Feb. 4, 1930. S. MORTON ET AL 1,745,633

TELEGRAPH RECEIVER

Original Filed Dec. 23, 1924 6 Sheets-Sheet 1

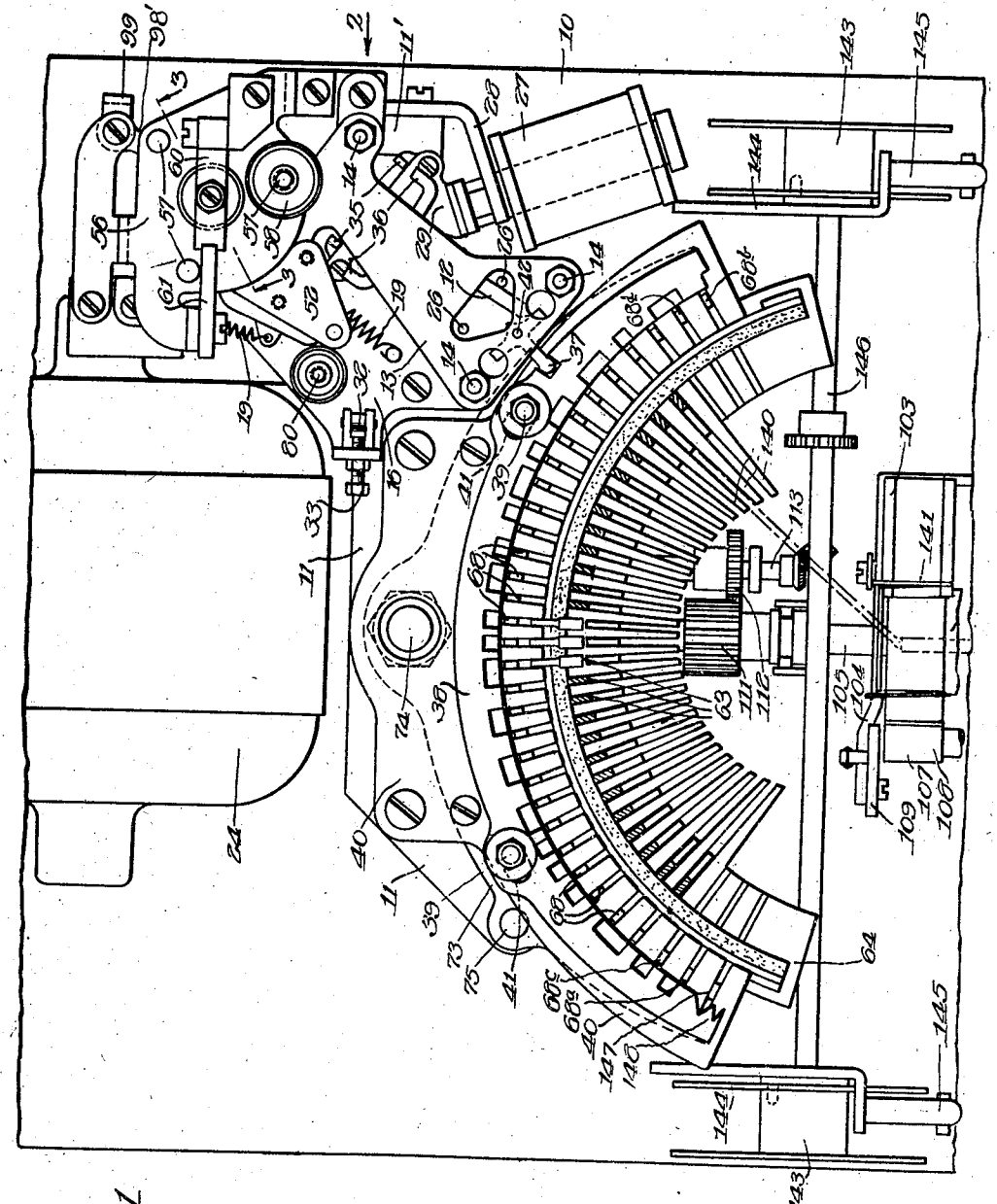

Fig. 1

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TELEGRAPH RECEIVER

Original Filed Dec. 23, 1924 6 Sheets-Sheet 2

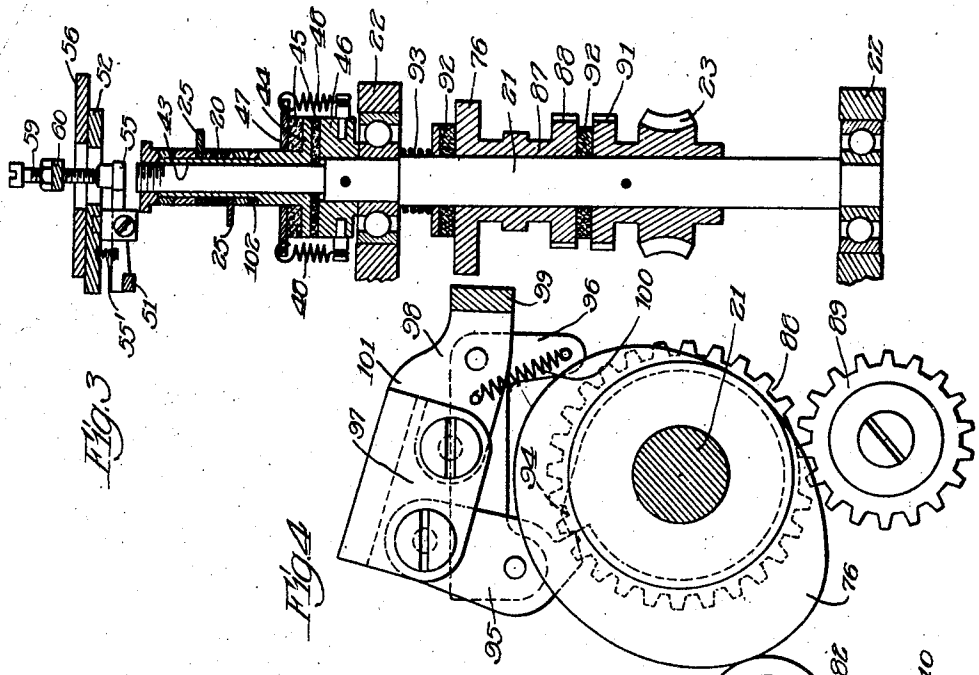

Fig. 3

Fig. 4

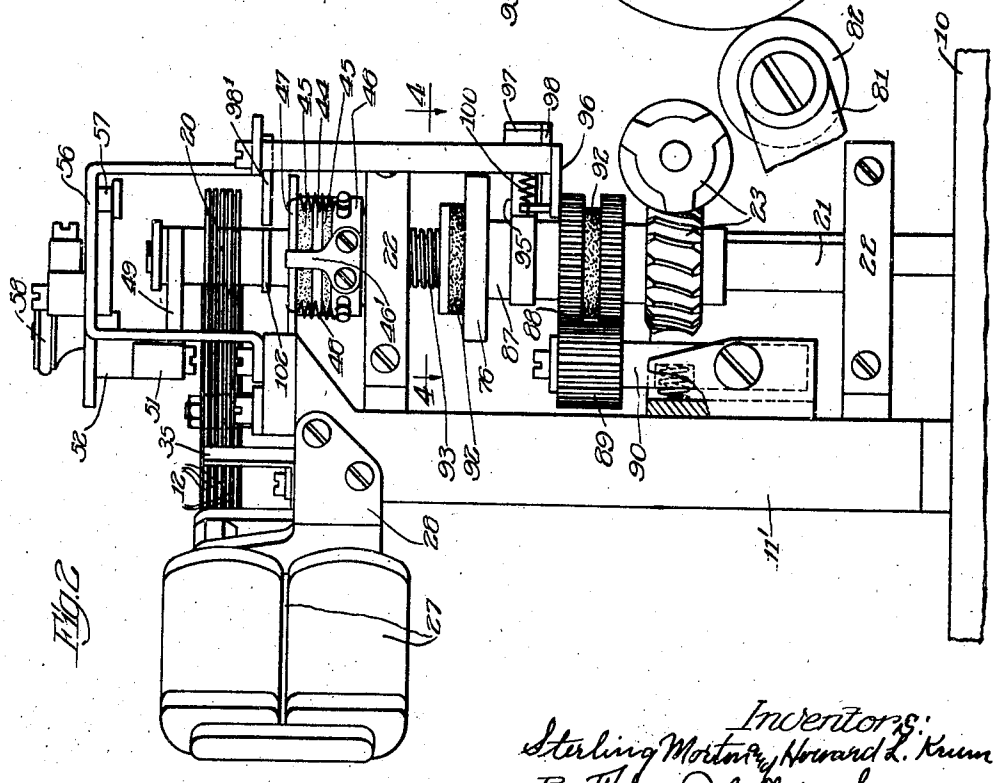

Fig. 2

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TELEGRAPH RECEIVER

Original Filed Dec. 23, 1924 6 Sheets-Sheet 3

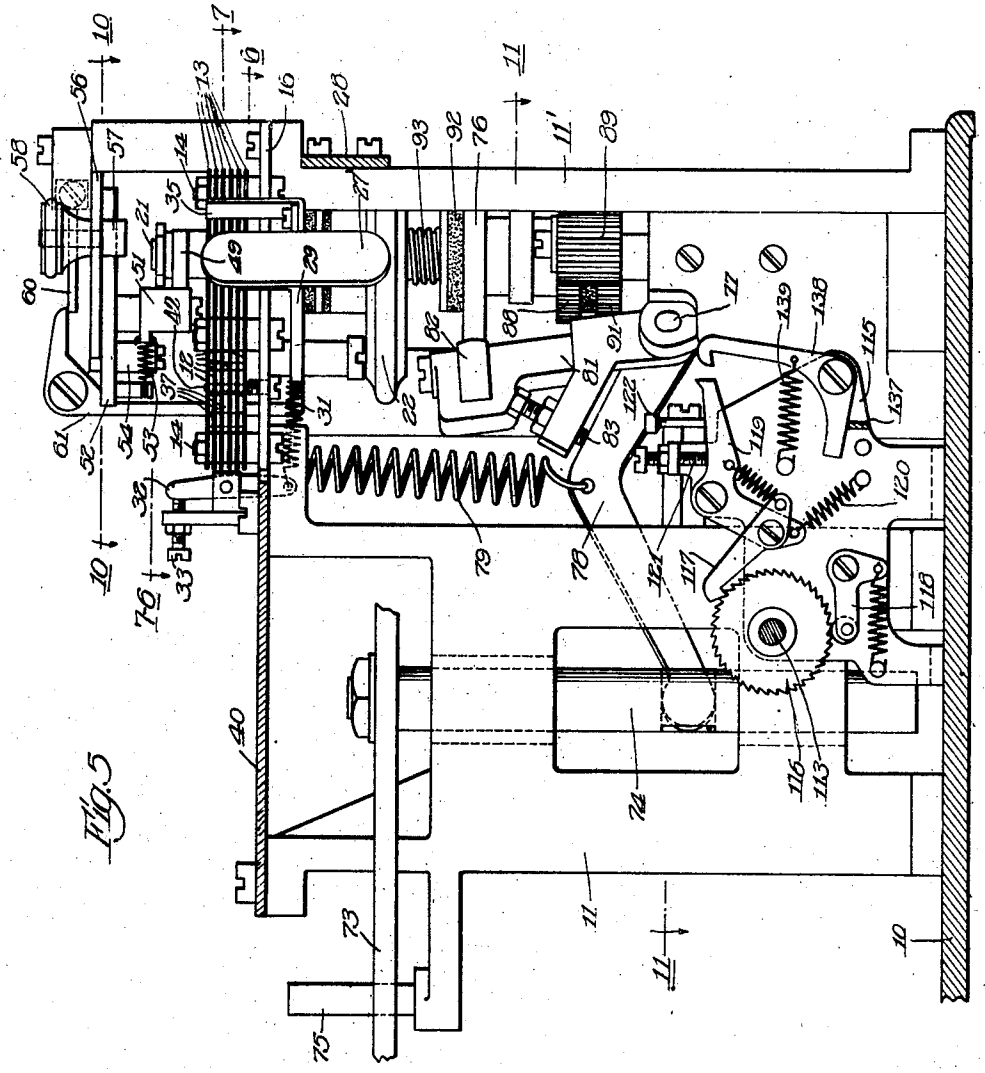

Fig. 5

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TELEGRAPH RECEIVER

Original Filed Dec. 23, 1924 6 Sheets-Sheet 4

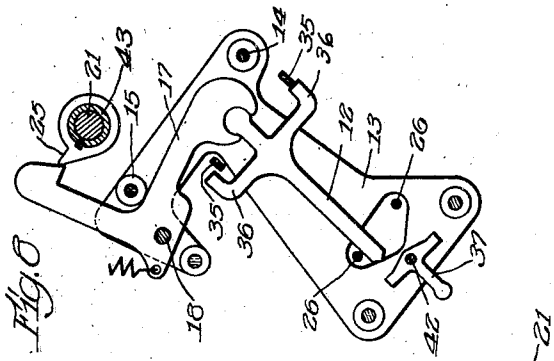

Fig. 6

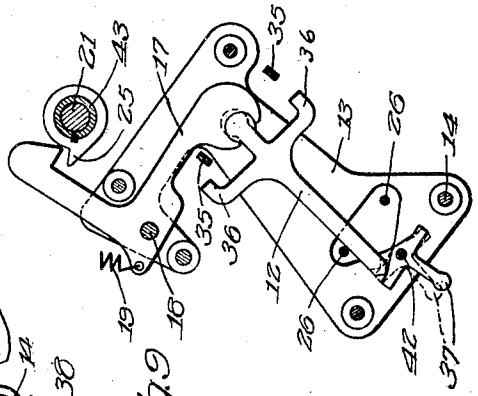

Fig. 9

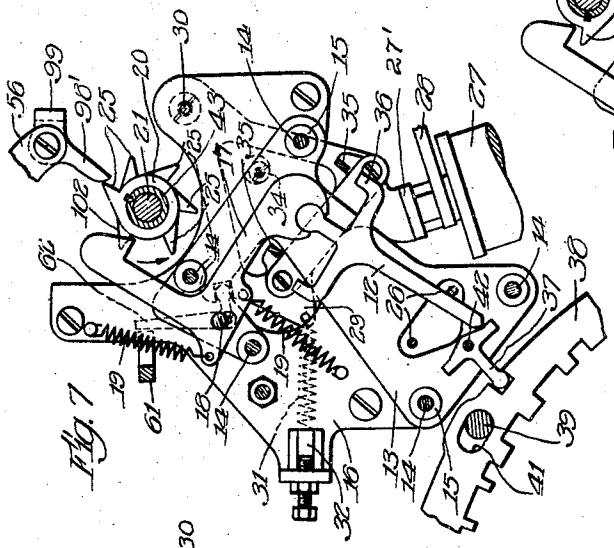

Fig. 7

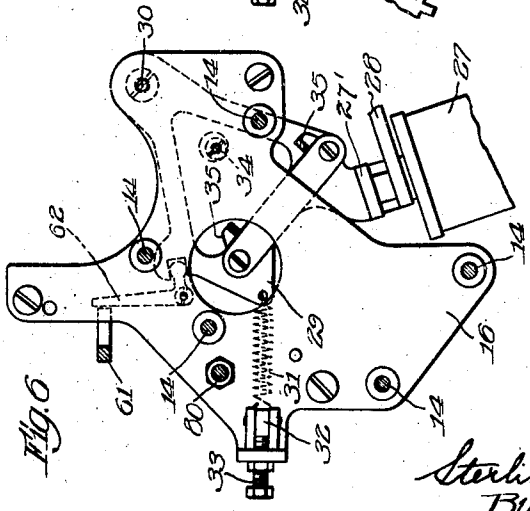

Fig. 6

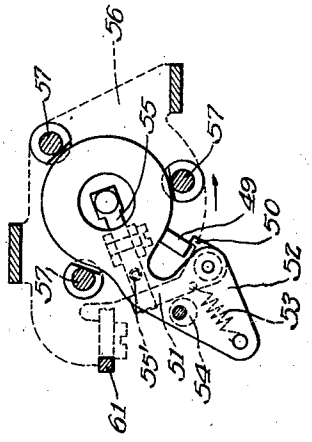

Fig. 10

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TELEGRAPH RECEIVER

Original Filed Dec. 23, 1924 6 Sheets-Sheet 5

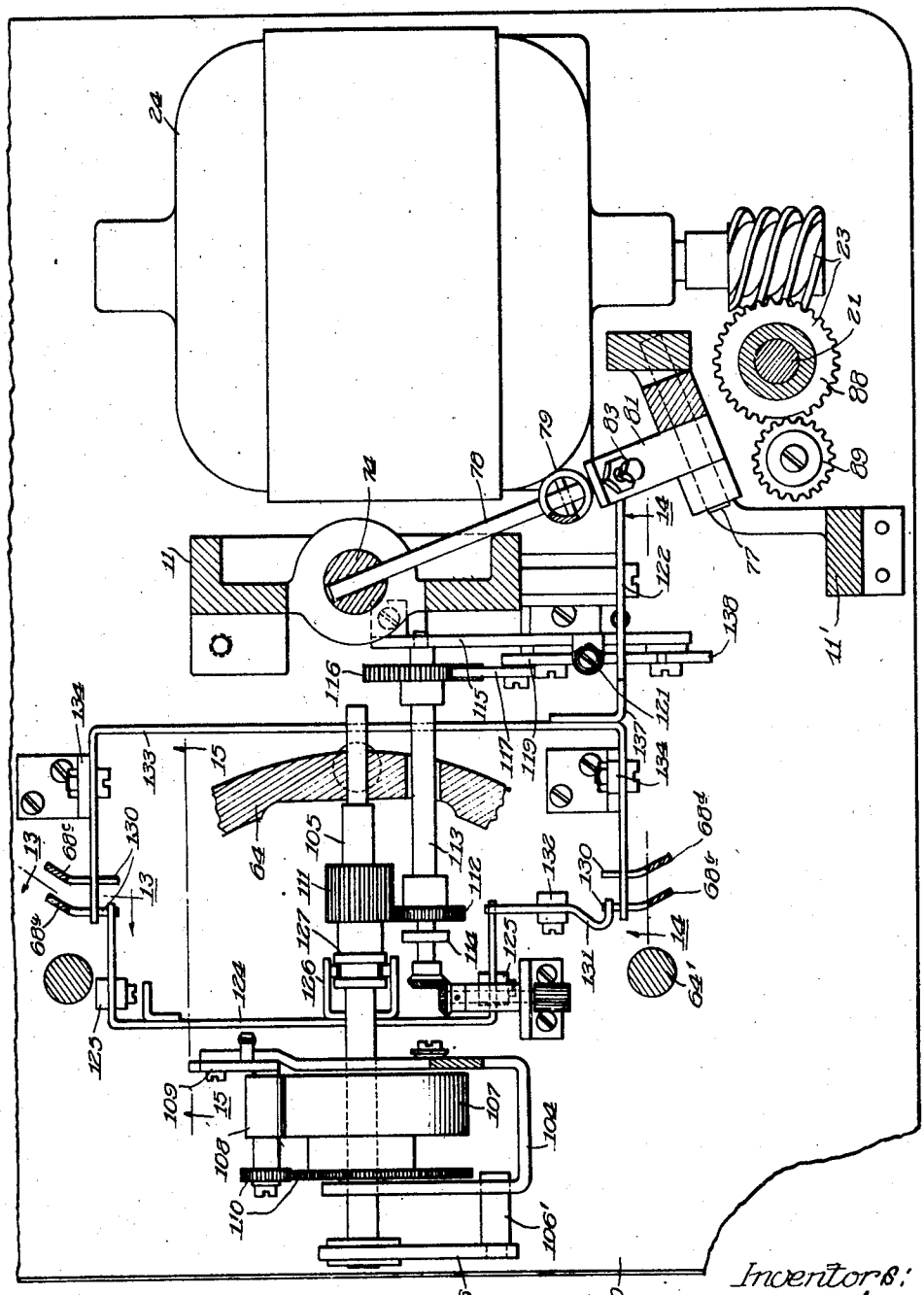

Fig. 11

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TELEGRAPH RECEIVER

Original Filed Dec. 23, 1924 6 Sheets-Sheet 6

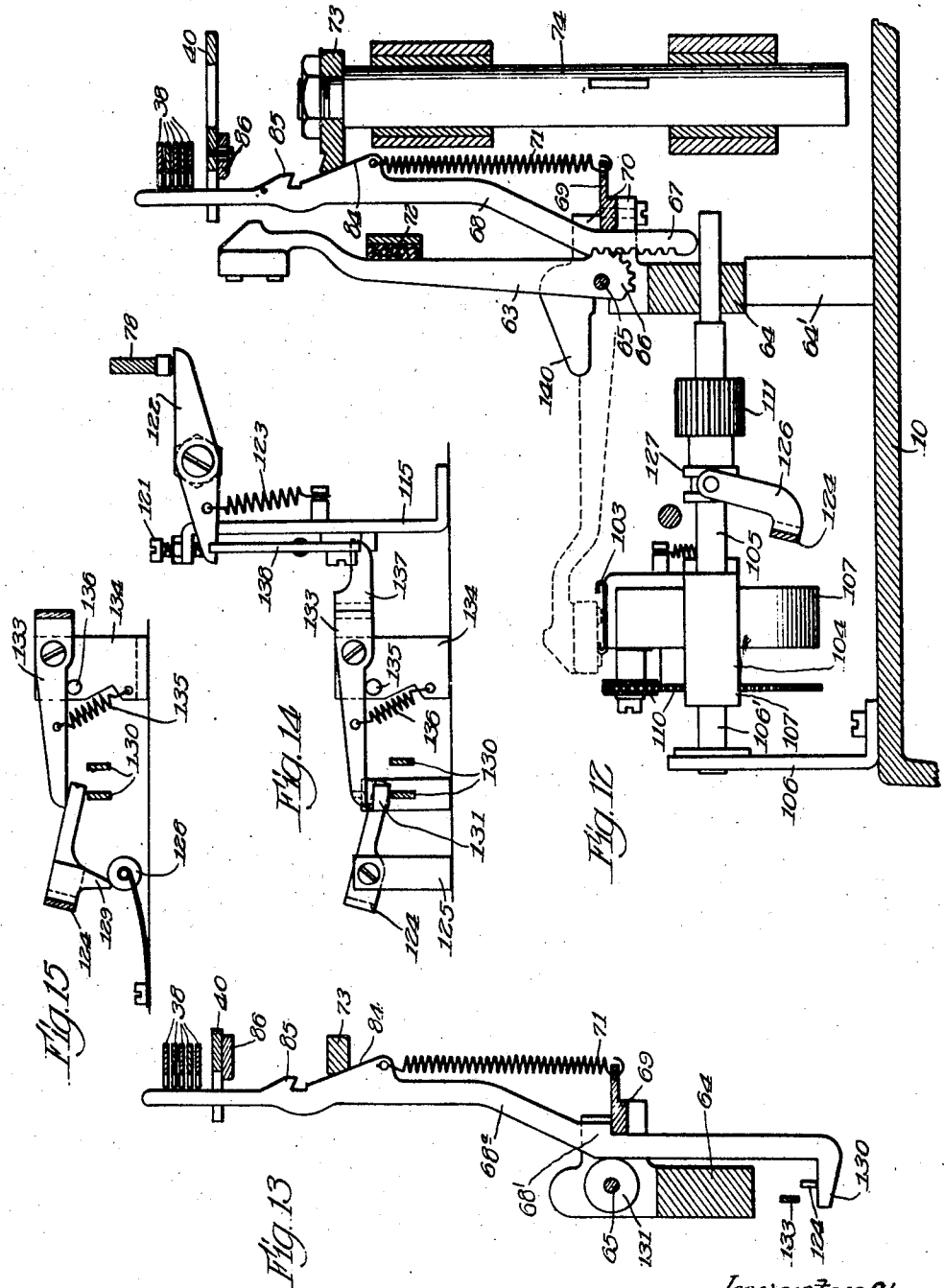

Fig. 15

Fig. 14

Fig. 12

Fig. 13

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Patented Feb. 4, 1930

1,745,633

UNITED STATES PATENT OFFICE

STERLING MORTON AND HOWARD L. KRUM, OF CHICAGO, ILLINOIS, ASSIGNORS, BY MESNE ASSIGNMENTS, TO TELETYPE CORPORATION, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE

TELEGRAPH RECEIVER

Application filed December 23, 1924, Serial No. 757,661. Renewed September 20, 1928.

The invention relates to receivers for selecting telegraph systems and particularly for those employing the Baudot code, i. e., one in which the character signals consist of two different electrical conditions, such as permutations of positive and negative impulses or current and no-current extending through a definite number, usually five, time intervals or units. Some of the features of the invention relate more particularly to so-called "start-stop" systems, namely, one in which the rotating member or distributer of the receiver is kept in step or in phase with the signals by start and stop mechanism that arrests the rotating member at the end of the signal period or during spacing intervals between signals and again initiates its operation in response to a starting interval or unit at the beginning of each signal.

The present invention seeks to provide an improved selector mechanism, and also, one more particularly adapted for start-stop systems and which can be mechanically operated under control of a single magnet. The invention further seeks to provide an improved start-stop mechanism for controlling the operation of the rotating member or distributer associated with the selector mechanism. A further object of the invention is to provide an improved and simplified type-bar printing mechanism for recording the signals.

With these objects in view, the invention consists in the features of improvement hereinafter set forth, illustrated in the preferred forms in the accompanying drawings and more particularly pointed out in the appended claims.

Fig. 1 is a plan view of the improved receiver.

Fig. 2 is a side elevation looking in the direction of arrow 2, Fig. 1, and illustrating the main drive shaft and parts of the selector mechanism.

Fig. 3 is a detail section on line 3—3 of Fig. 1, of the parts mounted on the main drive shaft.

Fig. 4 is a detail section on line 4—4 of Fig. 2.

Fig. 5 is a front elevation of parts shown in Fig. 2.

Figs. 6 and 7 are detail plan sections on lines 6—6 and 7—7 respectively of Fig. 5, illustrating portions of the selector mechanism.

Figs. 8 and 9 are views similar to Fig. 7, but showing the parts in shifted positions.

Fig. 10 is a detail section on line 10—10 of Fig. 5.

Fig. 11 is a plan view of the lower portion of the apparatus, parts being shown in section on line 11—11 of Fig. 5.

Fig. 12 is a central vertical section of the printer mechanism.

Figs. 13, 14 and 15 are detail views illustrating the shift mechanism for the printer, parts being shown in section on the lines 13—13, 14—14 and 15—15 of Fig. 11.

Selector mechanism.—The frame comprises a base 10 and upright members 11 and 11′. The selector mechanism comprises a set of selectors or fingers 12 (see Figs. 5 and 7) that are thin and flat and are arranged in superposed relation between guide plates 13. The latter are carried on studs 14 and spaced by washers 15, the studs being fixed to a plate 16 on the upper end of frame member 11′. The fingers 12 have circular rear ends which pivotally engage correspondingly shaped seats in the arms of a series of thin, flat bell-crank levers 17, arranged between the guide plates 13 and pivoted on a stud 18. The other arms of the bell-cranks are provided with pointed or cam-shaped ends and springs 19 normally hold the bell-cranks in the position shown in Fig. 7 with their pointed rear ends adjacent the periphery of a cam member 20 on the upper end of a shaft 21. The latter (see Fig. 2) is mounted in bearings 22 on frame member 11′ and is connected by worm gears 23 to the shaft of a small electric motor 24. Cam member 20 has a spirally arranged series of teeth 25, one for each of the levers 17, and arranged to successively oscillate the levers and reciprocate the selecting fingers 12 as the cam member is rotated.

The pivotal connections between the levers 17 and the fingers 12 permit the lateral swinging movement of the fingers in addition to the longitudinal reciprocation thereof. The swinging movements of the fingers are lim-

ited by a pair of stop pins 26 fixed to plate 16 and projecting upwardly through openings in guide plates 13, and are controlled by an electromagnet 27 on a bracket 28. The magnet armature 27′ is fixed to a lever 29, triangular in form, and pivoted at 30 on plate 16 to swing beneath it. A spring 31, connected to the armature and to a lever 32 adjusted by a screw 33, tends to move the armature into engagement with an adjustable stop 34 on plate 16, but normally magnet 27 is energized and holds the armature lever in the position shown in Figs. 6 and 7. Lever 29 has a pair of projecting lugs 35, one of which extends through openings in the guide plates 13, and these lugs cooperate with laterally projecting arms 36 on the rear ends of the selecting fingers 12, to position the latter either in their right or left hand positions.

The selecting members or fingers 12 act, through a series of T-levers 37, to position a second set of selecting members or notched permutation bars 38, which in turn control the operation of the printer mechanism. In the present construction, bars 38 are segmental, are superposed on studs 39 and held in spaced relation by washers on the studs. These studs are carried by a horizontal segmental plate 40 fixed to the upper portion of frame member 11 and the studs extend through short slots 41 in the permutation bars to permit the setting of each bar in either of two positions. The T-levers 37 are arranged between the guide plates 13 and swing on a pivot stud 42 with the rounded end of one arm of each lever engaging a notch in the corresponding permutation bar. The other lever arms are disposed on opposite sides of the pivot stud in position to be engaged by the forward ends of the fingers 12. Normally the latter are held in their forward positions and in engagement with the T-levers by the springs 19 and each permutation bar is thereby held in one or the other of its two positions according as the corresponding selecting finger is in its right or left hand position. By pressing the fingers against the T-levers, springs 19 also normally maintain the setting of the fingers. The studs 39 cooperate with the ends of the slots 41 to limit the movements of the permutation bars and the forward, spring-actuated movements of the fingers.

The lugs 35 of the armature lever 19 and the arms 36 of the selecting fingers 12 are arranged on opposite sides of the pivots of the fingers and are relatively so spaced that, as the armature lever vibrates under control of magnet 27, the lugs are alternately moved into and out of alignment with the ends of the arms and cooperate therewith to determine the setting of the fingers. Thus, if a finger is in its right hand position as shown in Fig. 7, and magnet 27 is energized as the finger is retracted by the operation of a cam tooth 25 on the corresponding lever 17, one of its arms 36 will strike the adjacent lug 35 and the finger will be shifted to its left hand position as shown in Fig. 8. The finger will remain in this left hand position until it is again retracted when the magnet is de-energized and the armature lever retracted by its spring. Then the other lug and arm will cooperate to swing the finger to its right hand position. In case the setting of any selecting finger, when retracted, is thus changed, it will, during the final portion of its forward movement, change the position of the corresponding T-lever 37 and permutation bar 38.

The two sets of selectors, namely the fingers 12 and permutation bars 38, and the associated levers 17 and 37, correspond in number, five in the present case, to the number of selecting intervals or units of the signal code. As each signal is received, magnet 27, which responds to all line conditions, variably positions the armature lever 29 and the fingers are successively retracted by the rotating cam 20 and brought into co-operative relation with the lugs 35 of the armature lever during the corresponding selecting intervals of the signals, so that the fingers are set as described, in their right or left hand positions in accordance with the signal. As stated, during the final portion of the forward or actuating movements of the fingers, represented by the dotted and full line positions of the finger shown in Fig. 9, the setting of the fingers is transferred to the permutation bars. Since such movements of the fingers are effected by the springs 19, the final portion of the forward movement of any finger and the change in position of the corresponding permutation bar may, if the bar is temporarily locked, be delayed until the bar is released. In other words, the forward movement of a selecting finger may be temporarily arrested in the position shown in dotted lines in Fig. 9. Such temporary locking of the permutation bars occurs during the printing operation and the arrangement permits overlap operation of the selecting and printing mechanisms. That is, it permits the setting or partial setting of the selecting fingers as a signal is received during the printing of the character selected by the previous signal. It is only necessary that the printing operation begin and lock the permutation bars before the next setting of the fingers is started.

Even though a finger is temporarily arrested, as shown in the dotted lines in Fig. 9, it is nevertheless moved forwardly out of cooperative relation with the lugs 35 and will not interfere with the further operation of the armature lever. In this connection, it is noted that the arms 36 and lugs 35 are in coactive relation only during the rear portions of the reciprocating movements of the fingers, and that the timing and speed of operation of

the cam 20 and the angular spacing of the cam teeth 25 are such that the arms and lugs are in co-active relation only during the mid-portions of the selecting intervals of the signals, and any change in the position of the armature lever is effected by magnet 27 while the selecting fingers are advanced and out of co-operative relation with the armature lever. It is also noted that the parts are so arranged that the engagement of the arms 36 with the lugs 35 aids in holding the armature in the position in which it is set either by magnet 27 or armature spring 31. Hence the tension of the spring and the current required to operate the magnet can be less than would otherwise be required.

In the improved selector mechanism, the two sets of selectors are not restored to normal positions at the end of each operation and the setting of each finger and bar is changed only in response to the operation of the line-controlled magnet 27, so that no restoring devices are required. Nor is any auxiliary device needed to transfer the setting of the first set of selectors to the second set. The selector mechanism is further simplified in that a single set of springs 19 is required for controlling the operation of the fingers and bars, and no latches, that resist change in the setting of the selecting members, and easily wear, are required. These springs also normally maintain the setting of the fingers and bars but do not resist any change in their setting. Instead they effect the changes in position of the bars and the fingers are entirely relieved of pressure when their setting is changed. Hence, wear on the contacting parts that determine the setting of the selecting fingers is reduced to a minimum. Preferably to confirm and insure the complete setting of the fingers, their ends and the T-levers 37 are provided, as shown, with oppositely beveled contacting portions. The parts of the selector mechanism are mostly thin, flat, metal pieces that can be economically manufactured of sheet metal stampings and readily and easily assembled.

The selector controlling magnet 27 can be imposed directly in the line or controlled by a relay, and can be responsive either to current and no-current intervals or to reversals of polarity, and, if desired, its circuit may be normally open.

Start and stop mechanism.—The operation of the distributer cam 20 is synchronized with the signals preferably by an improved start and stop mechanism. In the preferred form shown, the cam parts are made of separate sheet metal stampings keyed on a sleeve 43 that is loosely mounted on the upper reduced end of the shaft 21 and forms the driven member of a slip friction clutch (see Fig. 3). A flange 44 on the sleeve is interposed between felt washers 45 and the latter are engaged respectively by a collar 46 fixed to the shaft and a metal washer 47 connected to the collar by a key piece 46′ and by springs 48, the springs serving to press the parts of the friction clutch into contact.

A radial arm 49 on sleeve 43 is arranged to engage a stop 50 on an arresting dog 51. The latter is pivoted on an arm 52 and a light spring 53 tends to move the dog toward an adjustable eccentric stop 54 on the arm. The shaft and friction clutch tend to rotate the cam in a left hand direction as indicated by the arrows in Figs. 7 and 10, and the engagement of arm 49 with stop 50 tends to rotate the dog 51 on its pivot and normally holds its free end against the shoulder of a latch 55 (see Figs. 3 and 10). This latch is pivotally mounted on arm 52 and its outer end is pressed into engagement with the dog 51 by a light spring 55′. Arm 52 is mounted on a bracket 56, the edge of its inner, annular portion being engaged by the slotted heads of three studs 57 that hold it against the lower face of the upper horizontal portion of the bracket and in such a manner that the arm can be rotatably adjusted about an axis concentric with shaft 21 and cam member 20. A thumb-screw 58 upon one of the studs serves to clamp the arm in adjusted position. In this way, the position of stop 50 which determines the normal arrested position of the distributer cam 20, can be changed to thereby rotatably adjust the normal position of the cam teeth 25 relatively to their operating or selector setting positions at which they act on the levers 17 to retract the selecting fingers into cooperative relation with the armature lever.

To permit this adjustment while the machine is in operation and the engagement of the latch 55 by a suitable tripping device, the inner end of the latch is disposed in line with the axis of the cam member and is engaged by an adjustable screw 59 (see Fig. 3) on a trip lever 60 (see Fig. 5). The latter is pivoted on bracket 56 and its free end is engaged by the horizontal arm of a bell-crank 61, the vertical depending arm of which engages a bell-crank 62 that is operated by armature lever 29, as shown in Fig. 6.

In a start-stop system, each signal usually comprises in addition to the five selecting intervals or units, a starting interval and a terminal spacing interval during which the line is maintained in normal condition and preferably closed. Thus, magnet 27 is normally energized and the parts of the start-stop mechanism are normally maintained in the positions shown with the distributing cam held against movement by stop dog 51. During the starting interval of each signal, the line is either opened or its polarity reversed and armature lever 29 of magnet 27 is shifted by its spring 31, thereby moving lever 61 to

depress lever 60 and trip latch 55. Then the arresting dog 51 is free to yield and permit the rotation of the distributing cam, the initial movement of the cam serving to move stop 50 out of the path of arm 49. It is noted that arm 49 engages stop 50 at a point closely adjacent the pivot of the stop dog and latch 55 engages the latter at a considerable distance from its pivot so that the dog, when engaged by the arm, presses lightly on the shoulder of the latch. Hence the tension of the armature spring 31 which serves to trip the latch, can be very light and the amount of line current required to operate the magnet 27 correspondingly low. It is also noted that, as soon as arm 49 clears stop 50, spring 53 moves the arresting dog into engagement with stop 54 with its free end spaced slightly from the shoulder of the latch, so that there is no pressure exerted upon the latch, and, while the latch and trip levers are vibrated by the armature lever during the selecting intervals of each signal, the load on the armature lever is very light. During the spacing interval at the end of each signal, the magnet is energized and spring 55′ holds latch 55 in operative position so that stop dog 51 cooperates with arm 49 to arrest the distributing cam at the end of each selecting operation.

It is noted that the first and fifth cam teeth 25 are spaced apart so that there is a blank portion of the cam between these teeth which is opposite the ends of levers 17 during the spacing and starting intervals of the signals. The orientation or rotatable adjustment of the distributer cam compensates for variations in lag of its starting operation by so setting or adjusting its normal arrested position, that it will be tripped into operation in response to the starting interval of each signal and pass through its first selector setting position during the mid-portion of the first selecting interval of the signal. As stated, the distributer cam is driven at such speed by the shaft 21 and its teeth are angularly so spaced, that it passes through its other selector setting positions during the mid-portions of the succeeding signal intervals. The speed of shaft 21 is maintained uniform by a suitable governor associated with the motor 24 and provided with means whereby the motor can be set to operate at the desired speed. The improved construction effects the positive stopping and quick starting of the distributer cam and the orientation of the cam can be effected while the apparatus is in operation.

Printing mechanism.—The printing mechanism is provided with a set of type bars 63 carried by a segment 64. The latter is mounted on posts 64′ fixed to the base 10 and the type bars are arranged within radial slots in the upper edge of the segment and are engaged by a pivot rod 65. The lower ends of the type bars form segmental gears 66 which mesh with toothed racks 67 forming the lower ends of a series of actuating bars 68. A segmental bar 69 is arranged between lugs 70 on the segment and is secured thereto, thus holding the actuating bars in position with the gear teeth in mesh, but permitting a slight pivotal movement of the actuating bars. Bars 68 extend from the type bar segment first slightly outwardly and then upwardly and springs 71 connected to bar 69 and to the upper portions of the actuating bars, tend to move them both downwardly and rearwardly and hold them and the type bars 63 in normal position as shown in full lines in Fig. 12, with the type bars engaging a segmental rest 72, and the actuating bars pressed lightly against the forward edge of a common operating or striker bar 73. The forward edge of the fixed segmental plate 40 on which the permutation bars 38 are mounted, is radially slotted and forms a guiding comb bar for the upper reduced ends of the acuating bars. Bar 73 (see Fig. 1) is segmental in form and is centrally fixed to the upper end of a vertical plunger 74 slidably mounted in guide bearings on frame member 11 (see Fig. 5). The striker bar also engages a vertical guide pin 75 fixed to the frame member.

Main shaft 21 is provided with a cam 76 for controlling the operation of the common operating or striking bar 73 by means of an intermediate lever. Preferably, this lever comprises two parts both carried by frame member 11′ on a common pivot 77 (see Fig. 5). One of the parts projects forwardly and inwardly and its rounded end engages a slot in plunger 74. A coiled spring 79 is connected to lever part 78 and to a tension adjusting screw 80 (see Fig. 1). The other lever part 81 carries a roller 82 engaging cam 76 and an adjusting screw 83 that engages the lever part 78. The latter is held in engagement with screw 83 by spring 79 so that the two lever parts operate as one.

Normally cam 76 is held against movement and holds lever arm 78, plunger 74, and striker bar 73 in their lowermost positions with the spring 79 under tension. In this position, the forward edge of the segmental striker bar engages inclined cam portions 84 on the actuating bars 68 and holds them in the position shown in Fig. 12, with the upper ends of the bars in front of but spaced slightly from the notched forward edges of the segmental permutation members or bars 38. When the latter are set in accordance with any received signal, cam 76 is rotated and lever arm 78 raises and lowers the striker bar 73. As the latter moves upwardly, the springs 71 move the bars 68 rearwardly against the notched edges of the permutation members 38 and one of the bars corresponding to the setting of the permutation members, drops into the notches of the latter far enough to bring a rearwardly projecting lug 85 thereon into the path of movement of the striker bar 73.

Upon the continued upward movement of bar 73, its forward edge engages the lug 85 of the selected bar 68 and moves it upwardly, thereby throwing the corresponding type bar to the printing point, as shown in dotted lines in Fig. 12. When a bar 68 is engaged with the notches of the permutation bars, the latter are locked against adjustment, but, as the striker bar returns to normal position, it engages the cam portions 84 and moves all of the bars 68 clear of the permutation members. The latter are then ready to receive a new setting, as described, in accordance wtih the setting of the selecting fingers 12.

The upward operating movement of the striker bar 73 is effected by spring 79 and the cam 76 is so shaped that the spring imparts a quick impulse to a selected type bar, and preferably, such that the end portion of its striking movement is effected by momentum. At the upper end of the movement of the selected actuating bar 68, the upper inclined faces of its lug 85 engages a bar 86 and it is thereby disengaged from the striker bar 73, so that bar 68 together with its type bar, are quickly restored by the spring 71 connected thereto. Bar 86 is adjustably secured to the lower face of the plate 40, and by adjusting it and also the tension of the striker spring 79 and the normal position of striker bar 73 by means of the screw 83, the striking operation of the type bars can be regulated as desired. To insure against premature disengagement of the lugs 85 and striker bar 73, the contacting portions of these parts are parallel to the paths through which the lugs move into and out of line with the forward edge of the bar.

Cam 76 is formed on a sleeve 87 loose on shaft 21 and provided with a gear 88. The latter has a mutilated portion (see Fig. 4) which is normally in alignment with a pinion 89 on a spring-pressed pivoted arm 90 and in mesh with a gear 91 that is fixed to the shaft. Felt washers pressed against the ends of sleeve 87 by a spring 93, tend to rotate cam 76 and gear 88 to bring the latter into mesh with pinion 89. But normally, the sleeve 87 is held against movement by the engagement of a shoulder 94 thereon with a stop dog 95. This dog is pivoted on a bracket 96 and is connected by a toggle link 97 to the lower horizontal arm 98 of a bail 99. The upper and lower arms of this bail are mounted on aligned pivots carried respectively by the brackets 56 and 96. A spring 100 connected to arm 98 holds the parts in the normal position shown in Figs. 4 and 7 with a shoulder 101 on the lower arm engaging the end of link 97 and holding the latter in its dead center position, so that the stop dog 95 is locked in its normal position.

At the end of each selecting operation effected by the distributer cam 20 and magnet 27, a sixth cam tooth 102 on the cam engages the upper arm 98′ of the bail 99 and oscillates it, thus throwing the toggle link 97 away from its dead center position and rotating the stop arm 95 in the direction of movement of the shoulder 94 on sleeve 87. The latter is then rotated slightly by friction washers 92 to engage mutilated gear 82 with pinion 89. Thereupon cam 86 is positively driven through a single revolution and again arrested in normal position by stop dog 95.

The printing of characters is effected upon a paper tape passing through a guide 103 carried on a U-shaped bracket 104 (see Figs. 11 and 12). A shaft 105 extends through the arms of this bracket also through bearing openings in a small fixed bracket 106 on the base plate and in the type bar segment 64. Bracket 104 is held in horizontal position by a guide pin 106′ on bracket 106. The paper tape passes over a roller platen 107 mounted on shaft 105 between the arms of bracket 104 and is engaged by a pressure roller 108 carried by a spring-held arm 109. Preferably, intermeshing gears 110 connect the platen and pressure rollers to positively rotate the lattter as the platen is advanced by the letter-space feed mechanism.

This mechanism comprises a gear 111 on shaft 105 and meshing with a gear 112 on a short horizontal shaft 113 which is journaled in brackets 114 and 115. On the rear end of this shaft is a ratchet wheel 116 engaged by spring-held feeding and holding dogs 117 and 118. Feeding dog 117 is pivoted on a lever 119 that is held by a spring 120 against an adjustable screw 121 and extends beneath a second lever 122 (see Fig. 5). A spring 123 (see Fig. 14) holds this lever in normal position with its rear end in engagement with the lever arm 78. During the printing operation and as lever arm 78 is raised, spring 123, which is stronger than spring 120, shifts the levers 122 and 119 and moves the feeding dog backwardly over the teeth of ratchet wheel 116. Then, when lever arm 78 is returned to normal position, lever 122 is disengaged from lever 119 and spring 120 is effective to restore lever 119 and the feeding dog, thus advancing shafts 113 and 115 and the paper platen one step.

The type bars carry two sets of type and to effect the printing of either set, platen frame 104, platen 107 and shaft 105 are shifted by a bail 124 pivoted on studs 125 and having a fork 126 that engages a grooved collar 127 on the shaft. A spring-held detent roller 128 (see Fig. 15) cooperates with a lug 129 on the bail to hold the platen in either of two positions.

Two of the bars 68^a and 68^b controlled by the permutation members 38 and operated by the striker bar 73, one near each end of the segment, do not operate type bars but are provided (see Figs. 11 and 13) with depend-

ing lower ends having inwardly projecting offsets 130. Such bars are held in position with shoulders 68′ thereon engaging bar 69 by rollers 131 on the pivot rod 65. When bar 68^a is selected by a special signal and actuated by the striker bar, its offset 130 engages one of the arms of bail 124 and shifts the platen forwardly to its figure printing position. When bar 68^b is selected and shifted, its lug 130 acts through the medium of an interposed lever 131 on the other arm of the bail 124 to restore the platen to letter-printing position. Similar bars may be provided for performing other functions. For example, a bar 68^c may be provided for operating a signal bell, but with a simple tape printer, the "letters" and "figure" shifts are the only needed functional operations.

When any such function bar is operated, it is desirable to suppress the letter space feed. For this purpose, the lugs 130 of these bars extend beneath the arms of a bail 133 (see Figs. 11 and 14) pivoted on brackets 134 and held in normal position against a stop pin 135 by a spring 136. An extension 137 on the bail projects beneath a bell-crank lever 138, that is pivoted on bracket 115 and held in normal position with its horizontal arm engaging the extension by a spring 139 (see Fig. 5). When lever arm 78 is moved upwardly to operate either a type bar or a function bar, feeding dog carrier 119 is shifted as described against the tension of the spring 120 to move the feeding dog 118 backwardly over the teeth of ratchet 116. But, when a function bar is operated, bail 133 is also rocked and spring 139 (see Fig. 5) shifts lever 138 inwardly so that its upper hooked end engages and locks feeding dog lever 119 against return movement. Hence, no feeding operation occurs upon the return movement of the lever arm 78. At the next printing operation however, the outer end of the feeding dog lever 119 is depressed by lever 122 and so released from the catch lever 138 and the latter is restored to normal by its spring to again permit the operation of the letter space feed. Preferably a function bar 68^d is provided and is selected by the receipt of a blank signal, its sole purpose being to suppress the letter-space feed when blank signals are received.

To secure good alignment, the type bar segment is provided with forwardly projecting guiding arms 140 (see Figs. 1 and 12) that increase in length as shown from the central to the end portions of the segment.

The shiftable platen frame carries a guide 141 for a ribbon that passes over guide pins 145 on brackets 144 to spools 143. The latter are operated by a shaft 146 that is geared to the shaft 113, suitable means being provided for reversing the ribbon.

The arrangement of the actuating bars closely adjacent and substantially parallel to the normal positions of the corresponding type bars and the arrangement of the segmental permutation and striker bars greatly simplifies the printer mechanism. The striker bar not only effects the longitudinal operating movements of the actuating bars, but also controls the slight swinging movements thereof into and out of engagement with the permutation bars. As stated, the setting of the permutation bars is maintained during the printing operation by the engagement therewith of one of the actuating bars. Preferably also, a locking bar 147 cooperates with beveled teeth 148 on the permutation bars. This bar is mounted on the type bar pivot 65, and, like the actuating bars, is moved into and out of engagement with the permutation bars as the striker bar is raised and lowered.

The permutation bars are thus locked by the initial movement of the striker bar 73 and the printer operating cam 76. The cam is started in operation by the tooth 102 of the selector cam 20 as the latter completes a setting of the selecting fingers 12 and permutation bars 38, and cam 76 is so shaped and timed in operation that the bars are locked before the next setting of the fingers can begin, and again released before such setting can be completed. The cams and clutches are mounted on the same drive shaft. While the machine is durable in construction, the operating parts and particularly those of the selector mechanism, are subject to little wear and can be light and capable of high speed operation.

Numerous changes may be made without departure from the scope of the appended claims, and portions of the invention may be taken without its adoption in entirety.

We claim as our invention:

1. In combination in a telegraph receiver, a set of permutation members, a corresponding set of selectors for effecting the setting of said permutation members, and co-operating, vibratory and rotatable members controlled by received signals for mechanically determining the setting of each selector and for subsequently effecting the operation thereof upon the corresponding permutation member, each of said selectors and permutation members being arranged to retain its setting until the same is changed in response to a received signal.

2. In combination in a telegraph receiver, a set of permutation members, a corresponding set of selectors for changing the setting of said permutation members, electro-magnetic means responsive to received signals for changing the setting of said selectors, a rotary member and means controlled thereby for operatively associating said selectors in order with said electro-magnetic means and said permutation members and thereby effect the setting of said selectors and members in accordance with the signal, each of

said selectors and permutation members being arranged to retain its setting until the same is changed in response to a received signal.

3. In combination in a telegraph receiver, a set of permutation members, a corresponding set of selectors for positioning said members in different combinations, electro-magnetic means for selectively controlling the setting of said selectors in different combinations in accordance with received signals, a rotary member and means controlled thereby for operating said selectors in order to thereby bring each selector successively into cooperative relation with said electro-magnetic means and the corresponding permutation member, said operating means being arranged to retain the setting of said selectors and permutation members until the same is changed in response to a received signal.

4. In combination in a telegraph receiver, a set of permutation members, a set of selectors, each adapted to be set in one or another of two conditions and operative in each condition upon the correspondng permutation member to positively change the setting thereof from one of two positions to the other and means operative on said selectors in order and arranged, in response to received signals, to positively change the setting of each selector from either of its operating condition to the other and subsequently effect the operation thereof upon the corresponding permutation member.

5. In combination in a telegraph receiver, a set of permutation members, a set of selectors, each adapted to be set in one or another of two conditions and operative in each condition upon the corresponding permutation member to positively change the setting thereof from one of two positions to the other, an electro-magnet responsive to received signals, a rotary member and means under the joint control of said electro-magnet and said rotary member, operative in order on said selectors and adapted to positively change the setting of each selector from either of its operating conditions to the other in response to received signals.

6. In combination in a telegraph receiver, a set of permutation members, a corresponding set of selectors for determining the setting of said permutation members, an electro-magnet responsive to received signals for determining the setting of said selectors, a rotary member and means controlled thereby for operatively associating said selectors with the armature of said magnet and said permutation members to thereby effect the successive setting of said selectors and said members in accordance with the signals, said operating means being arranged to retain the setting of said selectors and members until the same is changed in response to a received signal.

7. In combination in a telegraph receiver, a set of permutation members, a corresponding set of selectors for determining the setting of said members, an electro-magnet responsive to received signals, a rotary member and means controlled thereby for operatively associating said selectors, in order and each successively, with the armature of said magnet and with the corresponding permutation member, said operating means being arranged to permit the delayed operation of said selectors upon said members.

8. In a printing telegraph receiver, a set of permutation members, a corresponding set of selectors, each operative in either of two conditions to change the setting of the corresponding member, electro-magnetic means arranged to change the setting of each selector from either of two conditions to the other in response to received signals, a rotary member for associating said selectors in order with said electro-magnetic means and spring means controlled by said rotary member for subsequently effecting the operation of said selectors on said permutation members.

9. In combination in a telegraph receiver, a set of permutation members, a corresponding set of selectors each operative upon the associated member to change the setting thereof from either of two positions to the other, an electro-magnet responsive to received signals, a rotary cam for successively shifting said selectors into cooperative relation with the armature of said magnet, said armature being arranged to change the setting of each of said selectors in response to received signals from either of two conditions to the other, and springs controlled by said cam for effecting the setting operations of said selectors upon said permutation members.

10. In combination in a telegraph receiver, a set of permutation members, a corresponding set of selectors, each adapted to vibrate in two different paths of movement and operative in each path of movement to change the corresponding permutation members from one of two positions to the other, means for vibrating said selectors in order and means responsive to received signals and co-operating with said vibrating means to determine the paths of movement of the selectors.

11. In combination in a telegraph receiver, a set of permutation members, a corresponding set of selectors, each adapted to vibrate in two different paths of movement and operative in each path of movement to change the corresponding permutation members from one of two positions to the other, a rotary cam, means controlled thereby for vibrating said selectors and an electro-magnet responsive to received signals for determining the paths of movement thereof.

12. In a telegraph receiver, a set of permutation members, a corresponding set of selectors each arranged to vibrate to and from two

different advanced positions in which it is operative to determine the setting of the associated permutation member, a rotary member, means controlled thereby for successively retracting said selectors and again advancing the same into operative relation with said permutation members, an electromagnet responsive to received signals and means controlled by said magnet and cooperating with said selectors, when retracted, to positively determine the operating positions thereof.

13. In a telegraph receiver, a set of permutation members, a corresponding set of selecting fingers each adapted to reciprocate through two different paths of movement, a set of springs for advancing said selectors, each in either of its paths, to thereby determine the setting of the corresponding permutation member, an electro-magnet responsive to received signals, and a rotary cam member for retracting said selecting fingers, one at a time, into cooperative relation with the armature of said magnet to thereby determine the paths of movement of said fingers.

14. In combination in a telegraph receiver, a set of permutation members, a corresponding set of selecting fingers, springs for advancing said selectors, each through two different paths in accordance with its setting and thereby effect the setting of the corresponding permutation member, an electromagnet responsive to received signals, a rotating cam for retracting said fingers successively into operative relation with the armature of the magnet and thereby determine the setting of said fingers, said cam cooperating with said springs to reciprocate said fingers one at a time as a signal is received, and said springs normally holding said fingers in their advanced positions and normally maintaining the setting of said fingers and of the said permutation members.

15. In combination in a telegraph receiver, a set of permutation members, a set of selectors each having two operating positions for determining the setting of said members, a magnet responsive to received signals for determining the setting of said selectors in their respective operating positions, a rotating cam and a set of springs for vibrating said selectors in order to thereby successively retract each selector into cooperative relation with the armature of said magnet and advance the same into operative relation with the corresponding permutation member, and an intermittently operated printer mechanism controlled by said permutation members and having means for temporarily holding the latter against movement, said springs being arranged to effect the forward operating movements of said fingers and permitting the delayed operation thereof upon said members.

16. In a telegraph printer, a set of permutation members, a corresponding set of selecting fingers, each adapted to be advanced through two different paths of movement in accordance with its setting and thereby effect the setting of the corresponding permutation member, an intermittently operated printer mechanism controlled by said permutation members and having means for temporarily holding the latter against movement, electro-magnetic means cooperating with said selectors when retracted for determining their setting, a rotary cam for retracting and operatively associating said selectors in order with said electro-magnetic means and for tripping said printer mechanism into operation and a set of springs for effecting the forward operating movements of said selectors and for permitting the delayed operation thereof upon said members.

17. In a telegraph receiver, a set of selectors each adapted to be vibrated through two different paths in accordance with its setting, a rotating member for vibrating said selectors in order as a signal is received, an electro-magnet cooperating with said rotating member to set said selectors in different combinations in accordance with the signals, and means for maintaining the setting of said selectors until the same is changed in response to a received signal.

18. In a telepgraph receiver, a set of selecting fingers, a corresponding set of pivoted, actuated levers to which said fingers are pivoted to permit the setting of each of the latter in either one of two conditions, an electromagnet responsive to received signals, a rotary cam and a set of springs cooperating with said levers to successively reciprocate said fingers and bring the same in order into cooperative relation with the armature of said magnet and thereby selectively determine the setting of said fingers, said springs normally holding said fingers in their advanced positions and out of cooperative relation with said armature and means cooperating with said springs and actuated by said fingers for maintaining the setting of the fingers until the same is changed in response to a received signal.

19. In combination in a telegraph receiver, a set of permutation bars, T-levers for shifting said bars, a set of selecting fingers operative upon the arms of said T-levers for changing the setting of said permutation bars, a rotating cam for successively retracting said fingers, a magnet responsive to received signals, and means controlled by said magnet and cooperating with the fingers as they are retracted for changing the setting thereof and springs for advancing said fingers into engagement with said T-levers and for normally maintaining the setting of said fingers and of said bars.

20. In combination in a telegraph receiver, a set of permutation members, a set of selectors for positioning said permutation members, a set of springs, one for each of said se-

lectors, for advancing and thereby effecting the operation of said selectors upon said permutation members and for normally holding each selector and member in either one of two positions in accordance with the setting of said selectors, means for retracting said selectors in order against the tension of said springs, and electro-magnetic means cooperating with said selectors in the retracted positions thereof and arranged to change the setting of each selector from either of two conditions to the other in response to received signals.

21. In combination in a telegraph receiver, a set of selectors, a rotary distributor cam for successively shifting said selectors, an electro-magnet responsive to received signals, means controlled thereby for invariably starting and stopping said cam and for variably changing the setting of each selectors as it is shifted by said cam from either one of two conditions to the other, and means for maintaining the setting of said selectors until the same is changed in response to a received signal.

22. In combination in a telegraph receiver, a rotating distributer, a yielding stop for arresting said distributer, a latch for holding said stop against yielding, a support adjustable on an axis concentric with said distributer and whereon said stop and latch are mounted, a trip for said latch mounted on a fixed support and a magnet responsive to the signals for actuating said trip.

23. In combination in a telegraph receiver, a distributer cam, a power operated slip friction clutch for rotating said cam, a yielding arresting stop for said cam, a latch for said stop, a support for said stop and latch rotatably adjustable about the axis of said cam, a magnet, and means controlled thereby for tripping said latch in the different adjusted positions of said arm.

24. In combination in a telegraph receiver, a distributer, a yielding stop for arresting said distributer in a normal position, a power operated slip friction clutch for rotating said distributer and normally tending to move said yielding stop to its inoperative position, a latch for holding said stop against yielding, a magnet responsive to received signals, and means controlled thereby for tripping said latch.

25. In combination in a telegraph receiver, a segmental series of type bars, a corresponding segmental series of actuating bars connected thereto, a common segmental striker bar for operating said actuating bars, and a set of segmental permutation bars cooperating directly with said actuating bars for selectively controlling the operative engagement thereof with said striker bar.

26. In combination in a telegraph receiver, a segmental series of type bars, a corresponding segmental series of actuating bars connected thereto, a common segmental striker bar for operating said actuating bars, and a set of segmental permutation bars cooperating directly with said actuating bars for selectively controlling the operative engagement thereof with said striker bar, said actuating bars being longitudinally movable to operate said type-bars and laterally movable into and out of cooperative relation with the striker and permutation bars.

27. In combination in a telegraph receiver, a segmental series of type-bars, a corresponding segmental series of actuating bars connected thereto, a segmental series of permutation bars for selectively controlling said actuating bars, the latter being longitudinally movable to operate said type-bars and laterally movable into and out of engagement with said permutation bars, and a common segmental striker bar for effecting both the lateral and longitudinal movements of said actuating bars.

28. In combination in a telegraph receiver, a series of pivoted type-bars, corresponding, longitudinally movable actuating bars, said type and actuating bars having intermeshing gear teeth, a set of segmental, notched permutation bars for selectively controlling said actuating bars and a segmental striker bar for operating the same, said actuating bars being laterally movable into and out of operative engagement with said permutation and striker bars.

29. In combination in a telegraph receiver, a series of pivoted type-bars, corresponding, longitudinally movable actuating bars directly connected thereto, segmental permutation and striker bars cooperating directly with said actuating bars, an operating spring for said striker bar, an intermittently operating rotary cam for returning the same to normal position, an adjustable connection between said cam and striker bar, a trip bar for disengaging said actuating bars at the ends of the operating movements thereof, and a set of springs for restoring said type and actuating bars and for moving the latter laterally into operative engagement with said permutation and striker bars.

30. In combination in a telegraph receiver, a series of pivoted type-bars, corresponding, longitudinally movable actuating bars directly connected thereto and arranged adjacent and substantially parallel to the normal positions of said type bars, segmental permutation and striker bars cooperating directly with said actuating bars, the latter being laterally movable into and out of operative engagement with the permutation and striker bars, and a set of springs cooperating with said striker bar to effect both the longitudinal and lateral movements of said actuating bars.

31. In combination in a telegraph receiver, a series of pivoted type-bars, correspond-

ing, longitudinally movable actuating bars directly connected thereto and arranged adjacent and substantially parallel to the normal positions of said type bars, segmental permutation and striker bars cooperating directly with said actuating bars, the latter being laterally movable into and out of operative engagement with the permutation and striker bars, a reciprocating plunger whereon said striker bar is mounted and an actuating spring and restoring cam for reciprocating said plunger.

32. In combination in a telegraph receiver, a set of type bars, corresponding actuating bars, segmental permutation and striker bars cooperating directly with said actuating bars, a tape platen, a letter-space feed for the tape, function bars controlled by the permutation and striker bars and means operated by said function bars for preventing the operation of the letter-space feed.

33. In combination in a telegraph receiver, a set of type bars, corresponding actuating bars, segmental permutation and striker bars cooperating directly with said actuating bars, a tape platen, a letter-space feed for the tape, two shift bars controlled by the permutation and striker bars, means operated thereby for shifting the platen in opposite directions and for preventing the operation of the letter space feed.

34. In combination in a telegraph receiver, a set of permutation bars, printing means controlled thereby and arranged to temporarily hold said permutation bars against movement, a set of selectors for positioning said bars, operating cams for said selectors and said printing means respectively, a common drive shaft and individual clutches for actuating said cams, an electro-magnet, means controlled thereby for tripping said selector clutch and for determining the setting of said selectors, a set of springs for effecting and permitting the delayed operation of said selectors upon said permutation bars, and for normally maintaining the setting of said selectors and bars, and means controlled by said selector cam for tripping said printer clutch.

35. In combination in a telegraph receiver, a set of permutation bars, printing means controlled thereby, a set of selectors for positioning said bars, a rotary cam, an electro-magnet, means controlled by said cam and magnet for setting said selectors and subsequently effecting the operation thereof upon said bars, a rotary cam for operating said printing means, individual clutches for controlling said selectors and printer cams, a common drive shaft whereon said cams and clutches are mounted, and devices controlled by said magnet and by said selector cam for respectively tripping said selector and printer clutches.

36. In a telegraph receiver, a plurality of selectable devices, a set of notched permutation members each movable in opposite directions to align the notches thereof and select said devices, a corresponding set of selectors each operative in two different conditions to selectively effect the movement of said permutation members, an electromagnet responsive to two different line conditions, a cooperating rotary member, mechanical means under the joint control of said rotary member and the armature of said magnet and operative, as the signals are received, to change the setting of each of said selectors from either one of its operative conditions to the other and means for permitting the delayed operation of said selectors on said permutation members.

37. In a telegraph receiver, a segmental series of pivoted type bars, a corresponding segmental series of actuating bars connected directly to said type bars and each adapted to operate a corresponding type bar by longitudinal, straight line movement, a set of segmental permutation bars and a segmental striker bar, said permutation and striker bars cooperating directly with said actuator bars to control and effect the operation thereof.

38. In a telegraph receiver, a plurality of type bars, selectable actuating bars therefor, a set of notched permutation bars adapted to be positioned in different combinations to select said actuating bars, the latter being laterally movable into and out of selective position and longitudinally movable to effect the operation thereof, a single universal bar for effecting the lateral and longitudinal movements of said actuating bars and a trip for disengaging said actuating bars from said striker bar.

39. In combination in a selecting mechanism for telegraph receivers, a set of permutating members, a corresponding set of selecting fingers, each operative in two different conditions upon the associated permutation member to thereby shift the same in opposite directions from either one of two positions to the other, a start-stop rotary member and a vibratory member responsive to received signals and co-operating with said rotary member to mechanically shift said selecting fingers in order and each in opposite directions to either of its operative conditions.

40. A selecting mechanism for telegraph receivers comprising a series of selectable devices, a set of notched permutation members movable in opposite directions to aline the notches thereof and select said devices, a set of pivoted levers connected to said permutation members, a corresponding set of selecting fingers each operative in either of two conditions to move the corresponding lever and permutation member in opposite directions, means for reciprocating said selectors to and from said permutation members, and a common vibrating member responsive to

received signals and operative on said selecting fingers when withdrawn from said permutation member to shift the same one at a time and each in opposite directions to either one of its operative conditions.

41. In combination, a selecting mechanism, a set of permutation members, a corresponding set of selectors for positioning said members in different conditions, each of said selectors being vibratable in one direction to either one of two operative conditions and in another direction to and from the corresponding permutation member to move the latter back and forth to either one of two positions to the other, a common vibratory member for shifting said selecting fingers one at a time to either one of its operating conditions and power actuated means for vibrating the fingers to and from said permutation members.

42. In a telegraph receiver, a set of permutation members, a corresponding set of selecting fingers pivoted to swing to either one of two operative conditions, a common vibratory member for controlling the pivotal movement of said fingers in response to received signals, and means for bodily reciprocating said fingers to and from said permutation members to move each of the latter from either one of two positions to the other.

43. In a telegraph receiver, a set of permutation members, a corresponding set of selecting fingers, each arranged to shift the corresponding permutation member back and forth to either one of two positions, a common vibratory member responsive to received signals for controlling the setting of said selectors one at a time and each in either one of two operative conditions, and means for bodily shifting said selector in one direction into cooperative relation with said vibratory member and in the opposite direction into co-operative relation with said permutation members.

44. In combination in a telegraph receiver, a set of permutation bars, T-levers connected to said bars, a set of selecting fingers, means for advancing said fingers into engagement with the arms of said T-levers to shift said bars in opposite directions and for withdrawing said fingers from said T-levers, an electro-magnet and a common member vibrated by said magnet and co-operating one at a time with said fingers when withdrawn to change the setting of said fingers and each from either one of two operative conditions to the other.

45. In combination in a telegraph receiver, a segmental series of type bars, a corresponding segmental series of actuating bars connected to said type bars and each adapted by a straight line movement to operate the corresponding type bars, segmental permutation and striker bars co-operating with said actuating bars, and a plunger having a straight line movement whereon said striker bar is mounted.

46. In combination, in a selecting mechanism for telegraph receivers, a set of permutation members, shifters individual to said members and connected thereto, a corresponding set of selectors, each operative in two different conditions upon one of said shifters to thereby move the associated permutation member in opposite directions from either one of two positions to the other, a single selecting magnet responsive to received signals and a start-stop rotary member cooperating with the armature of said magnet to mechanically shift said selectors in order and each in opposite directions from either one of its operative conditions to the other, whereby each of said selectors and permutation members retains its setting until the same is changed in response to a received signal.

47. In a selecting mechanism for telegraph receivers, a set of notched permutation members, T-levers individual to said permutation members and connected thereto, a corresponding set of selectors, each operative in two different conditions upon the arms of said T-levers to move the associated permutation member in opposite directions to either one of two positions and thereby selectively align the notches of said members, a member vibrated in response to received signals and operative upon each of said selectors to shift the same in opposite directions from either of its operative conditions to the other, and means for operatively associating said vibratory member with said selectors in order as each signal is received.

48. In combination, in a selecting mechanism for telegraph receivers, a set of permutation members, shifters individual to said members and connected thereto, a corresponding set of selectors each operative in two different conditions upon the corresponding shifter to thereby move the associated permutation member in opposite directions to either one of two positions, said selectors having pairs of spaced arms, a member vibrated in response to received signals and adapted to engage the spaced lugs of each of said selectors to move the same from either one of its operating conditions to the other and means for operatively associating said vibratory member with said selectors in order as each signal is received.

49. In combination, in a selecting mechanism for telegraph receivers, a set of permutation members, a corresponding set of selectors, a single selecting magnet responsive to received signals, a member vibrated by said magnet, said vibrating member and said selectors having pairs of spaced lugs arranged to be engaged to change the setting of each of said selectors from either one of two conditions to the other, and motor-driven means

for associating said selectors in order with said vibrating member and for transferring the setting of said selectors to said permutation members.

50. In a telegraph receiver, a plurality of selectable devices, a set of permutation members controlling the selection of said devices, a corresponding set of selectors for determining the setting of said permutation members, a single selecting magnet responsive to code combinations of two different electrical conditions, a member vibrated by said electromagnet arranged to shift each of said selectors in opposite directions from either one of two positions to the other, means for operatively associating said selectors in order with said vibrating member and means for effecting the operation of said selectors upon said permutation members.

51. In combination, in a telegraph receiver, a segmental series of pivoted type bars, a corresponding series of longitudinally movable, actuating bars having rolling connections with the pivoted ends of said type bars, a set of segmental, notched permutation bars for selecting said actuating bars and a segmental striker bar for operating the same, said actuating bars being laterally movable into and out of operative engagement with said permutation and striker bars.

52. In combination, in a telegraph receiver, a set of pivoted type bars, corresponding longitudinally movable, actuating bars connected to the pivoted ends of said type bars and arranged adjacent and substantially parallel to the normal positions of said type bars, a set of segmental permutation bars cooperating directly with the free ends of said actuating bars, the latter having lugs spaced from their free ends, a segmental striker bar cooperating with the lugs of said actuating bars to effect the operation thereof and guiding means for effecting a substantially straight line movement to said striker bar.

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