A. F. DIXON.

PRINTING TELEGRAPH RECEIVER.

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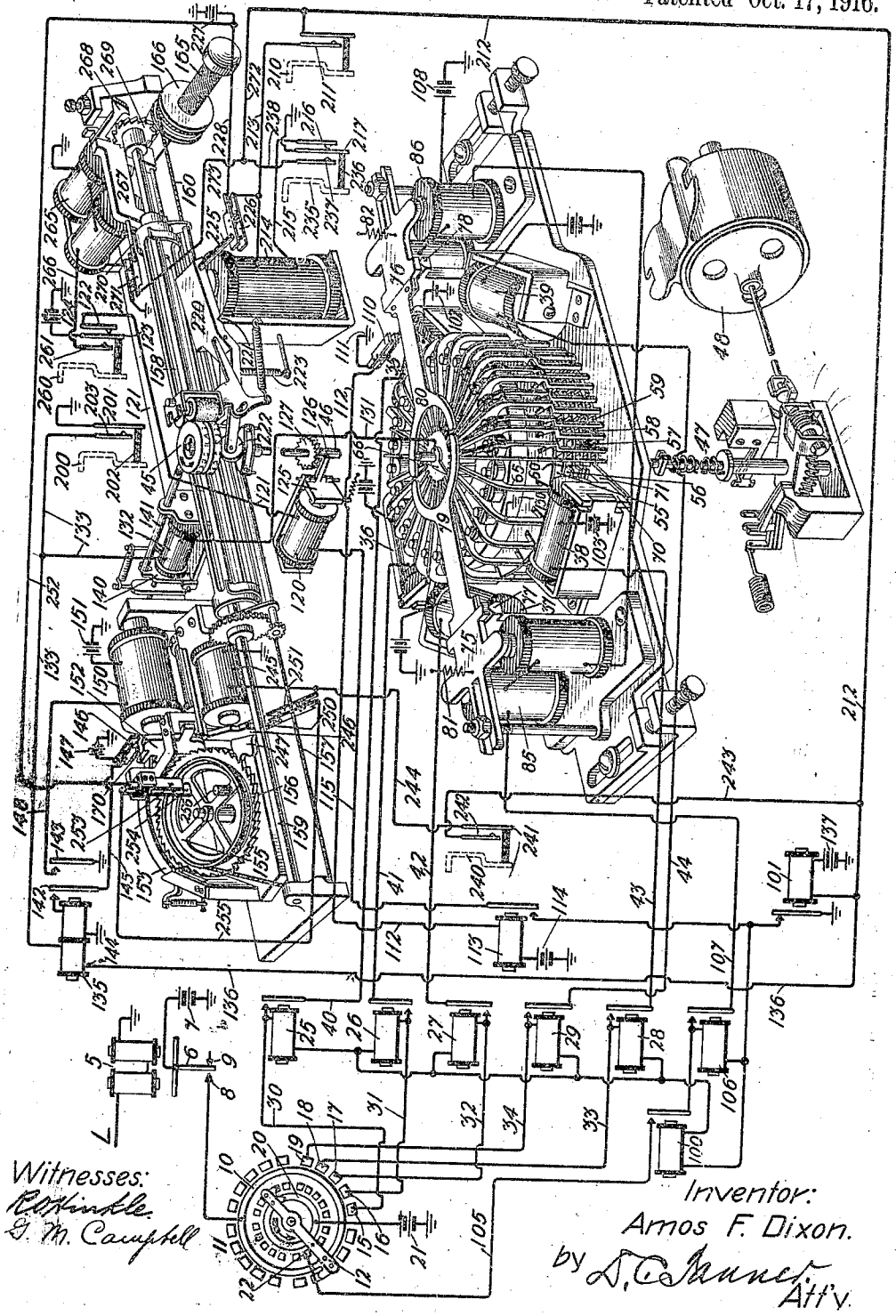

Witnesses:
R. Kinkle.
E. M. Campbell

Inventor:
Amos F. Dixon.
by D. C. Bunce
Att'y.

UNITED STATES PATENT OFFICE.

AMOS F. DIXON, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WESTERN ELECTRIC COMPANY, INCORPORATED, A CORPORATION OF NEW YORK.

PRINTING-TELEGRAPH RECEIVER.

1,201,809. Specification of Letters Patent. Patented Oct. 17, 1916.

Application filed October 14, 1913. Serial No. 795,073.

To all whom it may concern:

Be it known that I, AMOS F. DIXON, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Printing-Telegraph Receivers, of which the following is a full, clear, concise, and exact description.

This invention relates to printing telegraphs, and more particularly to printing telegraph receiving apparatus and systems wherein the letters and characters may be reproduced in page form.

One of the objects of this invention is to provide improved means for securing the effect of a prolonged line impulse in order to insure positive operation and to provide a receiving apparatus controlled by combinations of selecting and non-selecting current impulses wherein the apparatus remains inactive unless a combination of impulses contains at least one selecting impulse.

To the above ends, a series of electromagnetically controlled members is provided whose relative positions determine the character to be printed or operation to be performed by the receiving apparatus, while a system of intermediate electromagnetic devices provides for a prolonged effect of the line impulses.

The above and other objects of this invention will be fully set forth in the following description and claims, and will be more readily understood by reference to the accompanying drawing in which the system of connections is shown diagrammatically, so much of the apparatus as is necessary to a complete understanding of the device being shown in perspective.

This system is an improvement on the system disclosed and claimed in Patent No. 1,103,133, patented July 14, 1914, and is preferably operated by the well-known Baudot code of various combinations of five positive and negative current units or impulses, although other codes may be employed without departing from the spirit of this invention. These impulses arrive from a distant transmitting station, over a main line conductor L and pass to ground through the windings of a polarized relay 5. Relay 5 is provided with an armature 6 permanently connected to a grounded source of energy 7 and adapted to engage a front or active contact 8 and a back or inactive contact 9. The front contact 8 is connected to a conducting ring 10 of a current distributer 11 provided with a rotatable arm 12, which is driven in the direction of the arrow by any suitable source of power. The arm 12 is provided with a pair of outer insulated contact brushes, which are adapted to make engagement with a series of commutator segments 15, 16, 17, 18 and 19, connecting them successively with the ring 10. The arm 12 is likewise provided with a pair of inner insulated contact brushes engaging a current distributing ring 20, which is connected to a grounded source of energy 21, and a series of commutator segments 22. It is therefore apparent that when the arm 12 is rotated about its axis, battery is successively connected to the various commutator segments 15, 16, 17, 18 and 19 by the outer set of brushes, when the armature 6 is against the front contact 8, and to the commutator segments 22 by the inner set of brushes.

In order to simplify the description and to obviate confusing multiplication of parts in the drawing, only one receiving instrument is shown connected to the current distributer 11. It will be readily understood, however, that other receiving instruments may be connected in a similar manner to the idle commutator bars so that a number of instruments may be operated to receive several distinct messages being transmitted over the single line conductor L.

The commutator segments 15, 16, 17, 18 and 19 are connected, respectively, to intermediate electromagnetic devices or relays 25, 26, 27, 28 and 29 by means of conductors 30, 31, 32, 33 and 34. These relays may be constructed so as to be very sensitive and rapid in operation, and thus facilitate the attainment of high speed in transmitting messages, and they are adapted to lock themselves in actuated position after the receipt of an energizing impulse which insures the positive operation of the heavier and slower selecting magnets. Each of the intermediate relays is provided with an armature permanently connected to one of the selecting magnets 35, 36, 37, 38 and 39 by conductors 40, 41, 42, 43 and 44, respectively.

A type wheel 45, on which the characters are located in a double row, is carried by a rotatable type shaft 46 which may be driven, as hereinafter described, by a spring 47 in

the direction shown by the arrow. The spring 47 is kept under the proper tension by means of a suitable motor 48. Concentric with the type shaft 46 are five movable selecting disks 55, 56, 57, 58 and 59, each of which is provided with a series of notches 60. There is one notch in each of the disks corresponding to each vertical line of characters carried by the type wheel 45 and one corresponding to each operation, such as spacing, line feeding, etc., to be performed. Each of the vertical lines of notches, corresponding to a character to be printed, is provided with a pivoted spring-tensioned type selecting lever 65 which is adapted, under certain conditions to be hereinafter explained, to engage with a contact arm 66 carried by the type shaft 46. The vertical lines of notches representing other operations than type selection are also provided with pivoted spring-tensioned levers adapted to control circuit contacts, whereby the proper electromagnetic devices for performing the desired function are energized, as hereinafter described. Each of the selecting magnets 35, 36, 37, 38 and 39 is provided with a spring-tensioned armature 70 having a lever 71 which is connected to one of the aforementioned disks 55, 56, 57, 58 and 59, respectively. Thus, when the armatures of any of the selecting magnets are attracted, the corresponding disks are moved through a small angle, and whenever one or more of the disks are moved so that a continuous vertical line of notches is presented to one of the type or operation selecting levers, the spring thereof tends to force the inner end of the corresponding lever upwardly into a position to engage the rotating arm 66 or to cause the engagement of the proper circuit contacts. The type wheel may thereby be arrested in a position to present any desired character to the printing platen, or the proper electromagnetic device may be set in motion to space, feed the paper, change from letters to figures, reset the paper carriage, or accomplish any other operations which it is found desirable that the apparatus should perform. The type-selecting levers 65 and the operation-selecting levers, to be hereinafter more fully described, are normally held out of engagement with the selecting disks 55 to 59 inclusive, and, after the completion of a cycle of operations, are restored to their normal position by release levers 75 and 76 pivoted at 77 and 78, respectively. Release levers 75 and 76 have centrally projecting circular shaped ends 79 and 80 for engaging and depressing the selecting levers under the tension of springs 81 and 82. Upon the energization of release magnets 85 and 86, however, the magnetic pull overcomes the spring tension, and the centrally projecting ends 79 and 80 of the release levers 75 and 76 are raised, releasing the selecting levers, one of which, due to its coincidence with a line of notches, may move a sufficient amount to initiate the performance of the desired function.

The rotation of the arm 12 is so timed, by any of the means well known in the art, that upon the arrival of its outer brush upon any of the segments of the distributer 11, the impulse or current unit of the corresponding number is sent to the line L by the transmitting device at the sending end. For example, when the outer brushes are connecting the segment 15 to ring 10, the first impulse of the desired combination is acting upon the relay 5; when the brushes are connecting the segment 16 to ring 10 the second impulse is acting upon the relay 5, and so on for the entire number of impulses for each selection.

A sufficient description of the system and apparatus may be obtained from a description of a particular type selection and the various operations, such as spacing, line feeding, etc.

Let it be assumed that the sending apparatus at a distant station is transmitting a series of impulses for selecting the character D, and let it be further assumed that the character D is selected by five impulses combined in the following order: positive, negative, negative, positive, negative.

Upon the receipt of the first impulse, the outer brushes of the arm 12 of the distributer connect the commutator bar 15 with the distributing ring 10, and assuming that the relay 5 attracts its armature 6 against the front contact 8 only when energized by positive current units, which for convenience may be termed the "selecting impulses," the armature 6 will engage the front contact 8. A circuit is thereby established from grounded battery 7, armature 6, contact 8, ring 10, outer brushes of arm 12, segment 15, conductor 30, coil of intermediate relay 25, coil of release control relay 100, back contact and armature of clear-out relay 101 to ground. Relay 25 thereupon attracts its armature, establishing an energizing circuit for the selecting magnet 35 and a holding circuit for itself as follows: ground at the armature of clear-out relay 101, coil of release control relay 100, coil, front contact and armature of relay 25, conductor 40, coil of selecting magnet 35, to grounded battery 102. Release control relay 100 likewise attracts its armature and is held by the holding circuit above traced but performs no function at this time; its office in the system will be hereinafter explained. The energization of selecting magnet 35 causes the attraction of its armature 70 and the corresponding movement of disk 55 through the agency of lever 71, this condition being maintained by the above men-

tioned holding circuit. The second and third impulses arrive over the main line L, while the outer brushes of arm 12 connect the ring 10 respectively to commutator segments 16 and 17. These impulses, however, being of negative sign cause the armature 6 of relay 5 to rest against the back contact 9, and battery 7 is not connected to relays 26 or 27. Consequently selecting magnets 36 and 37 and their corresponding selecting disks 56 and 57 remain inactive. The fourth impulse is positive over line L, and acts upon relay 5, while the outer brushes of arm 12 connect segment 18 to ring 10. Relay 5 attracts its armature 6 against front contact 8 and a circuit is completed from grounded battery 7, armature 6, contact 8, ring 10, segment 18, conductor 33, coil of intermediate relay 28, coil of release control relay 100, back contact and armature of clear-out relay 101 to ground. Relay 28 attracts its armature and closes an operating and holding circuit from ground at armature of clear-out relay 101, coil of release control relay 100, coil, front contact and armature of relay 28, conductor 43, selecting magnet 38, to grounded battery 123. The closing of this circuit causes the continuing attraction of armature 70, of selecting magnet 38, and the consequent moving of selecting disk 58 through a small angle. The fifth impulse arrives over the line L while the outer brushes of arm 12 are connecting segment 19 with ring 10, but being negative the armature 6 is against the back contact 9 and no current flows. The selecting relays 25 and 28, the release control relay 100, and the selecting magnets 35 and 38 remain energized, attracting their respective armatures, while the movement of disks 55 and 58 has caused the presentation of a continuous vertical line of slots 60 before the selecting lever 65 which corresponds to the position of the character D upon the type wheel 45.

After the outer brushes of the arm 12 have passed the segment 19, the inner set of brushes connects the distributing ring 20 with one of the segments 22. This closes a circuit from grounded battery 21, ring 20, segment 22, conductor 105, front contact and armature of release control relay 100, coil of release relay 106, armature and back contact of clear-out relay 101 to ground. Release relay 106 attracts its armature, closing an operating and holding circuit for the release magnets as follows: ground at armature of clear-out relay 101, coil, front contact and armature of release relay 106, conductor 107, coils of release magnets 85 and 86, battery 108 to ground. The energization of magnets 85 and 86 causes the movement of release levers 75 and 76 against the tension of springs 81 and 82, which removes their ends 79 and 80 from engagement with the inner ends of all the selecting levers, whereupon the type-selecting lever 65, before which a continuous vertical line of slots is presented, raises its inner end into a position to engage the arm 66 carried by the type shaft. The movement of the release lever 76 also causes the engagement of a pair of contact springs 110 which close a circuit from ground 111 therethrough to conductor 112 and thence through the coil of start control relay 113 to grounded battery 114. Start control relay 113 attracts its armature, closing a circuit from ground at armature of clear-out relay 101, armature and front contact of start control relay 113, conductor 115, starting magnet 120, conductor 121, contact springs 122 and 123, to grounded battery 124. The starting magnet 120 thereupon attracts its armature 125, causing a pawl 126 carried thereby to be disengaged from a ratchet wheel 127 firmly secured to the type shaft 46. The type shaft thereupon rotates, under the tension of spring 47, in the direction of the arrow until the arm 66 engages the elevated inner end of the selected type lever 65 at which time, under the conditions assumed, the character D is in position to be printed. The release control relay 100 serves to prevent the actuation of any of the printing apparatus in case only negative impulses arrive over the main line L. This is apparent since the impulse over conductor 105 can become effective only when the armature of release control relay 100 is attracted and this condition obtains only when at least one positive impulse is received.

Upon the engagement of lever 65 and arm 66 a circuit is closed from ground 130, lever 65, arm 66, conductor 131, printing magnet 132, conductor 133, energizing coil of space-lock relay 135, conductor 136, coil of clear-out relay 101, to grounded battery 137. Relays 101 and 135, and magnet 132 are energized, pull up their respective armatures and effect the printing, spacing and return of the apparatus to normal in the following manner:

Printing magnet 132 attracts its armature 140, forcing a printing platen 141 against the paper, printing the selected character D. Space-lock relay 135 attracts both its armatures 142 and 143 and completes a holding circuit for itself as follows: ground at 144, holding coil of space-lock relay 135, armature 142, conductor 145, contact springs 146 to grounded battery 147. The second armature 143 completes a circuit from ground through conductor 148, spacing magnet 150, to grounded battery 151. Spacing magnet 150 thereupon attracts its armature 152, causing a stepping pawl 153 carried thereby to engage the teeth of a ratchet wheel 155, advancing said wheel through

the space of one tooth. The ratchet wheel 155 carries a drum 156 upon which is wound a cord 157 connected to a paper carriage 158. As the cord 157 is wound upon the drum 156, the carriage 158 is moved along a square rod 159 to present a clean portion of paper before the printing platen, and the cord 160 attached to the opposite end of the carriage 158 winds a retractile spring 165 through the agency of a cord containing drum 166. The space-lock relay insures the operation of the spacing magnet irrespective of the length of the operating impulses and its armatures remain locked up until the armature 152 of the spacing magnet separates the contact springs 146 through the agency of a pin 170 carried thereby and adapted to engage one of the springs 146. The separation of the contact springs 146 opens the circuit previously traced through the holding winding of the space-lock relay 135, which will thereupon release its armatures 142 and 143, and the spacing apparatus will be again at normal, providing the release magnets 85 and 86 have been deenergized to open the previously traced circuit through the operating coil of the space-lock relay, as hereinafter described. Although the printing and spacing operations are initiated simultaneously by the energization of the printing magnet 132 and the space-lock relay 135 respectively, the time required for the completion of the circuit through the spacing magnet 150 and the relatively slow movement of this heavily loaded magnet insures the completion of the printing of the selected character before the paper is spaced.

Clearing-out relay 101, in attracting its armature, removes the ground connection from the release control relay 100, the release relay 106, as many of the intermediate relays 25 to 29 inclusive as may be held energized, the release magnets 85 and 86 and the starting magnet 120, allowing all of these parts to return to normal. The return of release levers 75 and 76 depresses the elevated selecting lever 65, breaking the contact between arm 66 and lever 65, thus removing the ground connection from the printing magnet and the space-lock and clear-out relays, which thereupon return to normal. The return of the release lever 76 also opens the contact between springs 110, and the start control relay 113 is deënergized. A character has now been selected and printed, a clean surface presented for the next character, and the apparatus brought to normal ready to receive the next combination of impulses.

If it is desired to provide a space without the printing of a character, a combination of impulses is transmitted over the line conductor L to cause the operation of a space selecting lever 200. This space selecting lever 200 is located among the circularly arranged type selecting levers 65, is likewise provided with a centrally projecting portion adapted to be engaged by the release lever 75 or 76, and is under the tension of a spring, tending to move the lower or vertically disposed extension thereof into engagement with the selecting disks. Lever 200 is joined to the movable end of a contact spring 201 by means of a suitable insulated coupling 202 and is adapted under certain conditions to move the contact spring 201 into engagement with contact spring 203. This condition obtains when a continuous vertical row of slots in the selecting disks 55 to 59 inclusive is presented to the lever 200 and the release magnets 85 and 86 are energized. Assuming that the proper combination of five impulses has been received to move the selecting disks, as hereinbefore described, so that a row of notches is presented to the lever 200, an impulse passes over the conductor 105 as before. This flow of current energizes the release relay 106 which causes the energization of the release magnets 85 and 86, releasing all of the selecting levers centrally located about the shaft 46 as in the case of a type selection. Space-selecting lever 200 is moved by its tension spring so that contact springs 201 and 203 engage, closing a circuit from ground therethrough, to conductor 133, operating coil of space-lock relay 135, conductor 136, clear-out relay 101 to grounded battery 137. Space-lock relay 135 and clear-out relay 101 are both energized. The armature of the clear-out relay opens the holding circuit for the release control, release, and selecting relays and the release magnets, as in the case of type selections. The depression of release levers 75 and 76, after the deënergization of the release magnets 85 and 86, lowers the space-selecting lever 200, breaking the contact between springs 201 and 203 and thus opening the circuit through the clear-out relay 101 and the operating winding of space-lock relay 135. The armatures 142 and 143 of space-lock relay 135 close a holding circuit and an operating circuit through the spacing magnet 150, and after accomplishing the spacing, the apparatus returns to normal in precisely the same manner as hereinbefore described. The raising of the inner end of lever 76 at the moment of release allows the closing of the contact between springs 110, completing the previously traced energizing circuit for the start control relay 113. Start control relay 113 pulls up its armature, completing the circuit for the starting magnet 120. Due, however, to the fact that the clear-out relay 101 receives current at practically the same time as the start-control relay 113, and the starting magnet 120 is relatively slower in its operation, the starting magnet 120 does not receive sufficient

current to actute the pawl 126 and the shaft is not released during the performance of this function.

The characters carried by the type-wheel 45 are in two horizontal rows, the upper being normally in a position to present its characters to the printing platen 141. If it is desired to print a character from the lower row, a series of impulses is impressed upon line conductor L to cause the operation of shift-selecting lever 210. This lever is similar in all respects to space lever 200 and is adapted when selected and released to cause the engagement of contact springs 211. The closing of contact between springs 211 closes a circuit from grounded battery 137, clear-out relay 101, conductor 212, springs 211, conductor 213, shift magnet 214, conductor 215, contact springs 216 and 217, to ground. Clear-out relay 101 and shift magnet 214 are energized, the former causing the return of the selecting and releasing apparatus, in a manner hereinbefore described, and the latter attracting its armature 220. Armature 220 is pivoted at 221 and carries at its outer end a roller 222 situated beneath the type wheel 45. A spring 223 secured to the extending portion of armature 220 and to the frame holds the roller 222 normally in a lowered position. When the armature 220 is attracted, however, the tension of spring 223 is overcome and the roller 222 engages the under surface of the type wheel 45, raising the type wheel so that the lower row of characters is in line with the platen 141. Armature 220 likewise carries an insulated pin 225 adapted, when the armature is attracted, to cause the engagement of contact springs 226. The engagement of these springs completes a holding circuit from grounded battery 227, conductor 228, springs 226, shift magnet 214, conductor 215, springs 216 and 217 to ground. Thus, after being shifted to present the lower row of type to the platen, the type wheel is retained in this position until returned, as hereinafter described. As in the case of the spacing, the clear-out relay 101 attracts its armature before the starting magnet 120 can attract its armature and the type shaft 46 does not revolve; also the circuit through the clear-out relay is broken by the return of the release levers.

The lowering of the type wheel is accomplished by a combination of impulses adapted to select an unshifting lever 235. Unshifting lever 235 is likewise similar in all respects to space lever 200 and is joined to contact spring 217 by an insulating coupling 236. Spring 217 normally rests in contact with spring 216, completing the previously traced circuit through the shift magnet 214, but when the unshifting lever 235 is selected and released, spring 217 is disengaged from spring 216 and placed in contact with spring 237. The disengagement of springs 216 and 217 and the engagement of springs 217 and 237 breaks the holding circuit for the shift magnet 214, whereupon the type-wheel is returned to normal, and completes a circuit for the clear-out relay 101 which may be traced from grounded battery 137, clear-out relay 101, conductors 212 and 238, springs 237 and 217 to ground. The clear-out relay 101 returns the selecting and releasing apparatus to normal and, as in the case of the space and shift, prevents the rotation of the type wheel. The return of the release levers opens the energizing circuit of the clear-out relay, as previously explained.

The return of the paper carriage to the beginning of a line is accomplished by the transmission of a series of impulses adapted to select a carriage return lever 240. Lever 240 is connected to a contact spring 241 normally disengaged from a contact spring 242, but adapted under certain conditions to make engagement therewith. When lever 240 is confronted by a continuous row of slots in the selecting disks and released, spring 241 is caused to contact with spring 242, closing a circuit from grounded battery 137, clear-out relay 101, conductor 243, springs 242 and 241, conductor 244, and carriage return magnet 245 to ground. Clear-out relay 101 and carriage return magnet 245 are energized, the former returning the selecting and releasing apparatus to normal and the latter attracting its armature 246. Armature 246 carries a holding pawl 247 normally engaging the ratchet teeth in the wheel 155. The disengagement of the pawl 247 and the teeth of wheel 155 allows the tension stored up in the spring 165 during the advance movement of the carriage 158 to return the carriage to the beginning of a line. Armature 246 also carries a pin 250 adapted, when the armature is attracted, to cause the engagement of contact springs 251. The engagement of springs 251 insures the continued energization of the carriage return magnet 245 and the consequent withholding of the pawl 247 from the teeth of wheel 155 until the return is complete by closing a holding circuit as follows: grounded battery 227, conductor 252, contact springs 253 and 254, conductor 255, springs 251, carriage return magnet 245 to ground. As the limit of the carriage return is reached an insulating pin 256 carried by the wheel 155 engages spring 254, causing it to be disengaged from spring 253 and breaking the above traced holding circuit. Carriage return magnet 245 is thereupon deënergized, causing the return of holding pawl 247 and the disengagement of springs 251, whereupon all of the apparatus is again in a normal condition. Again, as in the space, shift and unshift, the type wheel is prevented

from rotating during the return of the paper carriage, and the clear-out relay is deënergized by the return of the release levers.

In order to feed the paper from line to line, a line-feeding lever 260 must be operated. Contact spring 123 is suitably connected to lever 260 and is adapted to be separated thereby from engagement with spring 122 and placed in contact with spring 261. The breaking of contact between springs 122 and 123 and the making of contact between springs 123 and 261 opens the circuit through the starting relay 120, preventing the rotation of the type shaft, and completes an energizing circuit for the line-feeding magnet 265 from grounded battery 124, springs 123 and 261, conductor 266, magnet 265, to ground. Line-feeding magnet 265 thereupon attracts its armature 267, causing an operating pawl 268, carried thereby, to engage a ratchet wheel 269 mounted on the end of the square shaft 159, rotating the paper carriage. Armature 267 carries an insulating pin 270 adapted, when the armature is attracted, to cause the engagement of contact springs 271. Springs 271 when thus forced together close a circuit from grounded battery 137, clear-out relay 101, conductors 212, 272 and 273, springs 271 to ground. The clear-out relay attracts its armature, causing the return to normal of all of the selecting and releasing apparatus, while the return of the release levers deenergizes the clear-out relay.

What I claim is:

1. A receiving apparatus comprising a plurality of selecting electromagnets, selecting members controlled thereby, intermediate electromagnetic devices, one for each said electromagnet and each having a single winding, and a plurality of series circuits, each including a winding of one of said devices and one of said electromagnets and controlled by said devices.

2. A receiving apparatus comprising a plurality of coöperating mechanical selecting members, a selecting electromagnet for each said member, a plurality of relays comprising windings and circuit contacts for controlling the operation of said electromagnets, an energizing circuit for each said relay, and series holding circuits each including one of said electromagnets and the same winding of said relays as is included in a corresponding energizing circuit.

3. In combination, a transmission line adapted to carry selecting and non-selecting current impulses, electromechanism controlled by such currents and adapted to perform complete functions only when released, release means for allowing said mechanism to complete its functions, and a release-control relay for preventing the operation of said means except upon the receipt of at least one selecting impulse.

4. In combination, a transmission line adapted to carry selecting and non-selecting current impulses, a plurality of selecting electromagnetic devices controlled by the selecting impulses only, apparatus coöperating with said devices for completing the desired functions, and means for preventing the operation of said apparatus except upon the receipt of at least one selecting impulse.

5. In a printing telegraph receiver adapted to function in response to combinations of selecting and non-selecting current impulses, the combination of a plurality of type selecting members, electromechanical devices adapted to respond to selecting current impulses and coöperating to control the action of said members, printing apparatus coöperating with said members, and electromagnetic means for preventing the coöperation of said apparatus and said members except upon the receipt of at least one selecting impulse.

6. In a printing telegraph receiver the combination of a rotating type shaft, means for starting the rotation of said shaft, a plurality of selecting disks, levers controlled by said disks for arresting said shaft in any desired position, a release magnet for freeing said levers, and means actuated by said release magnet for controlling the operation of said shaft rotation starting means.

In witness whereof, I hereunto subscribe my name this 10th day of October A. D., 1913.

AMOS F. DIXON.

Witnesses:
R. V. HINKLE,
M. V. CONATY.