

April 14, 1942.

W. J. ZENNER

2,279,609

PRINTING TELEGRAPH APPARATUS

Filed May 22, 1936

3 Sheets-Sheet 2

FIG. 2

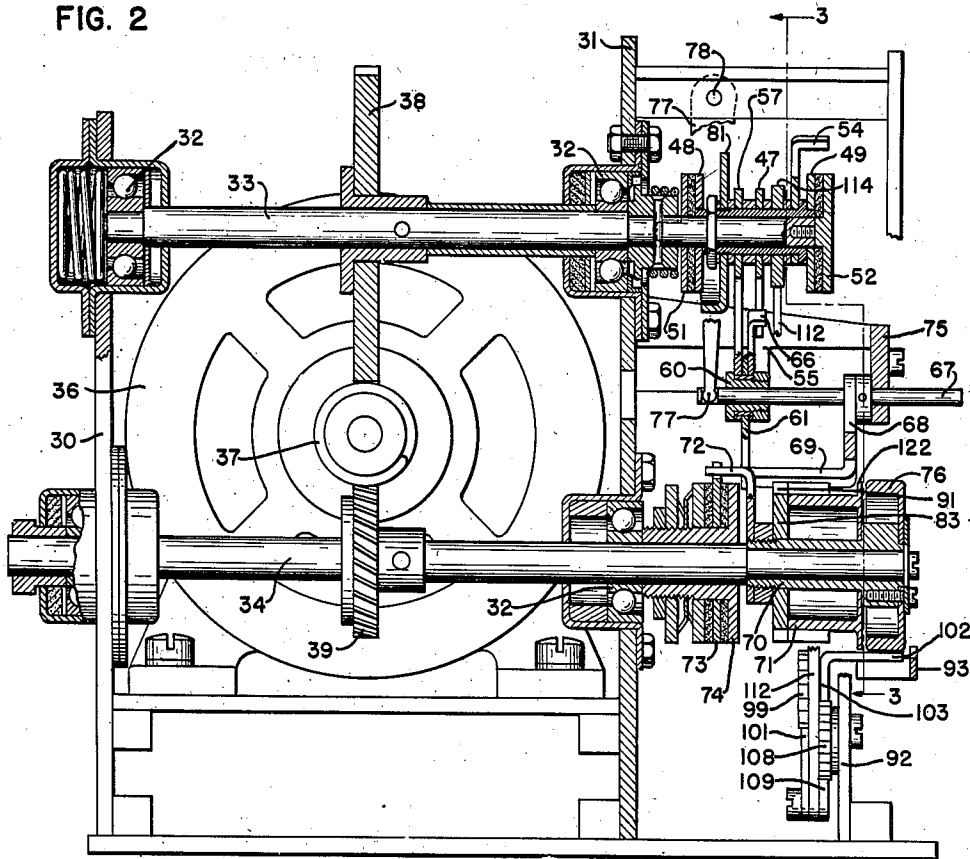


FIG. 5

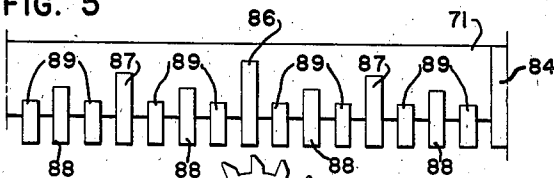


FIG. 6

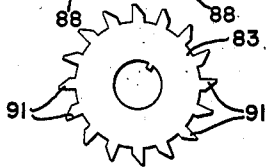
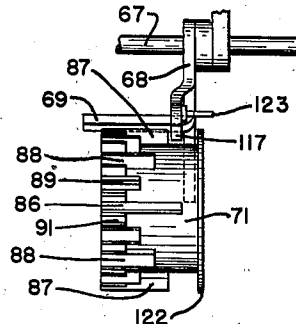


FIG. 7



INVENTOR
WALTER J. ZENNER

BY *H.B. Whitfield.*
ATTORNEY

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W. J. ZENNER

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FIG. 3

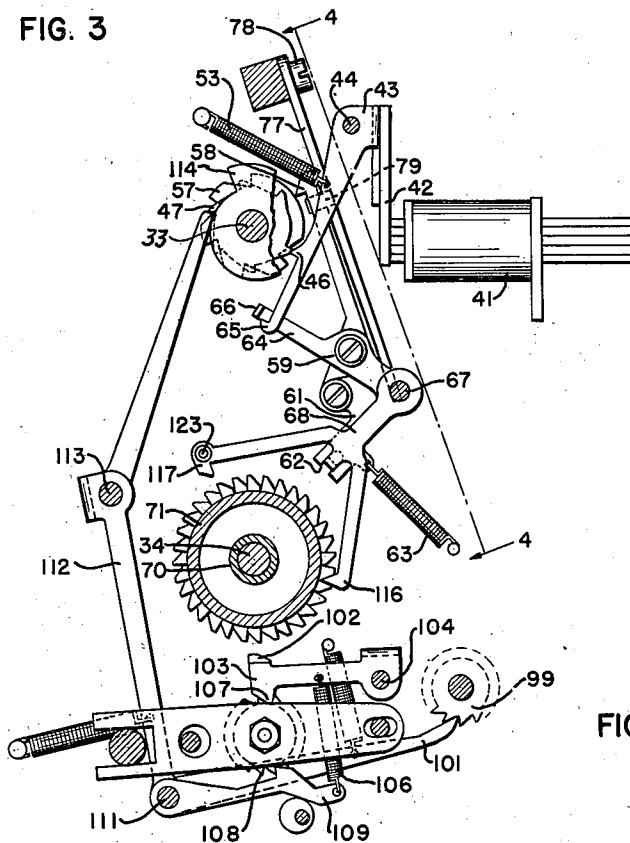


FIG. 8

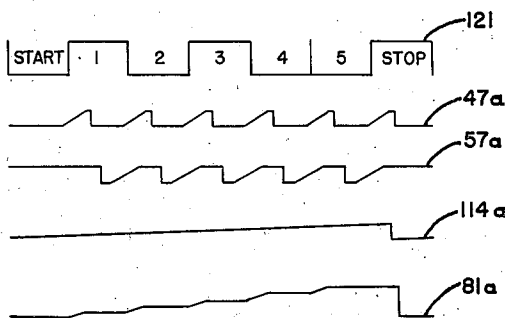
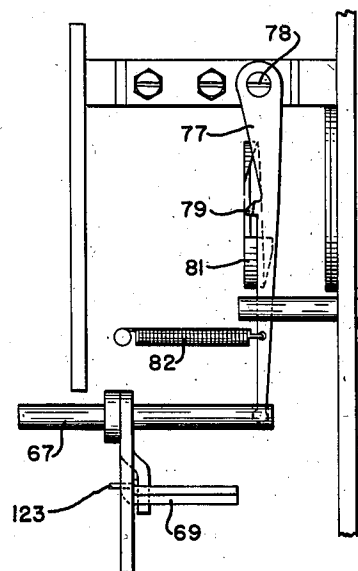


FIG. 4



INVENTOR
WALTER J. ZENNER

BY *H. B. Whitfield*
ATTORNEY

UNITED STATES PATENT OFFICE

2,279,609

PRINTING TELEGRAPH APPARATUS

Walter J. Zenner, Des Plaines, Ill., assignor to
Teletype Corporation, Chicago, Ill., a corporation
of Delaware

Application May 22, 1936, Serial No. 81,166

37 Claims. (Cl. 178—34)

This invention relates to printing telegraph apparatus, and particularly to a type wheel printer.

An object of the invention is to provide a simple, efficient, compact, and inexpensive telegraphic recorder.

The invention features an escapement mechanism associated with the type wheel of the printer and consisting of a pawl and toothed drum for controlling the positioning of the type wheel in accordance with signal impulses received by a selector magnet.

Briefly, the printer includes a pair of motor driven shafts, one of which carries a type wheel and a ribbed selecting drum, and the other of which carries selecting and operating cams. A selector magnet, the armature of which is actuated cyclically by a selector cam and is held when the magnet is energized by certain signal impulses, controls a pawl latch which straddles the ribbed selecting drum. Each arm of the pawl is provided with an escape tooth which may be brought into engagement with a rib on the selecting drum when the pawl is rocked right or left. The pawl is spring urged for rotation in one direction and is cyclically freed by a cam for rotation in response to the urging of the spring, if it is simultaneously freed by a latch controlled by the selector magnet. The cam restores the pawl to its opposite position against the tension of the spring. Another cam causes the pawl to travel from one end of the ribbed drum to the other during a cycle of operation of the printer, after which the pawl is spring restored to its normal position. The ribs of the drum are of several different lengths in accordance with a predetermined plan, and by virtue of the combined rocking and translational movement of the pawl, the rotation of the ribbed drum is controlled. The type wheel is rigidly secured to the drum, and the position to which the drum has been rotated during a cycle of operation of the selecting mechanism determines the type character that will be presented in cooperation with a printing platen to make an impression on the tape. Printing and tape feeding operations are effected by a cam carried by the selector cam shaft.

For a complete understanding of the invention, reference may be had to the following detailed description, taken in connection with the accompanying drawings in which

Fig. 1 is a front elevation partly in section of a printing telegraph mechanism in accordance with the invention;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken approximately on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a development of the cylindrical portion of the escapement drum;

Fig. 6 is a plan view of the disc portion of the escapement drum;

Fig. 7 is an elevational view of the escapement drum and pawl as viewed from the left, and

Fig. 8 is a combined timing chart and cam outline chart.

Referring now to the drawings in which like reference numerals designate corresponding parts throughout the several views and particularly to Fig. 1, the reference numeral 11 indicates generally a keyboard transmitter mechanism which may be of any desired form such as the one disclosed in United States Patent 1,595,472, granted August 10, 1926 to Howard L. Krum. The keyboard transmitter 11 includes a base casting 12 which carries a plurality of character selecting key levers 13. The key levers are operable upon a set of permutation bars (not shown) to control transmitting apparatus indicated generally by the reference character 14.

The transmitting apparatus includes a transmitting cam shaft 16 which carries a plurality of transmitting cams 17, only one of which is shown in the drawings. There is a contact controlling bell crank lever 18 associated with each of the transmitting cams 17. The outer end of one arm of each of the bell crank levers 18 is disposed in engagement with one spring of a pair of transmitting contact springs 19 and the outer end of the other arm is aligned with a lever 21 which is controlled by the permutation bars (not shown) and which has a tongue 22 which is moved into or out of position above the end of the contact controlling bell crank lever 18. Each of the transmitting cams 17 is provided with a notch (not shown) into which a lug 23 of the bell crank lever 18 which follows the contour of the transmitting cam 17 may drop if the lever 18 is not restrained from counterclockwise rotation by the tongue 22 on the controlling lever 21. When the lug 23 enters a notch in the transmitting cam 17, the contact controlling lever 18 rocks counterclockwise and in so doing, permits the contact springs 19 to come into mutual engagement, thus impressing an impulse on the telegraph line to which the transmitter is connected. A locking bail 24 has a portion which follows a cam 26 on

the transmitting cam shaft and has a knife edge 27 which prevents shifting of the levers 21 during the transmission of a set of signals representing a character.

The base casting 12 supports vertical plates 30 and 31 (Fig. 1), in which are rotatably supported in suitable anti-friction bearings 32, receiving printer shafts 33 and 34. Mounted between the plates 30 and 31 on the base casting 12 is an electric motor 35, the rotor shaft of which carries a pinion 37. The shaft 33 has fixed thereto a gear 38 which meshes with the pinion 37 and the shaft 34 has fixed thereto a gear 39 which also meshes with the pinion 37. The shafts 33 and 34 are continuously driven by the motor and the shaft 33 drives selecting and controlling cams while the shaft 34 effects rotation of the type wheel of the printer.

On the front of the vertical plate 31 there is mounted a selector magnet 41 (Figs. 1 and 3) which forms a part of a selecting mechanism which will be described briefly, but for a more complete understanding of which reference may be had to United States Patent 1,937,376 granted November 28, 1933, to Walter J. Zenner. The selector magnet 41 is provided with an armature 42 which constitutes one arm of a bell crank lever 43 that is pivoted at 44. The other arm of the bell crank lever 43 has a follower portion 46 which is adapted to follow a flutter cam 47 carried by the shaft 33. The flutter cam 47 is one of an assembly of cams confined between discs 48 and 49 of friction clutches 51 and 52, respectively (Fig. 2). The bell crank lever 43 is biased by a spring 53 in a clockwise direction to draw the follower portion 46 into engagement with the cam 47 and the armature 42 away from the pole face of the selector magnet 41. The cam assembly confined between friction clutch discs 48 and 49 includes a stop arm 54 in the path of rotation of which is disposed a stop gate (not shown), the operation of which is controlled by a plunger 56 in a manner clearly described in the above mentioned Patent 1,937,376. The plunger 56 is controlled by the armature 42 in such manner that the stop gate (not shown) is latched to prevent rotation of the stop arm 54 when the armature 42 is in engagement with its pole face, and is released to permit the stop arm and its associated cam assembly to rotate when the armature 42 is withdrawn from engagement with its pole face.

When the stop gate (not shown) releases the stop arm for rotation, the flutter cam 47 is rotated, and as this cam is provided with a plurality of apices, the bell crank lever 43 which has the portion 46 following the flutter cam 47 is rotated counterclockwise as viewed in Figs. 1 and 3 each time the follower 46 passes over an apex of the cam 47 and the armature 42 is thereby rocked into engagement with the pole face of the selector magnet 41. If the selector magnet 41 is then energized due to reception of an energizing impulse, the armature 42 will be held and the bell crank lever 43 will not be free to rotate clockwise under the influence of the spring 53 when an apex of the cam 47 passes out of alignment with the cam follower 46. The number of apices on the cam 47 corresponds to the number of impulses representing a character. The code which is intended to be employed for the operation of this printing mechanism is a start-stop permutation code.

The cam assembly carried by the shaft 33 includes a cam 57 having a plurality of apices and

against which rides a cam follower portion 58 (Fig. 3) at one end of a three-armed lever 59, which is journaled on a bushing 60 carried by a bracket 55. One arm 61 of the three-armed lever 59 is bifurcated as shown at 62 and a spring 63 connected to the arm 61 tends to rotate the three-armed lever 59 counterclockwise. Another arm 64 has a portion 66 formed perpendicularly at the end thereof in alignment with a hook portion 65 of an arm of the selector bell crank lever 43. When the three-armed lever 59 and the bell crank lever 43 are in their extreme clockwise positions, the arm 64 is engaged and held by the hook portion 65 of the bell crank lever 43 and the lever 59 is incapable of rotating counterclockwise in response to the urging of the spring 63, even when an apex of the cam 57 passes out of alignment with the follower portion 58. However, when the bell crank lever 43 is in its extreme counterclockwise position, the lever arm 64 is disengaged from the hook portion 65 of the bell crank lever 43 and three-armed lever 59 can rotate counterclockwise when a low portion of the cam 57 is aligned with the cam follower 58.

Slidably and rotatably mounted in the bushing 60 and arm 75 of bracket 55 is a slidable rock shaft 67 to which is fixed a pawl 68. Intermediate the arms of the pawl there is a perpendicularly extending arm 69 which is disposed within the bifurcated portion 62 of the previously described arm 61 of three-armed lever 59. The pawl 68 straddles and controls the rotational escapement of a ribbed drum 71 which is mounted on a bushing 70 fitted over the shaft 34, which carries an arm 72 disposed within a notch of a friction disc 73 of a friction clutch mechanism 74 carried by the shaft 34. The friction disc 73 tends to rotate the bushing 70 and drum 71 and does, in fact, rotate them when the pawl 68 permits such rotation. A type wheel 76 having characters arranged around the periphery thereof is mounted on the shaft 34 and is secured to the bushing 70 to rotate therewith.

The pawl 68 is relatively thin with respect to the length of the ribbed drum 61 and is adapted to cooperate with various portions of the surface thereof during a cycle of operation of the printer. The slidable mounting of the rock shaft 67 permits the pawl to traverse the drum from one end to the other during a cycle of operation, and for this movement, a lever 77 pivoted at 78 to a fixed portion of the apparatus has an end disposed within a recess in the shaft 67. Intermediate its ends the lever 77 has a cam follower portion 79 which cooperates with a cylindrical cam 81 included in the cam assembly carried by the shaft 33. The cam surface of the cam 81 is at the side thereof and consists of alternate rises and dwells. The cam follower 79 engages the cam surface and as the cam rotates the lever 77 is gradually rocked counterclockwise, as viewed in Fig. 4, against the tension of a spring 82, until the cam follower 79 rests upon the outermost portion of the cam surface, which marks the extreme point of counterclockwise rotation of the lever 77, after which the cam follower 79 drops off the cam surface and the spring 82 restores the lever 77 to its extreme clockwise position. By virtue of the previously described articulation of the lever 77 to the shaft 67, the pawl 68 traverses the ribbed escapement drum 71 as the lever 77 is operated by the cam 81 and is suddenly restored to its normal position by the spring 82 when the cam follower 79 is re-

leased from engagement with the cam surface of cam 81.

As previously described, the perpendicularly extending arm 69 of the pawl 68 is disposed within the bifurcated portion 62 of the lever arm 61 and all rocking movements which the three-armed lever 59 undergoes during a cycle of operation of the printer will be imparted to the pawl 68 as the cam 81 causes it to traverse the escapement drum 71.

The particular embodiment of the printer shown in the drawings is intended for operation on a five-unit permutation code which affords thirty-two selective possibilities. Other codes contemplating greater or lesser numbers of impulses may be employed and a greater or lesser number of selective possibilities thus afforded. Since in the present embodiment thirty-two code combinations may be obtained, it is possible to select thirty-two positions of the type wheel. Accordingly, the ribbed drum 71, the escapement of which is controlled by the pawl 68, is provided with thirty-two ribs or teeth of different lengths in accordance with a predetermined plan, uniformly spaced around the periphery of the drum. In its preferred embodiment, the escapement drum has sixteen ribs uniformly spaced around the periphery thereof and an end plate, which has sixteen teeth also uniformly spaced, is adapted to be applied to the drum so that each tooth of the end plate or disc is disposed between two ribs of the drum.

In Fig. 5 there is shown a development of the surface of the escapement drum with the ribs arranged thereon according to the preferred plan and in Fig. 6 is shown a plan view of the end plate or disc with the sixteen teeth. The reference numeral 71 which designates the drum in the other figures designates the developed view of the drum in Fig. 5, and the reference numeral 83 indicates the toothed disc in Figs. 6 and 7. It will be observed that a rib 84 extends across the drum from end to end thereof, and that half way around the drum there is a rib 86 which is shorter than the rib 84 by a distance approximately equal to the distance by which the ribs of the drum overlap the toothed disc. Intermediate the ribs 84 and 86 in both directions are ribs 87 which differ in length from rib 86 by approximately the same amount that the rib 86 differs from rib 84. Intermediate the ribs 84 and 87 and 86 and 87 are ribs 88 which are shorter than the ribs 87. Intermediate any two ribs previously mentioned are ribs 89 which are shorter than the ribs 88. The teeth 91 of disc 83 are shorter than the ribs 89. The escapement drum 71 will thus be seen to consist of one rib 84, one rib 86, two ribs 87, four ribs 88, eight ribs 89, and sixteen ribs 91 of lesser extent in the order named, and totaling thirty-two ribs. The progress of the pawl 68 in traversing the drum 71 is toward peripheral bands containing increasing numbers of ribs. Thus, if the pawl is rocked as it passes from the first or zero peripheral band which is the upper band in Fig. 5, into the peripheral band corresponding to the first signal interval, the drum will be permitted to rotate through one-half revolution before it is stopped by engagement of the pawl with rib 86. It may rotate through one-quarter of a revolution during the second signal interval in being released by rib 84 or 86 to be stopped by a rib 87. It may rotate one-eighth of a revolution during the third signal interval in being released by a rib 84, 86, or 87 to be stopped by a rib 88. It may rotate

through one-sixteenth revolution during the fourth signal interval in being released by a rib 84, 86, 87, or 88 to be stopped by a rib 89. Lastly, it may rotate through one thirty-second of a revolution during the fifth or final signal interval in being released by any of the ribs mentioned above to be stopped by a rib 91. In this manner, the drum 71 may be stopped in any one of the possible thirty-two positions by rocking the pawl 68 or preventing it from rocking during predetermined intervals of the cycle in which it traverses the drum 71. The type wheel 76 is controlled by the escapement drum and therefore it may be brought to any one of thirty-two selective positions.

As indicated in Figs. 1 and 2, the base casting 12 supports a plate 92 directly below the type wheel 76 and the selecting drum 71, which plate carries tape feeding mechanism, a tape guiding channel, a printing platen, and a type wheel inking roll. The tape guiding channel is shown at 93, Fig. 1, and the tape feed roll is shown at 94. A pressure roll 96 carried on a pivoted arm 97 which is spring urged in a counterclockwise direction as shown in Fig. 1, maintains the tape in engagement with the feed roll 94. A flange 98 retains the tape in the desired alignment over the feed roll. A ratchet wheel 99 (Figs. 2 and 3) which is actuated by a feed pawl 101, rotates the feed roll 94 to advance the tape to the printing point. As shown in Fig. 3, a printing platen 102 is carried at the end of an arm 103 which is pivotally mounted at 104 and is urged in counterclockwise direction by a spring 106. The platen arm 103 has an acute angled portion 107 which is disposed above and in alignment with a rotatable ratchet wheel 108. The ratchet 108 is rotated by a pawl 109 and as it rotates, it cams the acute angled portion 107 of the platen arm 103 and thus lifts the platen 102 to press the tape, upon which characters are to be printed, against the type wheel to receive an impression. The tape feeding pawl 101 and the platen operating pawl 109 are articulated at 111 to a lever 112 which is pivoted at 113 and at its upper end follows a cam 114 included in the cam assembly frictionally driven by the shaft 33. As shown in Fig. 3, the drop from the highest portion to the lowest portion of cam 114 is abrupt, and when the upper end of lever 112 drops from the highest to the lowest part of the cam, the lever is suddenly and sharply rotated in a clockwise direction which, through the pawl 109 and platen ratchet 108, causes the platen arm 103 to be sharply rotated clockwise, whereby the platen 102 strikes the tape against the type wheel vigorously. The feeding of the tape occurs as indicated in Fig. 3, somewhat gradually as the lever 112 is rotated counterclockwise by the rotation of the cam 114.

In the operation of the printer, the selector magnet 41 is energized and deenergized in accordance with signals impressed upon the telegraph line to which the magnet is connected. The armature 42 is periodically moved into engagement with its pole face through the operation of cam 47, upon bell crank lever 43, and when the magnet is energized at the time the armature approaches its pole face, the armature is held and the three-armed lever 59 is released from retained engagement with the hook portion 57 of the bell crank lever 43. The cam 57 then permits the three-armed lever 59 to rotate counterclockwise, withdrawing the right-hand escape tooth of pawl 68 from engagement with a rib of the escapement drum 71 and permitting it to ro-

tate until it is stopped by the engagement of the left-hand arm of the pawl with a rib. The timing of the apparatus as between the cams 47 and 57 is such that if the armature 42 is not held due to energization of the selector magnet 41, the bell crank lever 43 returns to its extreme clockwise position before the cam 57 releases the three-armed lever 59. Thus, when a marking signal is received which is evidenced by energization of the selector magnet, the pawl 68 is permitted to rock and the escapement drum is permitted to rotate, but when a spacing signal is received, the armature 42 is not held and the three-armed lever is unlatched and latched by the hook 65 before the cam 57 can release the three-armed lever for operation.

It will be understood that the cam 57 restores the three-armed lever 59 and the escapement pawl 68 to their extreme clockwise positions after they have rotated to their counterclockwise positions. As a combination of marking and spacing signals representing a character is received, the escapement pawl 68 travels the length of the escapement drum, due to the operation of the lever 77 by the cam 81. Movement of the pawl longitudinally of the drum is intermittent and as the pawl rocks or remains unrocked, due to the reception of marking or spacing signals, the escapement drum rotates or remains stationary in accordance with received signals, until the pawl comes into engagement with one of the teeth of the toothed disc 91 or one of the ribs intermediate those teeth. This completes the selection, whereupon the lever 112 operates and causes the platen 102 to imprint the selected character upon the tape. Thereafter the cam 81 frees the lever 77 and permits the spring 82 to restore the escapement pawl 68 to its foremost position. This releases the escapement drum for rotation and it rotates to its normal or idle position which is with the right-hand escape tooth 116 of the escapement pawl 68 in engagement with the rib 84 at the foremost portion thereof. During the next cycle of operation and specifically while the selection of the printing position of the type wheel is being completed, the lever 112 rotates the tape feeding ratchet 99 and feeds a blank portion of the tape into alignment with the printing position of the type wheel.

The operation of the printer being now understood, attention is directed to Fig. 8 wherein is displayed the timing of operations by reference to their operating members. The reference numeral 121 designates a representation of the intervals of which a start-stop permutation code signal is composed, which are "start" impulse interval, signal impulse intervals 1, 2, 3, 4, and 5, and "stop" impulse interval. The signal impulse intervals may be and usually are of equal lengths, and the signals transmitted and received during said intervals may be either marking or spacing in any permutative order.

The irregular line 47a represents the flutter or armature operating cam 47, and indicates that said cam has an apex for each signal impulse interval, and one for the stop interval. The preferable timing of cam 47 with respect to the signal intervals is, as shown in Fig. 8, such that the cam follower 46 rides onto an apex near the middle of an interval and falls away abruptly unless the selector magnet is energized and the armature thereby attracted.

The line 57a relates to the timing of the escapement pawl cam 57. This cam, it will be ob-

served, has five apices, corresponding to the five signal intervals. Cam 57 and its follower 58 are so disposed with respect to cam 47 and its follower 46 that cam follower 58 falls away from an apex slightly later in a signal interval than the falling away of cam follower 46. This time difference in the descent of the two cam followers accounts for the previously described circumstance that if the follower 46 falls away from an apex, due to deenergized condition of the magnet, the three-armed lever 59 and the escapement pawl which it controls cannot rotate counterclockwise when the follower 58 falls away from an apex due to latching of the lever arm 64 by the hook 67.

The line 114a relates to the operation of printing and tape feeding cam 114. This cam, it will be observed, has one apex, the rise to which is very gradual, being extended over substantially the full periphery of the cam, and the descent from which is very abrupt. The apex is so positioned with respect to the cams 47 and 57 that its follower falls away just after the escapement pawl 68 has been restored to its extreme clockwise position by the cam 57 following release for counterclockwise rocking by the apex of cam 57 which corresponds to the fifth signal interval. This line thus indicates graphically the previously stated fact that the printing platen is actuated violently just after the type wheel has been brought to its selected position, and that the tape is fed gradually during the next selecting cycle of the escapement drum.

The line 81a indicates generally the contour of the cam 81 which causes the escapement pawl 68 to traverse the escapement drum 71 from end to end. It will be noted that the cam 81 is so positioned with respect to the other cams that it begins to move its follower early in the first signalling interval. The cam surface consists of alternate rises and dwells, there being a rise effective to move the escapement pawl during a portion of each of the signal intervals. Thus the escapement pawl traverses the drum intermittently in steps coordinated with the signal interval until the end of the drum is reached after which the follower falls away to the lowest level of the cam thus permitting the escapement pawl 68 to be restored to its normal or initial position where it remains until being shifted again upon the reception of another series of signal impulses.

The provision of alternate dwells and rises on cam 81 enables the movement of the pawl longitudinally of the drum to be coordinated accurately with respect to the signal intervals. It is apparent that the time intervals during which the drum rotates decrease as successive signal intervals in a given signal combination are traversed, the reason being that as the pawl advances to peripheral areas of the escapement drum in which the ribs increase in number, the drum rotates through progressively smaller angles. The timing of the translational movement of the pawl with respect to its rocking movement is not especially critical during the first three or four intervals, and the cam 81 could, if desired, be so constructed as to move the pawl continuously during the first three or four signal intervals, but if the escapement pawl shifting cam follower moves steadily during the fifth signalling interval, or during any subsequent intervals which might be provided in connection with codes of more than five units, there is a possibility that the pawl may be shifted longitudinally

of the drum at the wrong instant and into engagement with the wrong rib or tooth. This possibility is eliminated by causing the cam follower 79 to stand idle for a brief instant during each signal interval.

It will be noted that in point of time the escapement pawl is restored to its initial position due to the falling away of the cam follower 79 from the highest portion of the cam 81 just after the printing operation has been performed by the cam 114. With this arrangement it is a certainty that the escapement drum 71 will be held stationary during a printing operation so that clear and legible printing may be had.

Referring now to Fig. 7, it will be noted that the two arms of the escapement pawl are not disposed in the same plane. The upper or left-hand arm (viewing the mechanism from the front) has a rearward offset, so that the escape tooth 117 of that arm is displaced rearwardly from the escape tooth 116 of the other arm a distance substantially equal to the previously described difference in the length between any escapement rib and the next shorter rib. When the pawl is rocked counterclockwise to withdraw the right-hand escape tooth 116 from engagement with a rib thus permitting the escapement drum 71 to rotate, the left-hand escape tooth 117 is then in the path of the next shorter rib and will stop the drum when that rib is encountered even though the pawl should not be shifted immediately, as when pawl shifting cam follower encounters a dwell. If, however, the two escape teeth were disposed in the same plane, it would be necessary to shift the pawl suddenly as soon as the escapement drum should be released for rotation in order that the left-hand escape tooth 117 should be shifted into the path of the next shorter rib before that rib could rotate past the escape tooth.

Referring to Figs. 1 and 7, attention is directed to a cam disc 122 which is fixed to the drum and rotates therewith and to a pin 123 carried by the left-hand arm of the escapement pawl 68. These elements permit the type wheel shaft, type wheel, and selecting drum to be operated at a lesser velocity than could be employed in the absence of the disc and pin. Rotation of the type wheel at reduced speed is desirable because of the very frequent stopping of the type wheel for printing.

The cam 122 and pin 123 cooperate to overcome, at the beginning of a cycle of operation, a condition that may arise as a result of the inertia characteristics of the escapement drum and type wheel. The apex 124 of the cam 122 extends a sufficient distance from the axis of the cam to engage the pin 123 and hold the escape tooth 117 out of engagement with the selecting drum 71, thus holding the pawl 68 in its extreme clockwise position under conditions when it might otherwise be released for counterclockwise rotation. When the signaling impulse received during the first interval is a marking signal, the pawl 68 rocks in a counterclockwise direction under the influence of the spring 63 to withdraw the right-hand escape tooth 116 from engagement with the rib 84 and to place the escape tooth 117 in the path of that rib. It is possible that the inertia of the type wheel and selecting drum may delay the response of those elements to the driving force of the friction clutch and thus the drum and type wheel may lag with respect to incoming signal impulses. A marking impulse in the first interval as pre-

viously set forth indicates and establishes a condition for selection of a character in the second half of the type wheel which means that the type wheel must be rotated through 180° in response to a marking signal in the first interval and that rib 84 must rotate past the left-hand escape tooth 117 since the pawl 68 spans less than half the periphery of the drum 71. If a marking signal is received during the second interval, the escapement drum should be stopped by engagement of the right-hand escape tooth 116 with the rib 87 in the second half of the drum. If the rib 84 has not passed the left-hand escape tooth 117 at the time the marking signal in the second interval is received, that tooth will drop into the path of the rib 84 and will stop the drum before it has completed 180° of rotation from its initial position. When the escapement pawl is restored to its normal or extreme clockwise position, the right-hand escape tooth 116 will stop the escapement drum by engagement with the rib 85 instead of by engagement with the rib 87 at a point 90° farther along the periphery of the drum.

During the interval in which the pin 123 rides on apex 124 of cam 122, the pawl is unable to respond to a marking signal and it is released to respond to such signal as soon as the pin 123 falls away from the apex 124 of cam 122. It is by means of this arrangement that the left-hand escape tooth 117 of the pawl 68 cannot interfere with rotation of the escapement drum through the proper angular distances in accordance with the received signals. The cam 122 and pin 123 do not interfere with the selection of a final stop position of the drum with the cam apex in alignment with the pin 123 for the reason that by the time the apex 124 of the cam has rotated into such alignment the pawl 68 has been shifted longitudinally of the escapement drum by the cam 81 and thus the pin 123 has been moved out of the path of the apex 124 of cam 122.

The inking of the type wheel 76 is accomplished by means of an ink supply roll 126 which is rotatably mounted on pivoted arm 127 and which is biased into engagement with the periphery of the type wheel 76 by means of spring 128. Thus as the type wheel is rotated, the characters carried on the periphery thereof are successively inked by engagement with the inked roll 126 and are thus conditioned for transferring an impression to the tape by operation of the printing platen 102.

Although a specific embodiment of the invention has been disclosed and described herein, it is to be understood that the apparatus and the manner in which it operates are capable of rearrangement, modification, or substitution without departing from the spirit of the invention and within the scope of the appended claims.

What is claimed is:

1. In a printing telegraph receiver, a type wheel, means for rotating the type wheel, a ribbed drum for controlling the rotation of the type wheel, a pawl for controlling the drum, signal controlled means for oscillating the pawl, and means for shifting the pawl longitudinally of the drum.

2. In a printing telegraph receiver, a type wheel, means for rotating the type wheel, a ribbed drum associated with the type wheel, a pawl oscillatable in two directions for controlling the extent of rotation of the drum, and means for oscillating the pawl.

3. In a printing telegraph receiver, a type wheel, means for rotating the type wheel, a ribbed drum associated with the type wheel, a pawl for controlling the drum, means for shifting the pawl longitudinally of the drum, and means responsive to signal impulses for rocking the pawl intermittently.

4. In a printing telegraph receiver, a type wheel, means for rotating the type wheel, a drum associated with the type wheel having a plurality of ribs of varying lengths, a pawl for controlling the drum, and means for associating the pawl with different ribs and with different portions thereof during a signaling cycle.

5. In a printing telegraph receiver, a type wheel, means for rotating the type wheel, a drum associated with the type wheel having a plurality of ribs beginning at various points longitudinally of the drum and terminating at an end thereof, a pawl for controlling the drum, means for rocking the pawl, and means for shifting the pawl longitudinally of the drum toward areas having increasing numbers of ribs.

6. In a printing telegraph machine, a type wheel, means for rotating the type wheel, a drum associated with the type wheel having a plurality of ribs extending longitudinally thereof, and a pawl for controlling the drum having escape teeth, one of said teeth being displaced longitudinally of the drum with respect to the other tooth.

7. A selecting mechanism for printing telegraph apparatus comprising a magnet having an armature, a rotatable cam shaft controlled by said magnet, a latch controlled by said armature, a pawl controlled jointly by said cam shaft and said latch, and a ribbed escapement drum controlled by said pawl.

8. A selecting mechanism for printing telegraph apparatus comprising a magnet having an armature, a rotatable cam shaft controlled by said magnet, a latch controlled by said armature, a pawl capable of rotational and translational movements, means on said cam shaft for effecting both of said movements, and means controlled by said latch for blocking one of said movements.

9. In a selecting mechanism for printing telegraph apparatus, a signal responsive magnet having an armature, a rotatable cam shaft, a cam on said cam shaft for rocking said armature independent of signals, a latch lever carried by said armature, an escapement drum, a pawl associated therewith whose position is determined by said magnet armature, a cam on said cam shaft for rocking said pawl, and a lever carried by said pawl in cooperative relation to said latch lever.

10. In a selecting mechanism for printing telegraph apparatus, an escapement drum having external ribs longitudinally thereof, a pawl straddling said drum for cooperation with the ribs thereof, a selector magnet having an armature, and a rotatable shaft carrying a plurality of cams, one of said cams operable to rock said armature, another of said cams operable to rock said pawl, and another of said cams operable to shift said pawl longitudinally of said drum.

11. In a selector for stopping a rotatable shaft, a cylinder carried by said shaft having projections thereon, a reciprocable pawl disposed to be moved in two different planes with respect to the cylinder in cooperation with the projections to determine the rotation of said shaft, signal responsive means for controlling the movement

of said pawl in one of said planes, and locally actuated means for controlling the movement of said pawl in the other of said planes.

12. In a telegraph receiver, a type wheel, a drum integral with said type wheel having variably arranged projections on the periphery thereof, pivotally and translatablely movable means operative with said drum for controlling rotation thereof in steps to determine its position and the consequent position of the type wheel, and a signal responsive selector mechanism operative directly on said means to control pivotal movement according to signals and translational movement independently of signals whereby the selective position of the drum and type wheel may be determined.

13. In a telegraph receiver, a type wheel, means having a variable number of stop positions for determining the position of said type wheel, a cam shaft, an electromagnet responsive to line signals, and means under the joint control of said cam shaft and said electromagnet for determining the stop position of said means.

14. In a selector, a rotatable type wheel, a cylinder supporting a plurality of projections, a pawl, rotatable means for effecting relative movement between said cylinder and said pawl, and signal control means for controlling the cooperative relation between said cylinder and said pawl to determine the rotation of said type wheel.

15. In a printing telegraph receiver, a type wheel, means controlling the position of said type wheel including a drum having a plurality of projections and mechanism cooperating with said projections, a printing element, and signal controlled mechanical means for operating said mechanism and said printing element.

16. In a printing telegraph receiver, a type wheel, means controlling the position of said type wheel including a drum having a plurality of projections, an electromagnet, a cam shaft released by said electromagnet for controlling the operation of said means in accordance with the operation of said electromagnet, and a printing element operated from said cam shaft following the operation of said means.

17. In a printing telegraph receiver, a type wheel, means controlling the position of said type wheel including a drum having a plurality of projections, an electromagnet having an armature, mechanical means for moving said armature into magnetic relation to said electromagnet, and an escapement mechanism controlled by said armature in accordance with the energization of said electromagnet for determining the position of said type wheel through said drum.

18. In a printing telegraph receiver, a type wheel, means controlling the position of said type wheel including a drum having a plurality of projections and a cooperating pawl, an electromagnet having an armature, mechanical means for moving said armature into magnetic relation to said electromagnet, and means under the control of said armature in accordance with the energization of said electromagnet for controlling the cooperative action between said pawl and said drum to determine the position of said type wheel.

19. In a printing telegraph receiver, a type wheel, means controlling the position of said type wheel including a drum having a plurality of projections, an electromagnet having an armature, a pawl movable longitudinally of said drum, and means under the control of said armature in accordance with the energization of said electro-

magnet for operating said pawl in its several positions with respect to said drum to determine the position of said type wheel.

20. In a printing telegraph receiver, a type wheel, means controlling the position of said type wheel including a drum having a plurality of projections, a pawl cooperatively associated with the projections on said drum, means for effecting relative movement between said pawl and said drum periodically during each signal interval, and an electromagnet responsive to line signals for determining the relative movement between the drum and pawl.

21. In a printing telegraph receiver, a type wheel, means controlling the position of said type wheel including a drum having a plurality of projections, a pawl cooperatively associated with the projections on said drum, cam means for effecting relative movement between said pawl and said drum periodically during each signal interval, and an electromagnet responsive to line signals for determining the relative movement between the drum and pawl.

22. In a printing telegraph receiver, a type wheel, means controlling the position of said type wheel including a drum having a plurality of projections, a pawl cooperatively associated with the projections on said drum, cam means for oscillating said pawl with respect to the projections on said drum periodically during each signal interval, and an electromagnet responsive to line signals for controlling the oscillation of said pawl and thus the escapement of said drum.

23. In a printing telegraph receiver, a type wheel, means controlling the position of said type wheel including a drum having a plurality of projections, an electromagnet having an armature, a pawl, mechanical means for progressively moving said pawl into cooperative relation with said projections, and means cooperating with said pawl following each progressive movement thereof in response to the control of said electromagnet for determining the position of said type wheel.

24. In a printing telegraph receiver, a type wheel, means for rotating the type wheel, a drum ribbed on its periphery associated with the type wheel, a pawl oscillatable in two directions for controlling the extent of movement of the drum, means for oscillating the pawl, and a single electromagnet for initiating the operation of the receiver and subsequently controlling the action of the pawl with respect to the drum whereby the degree of rotation of the type wheel is controlled.

25. In a telegraph receiver, a rotatable shaft, a type wheel fixed to said shaft, an externally toothed member also fixed to said shaft, pivotally and translatablely movable means cooperative with said member for controlling rotation thereof in steps to determine its position and the consequent position of the type wheel, and a signal selector mechanism responsive to permutation code signals and operative directly on said means to control pivotal movement according to signals and translational movement independently of signals whereby the selective position of the member and type wheel may be determined.

26. In a telegraph receiver, a rotatable shaft continuously under torque, a type wheel fixed to said shaft, a variably toothed escapement member also fixed to said shaft, pivotally and translatablely movable means cooperative with said member for controlling its position and the consequent position of the type wheel, and a signal selector mechanism responsive to permutation

code signals and operative directly on said means to control pivotal movement according to signals and translational movement independently of signals whereby the selective position of the member and type wheel may be determined.

27. In a telegraph receiver, a type wheel, a shaft to which said type wheel is secured, means also secured to said shaft having variably arranged stop projections on the periphery thereof for determining the position of said type wheel, a cam shaft, an electromagnet responsive to line signals, and means under the joint control of said cam shaft and said electromagnet for determining the stop position of said means.

28. In a telegraph receiver, a first shaft, a cam assembly operable intermittently by said shaft, electromagnetic means for controlling the rotation of said cam assembly, a second shaft, a variably toothed escapement member fixed to said shaft, a type wheel carried by said second shaft in fixed angular relation to said escapement member, and means controlled jointly by said cam assembly and said electromagnetic means for controlling said escapement member and consequently said type wheel.

29. In a telegraph receiver, an electromagnet responsive to line signals, a cam shaft operable in signal controlled cycles, a type wheel, means having a variable number of stop positions per cycle of said cam shaft for determining the position of said type wheel, and means under the joint control of said cam shaft and said electromagnet for determining the stop position of said means.

30. In a telegraph receiver, a type wheel, means for rotating the type wheel, a variably toothed escapement member for controlling the rotation of the type wheel, a pawl for controlling the rotation of the escapement member, and means for producing relative motion of translation between said pawl and said escapement member.

31. In a telegraph receiver, a type wheel, means for rotating the type wheel, a variably toothed escapement instrumentality for controlling the rotation of the type wheel, a pawl for controlling the rotation of the escapement instrumentality, and cam means for imparting oscillatory movement to said pawl and for producing relative motion of translation between said pawl and said escapement instrumentality.

32. In a telegraph receiver, a magnet having an armature, a rotatable cam assembly controlled by said magnet, a latch controlled by said armature, a pawl controlled by said latch, an externally toothed instrumentality controlled by said pawl, a type wheel controlled by said externally toothed instrumentality, means included in said cam assembly for oscillating said pawl and means also included in said cam assembly for producing relative motion of translation between the said pawl and said externally toothed instrumentality.

33. In a printing telegraph apparatus, a type wheel, means for rotating the type wheel, an instrumentality connected to said type wheel having variably arranged peripheral projections, a member movable according to two characteristics for controlling the extent of rotation of said instrumentality, and signal controlled rotatable means for controlling the motion of said member.

34. In a printing telegraph apparatus, a type wheel, means for rotating the type wheel, an instrumentality connected to said type wheel having variably arranged peripheral projections, an escapement mechanism movable according to two

characteristics for controlling the extent of rotation of said instrumentality, and signal controlled rotatable means and signal responsive electromagnetic means for jointly controlling the motion of said escapement mechanism.

35. In a printing telegraph apparatus, a type wheel, means for rotating the type wheel, an instrumentality connected to the type wheel having on the periphery thereof rows of projections varying in number according to a mathematical progression, escapement means operable with reference to successive rows of said projections for controlling the rotation of said instrumentality and consequently the rotation of said type wheel, signal controlled rotatable means for progressively conditioning said escapement means for rotation controlling cooperation with successive rows of said projections, and signal responsive electromagnetic means for controlling said escapement means jointly with said rotatable means.

36. A telegraph receiver in which a printed record is made from a typewheel, means to position the typewheel comprising stops, one for each printing position of the typewheel, said stops being located in groups, each group having double the number of stops of the previous group, a

selector mechanism to selectively operate said groups of stops progressively from a smaller to a larger group to selectively position the typewheel whereby the degree of motion of said typewheel corresponding to the actuation of said last named stops decreases progressively and printing means to cooperate with said typewheel to effect printing, means to operate said printing means, and means to free said printing means from said typewheel before said typewheel positioning means comes to its normal stop position.

37. In a printing telegraph machine, a plurality of type faces, selecting mechanism comprising a plurality of stops adapted to be selectively controlled in response to code signals, means having a predetermined cycle of operation arranged to act upon said stops to position a desired type face into ultimate printing position when the last code signal is received and before a cycle of operation has been completed, printing means to cooperate with said type faces to effect printing, means to operate said printing means, and means to free said printing means from said type faces before said selecting mechanism and stop positioning means come to normal stop positions.

WALTER J. ZENNER.