said contact member against further rotation and for effecting the coöperation of said contact members.

41. In a selective signaling system, a main line, a receiving apparatus bridged across said main line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a coöperating contact member, means for locking said rotatable contact member against further rotation; and means actuated by current impulses of the opposite polarity for controlling said locking means and closing the contact between said contact members, and by current impulses of said given polarity for separating said contact members in combination with a transmitting apparatus provided with means for automatically sending over said main line a predetermined number of current impulses of said given polarity followed by current impulses of the opposite polarity.

42. In a selective signaling system, a main line, a receiving apparatus bridged across said main line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a coöperating contact member and means actuated by current impulses of the opposite polarity for bringing said coöperating contact member against said rotatable contact member; and by current impulses of said given polarity for separating said contact members in combination with a transmitting apparatus provided with means for automatically sending over said main line a predetermined number of current impulses of said given polarity followed by current impulses of the opposite polarity.

43. In a selective signaling system, a main line, a receiving apparatus bridged across said main line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto, a coöperating contact member, means for locking said rotatable contact member against further rotation, means actuated by current impulses of the opposite polarity for controlling said locking means and holding said coöperating contact member against said rotatable contact member, and by current impulses of said given polarity for separating said contact members; in combination with a transmitting apparatus provided with means for automatically sending over said main line a predetermined number of current impulses of said given polarity followed by current impulses of the opposite polarity

44. In a selective signaling system, a main line, a receiving apparatus bridged across said main line and comprising a rotatable member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation thereto and means actuated by current impulses of the opposite polarity for locking the same against further rotation, and by current impulses of said given polarity for releasing the same, in combination with a transmitting apparatus provided with means for automatically sending over said main line a predetermined number of current impulses of said given polarity followed by a current impulse of the opposite polarity.

45. In a selective signaling system, a main line, a receiving apparatus bridged across said main line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting step-by-step rotation thereto, a coöperating

contact member and means actuated by a current impulse of the opposite polarity for effecting the coöperation of said contact members and by current impulses of said given polarity for separating the same; in combination with a transmitting apparatus provided with means for automatically sending over said main line a predetermined number of current impulses of said given polarity followed by current impulses of the opposite polarity.

46. In a selective signaling system, a main line, a receiving apparatus bridged across said main line and comprising a rotatable contact member, means controlled by current impulses of a given polarity for imparting step-by-step rotation thereto, a coöperating contact member and means actuated by a current impulse of the opposite polarity for locking said contact member against further rotation and for effecting the coöperation of said contact members and by current impulses of said given polarity for separating the same; in combination with a transmitting apparatus provided with means for automatically sending over said main line a predetermined number of current impulses of said given polarity followed by current impulses of the opposite polarity.

47. In a selective signaling system, a main line, a plurality of receiving apparatus bridged across said main line and each comprising a rotatable member capable of rotation in one direction only, means controlled by current impulses of a given polarity for imparting a step-by-step rotation to each rotatable member, means actuated by a current impulse of opposite polarity for locking said rotatable members against further rotation, and means for automatically synchronizing said rotatable members.

48. In a selective signaling system, a main line, a plurality of receiving apparatus bridged across said main line and each comprising a rotatable contact member capable of rotation in one direction only, means controlled by current impulses of a given polarity for imparting a step-by-step rotation to each rotatable contact member, a coöperating contact member for each rotatable contact member, means actuated by a current impulse of the opposite polarity for effecting the coöperation of each pair of contact members, and means for automatically synchronizing said rotatable contact members.

49. In a selective signaling system, a main line, a plurality of receiving apparatus bridged across said main line and each comprising a rotatable contact member capable of rotation in one direction only, means controlled by current impulses of a given polarity for imparting step-by-step rotation to each rotatable contact member, a coöperating contact member for each rotatable contact member, means actuated by a current impulse of the opposite polarity for locking said rotatable contact members against further rotation and for effecting the coöperation of each pair of contact members, and means for automatically synchronizing said rotatable contact members.

50. In a selective signaling system, a main line, a plurality of receiving apparatus bridged across said main line and each comprising a rotatable member capable of rotation in one direction only, means controlled by current impulses of a given polarity for imparting a step-by-step rotation to each rotatable member, means actuated by a current impulse of opposite polarity for locking said rotatable members against further rotation and means for automatically synchronizing said rotatable members; in combination with a transmitting apparatus provided with means for automatically sending over said line a predetermined number of current impulses of said given polarity followed by a current impulse of the opposite polarity.

51. In a selective signaling system, a main line, a plurality of receiving apparatus bridged across said main line and each comprising a rotatable contact member capable of rotation in one direction only, means controlled by current impulses of a given polarity for imparting a step-by-step rotation to each rotatable contact member, a coöperating contact member for each rotatable contact member, means actuated by a current impulse of the opposite polarity for effecting the coöperation of each pair of contact members, and means for automatically synchronizing said rotatable contact members; in combination with a transmitting apparatus provided with means for automatically sending over said line a predetermined number of current impulses of said given polarity followed by a current impulse of the opposite polarity.

52. In a selective signaling system, a main line, a plurality of receiving apparatus bridged across said main line and each comprising a rotatable contact member capable of rotation in one direction only, means controlled by current impulses of a given polarity for imparting a step-by-step rotation to each rotatable contact member, a coöperating contact member for each rotatable contact member, means actuated by a current impulse of the opposite polarity for locking said rotatable contact members against further rotation and for effecting the cooperation of each pair of contact members, and means for automatically synchronizing said rotatable contact members; in combination with a transmitting apparatus provided with means for automatically sending over said line a predetermined number of current impulses of said given polarity followed by a current impulse of the opposite polarity.

53. In a selective signaling system, a main line, a plurality of receiving apparatus bridged across said main line and each comprising a rotatable member, means controlled by current impulses of a given polarity for imparting a step-by-step rotation to each rotatable member arresting means for stopping the rotation of each rotatable member at a given point, and means actuated by a current impulse of the opposite polarity for moving said arresting means to releasing-position, in combination with a transmitting apparatus provided with means for automatically sending over said main line a plurality of current impulses of given polarity followed by a current impulse of opposite polarity.

In testimony whereof, I have hereunto subscribed my name this 12th day of May 1910.

VERNON DURBIN.

Witnesses:
GEO. K. WOODWORTH,
E. B. TOMLINSON.