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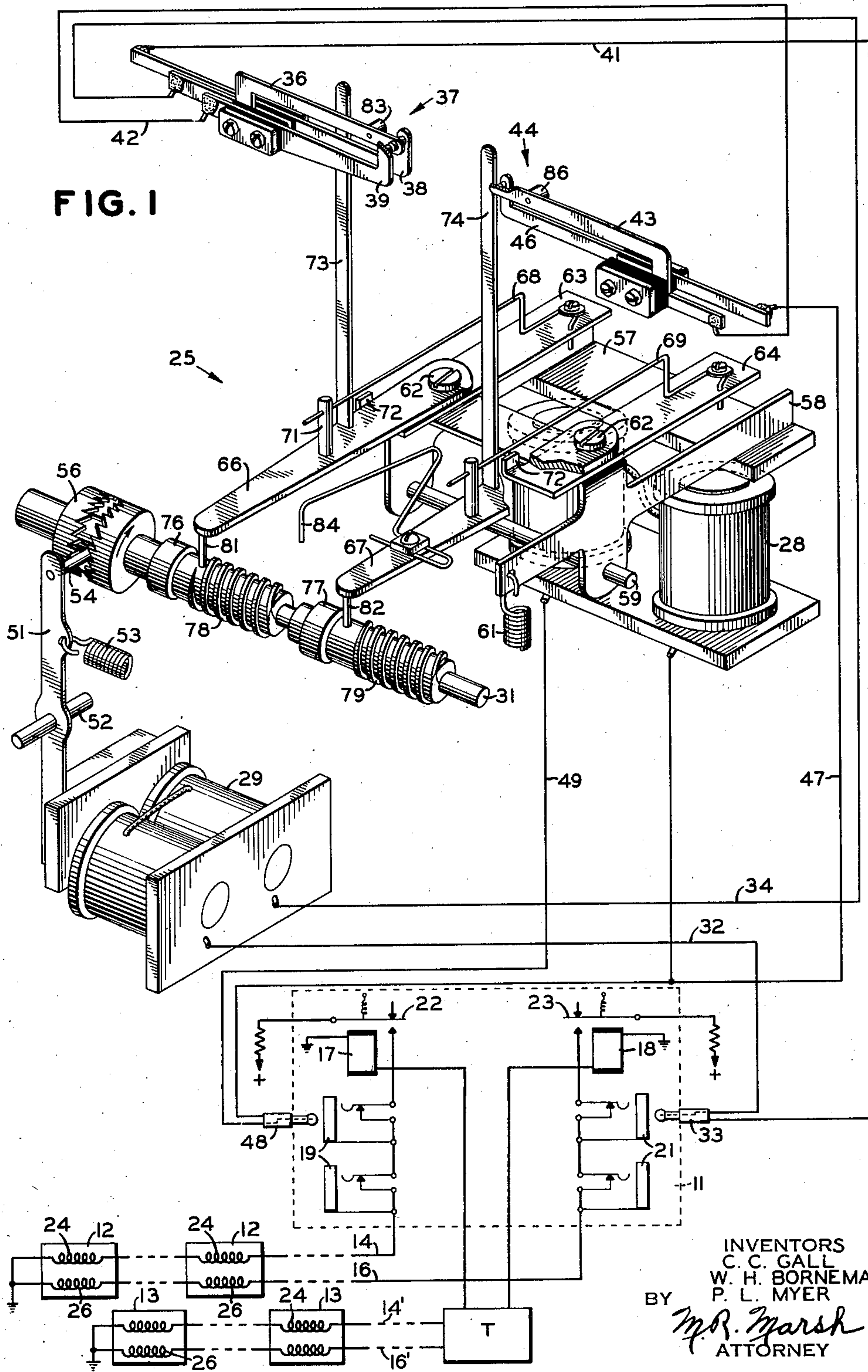
C. C. GALL ET AL

2,301,393

TELEGRAPH SYSTEM

Filed May 26, 1939

2 Sheets-Sheet 1



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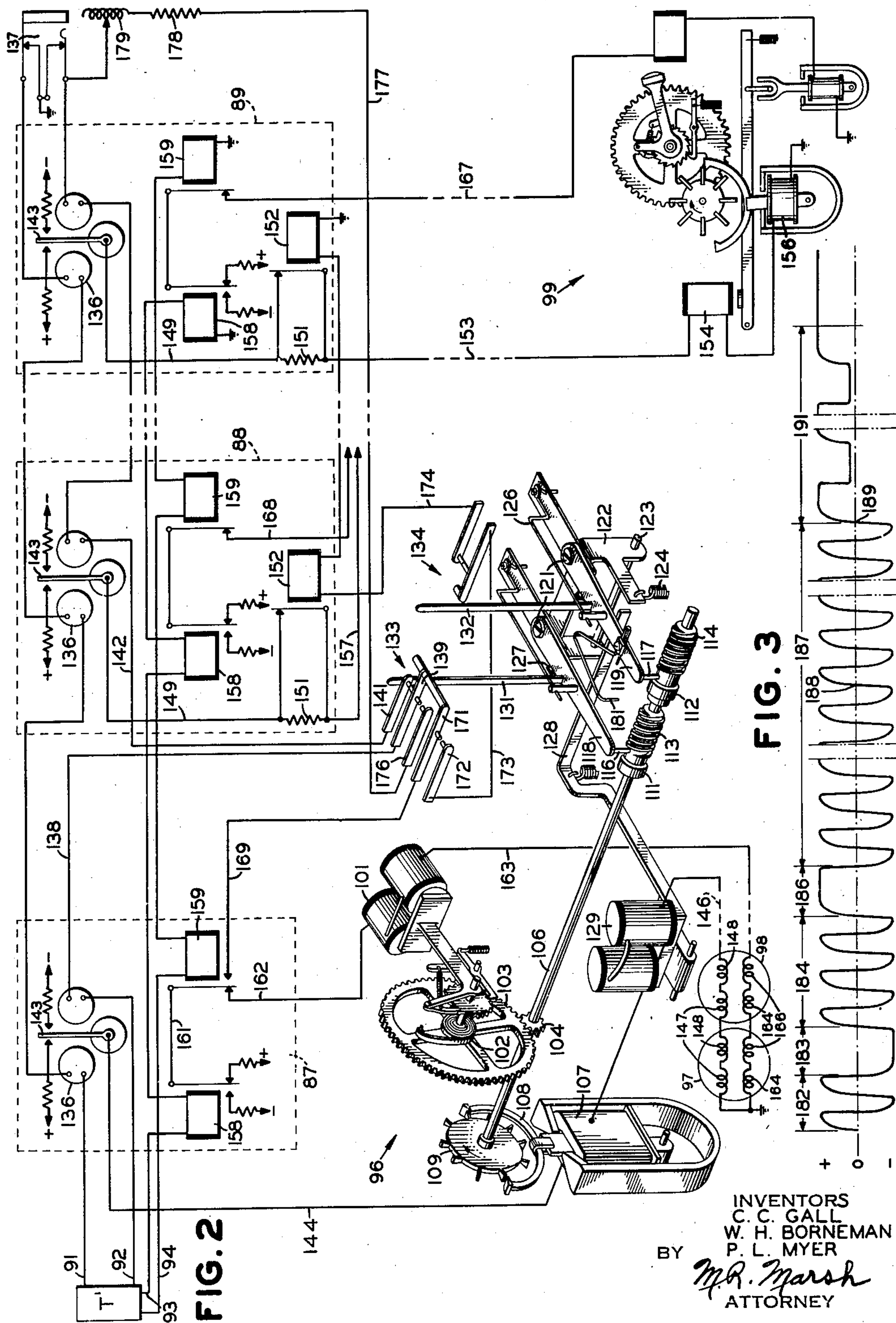
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2 Sheets-Sheet 2



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TELEGRAPH SYSTEM

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36 Claims. (Cl. 178—42)

This invention relates in general to an automatic tape feeding system for use in conjunction with a system such as a stock quotation broadcasting system employing tape recorders, and more particularly to a system and apparatus for automatically feeding a predetermined length of tape through predetermined of the recorders on a system, such as those on the system which may be associated with projectors, whenever the character selecting impulses cease to be transmitted for a predetermined length of time. The invention is hereinafter shown and described as applied to tickers of the step-by-step types known in the art as universal and self-winding tickers, however the application of the principles of the invention is not limited to systems employing only these types of tickers but can readily be applied to others. Two line circuits are employed to control the above named types of tickers. One of the circuits, called the type circuit, in the case of the universal tickers, operates an escapement magnet which steps the typewheel around to the desired position relative to the press pad. The other circuit, called the press circuit, controls a press magnet which when operated actuates the press pad to press the recording tape against the typewheel to record the selected character thereon.

In tickers of the self-winding type four magnets are employed, namely, a press magnet, an escapement magnet, a winding magnet, and a shift magnet. The press and escapement magnets are connected in series and are controlled by the so-called escapement and press circuit. The press magnet operates the printing hammers while the escapement magnet allows the typewheel to be stepped around to bring the desired characters thereon over the printing hammers. The press magnet is a marginal or slow operating magnet and the short escapement impulses do not operate it, it being operated only by the longer press impulses. The other circuit to a self-wind ticker, called the shift and winding circuit, controls the operation of the shift and winding magnets. The shift magnet is a polarized magnet which determines whether a letter or a figure on the typewheel will be printed on the operation of the press magnet. The winding magnet is a neutral magnet which operates on make and break signals of either polarity and serves to wind up a spring which tends to rotate the typewheel.

In both the above types of tickers each time the press magnets are operated to print a character on the recording tape, the recording tape is

advanced one letter space. When there are no quotations to be transmitted for the time being, the escapement impulses continue to be received and rotate the typewheels to a unison position where further rotation thereof is prevented until after the receipt of a press impulse.

Each of the above types of tickers are used in conjunction with projectors which, as well known, project an enlarged image of the characters on the recording tape on to a screen where they can be observed by a group of people. Where such tickers are used in conjunction with projectors and there are no more quotations to be printed for the time being, a number of tape stepping signals are usually transmitted to advance blank tape through the tickers so that the last quotation may be projected on to the screen. All the tickers in a system are usually controlled from one transmitting source and where the tape stepping signals are introduced for the purpose of advancing blank tape in the tickers associated with projectors blank tape is also advanced through those tickers in the system which are not associated with projectors. Obviously such an arrangement wastes considerable tape in the tickers not associated with projectors and in addition constitutes an annoyance to observers reading the tape as the blank spaces in the tape decrease the number of quotations in a given length. As in the above, the tape advancing through the tickers without having quotations thereon is hereinafter considered and referred to as being blank tape although it may or may not have a series of dots, such as unison dots thereon.

It is therefore one of the primary objects of this invention to provide a means whereby predetermined of the tickers in a broadcasting system, such as for example those associated with projectors, may automatically have a predetermined length of blank tape or a length of tape having no quotations printed thereon advanced there-through when character selecting conditions cease to be received for the time being, while the rest of the tickers in the system, such as those not associated with projectors, do not have tape advanced therethrough.

During normal operation of transmitting quotations, there are usually short delays between some of the quotations which may or may not be inherent in the broadcasting system and during such short delays it is not desirable to initiate the advancing of blank tape through the tickers associated with projectors as such a condition would unnecessarily waste the tape.

Accordingly another object of the invention is

to prevent the initiation of the advancement of blank tape through certain tickers until after the elapse of at least a predetermined length of time.

Another object of the invention is to enable the interval of time before the commencement of the advancement of blank tape through the desired tickers to be easily varied.

Another object of the invention is to stop the advancement of blank tape through the desired tickers after a predetermined amount has been advanced.

Another object of the invention is to easily vary the predetermined length of blank tape advanced through the desired tickers.

These and other objects of the invention will be more apparent in the following detailed description thereof when taken in conjunction with the accompanying drawings, in the latter of which;

Fig. 1 is a perspective diagrammatic view of one form of the invention together with a circuit panel and circuits extending therebetween for use in conjunction with universal type tickers;

Fig. 2 is a perspective diagrammatic view of a modification of the invention together with circuit panels and controlling circuits extending therebetween for use in conjunction with self-winding type of tickers; and

Fig. 3 illustrates the manner in which the signals on the escapement and press circuit are modified to control self-winding tickers in accordance with the invention.

In general the invention consists, in the case of the universal ticker, of a so-called switching unit, which for predetermined conditions automatically switches the impulses normally transmitted over the escapement circuit to the press circuit whereupon these escapement signals operate the press magnet and serve to advance blank tape through the ticker and after a predetermined length of blank tape has been advanced, the switching unit operates to stop further advancement of the tape. In the case of the self-winding ticker, a modified switching unit alters the impulses normally going to the escapement and press circuit so that they operate the press magnet to advance blank tape until a predetermined length of tape has been advanced whereupon the advancement of blank tape ceases. Both of the above forms of the switching unit are fully described in the following paragraphs.

Referring first to Fig. 1, the elements of a standard circuit control panel are shown within a dot-dashed rectangle 11 which is adapted to be controlled from a transmitting point or station such as that represented by the rectangle T. Ticklers diagrammatically represented at 12 are shown connected to the control panel 11 by line conductors 14 and 16 to be controlled in accordance with the operation of the invention as will be described, whereas tickers 13 are shown connected by line conductors 14' and 16' directly to the transmitting station T to operate in the regular well known manner. As is the general practice, the tickers 12 and 13 are shown connected in series to ground. Each such panel as 11 may be adapted to control one or more tickers. The control panel 11 comprises a press relay 17, an escapement relay 18 and jacks such as 19 and 21. The press and escapement relays 17 and 18, respectively, are operated in the well known manner by signals from the transmitting point T and have associated tongues 22 and 23, respectively. The tongues 22 and 23 are connected to

battery and the associated make stops are connected through the jacks associated therewith to the press and escapement circuit conductors 14 and 16, respectively, and in accordance with the operation of the relays, impulses of current and no current are transmitted over the line circuits 14 and 16. Each of the tickers such as 12 and 13 have press magnets 24 and escapement magnets 26. As is well known, the escapement magnets 26 cause the type wheels in the tickers to be stepped around to bring the desired character thereon in a printing position following which the press magnets are energized to record the selected character and concomitantly advance the associated tapes. Between printing operations the escapement relay 18 is energized and deenergized at a certain rate and when a printing operation is being performed as the result of the energization of the press relay 17, the escapement relay 18 is maintained in its last operated position so that the typewheels will be held from rotating during the press or printing operation. When there are quotations to be recorded, the press relay 17 operates comparatively frequently and whenever there are no more quotations to print, the escapement relay 18 continues to operate and the typewheels on the tickers are stepped around to a unison position where further rotation thereof is prevented until another press impulse is received. The escapement impulses, however, continue to be received but have no effect on the rotation of the typewheels after they reach their unison position.

In accordance with the invention the switching unit, referred to in general by reference numeral 25, comprises parts of a universal ticker among which are a press magnet 28, an escapement magnet 29 and a typewheel shaft 31, the typewheel being removed therefrom. Although these elements of the universal ticker are employed, it will be obvious that they are not necessary for the operation of the invention, as other elements adapted to perform similar functions could be employed, the elements of the universal ticker being employed merely for the purpose of convenience. One terminal of the escapement magnet 29 is connected by a conductor 32 to the tip terminal of a double conductor cord plug 33 which may be associated with one of the jacks 21. The other terminal of the magnet 29 is connected by a conductor 34 to the tongue 36 of a break-make contact indicated in general by reference numeral 37 having a break stop 38 and a make stop 39. The break contact 38, normally in contact with the tongue 36, is connected by a conductor 41 to the sleeve terminal of plug 33. The make stop 39 of the contact 37 is connected by a conductor 42 to the tongue 43 of a normally closed contact indicated in general by reference numeral 44. The break stop 46 of the contact 44, normally associated with the tongue 43, is connected by a conductor 47 to the sleeve terminal of a double conductor plug 48 associated with one of the jacks 19 in parallel with one of the terminals of the press magnet 28. The other terminal of the press magnet 28 is connected by a conductor 49 to the tip terminal of the plug 48.

When it is desired to control the tickers such as 12 associated with a panel such as 11 by and in accordance with the operation of a switching unit such as 25, the plugs 33 and 48 are inserted in the jacks 21 and 19 respectively. With the plug 33 in one of the jacks 21, the escapement magnet 29, the tongue 36 and break stop 38 of the contact 37 are in series with the escapement

circuit conductor 16. Similarly when the plug 48 is in one of the jacks 19, the press magnet 28 is in series with the press circuit conductor 14. Accordingly, each time the escapement relay 18 is energized, the magnet 29 is also energized to actuate a lever 51 pivotally supported on a rod 52 a slight amount in a counter-clockwise direction against the action of its attached spring 53, and when the magnet 29 is deenergized the lever 51 is actuated in a clockwise direction. A pin 54 in the upper end of the lever 51 cooperates with crown wheels 56 fixed to the shaft 31 to rotate the same a predetermined amount, in the direction indicated, on each of the above movements of the lever 51. Associated with the press magnet 28 is an armature 57 which is attached to a bracket 58 pivotally supported on a rod 59. Each time the press relay 17 is energized, the press magnet 28 is also energized and the bracket 58 is rocked a slight amount in a clockwise direction against the action of its attached spring 61, the spring 61 returning the bracket to its normal position when the magnet 28 is deenergized.

Fixed to the bracket 58 by shoulder screws 62 are two levers 63 and 64. Pivotally mounted on the shoulder screw 62 associated with the lever 63 is an arm 66 similar to another arm 67 pivotally mounted on the shoulder screw 62 associated with the lever 64. Fixed to the ends of the levers 63 and 64 are single wire springs 68 and 69 respectively which have the free ends thereof engaged in pins 71 on the arms 66 and 67. The springs 68 and 69 tend to pivot the arms 66 and 67 to keep them in engagement with stops 72 on the levers 63 and 64. The arms 66 and 67 are comparatively loose on the shoulder screws 62 for reasons hereinafter apparent and extending from the arms are contact actuating members 73 and 74 respectively which are adapted to operate the contacts 37 and 44 in a manner hereinafter described.

Fixed to the shaft 31 for rotation therewith are two collars or sleeves 76 and 77 which have formed integral therewith worms 78 and 79 hereinafter referred to as the start worm and the tape metering worm respectively. In the free end of the arm 66 is a follower 81 which is normally in operative relation or engaged with the start worm 78. A similar follower 82 in the free end of the arm 67 normally rests on a smooth portion of the sleeve 77 but is adapted as hereinafter described to be engaged with the worm 79.

The escapement impulses hereinbefore described operate the magnet 29 to rotate the shaft 31 and during such times the follower 81 moves along the worm 78 and the arm 66 is pivoted in a counter-clockwise direction. However, when quotation signals are being transmitted a press impulse is received on the magnet 28 before the follower 81 has traveled very far along the worm 78. The press impulse energizes the magnet 28 and rocks the bracket 58 to raise the free end of arm 66 and withdraw the follower 81 from engagement with the start worm 78 whereupon the spring 68 pivots the arm 66 back to its normal position against its stop 72. When the magnet 28 is subsequently deenergized the follower 81 again engages the worm 78 near the beginning thereof. Thus during normal operation or when quotation signals are being transmitted the follower 81 is lifted out of engagement with the worm 78 and returned to its normal position to re-engage the worm adjacent the beginning thereof before the follower 81 has time to ap-

proach very near the end of its worm. When there are no more quotation signals to be transmitted the escapement impulses continue but there are no press impulses. In the absence of the press impulse the follower 81 continues to move along the worm 78 until it reaches the end of the worm whereupon it drops down upon the shaft 31. The loose connection between the pivoted end of the arm 66 and the shoulder screw 62 permits the follower 81 to drop down without any appreciable movement of the bracket 58, the spring 68 assisting in this movement of the arm 66. As the follower 81 moves along the worm 78 the upper end of the member 73 moving with the arm 66 is brought opposite an insulating button 83 on the tongue 36 of the contact 37 and when the follower 81 drops on to the shaft 31 the member 73 engages the button 83 to move the tongue 36 out of engagement with its break stop 38 into engagement with its make stop 39. When the contact 37 is thus operated the impulses which originate at the escapement relay 18 and continued from the make stop thereof through the jack 21, plug 33, conductor 32, magnet 29, conductor 34 through the tongue 36 and break stop 38 of relay 37, conductor 41 to the escapement circuit conductor 16 are switched to the make stop 39 of the contact 37. From the make stop 39 the impulses continue over conductor 42 through the normally closed contact 44 over conductor 47 through the plug 43 and jack 19 to the press circuit conductor 14. Thereupon these escapement impulses are received on the press magnets 24 of the tickers such as 12 associated with the control panel 11 to operate the press magnets and step cut the tape. At the time the contact 37 is operated the escapement impulses received on the tickers 12 prior to the operation of the contact 37 will have rotated the type-wheels therein to a unison position and therefore, as the press magnets 24 are subsequently operated as hereinbefore described only unison dots will appear on the recording tapes. If desired the unison dots on the typewheels may be removed and with the dots removed each time the press magnet is operated with the typewheels in unison positions a section of blank tape will be advanced through the tickers an amount equivalent to one letter space. The above method of operating the contact 37 allows it to be quickly operated and by adjusting the position of the worm 78 the contact 37 will operate when there is no current therethrough, thus eliminating any sparking at the contact.

Some time prior to the time the follower 81 drops off the start worm 78 the arm 66 engages the end of a wire 84 adjustably secured to the arm 67 whereupon as the follower 81 continues along the worm 78, the arm 67 is pivoted so that its follower 82 is moved over and engages the metering worm 79. The escapement impulses continue to be effective on the magnet 29 to rotate the worms 78 and 79 and a predetermined amount of rotation of the shaft 31 after the follower 81 drops off its worm 78, the follower 82 approaches and drops off the end of its worm 79 onto the shaft 31. The adjustment of the wire 84 determines the time interval or the number of revolutions of the shaft 31 between the time the follower 81 drops off its associated worm and the time the follower 82 drops off its worm. Also by adjusting the lever 63 so as to change the position of the stop 72, the follower 81 can be made to start at different points on the worm 78 and various amounts of rotation of the worm 78 will

be necessary before the follower drops onto the shaft 31.

As the follower 82 moves along the worm 79 the arm 67 pivots and in so doing the member 74 movable therewith moves over opposite a button 86 on the tongue of the contact 44. Thus when the follower 82 drops off the worm 79 the member 74 engages the button 86 to open the normally closed contact 44 and in so doing opens the circuit heretofore described from the make stop of the escapement relay 18 to the press circuit conductor 14. Thus the impulses originating at the escapement relay 18 are no longer effective on the press magnets of the tickers associated with panel 11 and the advancement of blank tape through the tickers ceases. The tickers thereupon remain inactive until a press impulse preceding a quotation is transmitted which releases the typewheels from their unison position. The press impulse is effective on the magnet 28 of the switching unit to energize the same and rock the bracket 58. As the bracket 58 is thus rocked the free ends of the arms 66 and 67 are raised whereupon the followers 81 and 82 clear the worms 78 and 79, respectively, and the springs 68 and 69 pivot the arms back against the stop 72 on the levers 63 and 64. Energization of the magnet 28 also removes members 73 and 74 from engagement with the buttons 83 and 86 allowing the contacts 37 to 44 to resume their normal positions and restore the circuits controlled thereby to their original condition. Subsequent deenergization of the magnet 28 allows the spring to rock the bracket 58 to bring the follower 81 into engagement with its worm 78 and the follower 82 onto the clear portion of the sleeve 77.

From the above it can be seen that when the press impulses are not received for a certain length of time the follower 81 moves along and drops off the worm 78 allowing the member 73 to operate the contact 37. The operation of the contact 37 switches the normal escapement impulses to the press circuit, the impulse operating the press magnets to advance blank tape through the associated tickers. While the follower 81 is moving along the worm 78 the follower 82 is started in the worm 79 and after a definite number of impulses are transmitted to the press magnets the metering worm 79 allows the arm 67 to pivot downward and cause the opening of the contact 44. The opening of the contact 44 breaks the escapement circuit to the press magnets whereupon they cease operating. Thus each time the transmission of press impulses ceases for a predetermined length of time the predetermined length of blank tape is advanced through the associated tickers. The number of impulses thus shifted to the press circuits to operate the same to advance blank tape through the tickers are sufficient to advance the last quotation on the tape into the projecting field of associated projections where it can be projected onto a screen and the length of blank tape is always substantially the same.

Only those tickers associated with projectors or those in which it is desired to advance blank tape on the cessation of quotations are associated with panels controlled in accordance with the operation of a switching unit such as 25, and therefore the other tickers in the system do not have blank tape automatically advanced therethrough. Obviously the panel 11 could be employed in conjunction with the switching unit 25 as a master panel to control other panels instead of the tickers 12 and 13.

Referring now to Fig. 2, the application of a switching unit to a self-winding ticker system will be described. In the application of a switching unit to a self-winding system, various factors have to be considered in addition to those considered in applying a switching unit to a universal ticker system as polar signals are employed to control the self-winding ticker. However, the fundamentals are the same and consist primarily of changing the impulses normally transmitted to the escapement and press circuit to operate the press a predetermined number of times when the tickers cease operating for at least a predetermined length of time. As stated, the press and escapement circuit controls by means of the press and escapement magnets, the operation of the printing or press mechanism, and the rotation of the typewheel, the press magnet being a neutral magnet and the escapement a polar magnet. Normally the impulses which operate the press magnet are elongated escapement impulses, such pulses stepping the typewheel to its finally selected position and thereafter operating the press mechanism. Obviously, if a succession of polar impulses sufficiently long to operate the press magnet are transmitted, the impulses would also operate the escapement magnet, the result being that consecutive characters on the typewheel would be printed on the tape as the typewheel would be stepped one step for each impulse. Therefore, when it is desired to operate the press magnet in response to a succession of press impulses to advance blank tape through the ticker, it is necessary to keep the escapement magnet from operating. In accordance with the invention, this is accomplished by preventing the current in the escapement and press circuit from changing polarity and the succession of impulses which operate the press magnet are impulses of the same polarity but of different current values. A slight bias being maintained in the circuit insufficient to hold the press magnet operated but sufficient to hold the escapement magnet in its last actuated position to prevent rotation of the typewheel. Thus the succession of impulses of different values of current of the same polarity operate the press mechanism to advance the tape in the tickers while the typewheel is held from rotation.

In Fig. 2 the elements of three self-winding ticker circuit control panels represented within the dot-dashed rectangles 87, 88 and 89 are shown, they being controlled as hereinafter described by impulses received over the four conductors 91 to 94 from a master circuit control panel or a transmitting mechanism T' in the manner well known in the art. The circuit control panel 87 is shown connected to a switching unit, indicated in general by reference numeral 96, to which may also be connected the circuits to other self-winding tickers such as 97 and 98.

The panels 88 and 89 may be employed to control tickers, the operation of which are modified by the switching unit 96 in a manner hereinafter described. One self-winding ticker indicated in general by reference numeral 99, is shown connected to the panel 89 to be controlled thereby and usually several such tickers are connected in series to be controlled from one panel. Like in the switching unit of Fig. 1 comprising elements of a universal ticker to control the universal tickers in accordance with the operation of the switching unit, the switching unit employed in conjunction with self-winding control panels,

comprises elements of a self-winding ticker, the elements of the self-winding ticker being employed merely as a matter of convenience as they are well adapted to operate in response to the ticker signals. However, other elements and arrangements thereof could be employed. The self-winding switching unit 96 comprises neutral winding magnet 101 which in a well known manner winds up the spring 102 which through the gears 103 and 104 tends to rotate the typewheel shaft 105. Also employed in the switching unit is a polar escapement magnet 107, the armature operated escapement 108 of which cooperates with the escapement wheel 109 to allow the shaft to rotate one step for each change of condition of the magnet 107. Fixed to the shaft 106 for rotation therewith are two sleeves 111 and 112 which have formed integral therewith worms 113 and 114, respectively. The worms 113 and 114 are similar to the worms 78 and 79 of Fig. 1 and have associated followers 116 and 117, respectively, Fig. 2, which operate in much the same manner as the followers 81 and 82 of Fig. 1. The followers 116 and 117, Fig. 2, are supported in the free ends of arms 118 and 119, respectively, pivotally mounted on shoulder screws 121 supported in a bracket 122. The bracket 122 is pivotally supported on a rod 123 and a spring 124 attached to the bracket normally holds the follower 116 engaged with the worm 113 and the follower 117 on a smooth portion of the collar 112. Springs 126 bias the arms 118 and 119 downward and in a clockwise direction against stops such as 127. An arm 123 extends beneath the arms 118 and 119 and is adapted to be operated by the energization of a press magnet 129. Whenever the press magnet 129 is energized the arm 123 lifts the followers 116 and 117 from engagement with the worms 113 and 114, respectively, whereupon the springs 126 pivot the arms against the stops 127, if at the time of the energization of the magnet 129 they are not already engaging the stops 127. Associated with the arms 118 and 119 are contact actuating members 131 and 132, respectively, which are adapted to operate contacts indicated in general by reference numbers 133 and 134, respectively, in a manner which will hereinafter be described.

When no quotation signals are to be transmitted for the time being, impulses of current of equal length are alternately transmitted over conductors 91 and 92, first conductor 91 receiving an impulse and then conductor 92, one circuit being open while the other is closed. The conductor 91 is connected in series through the left hand coil of the escapement polar relays 136 of each of the panels 87 to 89 and through a jack 137 to ground. The conductor 92 is connected through the right hand coil of the escapement polar relay 136 of panel 87, over conductor 138, through the tongue 139 and break stop 141 of contact 132, over conductor 142, through the right hand coils of the escapement polar relays 136 of panels 88 and 89 and through the jack 137 to ground. Thus as the alternate impulses are received over conductors 91 and 92 the tongues 143 of the escapement polar relays 136 on the panels 87 to 89 make contact first with one of their stops and then with the other. The left and right hand stops associated with the tongues 143 are connected to positive potential and negative potential respectively. Thus as the tongues vibrate positive and negative potentials are alternately applied thereto.

The tongue 143 of panel 87 is connected by a

conductor 144 through the coil of the polar escapement magnet 107 of the switching unit 96 in series with the neutral press magnet 129 to a line conductor 145 which may complete the circuit to ground through the press and escapement magnets 147 and 148 respectively of tickers such as 97 and 98 which are to be controlled from the panel 87. The tongues 143 of the escapement polar relays 136 on the panels 88 and 89 are connected by conductors 149 through resistances 151 in parallel with the tongues and break stops of the auxiliary press relays 152 to escapement and press circuit conductors 157 and 153 respectively. The circuit conductor 153 is shown connected in series with the press and escapement magnets 154 and 155 respectively of the ticker 99 to ground. Usually the press and escapement magnets of several tickers such as 99 are connected in series to ground. Similarly the conductor 157 of panel 88 may extend to the press and escapement magnets of one or more tickers adapted to be controlled by the panel 88.

The impulses received over the conductors 93 and 94 are for the purpose of operating the shift and winding relays 158 and 159 respectively on the circuit control panels 87 to 89. These impulses are intervals of current and no current and all of the shift relays 158 are connected in series with the conductor 93 to ground. In a similar manner the winding relays 159 are connected in series with the conductor 94 to ground. The break and make stops, or the right and left hand stops, associated with the tongues of the shift relays 158 are connected to positive and negative potential respectively, the tongues being connected by conductors 161 to the tongues of the associated winding relays 159. The break stop of the winding relay 159 of panel 87 is connected by a conductor 162 through the neutral winding magnet 101 of the switching unit 96. As shown, this circuit is continued over line conductor 163 through the winding and shift magnets 164 and 166 of the tickers 97 and 98 to ground. It will be noted that a shift magnet is not employed in the switching unit 96 for reasons hereinafter apparent. The break stop associated with the tongue of the winding relay 159 on the panel 89 is connected by a conductor 167 through the winding and shift magnets of the ticker 99 and may be continued through the shift and winding magnets of other tickers controlled by the panel to ground. Similarly the break contact associated with the winding relay 159 of panel 88 may be connected by a conductor 168 to control tickers associated with this panel.

The make stop of the winding relay 159 of panel 87 is connected by a conductor 169 to a tongue 171 of the contact 133. A make stop 172 associated with the tongue 171 is connected by a conductor 173 through the tongue and break stop of the normally closed contact 134 and thence over a conductor 174, through the coils of the auxiliary press relays 152 of the panels 88 and 89 to ground. The make stop 176 associated with the tongue 139 of contact 133 is connected by a conductor 177 through a compensating resistance 178, a variable impedance coil 179 and the jack 137 to ground.

As hereinbefore stated, the impulses received over conductor 93 are intervals of current and no current, an interval of current being transmitted when the tickers are to print letters and an interval of no current being transmitted when the tickers are to print figures. The intervals of current and no current continue until the con-

dition of the printers is to be changed and they control the operation of the shift relays 158 on the panels 87 to 89. The impulses transmitted over conductor 94 are also intervals of current and no current which operate the winding relays 159 on the circuit panels 87 to 89 to make and break the circuit from the tongue of associated shift relays 158 to the shift and winding circuits such as 162, 167 and 168. Thus the impulses sent over the shift and winding circuits, such as 162 consist of make and break impulses of either positive or negative polarities, the polarities of the impulses depending upon the condition of the shift relays 158. These winding impulses energize the winding magnets such as 101 and 166 to wind up the springs such as 102 tending to rotate the typewheel shafts. During the printing operation the winding impulses are momentarily stopped for obvious reasons, but following a printing operation they immediately begin again.

When there are no more quotation signals to be transmitted for the time being, the escapement and winding impulses continue and perform their related functions as outlined above. After a sufficient number of escapement impulses have been received to allow the typewheel shafts of the tickers to make three revolutions following a press impulse, they are stopped in their unison positions. However, the shaft 106 on the switching unit 96, rotating in response to these continuing escapement impulses does not stop as there is no unison device and the follower 116 continues to move along the worm 113. After the typewheel shafts on the tickers in the system are stopped in their unison position, a few more revolutions of the shaft 106 allows the follower 116 to drop off the end of worm 113. This allows the member 131 to operate the contact 133 and move the tongues 139 and 171 thereof into contact with their make stops 176 and 172 respectively. As the tongue 139 moves from its break stop 141 to its make stop 176, the circuit from the right hand coil of the escapement polar relay 136 of the panel 87 which heretofore continued through the right hand coils of the escapement polar relays of the panels 88 and 89 is switched by the tongue 139 to the make stop 176, over conductor 177 through the compensating resistance 178 and variable impedance 179 to ground at the jack 137. Thereupon the impulses received over conductor 92 have no further effect on the relays 136 of panels 88 and 89 and tongues 143 thereof remain stationary on their left hand stops. However, the tongue 143 of the relay 136 on panel 87 continues to vibrate in response to the impulses received over conductors 91 and 92 as the circuits thereto were not disturbed.

When the tongue 171 of the contact 133 engages its make stop 172, a circuit from the make stop of the winding relay 159 of panel 87 is completed over conductor 169 through the tongue 171 and stop 172, over conductor 173 through the normally closed contact 134, over conductor 174 and through the auxiliary press relays 152 of panels 88 and 89 to ground. Thereafter each time the winding relay 159 of panel 87 is operated by a winding impulse received over conductor 94, an impulse of potential from the tongue of the associated shift relay 153 is transmitted to the auxiliary press relay 152 to operate the same. Each time these auxiliary press relays operate in response to these impulses they cut the resistances 151 into the escapement and press circuits 157 and 153 of panels 88 and 89. The value of the resistances 151 is such that when they are

cut into the escapement and press circuits they reduce the currents therein to a value of about one-seventh its former value. This current is always a positive current for the above condition as the tongues 143 of the escapement polar relays 136 on the panels 88 and 89 are at this time always in their left hand position. As the current in the escapement and press circuits such as 153 falls to about one-seventh its normal value, the press relays such as 154 connected therein return to an unoperated position as the decreased current is insufficient to hold them in an operated position. However, the current in the circuit is sufficient to hold the escapement magnet, such as 156, in its last operated position which is the unison position. Therefore each time the auxiliary press relays 152 are operated the current in the associated escapement and press circuits is decreased and returns to its normal value during the time the relays 152 are unoperated. The frequency of these changes is sufficiently slow to permit the press magnets such as 154 in the circuits to operate and each time they operate they advance the tape through the tickers. Therefore each time the winding relay 159 on panel 87 is energized and deenergized for the above conditions the tape in all the tickers that may be associated with panels such as 88 and 89 continues to be advanced one letter space until stopped as hereinafter described. It is obvious, however, that tickers such as 97 and 98 associated with panels such as 87 not having an auxiliary press relay do not have blank tape advanced there-through as the impulses in their press and escapement circuits continues to be only short escapement impulses.

Some time before the follower 116 drops off the worm 113, the arm 118 engages a wire 181 adjustably secured to the arm 119 and pushes the follower 117 over and into engagement with the worm 114. As the escapement impulses over conductors 91 and 92 are still effective to rotate the shaft 106 the follower 117 moves along the worm 114. When the follower 117 travels the length of the worm 114 it drops on to the shaft 116 allowing member 132 associated therewith to open the contact 134. The opening of the contact 134 opens the circuit to the auxiliary press relays 152 and thereafter the impulses previously transmitted thereto from the make stop of the winding relay 159 of panel 87 are no longer effective to operate the same.

The tongues of the auxiliary press relays 152 thereupon return to and remain in their unenergized positions until they are again energized in the same manner as hereinbefore described. When the tongues of relays 152 return to their unenergized positions the currents in the press and escapement circuits such as 153 and 157 return to and remain at their normal maximum value.

Fig. 3 illustrates the various impulses that may occur in an escapement and press circuit such as 153 for the above described conditions. Starting at the left, the short intervals in section 182 represent escapement impulses which operate the escapement magnet such as 156 to step the typewheel as above described. Following the escapement impulses in section 182 is an elongated negative press impulse in section 183 which operates the press magnet such as 154 to actuate the press mechanism to print the selected character on the typewheel. Following the press impulse in section 183 are more escapement impulses in section 184 which step the typewheel from its last select-

ed position to a new selected position whereupon the positive press impulse in section 186 again actuates the press mechanism to record this second selected character. Let it be assumed that the character recorded by the press impulse in section 186 is the last to be recorded for the time being whereupon as described above the escapement impulses continue to be received. These impulses are represented in section 187 and on the receipt of about 90 of these escapement impulses all the tickers in the system are run to their unison position which will occur at some point such as 188. At this time the follower 116, Fig. 2, will have traveled a predetermined distance on the worm 113 and continues to move therealong as the escapement impulses in section 187, Fig. 3, continue to be received. At the point 189 in the curve the follower 116 drops off the worm 113 whereupon the auxiliary press relays 152, Fig. 2, are connected in the circuit from the make stop of the winding relay 159 to be operated in response to the shift impulses as described. As the relays 152 are operated the resistances 151 are cut into their associated escapement and press circuits 153 and 157 lowers the currents therein. When the relays 152 are unoperated the currents in the circuits 153 and 157 return to their normal maximum value. The high values of current in section 191, Fig. 3, represent the time when the relay 152 of panel 89 is unoperated and the low values the times when the relay is operated. These changes of current value of the same polarity continue until the follower 117 drops off its associated worm 114 to operate the contact 134 and each time a change occurs the press magnet such as 154 is operated to advance the tape in the ticker. The operation of the contact 134 opens the circuit to the relays 152 whereupon their tongues return to their normal condition and the current value in the conductor 153 returns to its normal maximum value where it remains until a regular printing pulse is received hence the advancement of blank tape through the ticker ceases.

It will be obvious that by adjusting the position of the stop 127, Fig. 2, associated with the arm 113, the point at which the follower 116 engages the worm 113 can be changed. Accordingly, the time interval between the time the tickers run to unison such as the point 183 on the current curve in Fig. 3 and the time the follower 116 drops off its worm 113 such as the point 189 on the curve can be varied. This, as described, varies the time after the tickers run to unison before they start feeding out blank tape. Adjusting the wire 181 determine at what position of the follower 116 along the worm 113 the follower 117 begins traveling along its associated worm 114. Thus the length of time that the follower 117 is traveling along its worm after the follower 116 drops on to the shaft 186 is varied. During this time the winding impulses are effective on the relays 152 and accordingly the adjustment of the wire 181 determines the number of operations of the relays 152. The number of operations of the relays 152 determine the number of operations of the press magnets, such as 154 and accordingly determine the length of blank tape advanced. The length of blank tape advanced is such that the last printed quotation can be advanced until it is in the projecting field of associated projectors.

Following the advancement of a predetermined length of blank tape through the tickers controlled by panels such as 88 and 89 the next reg-

ular press impulse energizes the magnet 129 and the arm 128 lifts the arms 118 and 119 whereupon the springs 126 pivot them back against their stops 127. This allows the contacts 133 and 134 to return to their normal positions and restore the circuits to normal. Similarly a press impulse received on the magnet 129 during the advancement of blank tape or for any position of the followers 116 and 117 along their worms restores the contacts 133 and 134 to normal.

Thus when quotation signals cease to be received for a predetermined length of time, tickers such as 99 that may be associated with panels such as 88 and 89 have the tapes therein advanced a predetermined length while tickers such as 97 and 98 which may be associated with panels such as 87 do not have the tapes advanced therein. In this manner the tickers in a system may be selectively controlled so that only the desired ones will have blank tape advanced therein when quotation signals cease to be transmitted. As a switching unit 96 may control a plurality of panels in accordance with the operation thereof it is necessary to employ only one such switching unit at a distribution point. Obviously where the signals are transmitted for considerable distances to a distributing point from whence they continue to tickers that may and may not be associated with projectors the signals transmitted to these distributing points would be similar to those transmitted over conductors 91 to 94. Therefore at larger distributing points other switching units such as 95 would be employed to control panels associated with tickers operated in conjunction with projectors.

It is obvious, of course, that various other modifications of the invention may be made to accomplish the above results without departing from the spirit or essential attributes of the invention, and it is desired, therefore, that only such limitations be placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

What is claimed is:

1. In a step-by-step printing telegraph system of the type described employing tape recorders selectively controlled by impulses received over a type circuit and a press circuit, means for transmitting signals over said circuits whereby said type circuit has successions of impulses of varying numbers transmitted thereover to select characters and said press circuit has impulses transmitted thereover to operate recording mechanisms to print the characters selected by the impulses transmitted over said type circuit and concomitantly advance the recording tape, means operative after the receipt of a predetermined number of type impulses over said type circuit following a press impulse received over said press circuit for switching said type impulses to said press circuit to operate said recording mechanism and advance the tape in said recorders and means for stopping the transmission of said type impulses over said press circuit after a predetermined number have been transmitted thereover.

2. In a step-by-step telegraph system employing a type circuit and press circuit, means for transmitting signals over said circuits whereby said type circuit normally has successions of consecutive groups of type selecting impulses of varying numbers transmitted thereover to effect character selection, each of said successions of type selecting impulses normally being terminated and ceasing for at least a predetermined

length of time on the transmission of a press impulse over said press circuit to cause the recording of the selected character, means operative following a consecutive succession of a predetermined number of type selecting impulses transmitted over said type circuit for automatically transmitting a succession of impulses over said press circuit and means for stopping the transmission of impulses over said press circuit after a predetermined number have been transmitted thereover.

3. In a step-by-step telegraph system employing a type circuit and press circuit, means for transmitting signals over said circuits whereby said type circuit normally has successions of consecutive groups of type selecting impulses of varying numbers transmitted thereover to effect character selection, each of said successions of type selecting impulses normally being terminated and ceasing for at least a predetermined length of time on the transmission of a press impulse over said press circuit to cause the recording of the selected character, means operative following a consecutive succession of a predetermined number of type selecting impulses transmitted over said type circuit for automatically transmitting a succession of impulses over said press circuit, means for varying the consecutive number of type selecting impulses in a succession necessary to initiate the transmission of a succession of impulses over said press circuit and means for stopping the transmission of impulses over said press circuit after a predetermined number have been transmitted thereover.

4. In a step-by-step telegraph system employing a type circuit and press circuit, means for transmitting signals over said circuits whereby said type circuit normally has successions of consecutive groups of type selecting impulses of varying numbers transmitted thereover to effect character selection, each of said successions of type selecting impulses normally being terminated and ceasing for at least a predetermined length of time on the transmission of a press impulse over said press circuit to cause the recording of the selected character and means operative in the absence of press impulse transmitted over said press circuit for at least a predetermined length of time for transmitting a predetermined number of consecutive impulses over said press circuit.

5. In a step-by-step telegraph system employing a type circuit and press circuit, means for transmitting signals over said circuits whereby said type circuit normally has successions of consecutive groups of type selecting impulses of varying numbers transmitted thereover to effect character selection, each of said successions of type selecting impulses normally being terminated and ceasing for at least a predetermined length of time on the transmission of a press impulse over said press circuit to cause the recording of the selected character, means operative in the absence of press impulse transmitted over said press circuit for at least a predetermined length of time for transmitting a predetermined number of consecutive impulses over said press circuit and means operative after the transmission of a predetermined number of impulses over said press circuit for ceasing the transmission of impulses over both of said press and type circuits.

6. In a step-by-step telegraph system employing a type circuit and press circuit, transmitting means for transmitting signals over said circuits whereby said type circuit normally has succes-

sions of consecutive groups of type selecting impulses of varying numbers transmitted thereover to effect character selection, each of said successions of type selecting impulses normally being terminated and ceasing for at least a predetermined length of time on the transmission of a press impulse over said press circuit to cause the recording of the selected character, a unison press impulses invariably being transmitted over said press circuit to initiate recording operations whenever the number of impulses in a single consecutive group transmitted over said type circuit exceed a first predetermined number, means operative following the transmission of a second predetermined number of type impulses over said type circuit for stopping transmission thereover and transmitting a series of impulses over said press circuit, means for stopping the transmission of said series of press impulses over said press circuit when a predetermined number have been transmitted and means operative thereafter on the next unison press impulse for returning said press and type circuits to normal condition.

7. In a step-by-step telegraph system employing a type circuit and press circuit, transmitting means for transmitting signals over said circuits whereby said type circuit normally has successions of consecutive groups of type selecting impulses of varying numbers transmitted thereover to effect character selection, each of said successions of type selecting impulses normally being terminated and ceasing for at least a predetermined length of time on the transmission of a press impulse over said press circuit to cause the recording of the selected character, a unison press impulse invariably being transmitted over said press circuit to initiate recording operations whenever the number of impulses in a single consecutive group transmitted over said type circuit exceed a first predetermined number, means operative following the transmission of a second predetermined number of type impulses over said type circuit for stopping transmission thereover and transmitting a series of impulses over said press circuit and means operative on the transmission of a unison press impulse during the transmission of said series of impulses over said press circuit for returning said press and type circuits to normal.

8. In a step-by-step telegraph system, a transmitting station, a plurality of receiving stations, a plurality of press and type circuits connecting said transmitting station with said receiving stations, transmitting means for transmitting signals over said circuits whereby said type circuits normally have successions of groups of type selecting impulses transmitted thereover, each of said groups being terminated by the transmission of a press impulse over said press circuits, means operative following the transmission of a group of impulses of a predetermined number over said type circuits for automatically transmitting consecutive impulses over predetermined of said press circuits to predetermined of said receiving stations and means for stopping the transmission of the consecutive impulses over said press circuits after a predetermined number have been transmitted.

9. In a step-by-step telegraph system, a transmitting station, a plurality of receiving stations, a plurality of press and type circuits connecting said transmitting station with said receiving stations, transmitting means for transmitting signals over said circuits whereby said type circuits

normally have successions of groups of type selecting impulses transmitted thereover each of said groups being terminated by the transmission of a press impulse over said press circuits, means operative after the lapse of a predetermined length of time following the last press impulse transmitted over said press circuits for transferring following type impulses to predetermined of said press circuits and means operative following the transmission of a predetermined number of said type impulses over said press circuits for stopping the transmission thereof.

10. In a telegraph system, a transmitting station, a plurality of receiving stations, a plurality of type and a plurality of press circuits extending from said transmitting station to said receiving station, each of said receiving stations having a press and a type circuit associated therewith, transmitting means for transmitting signals over said circuits whereby said type circuits normally have successions of impulses comprising alternate open and closed line conditions transmitted thereover to effect character selection and said press circuits normally having press impulses transmitted thereover following each succession of type impulses to effect recording of said selected characters, said type impulses continuing in the absence of a press impulse, means operative after the transmission of a predetermined number of type impulses following a press impulse for transmitting type impulses over predetermined of said press circuits while preventing the transmission of type impulses over the type circuits associated with said predetermined press circuits and continuing the transmission of type impulses over the other of said type circuits and means for stopping the transmission of said type impulses over only said predetermined press circuits after a predetermined number of said impulses have been transmitted thereover.

11. In a step-by-step telegraph system, a transmitting station, a plurality of receiving stations, one or more type circuits and one or more press circuits, each of said receiving stations being connected to said transmitting station by a type and a press circuit, transmitting means for transmitting signals over said circuits whereby said type circuits normally have successions of impulses transmitted thereover to effect character selection, said successions of impulses ceasing momentarily on the transmission of a normal press impulse over said press circuits to effect character recording, a unison press impulse invariably being transmitted over said press circuit to initiate recording operations whenever a succession of type impulses exceeds a first predetermined number, means operative following the transmission of a second predetermined number of type impulses over said type circuits in excess of said first predetermined number for stopping transmission of type impulses over predetermined of said type circuits and transmitting the same over predetermined of said press circuits, means for stopping the transmission of type impulses over said predetermined press circuits after a predetermined number have been transmitted and means operative on the transmission of a unison press impulse following the transmission of said type impulses over said predetermined press circuits for returning said predetermined press and type circuits to normal.

12. In a step-by-step telegraph system, a transmitting station for transmitting type and press impulses, said press impulses normally separating groups of said type impulses, a plurality of re-

ceiving stations, each of said receiving stations having a type selecting mechanism for selecting characters and a press mechanism for recording characters and concomitantly advancing associated recording tapes thereat, circuits connecting said stations, means at said transmitting station automatically operative following a period of inactivity of a predetermined length of said press mechanisms at said receiving stations to transmit impulses for causing operation of press mechanisms at predetermined of said receiving stations a predetermined number of times and means for maintaining the press mechanisms at the others of said receiving stations inactive during such operation of the press mechanisms at said predetermined stations.

13. In a telegraph broadcasting system, a broadcasting station, a plurality of receiving stations each having a type selecting mechanism for selecting characters and a press mechanism for recording selected characters and concomitantly advancing associated recording tapes thereat, channels of communication extending between said broadcasting station and said receiving stations, means at said broadcasting station associated with predetermined of said channels for automatically initiating the transmission of impulses to cause the operation of the press mechanisms at the stations associated with said predetermined of said channels for a series of abnormal operations following a period of inactivity thereof of at least a predetermined length and means for maintaining the press mechanisms at the receiving stations not associated with the said predetermined channels inactive during the abnormal operations of the press mechanisms at the stations associated with the said predetermined channels.

14. In a step by step telegraph system, an escapement and press circuit, means for transmitting escapement and press impulses over said circuits whereby said escapement impulses comprise successions of alternately opposite polar signals of predetermined length and said press impulses normally separate said escapement successions and comprising an elongated impulse of the polarity of the last escapement impulse in a succession, means automatically operative following a succession of a predetermined number of escapement impulses for transmitting a series of abnormal press impulses, said abnormal press impulses comprising impulses of different values of the same polarity and means for stopping the transmission of said abnormal press impulses when a predetermined number have been transmitted.

15. In a step by step telegraph system, an escapement and press circuit, means for transmitting escapement and press impulses over said circuits whereby said escapement impulses comprise successions of alternately opposite polar signals of predetermined length and said press impulses normally separate said escapement successions and comprising an elongated impulse of the polarity of the last escapement impulse in a succession, means automatically operative following a succession of a predetermined number of escapement impulses for maintaining a predetermined polarity on said circuit and means for simultaneously varying the strength of the current in said circuit in a predetermined manner.

16. In a step by step telegraph system, an escapement and press circuit, means for transmitting escapement and press impulses over said cir-

cuits whereby said escapement impulses comprise successions of alternately opposite polar signals of predetermined length and said press impulses normally separate said escapement successions and comprising an elongated impulse of the polarity of the last escapement impulse in a succession, means operative following the transmission of a succession of at least a predetermined number of escapement impulses over said circuit for impressing a predetermined polarity on said circuit, means for changing the current values of said predetermined polarity in a predetermined manner and means for maintaining a steady state of current in said circuit of said predetermined polarity after a predetermined number of changes have been made in the value thereof.

17. In a step by step telegraph system, an escapement and press circuit, means for transmitting escapement and press impulses over said circuits whereby said escapement impulses comprise successions of alternately opposite polar signals of predetermined length and said press impulses normally separate said escapement successions and comprising an elongated impulse of the polarity of the last escapement impulse in a succession, means operative following the transmission of a succession of at least a predetermined number of escapement impulses over said circuit for impressing a unidirectional current on said circuit, means for changing the number of escapement impulses in a succession necessary to initiate the impression of said unidirectional current on said circuit, means for automatically and alternately changing the value of said unidirectional current a predetermined number of times, means operative thereafter for impressing a uniform value of said unidirectional current on said circuit and means for varying the number of changes in said unidirectional current prior to the impression of said uniform value.

18. In a step by step telegraph system, a transmitting station, a plurality of receiving stations, circuits connecting said receiving stations to said transmitting station, means for transmitting signals over said circuits whereby said circuits normally have escapement and press impulses alternately transmitted thereover to effect character selections, and recording and associated functions respectively at said receiving stations, means operative following the transmission of a predetermined sequence of escapement impulses over all of said circuits for automatically transmitting press impulses over predetermined of said circuits and means for continuing the transmission of escapement impulses over the remainder of said circuits during the transmission of press impulses over said predetermined circuits.

19. In a step by step telegraph system, a transmitting station, a plurality of receiving stations, circuits connecting said receiving stations to said transmitting station, means for transmitting signals over said circuits whereby said circuits normally having escapement and press impulses alternately transmitted thereover to effect character selections and recording and associated functions respectively at said receiving stations, signal responsive means at said transmitting station and means controlled by said signal responsive means following the transmission of a sequence of at least a predetermined number of escapement impulses for transmitting a predetermined sequence of press impulses over only predetermined of said circuits.

20. In a step by step telegraph system, a transmitting station, a plurality of receiving stations,

circuits connecting said receiving stations with said transmitting station, means for transmitting signals over said circuits whereby said circuits normally have escapement and press impulses alternately transmitted thereover to effect character selections, and recording and associated functions respectively at said receiving stations, signal controlled means at said transmitting station, means including said signal controlled means following the transmission of a first predetermined sequence of signals over all of said circuits for transmitting a second predetermined sequence of signals over only predetermined of said circuits and means for varying the number of signals in both of said sequences of signals.

21. In a step by step telegraph system, a transmitting station, a plurality of receiving stations, a plurality of circuits connecting said transmitting station with said receiving station, transmitting means for transmitting signals over said circuits whereby said circuits normally have escapement impulses comprising successions of alternately opposite polar signals transmitted thereover with each succession normally being terminated by a press impulse comprising a prolongation of the last escapement impulse, means operative on the transmission of at least a predetermined number of successive escapement impulses for automatically stopping the transmission of further escapement impulses over predetermined of said circuits while continuing the transmission thereof over the remainder of said circuits, means also operative thereupon for impressing a unidirectional current on said predetermined circuits and means for alternately varying the magnitude of said unidirectional current within predetermined limits.

22. In a step by step telegraph system, a transmitting station, a plurality of receiving stations, a plurality of circuits connecting said transmitting station with said receiving station, transmitting means for transmitting signals over said circuits whereby said circuits normally having escapement impulses comprising successions of alternately opposite polar signals transmitted thereover with each succession normally being terminated by a press impulse comprising a prolongation of the last escapement impulse, a unison press impulse invariably being transmitted to initiate the transmission of a succession of escapement impulses when the preceding succession of escapement impulses exceeds a first predetermined number, means operative following the transmission of a succession of escapement impulses of at least a second predetermined number over all of said circuits for stopping transmission of further of said escapement impulses over predetermined of said circuits while continuing the transmission thereof over the remainder of said circuits, means operative thereupon for transmitting a unidirectional current of varying magnitude over said circuits, means for maintaining a steady state of current of said unidirectional current polarity on said predetermined circuits after a predetermined number of variations in the magnitude thereof, means for restoring all of said predetermined circuits to the condition of the remaining circuits on the transmission of the unison press impulses irrespective of the condition of said predetermined circuits at the time of transmitting said unison press impulses.

23. In a step by step telegraph system, a source of press and a source of escapement impulses, press and escapement circuits, means for trans-

mitting said press and escapement impulses respectively over said circuits whereby the escapement impulses are normally transmitted in the absence of said press impulses, first and second rotatable worms, means responsive to each escapement impulse from said source for rotating said worms a predetermined amount, a first follower normally associated with said first worm at a starting point adjacent the beginning thereof and adapted to travel therealong as said worm rotates, a second follower normally out of operative relation with said second worm and adapted to be moved into engagement therewith to travel therealong as said second worm rotates, adjustable means operable by said first follower after a predetermined amount of travel along said first worm for causing engagement of said second follower with said second worm for movement therealong, both of said followers being movable in a direction substantially at right angles to the direction of travel along said worms when reaching the ends thereof, means controlled by said first follower on reaching the end of said first worm for connecting said source of escapement impulses to said press circuit, means controlled by said second follower when reaching the end of said second worm for opening said press circuit and means operative by a press impulse from said source of press impulses for returning said followers and said circuits to normal.

24. In a step-by-step telegraph system, a source of press and a source of escapement impulses, press and escapement circuits, means for transmitting said press and escapement impulses respectively over said circuits whereby the escapement impulses are normally transmitted in the absence of said press impulses, first and second rotatable worms, means responsive to each escapement impulse from said source for rotating said worms a predetermined amount, a first follower normally associated with said first worm at a starting point adjacent the beginning thereof and adapted to travel therealong as said worm rotates, a second follower normally out of operative relation with said second worm and adapted to be moved into engagement therewith to travel therealong as said second worm rotates, adjustable means operable by said first follower after a predetermined amount of travel along said first worm for causing engagement of said second follower with said second worm for movement therealong, both of said followers being movable in a direction substantially at right angles to the direction of travel along said worms when reaching the ends thereof, means controlled by the right angle movement of said first follower on reaching the end of said first worm for connecting said source of escapement impulses to said press circuit and opening said escapement circuit, means controlled by the right angle movement of said second follower on reaching the end of said second worm for opening said press circuit and means controlled by a press impulse from said source of press impulses for withdrawing said followers from engagement with associated worms and returning said first follower to the starting point on said first worm and said second follower to a normal position in operative relation with said second worm irrespective of the position of said followers at the time of transmission of said press impulses.

25. In a step-by-step telegraph system, a source of press and escapement impulses, circuits for transmitting said impulses, means for trans-

mitting said escapement impulses comprising successions of alternately opposite polar signals and said press impulses comprising prolongations of the last impulse of a succession of escapement impulses over said circuits, said escapement impulses normally being transmitted continuously in the absence of press impulses, first and second rotatable worms, means responsive to each escapement impulse from said source for rotating said worms a predetermined amount, a first follower normally associated with said first worm at a starting point adjacent the beginning thereof and adapted to travel therealong as said worm rotates, a second follower normally out of operative relation with said second worm and adapted to be moved into engagement therewith to travel therealong as said second worm rotates, adjustable means operable by said first follower after a predetermined amount of travel along said first worm for causing engagement of said second follower with said second worm for movement therealong, both of said followers being movable in a direction substantially at right angles to the direction of travel along said worms on reaching the ends thereof, means controlled by said first follower on reaching the end of its worm for impressing a unidirectional current on said circuits, means operative during the time of travel of said second follower along its worm after said first follower reaches the end of said first worm for varying the magnitude of said unidirectional current within predetermined values and in a predetermined time relationship, means controlled by said second follower on reaching the end of said second worm for maintaining a steady state of current on said circuit and means operative on the transmission of a press impulse from said source for returning said circuits to normal condition irrespective of the positions of said followers.

26. In a step-by-step printing telegraph system of the type described employing tape recorders selectively controlled by impulses received over a type circuit and a press circuit, means for transmitting signals over said circuit whereby said type circuit has successions of impulses of varying number transmitted thereover to select characters and said press circuit having impulses transmitted thereover to operate recording mechanisms to print the characters selected by the impulses transmitted over said type circuit and concomitantly advance the recording tape, means operative after the receipt of a predetermined number of type impulses over said type circuit following a press impulse received over said press circuit for switching said type impulses to said press circuit to operate said recording mechanism and advance the tape in said recorders, means for stopping the transmission of said type impulses over said press circuit after a predetermined number have been transmitted thereover and means for restoring said type and press circuits to normal on receipt of a regular press impulse over said press circuit.

27. In a step-by-step telegraph system employing a type circuit and press circuit, means for transmitting signals over said circuit whereby said type circuit normally has successions of consecutive groups of type selecting impulses of varying numbers transmitted thereover to effect character selection, each of said successions of type selecting impulses normally being terminated and ceasing for at least a predetermined length of time on the transmission of a press impulse over

said press circuit to cause the recording of the selected character, means operative following a consecutive succession of a predetermined number of type selecting impulses transmitted over said type circuit for automatically transmitting a succession of impulses over said press circuit, means for varying the consecutive number of type selecting impulses in a succession necessary to initiate the transmission of a succession of impulses over said press circuit, means for stopping the transmission of impulses over said press circuit after a predetermined number have been transmitted thereover and means for varying the number of impulses in a succession transmitted over said press circuit.

28. In a step-by-step telegraph system employing a type circuit and press circuit, means for transmitting signals over said circuit whereby said type circuit normally has successions of consecutive groups of type selecting impulses of varying numbers transmitted thereover to effect character selection, each of said successions of type selecting impulses normally being terminated and ceasing for at least a predetermined length of time on the transmission of a press impulse over said press circuit to cause the recording of the selected character, means operative following a consecutive succession of a predetermined number of type selecting impulses transmitted over said type circuit for automatically transmitting a succession of impulses over said press circuit and means for stopping the transmission of impulses over said type circuit during the transmission of said succession of impulses over said press circuit.

29. In a step-by-step telegraph system employing a type circuit and press circuit, means for transmitting signals over said circuit whereby said type circuit normally has successions of consecutive groups of type selecting impulses of varying numbers transmitted thereover to effect character selection, each of said successions of type selecting impulses normally being terminated and ceasing for at least a predetermined length of time on the transmission of a press impulse over said press circuit to cause the recording of the selected character, means controlled by the transmission of a consecutive succession of an abnormal number of type impulses over said type circuit for transferring following of said type impulses to said press circuit and means for halting transmission of impulses over both of said type and press circuits after a predetermined number of said type impulses have been transmitted over said press circuit.

30. In a telegraph system, a transmitting station, a plurality of receiving stations, a plurality of type and a plurality of press circuits extending from said transmitting station to said receiving stations, each of said receiving stations having a press and a type circuit associated therewith, transmitting means for transmitting signals over said circuits whereby said type circuits normally have successions of impulses comprising alternate open and closed line conditions transmitted thereover to effect character selection and said press circuits normally having press impulses transmitted thereover following each succession of type impulses to effect recording of said selected characters, said type impulses continuing in the absence of a press impulse, means operative after the transmission of a predetermined number of type impulses following a press impulse for transmitting type impulses over predetermined of said press circuits while ceasing

the transmission of type impulses over the type circuits associated with said predetermined press circuits and continuing the transmission of type impulses over the other of said type circuits, means for stopping the transmission of said type impulses over only said predetermined press circuits after a predetermined number of said impulses have been transmitted thereover, means for changing the number of type impulses transmitted over said type circuit following a press impulse transmitted over said press circuit to initiate the transmission of type impulses over said press circuits and means for changing the number of type impulses in a series transmitted over said press circuit.

31. In a step-by-step telegraph system, a transmitting station, a plurality of receiving stations, one or more type circuits and one or more press circuits, each of said receiving stations being connected to said transmitting station by a type and a press circuit, transmitting means for transmitting signals over said circuits whereby said type circuits normally have successions of impulses transmitted thereover to effect character selection, said successions of impulses ceasing momentarily on the transmission of a normal press impulse over said press circuits to effect character recording, a unison press impulse invariably being transmitted over said press circuit to initiate recording operations whenever a succession of type impulses exceeds a first predetermined number, means operative following the transmission of a second predetermined number of type impulses over said type circuits in excess of said first predetermined number for stopping transmission of type impulses over predetermined of said type circuits and transmitting the same over predetermined of said press circuits and means operative on the transmission of a unison press impulse during the transmission of said type impulses over said predetermined press circuits for returning said predetermined type and press circuits to normal condition.

32. In a step-by-step telegraph system, an escapement and press circuit, means for transmitting escapement and press impulses over said circuits whereby said escapement impulses comprise successions of alternately opposite polar signals of predetermined length and said press impulses normally separate said escapement successions and comprise an elongated impulse of the polarity of the last escapement impulse in a succession, means operative following the transmission of a succession of escapement impulses of a predetermined length for stopping further transmission thereof and initiating the transmission of a series of abnormal press impulses of a uniform polarity and means for transmitting a steady current of the polarity of said abnormal press impulses after a predetermined number have been transmitted.

33. In a step-by-step telegraph system, an escapement and press circuit, means for transmitting escapement and press impulses over said circuits whereby said escapement impulses comprise successions of alternately opposite polar signals of predetermined length and said press impulses normally separate said escapement successions and comprise an elongated impulse of the polarity of the last escapement impulse in a succession, means operative following the transmission of a succession of at least a predetermined number of escapement impulses over said circuit for maintaining a uniform polarity on said circuit, a resistance

and means for cutting said resistance into and out of said circuit to alternately change the magnitude of the current therein a predetermined number of times and in a predetermined time relationship.

34. In a step-by-step telegraph system, an escapement and press circuit, means for transmitting escapement and press impulses over said circuits whereby said escapement impulses comprise successions of alternately opposite polar signals of predetermined length, and said press impulses normally separate said escapement successions and comprise an elongated impulse of the polarity of the last escapement impulse in a succession, means operative following the transmission of a succession of at least a predetermined number of escapement impulses over said circuit for transmitting a unidirectional current over said circuit, means operative thereupon to change the value of said unidirectional current in a predetermined manner and means for varying the number of escapement impulses transmitted prior to the initiation of the transmission of said unidirectional current.

35. In a step-by-step telegraph system, a transmitting station, a plurality of receiving stations, a plurality of circuits connecting said transmitting station with said receiving station, transmitting means for transmitting signals over said circuits whereby said circuits normally have escapement impulses comprising successions of alternately opposite polar signals transmitted thereover with each succession normally being terminated by a press impulse comprising a prolongation of the last escapement impulse, means operative on the transmission of at least a predetermined number of successive escapement impulses for automatically stopping the transmission of further escapement impulses over pre-

determined of said circuits while continuing the transmission thereof over the remainder of said circuits, means also operative thereupon for impressing a unidirectional current on said predetermined circuits and means for alternately varying the magnitude of said unidirectional current within predetermined limits a predetermined number of times and means for maintaining a steady state of said unidirectional current of the value of one of said predetermined limits on said predetermined circuits following the transmission of said unidirectional variations.

36. In a step-by-step telegraph system, a transmitting station, a plurality of receiving stations, a plurality of circuits connecting said transmitting station with said receiving station, transmitting means for transmitting signals over said circuits whereby said circuits normally have escapement impulses comprising successions of alternately opposite polar signals transmitted thereover with each succession normally being terminated by a press impulse comprising a prolongation of the last escapement impulse, individual resistances connected in shunt relation with predetermined of said circuits, means operative following the transmission of a succession of at least a predetermined number of escapement impulses over all of said circuits for stopping the transmission of further escapement impulses over said predetermined circuits, means operative thereupon for impressing a unidirectional current on said predetermined circuits and means for shunting said resistances into and out of said circuits a predetermined number of times to vary the magnitude of said unidirectional current within predetermined limits.

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