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PRINTING TELEGRAPH

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FIG. 1

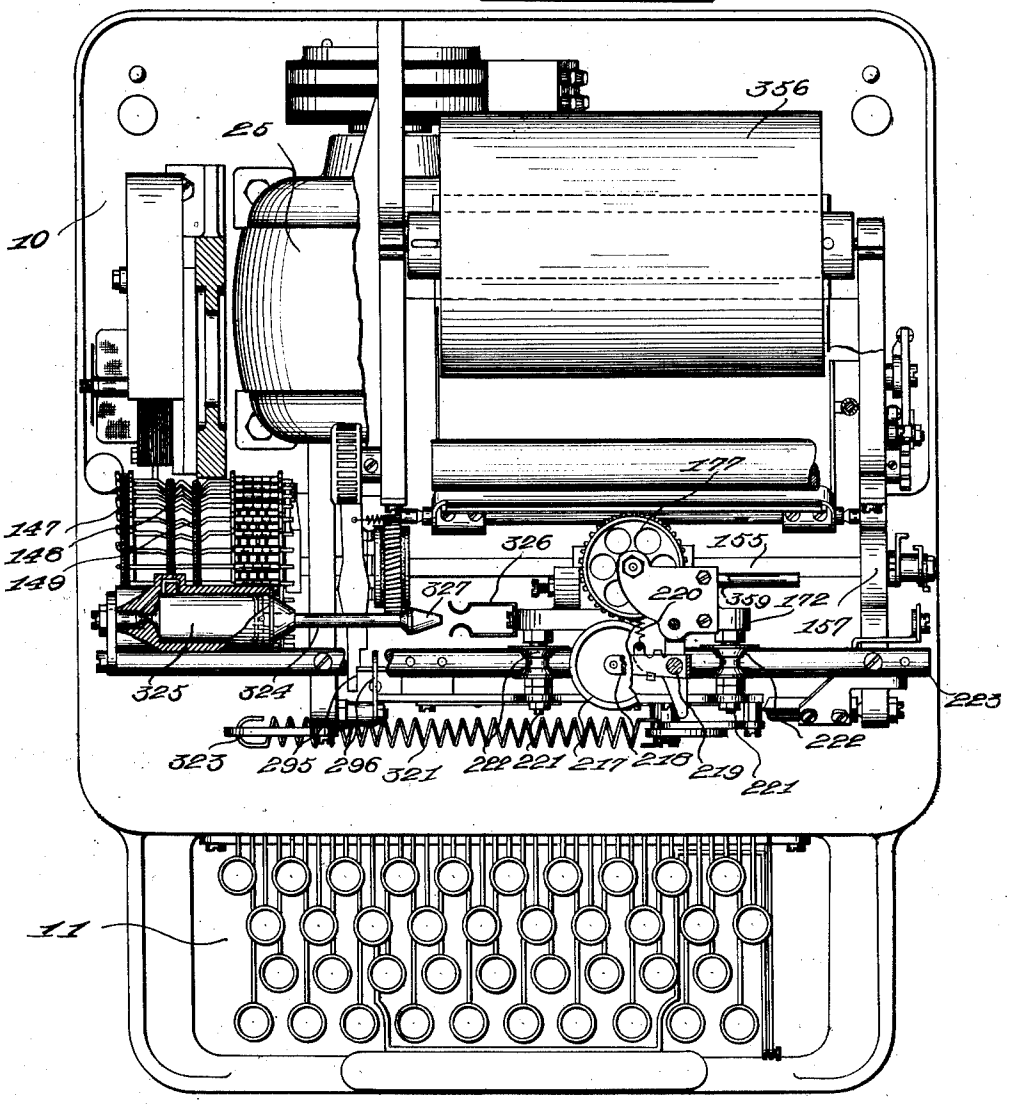
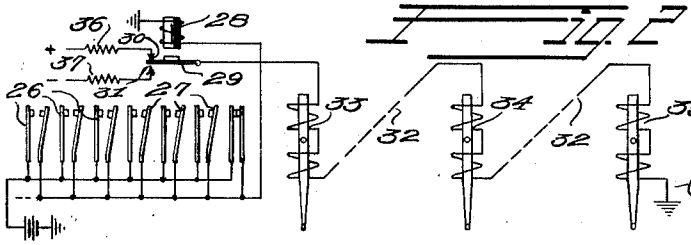


FIG. 2



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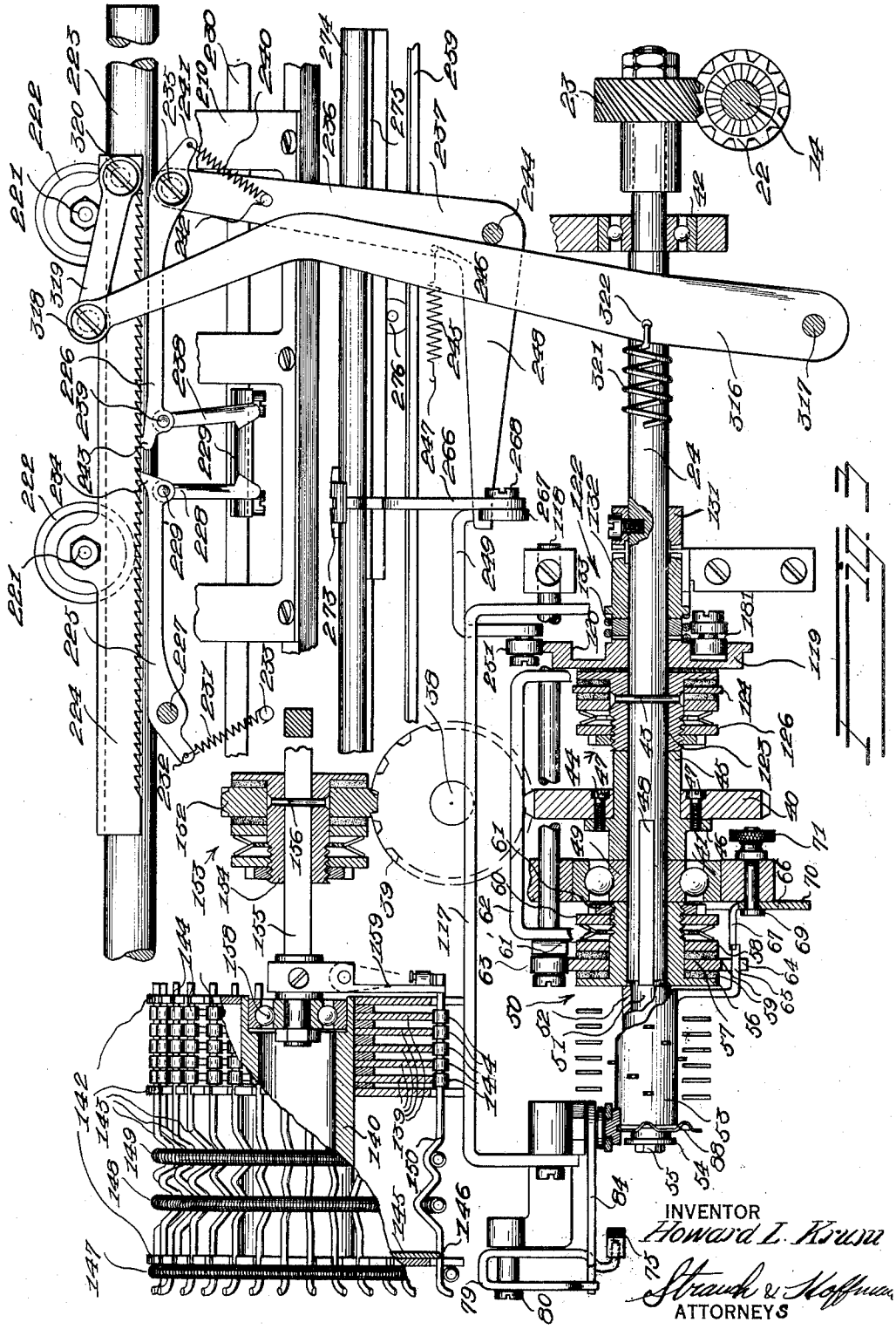

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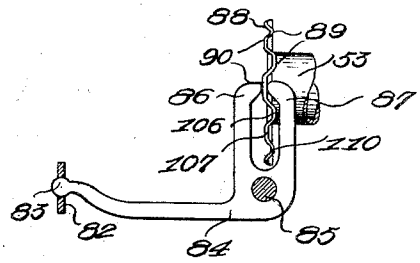

Fig. 5

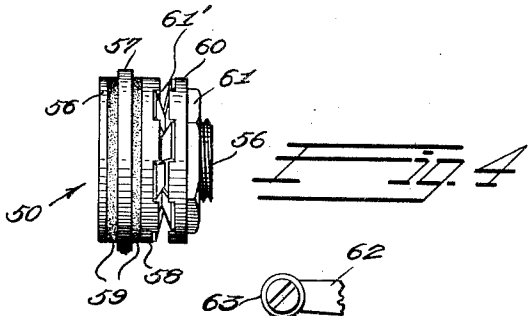

Fig. 4

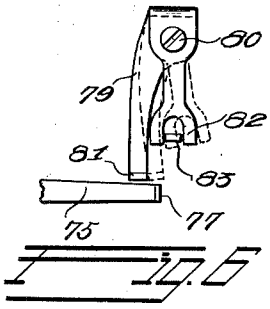

Fig. 6

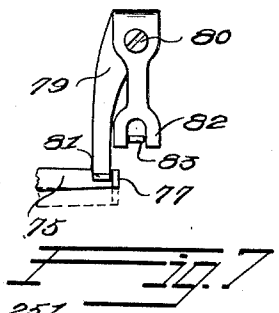

Fig. 7

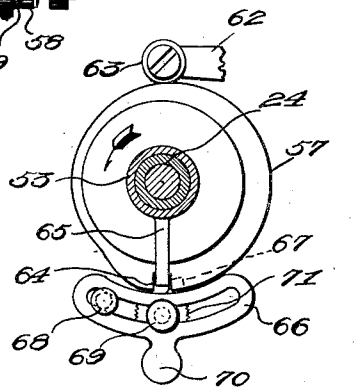

Fig. 8

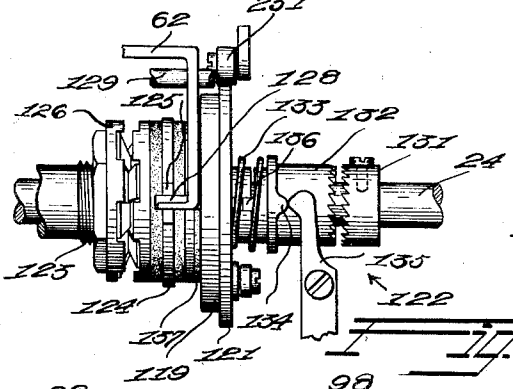

Fig. 9

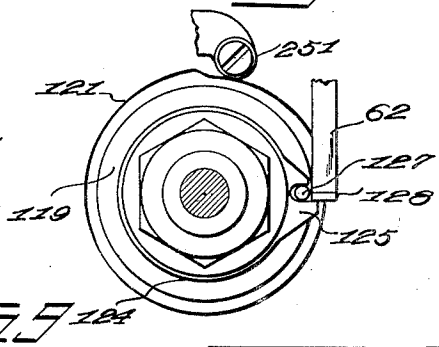

Fig. 10

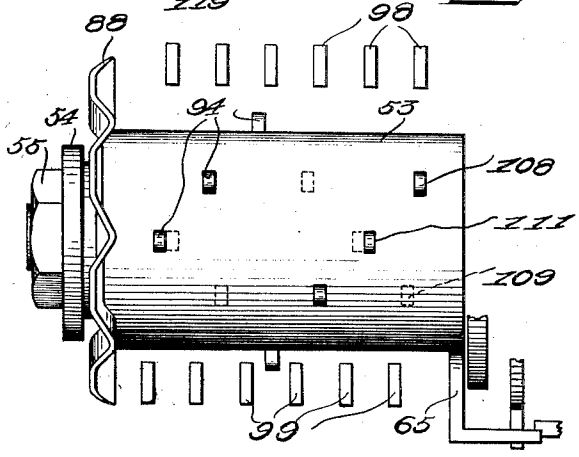

Fig. 11

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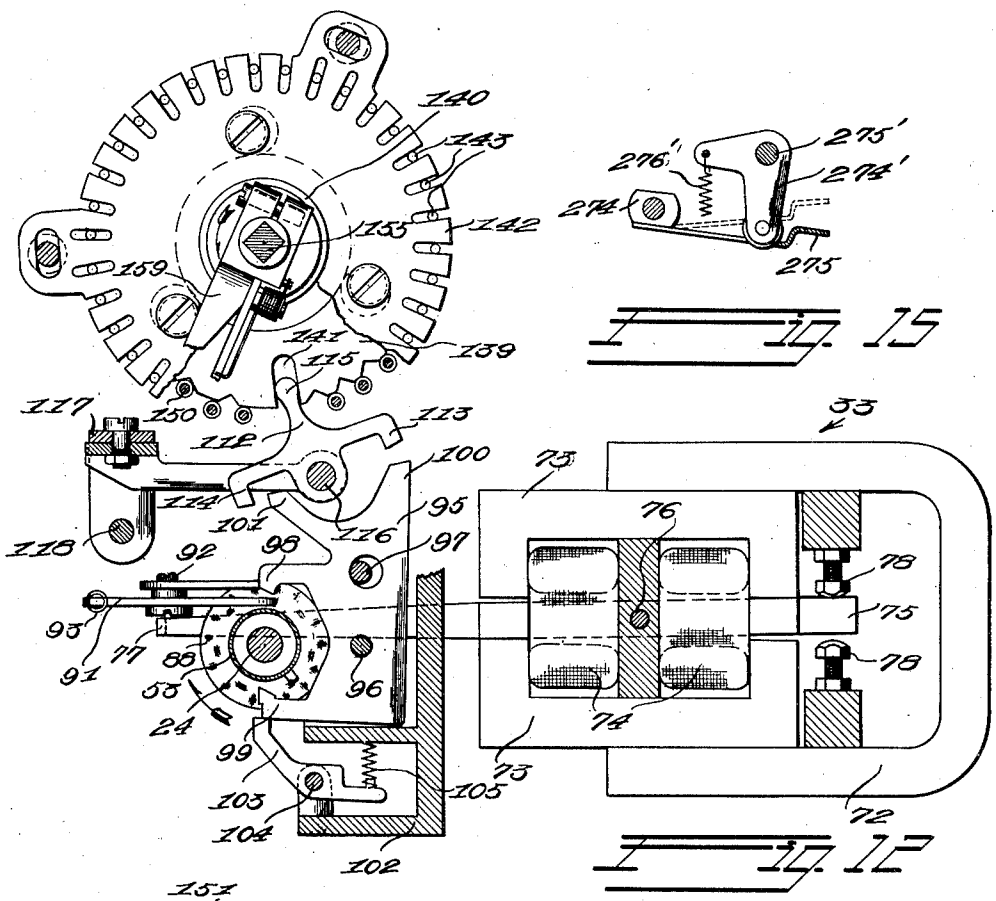

Fig. 12

Fig. 15

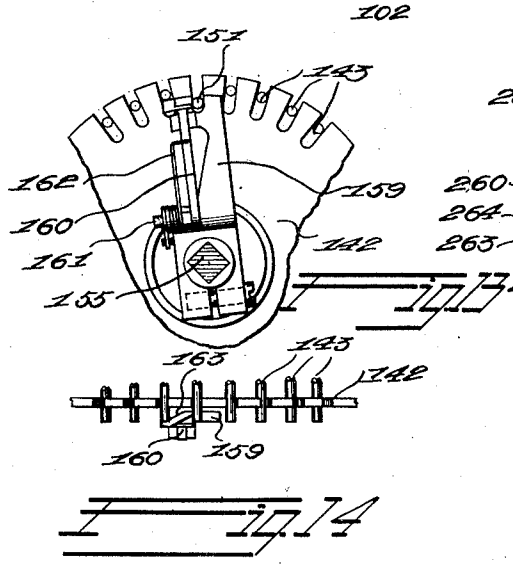

Fig. 14

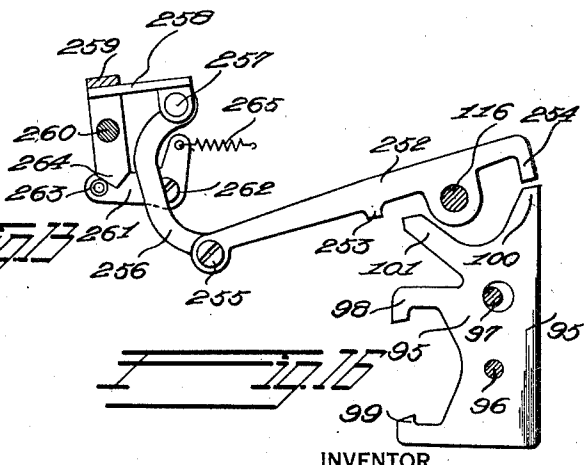

Fig. 16

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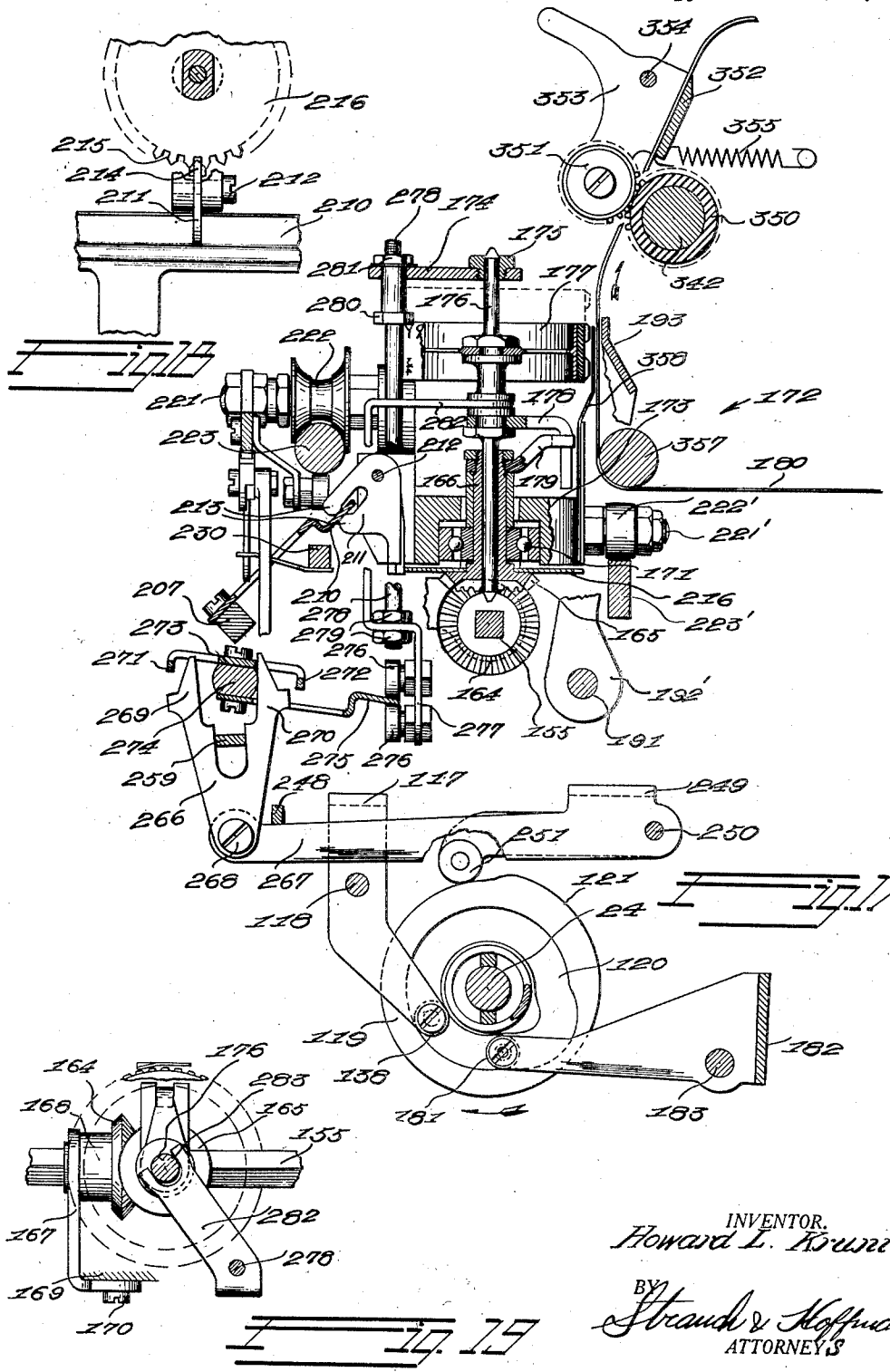

FIG. 14

FIG. 17

FIG. 19

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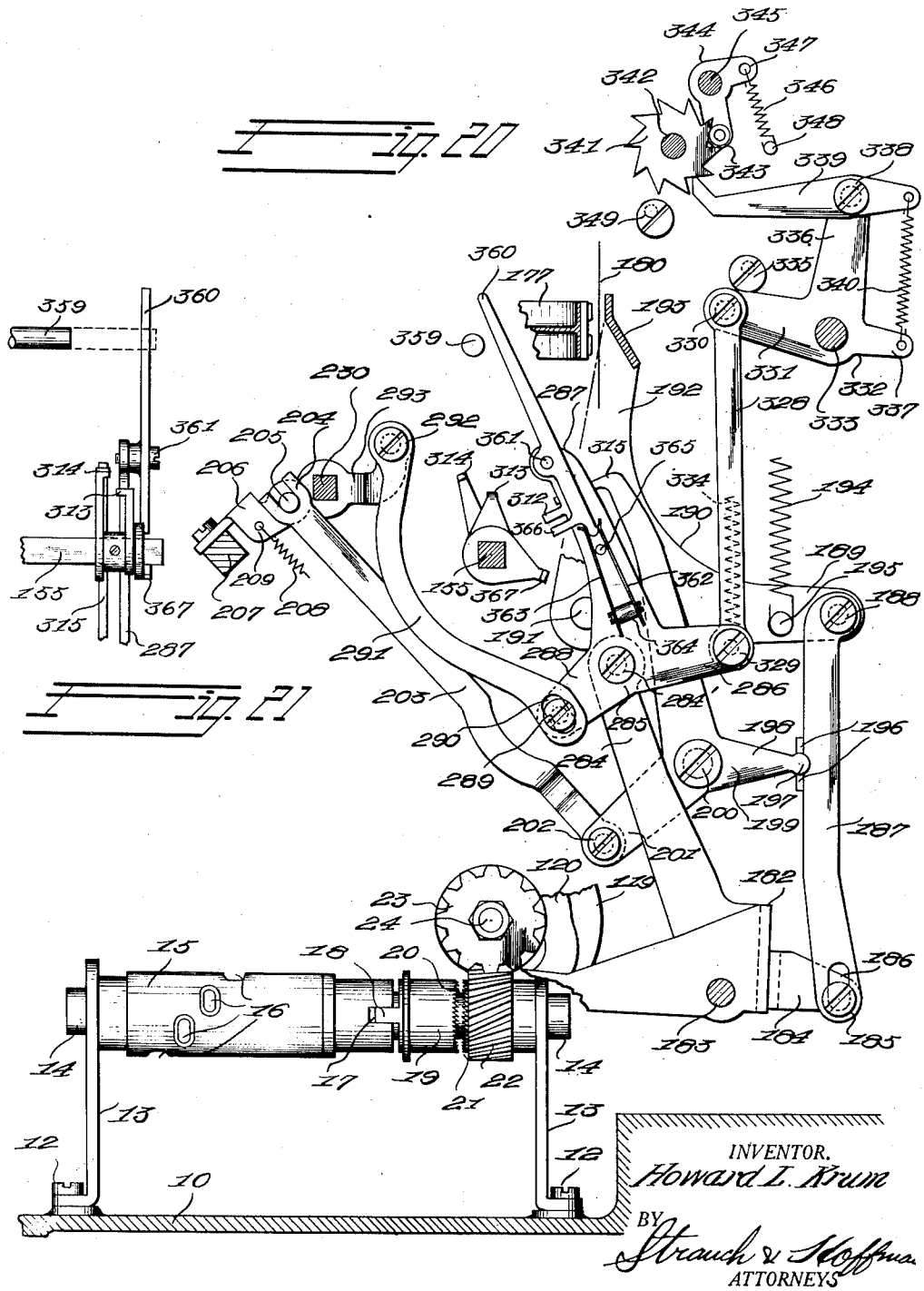

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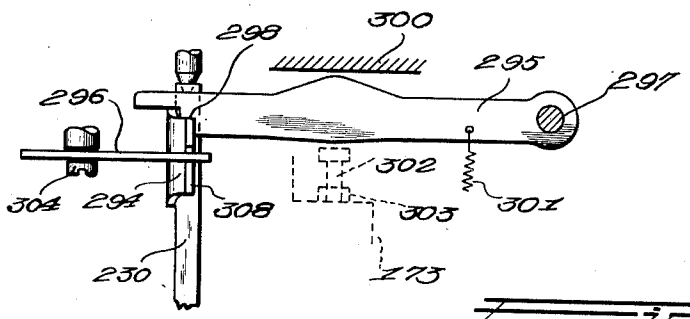

Fig. 22

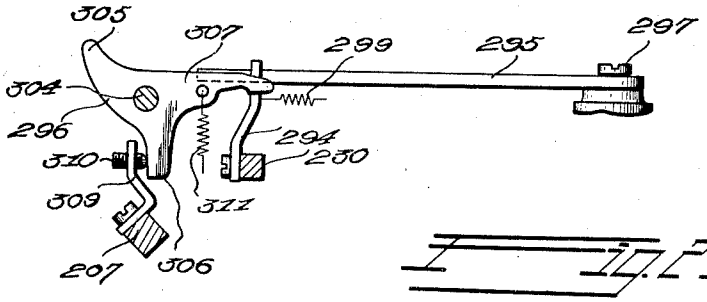

Fig. 23

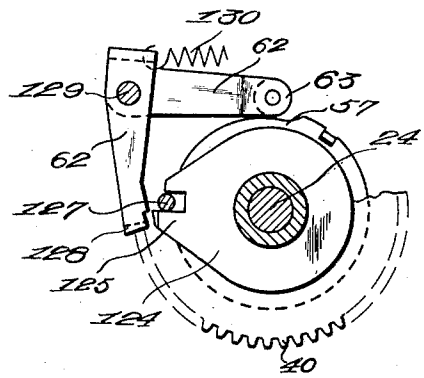

Fig. 24

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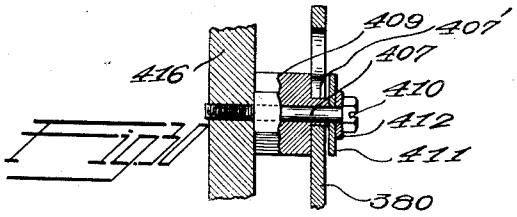
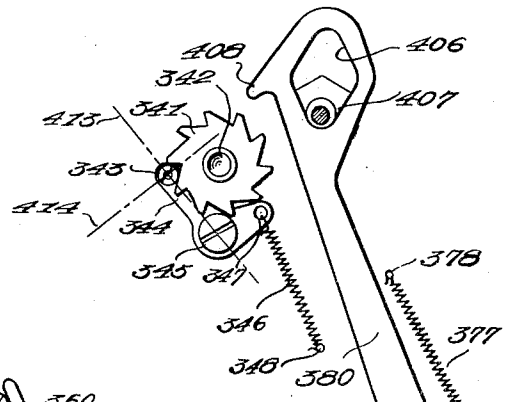


Fig. 37



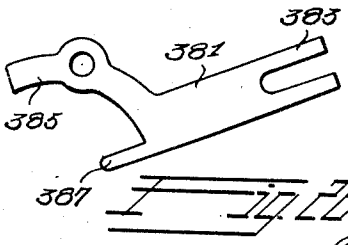


Fig. 26

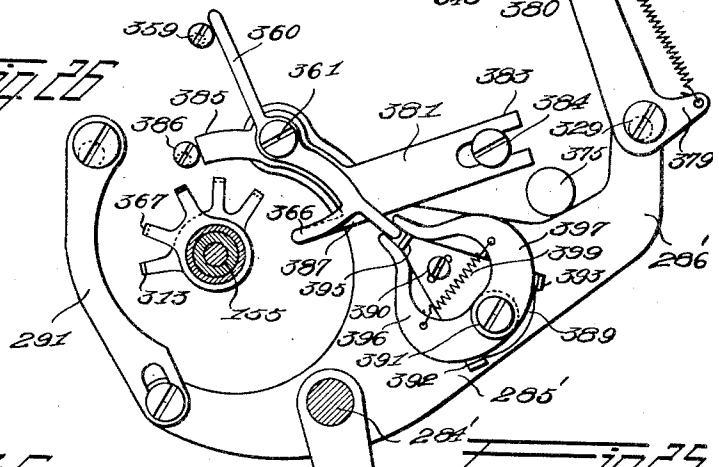


Fig. 25

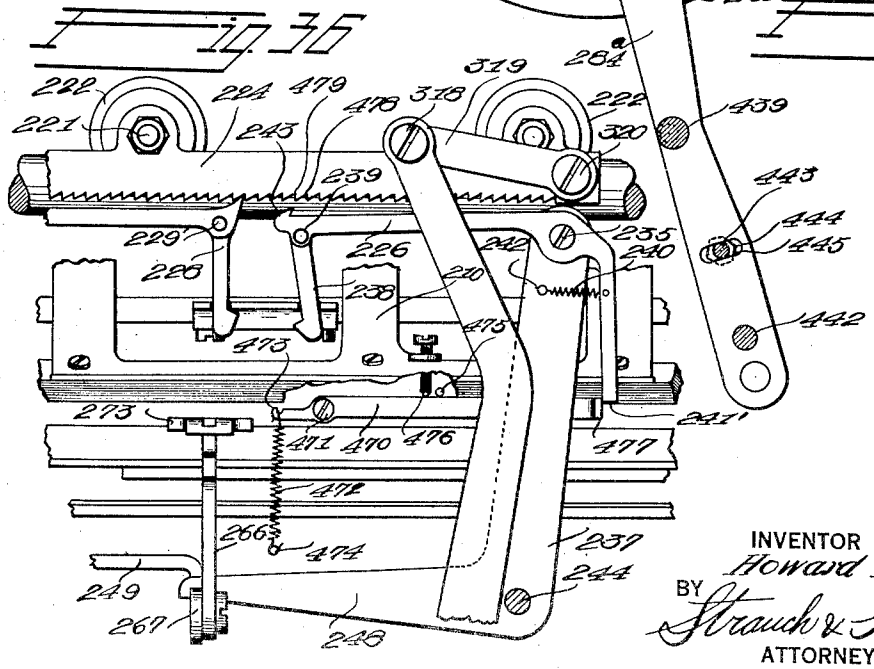


Fig. 36

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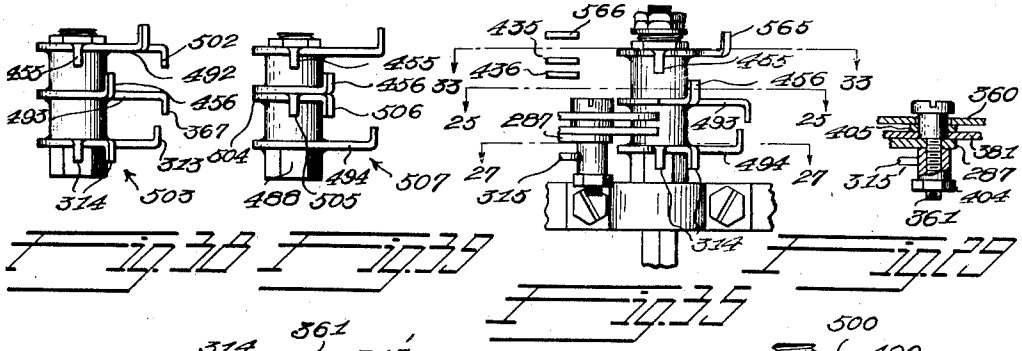

Fig. 30 Fig. 39

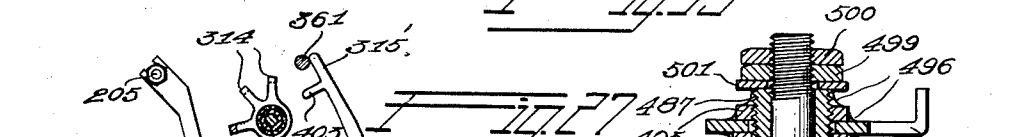

Fig. 35

Fig. 29

Fig. 27

Fig. 28

Fig. 33

Fig. 37

Fig. 47

Fig. 43

Fig. 44

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Fig. 45

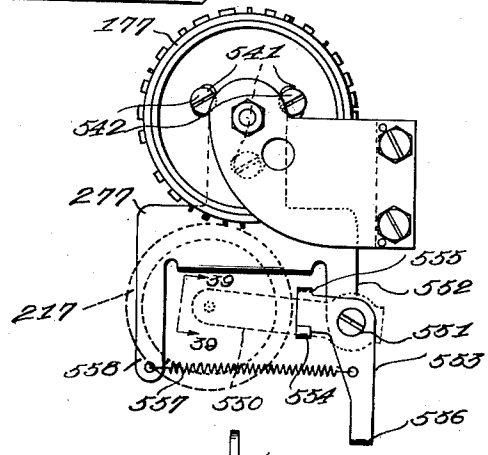


Fig. 37

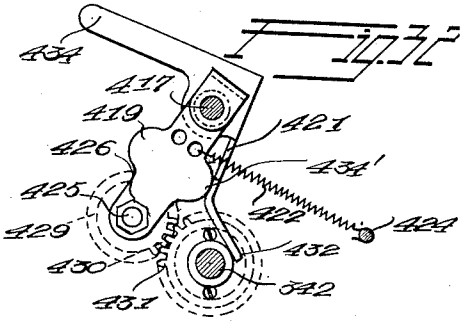


Fig. 31

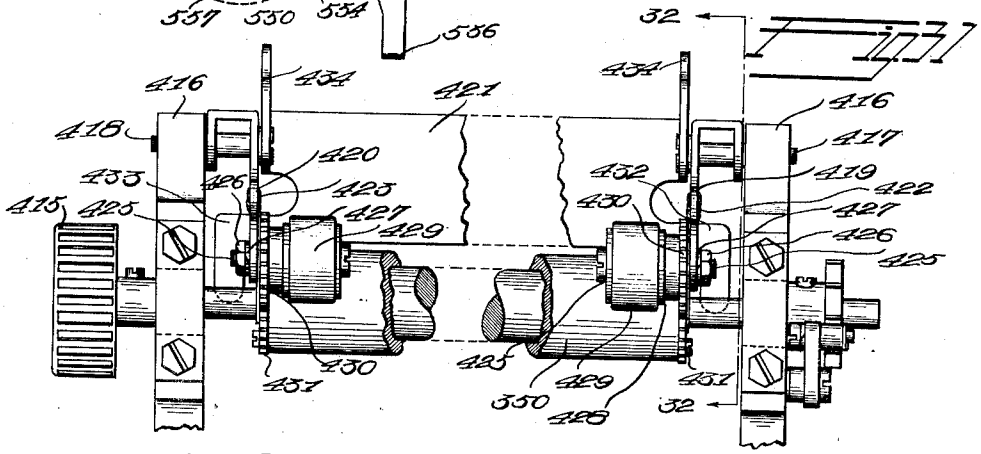


Fig. 34

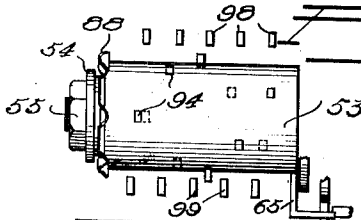


Fig. 42

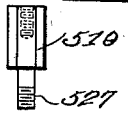


Fig. 46

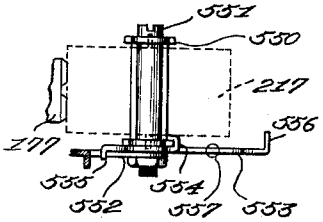


Fig. 40

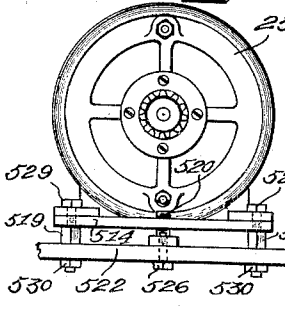
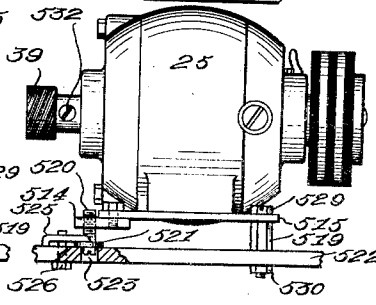


Fig. 41



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Patented Oct. 25, 1932 1,884,754

UNITED STATES PATENT OFFICE

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PRINTING TELEGRAPH

Application filed January 27, 1930. Serial No. 423,781.

My present invention relates to selecting and recording mechanisms and is especially suitable for printing telegraphs particularly of a bulletin printing type, but is also equally applicable to various other types of selective register devices.

Bulletin printing or broad tape printers are usually employed as news printers in offices, where comparative quietness of operation is very desirable. Accordingly an object of my invention is to provide a telegraph printer with cushioning devices to minimize the noise of printing operations.

Devices of the character here involved generally include a printing platen which carries the paper or other material upon which the printing is to be accomplished, a printing mechanism for the impression of the desired character on the paper and a selecting mechanism which controls the printing mechanism. Another object of my invention is to provide novel means for shifting the type carrying means for letter spacing with respect to a paper platen and at the same time maintain it at all times in operative relation with the selecting mechanism.

Although it is usually desirable to operate a transmitter and printer in combination, conditions may arise where it is desirable to operate the transmitter or the printer alone. Accordingly, a further object of my invention is to provide means in a device of the above character for arranging the keyboard and sender as a detachable unit from the printer and vice versa, so that they may be used singly or together.

It may be desirable to operate a page printer by tape printer signals which make no provision for line shift and carriage return operations essential in a page printer, but not used in a tape printer.

Accordingly, a still further object of my invention is to provide means operative within certain limits in a line of printing for automatically returning the carriage and for line feeding in addition to a normal carriage return operative in response to predetermined code combinations of impulse conditions whereby a page printer may be operated on tape printer signals.

Another object of my invention is to provide a novel simplified typewheel printer in which a paper platen is movable with respect to the typewheel for printing operations.

In printers of this character, in order to provide for high speed operation, it is desirable that the line magnet be required to perform a minimum of work. To this end, provision is made in the present device for operating the magnet as a relay by leaving its armature free to move between its two limits without performing any work.

Further objects of my invention are to provide a simplified printing device in which receiver may comprise a selecting mechanism and a novel typewheel adjusting mechanism for bringing the type faces into operative position, novel spring operated impressing mechanism for bringing the printing platen into printing relation with a selected type face, novel spacing mechanism for shifting the typewheel carriage along the line of printing, novel case shift mechanism for changing the relation of the typewheel with respect to the platen, novel normal and automatic carriage returns, a novel paper feed, and novel cushioning means for preventing noise by printing operations.

Still a further object of my invention is to provide a novel printing mechanism in which all of the functions or stunt operations of the printer are controlled by the same selecting mechanism which controls the selection of the type face for printing.

A further object of my invention is to provide an interchangeable function control member whereby a machine of the type herein disclosed may be readily modified to perform various functions.

Another object is to provide a case shift mechanism adapted to operate in response to a full code combination of impulse conditions.

Still another object is to provide means for suppressing printing operations during carriage return operations.

Another object is to provide means for suppressing spacing operations during case-shift operations.

Further objects of the invention are such

as may be obtained by the utilization of the principles herein set forth, and as are defined by the scope of the appended claims.

In the drawings, Figure 1 is a top plan view of a preferred form of my invention with transmitting keyboard, a portion thereof being broken away and in section.

Figure 2 is a circuit diagram showing diagrammatically an arrangement of one transmitter and three printers embodying my invention on a news circuit, one of the printers being a home recorder for the transmitter.

Figure 3 is a front elevational view of the preferred embodiment of my invention partially in elevation and partially in section.

Figure 4 is an edge elevational view of one of the friction clutch units embodied in my invention.

Figure 5 is a fragmentary vertical sectional view showing details of the flutter cam and flutter lever embodied in the invention.

Figure 6 is a fragmentary elevational view showing the end of the armature and the operating end of the bell crank as embodied in the present invention.

Figure 7 is a view similar to Figure 6 showing the elements of Figure 6 in an alternative position.

Figure 8 is a vertical sectional view with some parts in elevation, particularly disclosing the orientation device, as embodied in the invention.

Figure 9 is a fragmentary elevational view showing the combination clutch embodied in the present invention.

Figure 10 is a vertical sectional view with some parts in elevation showing the combination clutch and the stop means associated therewith.

Figure 11 is an enlarged detail view disclosing the pin barrel, signal levers and stop arm, as embodied in the invention.

Figure 12 is a vertical sectional view disclosing the signal receiving, recording, transferring and indexing mechanism, as embodied in the invention.

Figure 13 is a fragmentary view partially in section and partially in elevation particularly disclosing the index stop arm embodied in the invention.

Figure 14 is a broken top edge view of the mechanism shown in Figure 13.

Figure 15 is a detail view partly in section and partly in elevation showing the case-shift jockey.

Figure 16 is an elevational view partially in section showing the case-shift transfer mechanism embodied in the invention.

Figure 17 is a vertical sectional view particularly disclosing the carriage, the typewheel and the case-shift mechanism embodied in the invention.

Figure 18 is a detail view disclosing the typewheel lock.

Figure 19 is a detail view showing the arm for case-shifting the typewheel.

Figure 20 is a detail sectional view, partly in elevation, showing details of mechanism for performing the printing operation, the paper feed operation, and the carriage return.

Figure 21 is a detail elevational view showing the interference devices for effecting the return of the carriage.

Figure 22 is a detail view disclosing the carriage return stop and latch means.

Figure 23 is another detail view of the apparatus of Figure 22, as seen at right angles thereto.

Figure 24 is a detail view partly in section and partly in elevation, particularly disclosing the trip bail embodied in the invention.

Figure 25 is a sectional view, taken on the line 25—25 of Figure 35, showing details of modified carriage return and line feed mechanism.

Figure 26 is a detail view showing one of the testing members of Figure 25.

Figure 27 is a sectional view, taken on the line 27—27 of Figure 35, showing details of a modified print-suppression mechanism.

Figure 28 is a detail view of the assembly of the adjusting screw of Figure 27.

Figure 29 is a detailed view of the stud member of Figure 35 showing the assembly of its parts.

Figure 30 is a detail view of the adjustable stud of Figure 25 and shows the assembly of the stud and associated structural elements.

Figure 31 is an elevational view showing a modified construction of presser rolls and paper knife.

Figure 32 is a side elevational view of the mechanism of Figure 31, partially in section, taken on the line 32—32 of Figure 31.

Figure 33 is a sectional view, taken on the line 33—33 of Figure 35 showing details of a modified case shift mechanism.

Figure 34 is a detail view of a modified pin barrel having five pairs of pins and suitable for use with the case shift mechanism of Figure 33.

Figure 35 is a plan view showing the right end of the square stop shaft with the modified arrangement of the rotary abutment members and five testing elements.

Figure 36 is a fragmentary front elevational view showing a part of the mechanism of Figure 3, modified to include means for effecting space suppression.

Figure 37 is a longitudinal sectional view through the shaft, journal and rotary abutments of Figure 35, showing the manner of assembling the parts thereof.

Figures 38 and 39 are detail views of modified rotary abutment units.

Figures 40 and 41 are detail views showing

mechanism for adjusting the height of the motor shaft.

Figure 42 is a detail view of one of the posts shown in Figures 40 and 41.

Figure 43 is an elevational view partially in section showing a modified elevator mechanism for the typewheel.

Figure 44 is a detail view of the mechanism of Figure 43 showing the articulation of the typewheel shaft with the elevator slide.

Figure 45 is a plan view showing details of the mechanism for mounting the ink roller.

Figure 46 is an elevational view showing further details of the mechanism of Figure 45 and illustrating the ready replacement feature of the ink roller.

Figure 47 is a detail view of the ink guard shown in Figure 43.

The keyboard and sender

In Figure 1, the keyboard and sender which may correspond in all fundamental details to the keyboard and sender disclosed in the U. S. Patent 1,595,472, issued to me, August 10th, 1926, comprises a cast metal base or frame 10 provided at the front thereof with a keyboard 11. Extending vertically from the base 10 and secured thereto by means of screws 12 are a pair of uprights 13 which support a shaft 14 therebetween as shown in Figure 20. Loosely mounted on the shaft 14 is a cam drum 15 which is provided with a series of cam slots 16. As the cam drum 15 is rotated, the slots 16 successively cooperate with a set of switch controllers (not shown) and as described in the above mentioned patent control the transmission of code combinations of impulse conditions in accordance with the keys operated. The cam drum 15 has at one end thereof a slot 17 which embraces an extension 18 on a sleeve member 19 loosely mounted on the shaft 14 adjacent the cam drum 15. The connection between cam drum 15 and the sleeve member 19 is such that the two members 15 and 19 rotate together but sleeve member 19 may slide longitudinally with respect to the shaft 14. The sleeve member 19 is provided with teeth 20 which are adapted to cooperate with teeth 21 on a gear 22 which is fixed to the shaft 14. The gear 22 meshes with a spiral gear 23 which is fixed to the main shaft 24 of the printer and which is driven continuously at uniform speed by the motor 25, (Figure 1) of the printer. As described in the above mentioned patent, the member 19 is normally disengaged from gear 22 and accordingly does not rotate. On the operation of any key lever member 19 is moved longitudinally to engage the teeth thereof with the teeth of gears 22 and cam drum 15 is thereupon driven through one revolution to transmit the code combination of impulse conditions in accordance with the operated key.

Figure 2 is a diagram of preferred electrical connections employed in my system. The transmitter contact arms 26 are connected together and to battery and through a sending relay 28 to ground. As will be understood, contacts 26 and their adjacent contacts 27 engage in various combinations under control of drum 15 and the operated key. The armature 29 of the relay 28 cooperates with contact 30 or contact 31 to extend positive or negative battery over a line 32. This line may include a home station polar magnet 33 and extend to a mid-line station polar magnet 34 and a terminal station polar magnet 35. A resistance 36 is included in the connection between positive battery and contact 30 and a similar resistance 37 is included in the connection between negative battery and contact 31. The operating circuit extends from positive (or negative) battery through resistance 36 (or 37) contact 30 (or 31), armature 29, polar magnet 33, line 32, polar magnet 34, line 32 and polar magnet 35 to ground. The system thus is organized to transmit from the contacts 26, 27 for variably operating the sending relay 28 which in turn controls the transmission of the code combinations through the home station polar magnet 33 and the two polar line magnets 34 and 35 at the different stations.

At the mid line and terminal stations, or at any station where sending is not required, the keyboard and sender may be omitted. Where the home printer is not needed, the printer unit may be lifted from the keyboard base, the gears 22 and 23 automatically disengaging.

Signaling receiving and storing

Motor 25 (Figure 1) drives a shaft 38 (Figure 3) which has secured thereto a spiral gear 39. In mesh with the spiral gear 39 is a spiral gear 40 on the main shaft 24 which is journaled in bearings 41 and 42. Mounted on the main shaft 24 and fixed thereto by means of a pin 43 is a friction clutch unit 44, the purpose of which will appear hereinafter. In abutting relationship with the clutch 44, is the sleeve member 45 having a flange 46 to which the gear 40, which drives the shaft 24, is secured by means of screws 47. The sleeve 45 is keyed into the key way 48 to prevent it from turning on the shaft 24. The journal member or inner ball race 49 of the bearing 41 fits closely upon the shaft 24 and abuts the sleeve 45 and is keyed into the key way 48. A friction clutch unit 50, to be described in detail hereinafter, fits closely upon the shaft 24 and abuts the race 49 and is also keyed into the key way 48. From a point within the clutch 50, the shaft 24 has an extension of reduced diameter as shown at 51. A sleeve 52 surrounds the extension 51 and loosely mounted on this sleeve is a hollow sleeve member 53 which will be referred to hereinafter as the pin barrel.

The pin barrel 53 is adapted to undergo two forms of motion; namely, rotation about its longitudinal axis and reciprocation along said axis. The manner in which the pin barrel 53 is operated and the purpose thereof will appear fully in the following description.

Adjacent the sleeve 52 on the shaft 24 is a washer 54 which is of larger diameter than the sleeve 52 for retaining the pin barrel 53 upon the sleeve 52 and also forming a stop for the pin barrel 53 against which the pin barrel is pressed as will be described. A nut 55 upon the shaft 24 clamps all of the elements 52, 54, 50, 49 and 45 against the clutch 44 and all of these elements are rigidly secured to the shaft 24 so as to rotate therewith.

The friction clutch 50 (see Figures 3 and 4) is an integral removable unit and comprises a flanged sleeve member 56 as one operating element and a driven disc 57 as the other operating element. The driven disc 57 is rotatably mounted upon the sleeve 56, as shown most clearly in Figure 3. In addition, a friction plate 58 is loosely mounted on the member 56. A friction member 59, such as a felt washer, is placed between plate 58 and driven disc 57 and another friction member 59 is placed between the disc 57 and the flange of the member 56. The friction members are confined upon the member 56 by an adjustable threaded member 60 and its lock nut 61. The friction members are pressed into engagement with the members 56, 57 and 58 by an annular member 61′ comprising a ring with a plurality of radial wings turned alternately right and left. The wings engage corrugations in the threaded member 60 and the loose friction plate 58 and cause the friction plate 58 to turn at all times with the principal operating member 56 while at the same time pressing the friction elements together. The tension of the clutch is adjustable by means of the threaded member 60 and its lock nut 61.

The driven member 57 of the clutch 50 has a contour as shown in Figure 8. By reason of its shape member 57 functions as a cam to operate a bail 62 which has a roller 63 in continuous engagement with the periphery of member 57. The purpose of bail 62 will appear hereinafter. The disc 57 is provided with a slot 64 into which extends the arm 65 of the pin barrel 53 as shown in Figure 3. The arm 65 is positioned within the slot 64 at the time that the pin barrel is assembled upon the sleeve 52. When the pin barrel 53 is not restrained the disc 57, through this slot and arm connection, drives the pin barrel 53.

As shown in Figures 3 and 8, an adjustable orientation arc 66 is provided adjacent the clutch 50. Projecting laterally from the orientation arc 66 is a stop arm 67 adapted to be engaged by arm 65 of the pin barrel for stopping the rotation of the pin barrel. The lengths of the stop arms 65 and 67 are such that they engage to stop the pin barrel 53 when the pin barrel is at the right hand of its limited travel upon the sleeve 52 but they clear each other and permit the pin barrel 53 to rotate when the pin barrel is at the left hand of its limited travel upon the sleeve 52.

The angular position in which the pin barrel is stopped is determined by the position of the stop arm 67 which is adjustable by means of the arc 66 sliding upon its guide studs 68 and 69 and operated by its handle 70. When adjusted it is locked by the nut 71 on the loose stud 69.

The selective operation of the pin barrel 53 as it is rotated is controlled by a single selector magnet which may be of any well known construction. As shown in Figure 12, the selector magnet 33 is of a sensitive polarized type such as used in stock ticker operation and comprises a permanent U-shaped magnet 72, surrounding the pole pieces 73. Disposed within the pole pieces 73 are the magnet windings 74 which are energized in accordance with impulses received over the signalling line 32 to operate its armature 75. Armature 75 is pivotally supported on an armature bearing at 76 in any conventional manner and has a protruding extension 77 formed on one end thereof. The movement of the armature 75 is limited by the adjustable screws 78, adapted to separately engage the opposite sides of the inner end of the armature 75.

As the magnet 33 energizes and deenergizes in accordance with marking and spacing impulses received over the signalling line 32, the extension 77 of armature 75 is moved into and out of the path of a bell crank lever 79 shown in detail in Figures 6 and 7. The bell crank lever 79 is pivotally mounted at 80 on a stationary part of the frame work of the machine as shown in Figure 3. One end 81 of the bell crank lever 79 is formed and positioned to engage the end 77 of the armature 75. The mutual relation of ends 77 and 81 is such that when the armature 75 is in the position shown in Figure 7, the end 77 prevents motion of the bell crank end 81. The other end 82 of the bell crank is forked to span the operating end 83 of a flutter lever 84. The flutter lever 84 is pivotally mounted on a pin 85 and has a pair of arms or cam followers 86 and 87.

In operative relation with the cam followers 86 and 87 is the flutter cam 88, which is secured to the pin barrel 53. The flutter cam 88 has a plurality of radially arranged right and left corrugations or flutes such as 89 and 90 formed therein and disposed as an annulus about the axis thereof.

A member 91 (Figure 12) pivoted at 92 and yieldably urged by spring 93 presses upon a smooth arc of the flutter cam 88 and thus draws the pin barrel 53 to the left in which position it engages the washer 54 as a stop

and in which position the stop arm 65 clears the stop arm 67 so that the pin barrel is free to rotate. To stop the pin barrel 53 from rotating it is necessary to shift the pin barrel against the tension of the spring 93. This is effected in a manner now to be described.

The pin barrel 53 has twelve selector pins 94 angularly and longitudinally spaced on the pin barrel and projecting from its outer surface. (See Figure 11.) The pins 94 are arranged in pairs, each pair comprising a marking pin and a spacing pin. Associated with each pair of selector pins 94 is one of six selector levers 95, Figure 12, pivotally mounted on a common rod 96 suitably carried by the frame of the machine. A common stop rod 97 extends through all of the selector levers and limits the angular rotation of the levers around their pivot 96. Each selector lever 95 has two operating cam arms, the upper or marking cam arm 98 and the lower or spacing cam arm 99 the one or the other of which is engaged by its associated selector pin 94 as it rotates past the lever. The ends of the cam arms 98 and 99 are off-set with respect to each other so that when the marking pin individual to a particular selector lever lines up with the cam arm 98, the other cam arm 99 will freely pass by the spacing pin individual thereto. When the spacing pin is in line with the cam arm 99, the marking pin will freely pass by the cam arm 98. In addition the selector levers 95 each have two abutment arms, the right or marking abutment arm 100 and the left or spacing abutment arm 101.

The selector levers 95 are carried in a selector lever guide unit 102. The selector levers 95 have no normal position, but remain set in either operated position until the impulses in a succeeding code are such as to shift them to the opposite position. Inasmuch as they have no normal position, very little power is necessary to operate them and the number of operations is reduced as they do not operate until a change in the code signal is received. In order to insure against accidental movement of the selector levers from the position to which they have been moved, a latching means is provided for each of the selector levers. This latching means comprises a jockey 103 pivotally mounted on a pin 104 and normally urged about the pivot pin by a compression spring 105.

The operation of setting the selector levers in accordance with a received code combination of impulse conditions is as follows:

The normal condition of idleness or stop between code combinations of impulse conditions is produced by a marking pulse of current. This marking pulse energizes magnet 33 and lifts the armature 75 bringing the operating end 77 into the position shown in Figure 7, thus holding the bell crank 79 in the position shown, with the ends 81 and 82 in their back or marking position. The forked end 82 of the bell crank 79 restrains the end 83 of the flutter lever 84, thus holding the flutter lever in its marking position with the cam followers 86 and 87 moved to the right. The cam followers 86 and 87 being held fixed, it follows that as the flutter cam 88 turns, the flutter cam 88 and pin barrel 53 must move laterally by sliding upon the sleeve 52. When the stop arm 65 reaches that angular position in which it may engage the stop pin 67, the flutter cam 88 will have a left flute within the followers 86 and 87, the pin barrel will be in its right hand position, as shown in Figure 3, the arm 65 and the arm 67 will engage as shown in the figure and the pin barrel will be stopped and the friction clutch 50 will slip its friction members. This is the normal condition of idleness or the position of stop between codes, awaiting the ensuing start signal or spacing signal in the line 32 and coils 74 of the magnet 33.

The sender (Figure 2) now sends a starting impulse, which is always negative, followed by six other impulses, each of which is arbitrarily either negative or positive. The negative starting impulse moves the armature 75 downward, Figure 7, and the operating end 77 releases the bell crank end 81 as shown in Figure 6. This in turn releases the flutter lever 84 which releases the flutter cam 88 to move sidewise under the pressure of spring arm 91 and the spring 93. The pin barrel 53 thus is shifted to the left, carrying the stop arm 65 out of engagement with the stop arm 67 and the pin barrel is released to start to rotate under the urge of the friction clutch 50. The pin barrel 53 now is in its left hand position, the ends 83 and 82 of the flutter lever 84 and bell crank 79, respectively, are forward as shown in dotted lines in Figure 6 and the cam followers 86 and 87 span a left flute 90, Figure 5. The motor 25 drives the pin barrel 53 and flutter cam 88, and a right flute 106 of the flutter cam 88 passes between the cam followers 86 and 87. The bell crank lever 79 is rocked clockwise as viewed in Figure 6, from the position shown in dotted lines to the position shown in full lines. Should the first signal pulse be marking, the armature 75 will move its end 77 into the path of the end 81 as shown in Figure 7. As the motor rotates the pin barrel 53 and the flutter cam 88, the left flute 107 of the flutter cam 88 passes between the cam followers 86 and 87. These are now immovable because of the obstruction by the end 77 of the armature 75 and consequently the pin barrel 53 moves to the right against the tension of the spring 93. In moving to the right, the pin barrel 53 carries the marking pin 108, Figure 11, into alignment with the marking cam 98 of the first selector lever 95 and carries the spacing pin 109 out of alignment with the spacing cam 99 of the first selector lever

95, as shown in Figure 11. As the pin barrel continues turning, the pin 108 passes under the cam 98. If the first selector lever is already in its upper or operated position, the pin 108 has no effect on it. But, if this lever is not in its upper position pin 108, acting on cam 98, forces the lever up into that position. The spacing pin 109 passes beside the spacing cam 99 without engaging the spacing cam because it is out of alignment.

Had the first signal impulse been a spacing condition, the armature 75 would not have moved, the bell crank 79 would have remained unrestrained, the left flute 107 would have moved the flutter lever instead of moving the pin barrel, the marking pin 108 would have remained out of the path of the marking cam 98 of the first selector lever and the spacing pin 109 would have remained in the path of the spacing cam 99 of the first selector lever, and as the pin barrel rotated the pin 109 would have engaged the spacing cam 99 and would have shifted the first selector lever 95 into its alternative position.

The second selector lever 95 is then positioned in accordance with the second signal impulse in a similar manner. Thus, as the pin barrel rotates, the right flute 110 moves the bell crank end 81 out of the path of the armature end 77 and the armature 75 is free to move into its marking or spacing position in response to the marking or spacing impulse received over the line 32. The succeeding left flute then moves the pin barrel if the impulse is marking or moves the flutter lever if the impulse is spacing. The second marking pin 111 on the pin barrel 53 then operates the marking cam 98 of the second selector lever 95 if the pin barrel has been shifted to the right or its dotted companion operates the spacing cam 99 of the second selector lever 95 if the pin barrel has not been shifted. This operation is repeated for the remaining four impulses and then the marking stop impulse moves the armature end 77 into the path of the end 81 of the bell crank 79 and the pin barrel 53 is shifted to the right, the stop arm 65 engages the stop arm 67 and the pin barrel 53 stops. This operation effects the positioning of the six selector levers in accordance with the six impulses received over the line 32.

As will be clear to those skilled in the art, all of the movements of the pin barrel 53 are accomplished substantially entirely by power supplied by the motor 25 driving the pin barrel; that is, not only is the power for rotating the pin barrel 53 supplied from this original source, but due to the shaping of the flutter cam 88, the rotative motion is translated into a linear motion for moving the pin barrel 53 to the right or left, although this movement is controlled by the line magnet. Except, therefore, for releasing the clutch 50 in response to a start impulse there is a minimum requirement of power from the line magnet 33, the sole requirement of the line current during the signalling period, being to move the armature 75 which is free from any incumbrance as in the case of a relay. The receiving line magnet 33 may therefore be of a very delicate structure responsive to very small currents and having a minimum of inertia and may therefore operate at very high speed. Inasmuch as the local source of power supply may be of any value within practical limits, the pin barrel 53 may rotate and move longitudinally at a very high speed. It will, of course, be understood that the pin barrel is rotated at a speed which is in synchronism with the speed of code impulsing by any well known means.

Transferring and indexing

Each of the selector levers 95 has associated therewith an individual transfer lever 112 having three arms 113, 114 and 115. Each transfer lever 112 is controlled by its companion selector lever 95 through the engagement of one or the other of its two arms 113, 114 with one or the other of the two abutments 100 and 101 of the selector lever 95. All of the transfer levers 112 are carried by a pivot shaft 116 which is in turn carried by a transfer bail 117. The transfer bail 117 is mounted upon the transfer bail shaft 118 and is operated by a main cam 119 which is mounted to turn freely on the main shaft 24 (see Figures 3, 9, 10 and 17). The main cam 119 is provided with a cam groove 120 and an external cam edge 121 and is driven by the friction clutch 44 and by a toothed clutch 122 acting co-operatively. The friction clutch 44 is similar to the friction clutch 50 and comprises a flanged sleeve member 123, a driven disc 124 having a lug 125 and an adjusting member 126. A pin 127 (Figure 10) fixed to the main cam 119 engages the side of the lug 125 in the disc 124. Accordingly, when the disc 124 rotates, it drives the main cam 119.

When the motor 25 is operating and line signals are not being received, the main cam 119 is prevented from rotating. This is effected by end 128 of the trip bail 62, which at such times engages the lug 125 of the driven disc 124, as shown in Figure 10, and thereby causes the clutch 44 to slip its friction members. The trip bail 62 is supported pivotally upon the rod 129 and a spring 130 (Figure 24) normally urges the operating end 128 of the bail 62 away from the driven disc 124 and urges its operated end carrying roller 63 against the cam edge of the driven disc 57. When a portion of the driven disc 57 having a reduced radius passes under the roller 63, the bail 62 rocks on its shaft 129 and the operating end 128 of the bail 62 leaves the lug 125 of the driven disc 124, per-

mitting the disc 124 to rotate. As disc 124 rotates it operates main cam 119.

The main cam 119 may be driven also by the toothed clutch 122 (see Fig. 9). The clutch 122 comprises a driving member 131 which is secured upon the main shaft 24 and a driven member 132 which is sleeved upon the main shaft 24. The sleeve member 132 is urged towards the right at all times by the spring 133 but when in its position of rest it is forced to the left by engagement of the annular crown cam 134 thereon with the fixed abutment 135. The sleeve member 132 at all times engages the main cam 119 by means of a pair of spline teeth 136 which always engage the sides of a diametrical groove in the hub of the main cam 119. When the sleeve member 132 is permitted to occupy its right hand position it engages the driving member 131 and transmits the power of the main shaft 24 through non-slipping members to the main cam 119. The spring 133 operates incidentally to press the main cam 119 against the flange 123 of the clutch 44. Since the flange 123 is at all times turning and the main cam 119 is at times stopped, an antifriction member or washer 137 is interposed.

The main cam 119 by its cam groove 120 and cam follower roller 138 (Figure 17) moves the transfer bail 117 to depress the pivot shaft 116 (Figure 12) to move the transfer levers 112 at the proper instant in the cycle of operation.

The signal index mechanism comprises five selector discs 139 mounted to turn through a limited angle as loose sleeves upon a fixed tubular support 140 (see Figure 12). Each selector disc 139 is controlled by a transfer lever 112 whose head member 115 engages the sides of a radial slot 141 in the selector disc 139. At right angles to and equally spaced around the circumference of the selector discs 139 and guided in slots in three radially slotted guide plates 142 are a series of index pins 143 provided with cam rollers 144 (see Figure 3). The index pins 143 are supported in an arrangement in which each is parallel to all others and in which the total assembly is cylindrical. Each index pin is pivoted upon a circular pivot plate 145. A notch in each of the index pins engages the edge of the pivot plate 145 as shown at 146 and prevents the index pin from moving end-wise. A toroidal radially contractible pivot spring 147 holds all of the index pins against the pivot plate 145. The three guide plates 142 prevent the index pins from moving along the arc of the cylindrical assembly. The motion of each index pin occurs at the end of the pin remote from the pivot plate 145 and is in a direction radial to the axis of the cylindrical assembly and is controlled by two elements.

The first control element for the index pins is a spring for operating the free end of the index pins towards the axis of the cylindrical assembly. A convenient form of spring system is shown in which each index pin is engaged by a toroidal spring at a median point of each index pin. The index pins are bent in two shapes and are assembled by using the two shapes alternately. Two toroidal radially contractible springs 148 and 149 are used each of which engages alternate index pins. The spring system is simplified by using one spring for a plurality of index pins and the effective action of the spring upon any pin is promoted by bending away from the specific spring the two index pins which are adjacent the pin to be operated.

The second control element for the index pins is the set of five selector discs 139. These discs are variably notched along their circumferential edges according to code in such manner that at all times a notch in each disc will be in alignment with a notch in each of the other discs and a single specific index pin will be permitted to drop into the aligned notches and move toward the axis of the cylindrical system. Thus in Figures 3 and 12, the reference numeral 150 indicates a pin which has dropped into aligned notches in the discs. See also the pin designated by numeral 151 in Figure 13. For each setting of the selector discs 139 one of the index pins 143 will have under it five notches in alignment (one in each disc) and will accordingly be forced by the spring 148 or 149 into the notches, it being understood by those skilled in the art that only one such alignment of the notches can occur at any one time. As the code disc position corresponds to the electrical code impulses received over the line 32, the code of impulses which has been received is indicated by the identity of the selected index pin. The particular index pin selected also indicates the subsequent operation to take place such as printing, spacing or case shifting.

The operation of the transferring and indexing mechanism is as follows: At a moment in the cycle of operation of the printer at or about the time that the last selector lever 95 is being positioned that portion of the driven disc 57 which is of reduced radius will pass under the cam follower 63, permitting the trip bail 62 to operate and to release the driven disc 124 to start rotating, as shown in Figure 24. The friction clutch 44 through lug 125 and pin 127 drives the main cam 119 through a small angle, turning also the sleeve 132 (see Figure 9). The crown cam 134 moves from under the abutment 135 and the spring 133 forces the sleeve 132 into the teeth of the clutch member 131 thus coupling the main cam 119 positively to the main shaft 24. In this manner, the main cam 119 is started gently by power through the friction clutch 44, and after a short initial movement,

it is directly and positively coupled to the driving shaft 24 through toothed connections. Thus the advantage of a positive toothed clutch connection for the transfer power is obtained while at the same time the shock or jar as well as noise due to sudden starting by engagement of the teeth of such a clutch is obviated through the use of the friction clutch 44.

As the main cam 119 rotates further, the transfer bail roller 138 rides in the groove 120 and rocks the bail 117. The transfer levers 112 are carried downward toward the previously positioned selector levers 95 and almost immediately any transfer lever 112 which is to be changed will engage an abutment of a selector lever 95 with one of its arms 113 or 114 depending on the setting of the lever 95 in accordance with the previously received code combinations of impulse conditions, it being understood that by this time all of the levers have been positioned in accordance with the received code combinations as the transfer bail carries the specific transfer lever further, the fixed abutment acts as a pivot or fulcrum for the transfer lever 112, to rock the transfer lever 112 about the pivot shaft 116. As the transfer lever 112 rocks upon the pivot shaft 116 its head 115 in the slot 141 of the associated selector disc 139 shifts the latter into its new position to correspond to the positive or negative nature of the signal received from the line 32. Should the code disc 139 be already in the position corresponding to the position of the associated selector lever 95, (the abutment presented to the transfer lever will not be engaged, the transfer lever will not be rotated upon the pivot shaft 116 and the code disc 139 will not be shifted. Thus by one movement of the transfer bail 117 the setting of the five selector levers 95 will be transferred simultaneously through the five transfer levers 112 to the five code discs 139 and a new specific index pin 143 will move to its operated position, the prior operated index pin 143 being lifted into non-operated position by the cam action of the edges of the notches in the one or more discs 139 which have been moved in the action of transferring.

As the main cam 119 rotates further, the transfer levers 112 will be lifted from the selector levers 95 so that the latter may be positioned in accordance with the succeeding code combination of impulses while printing operations in accordance with the setting of discs 139 takes place. As the main cam 119 reaches the end of its revolution the crown cam 134 again engages the fixed abutment 135 forcing the sleeve 132 to the left to disengage the same from the toothed member 131. The friction clutch 44 continues to drive the main cam 119 for the small remainder of the revolution until it is stopped by the lug 125 on the driven disc 124 engaging the end 128 of the trip bail 62, as shown in Figure 10.

Typewheel angular adjustment

The gear 39 on the motor shaft 38 (Figure 3) in addition to driving the gear 40, also drives a gear 152 which, it will be noted, is of smaller diameter than gear 40 and accordingly rotates at a greater speed than gear 40. The gear 152 constitutes the driving element of a third friction clutch 153. The friction clutch 153 is similar in construction to the friction clutches 50 and 44 but the power is transmitted through clutch 153 in reversed direction, the median disc or gear 152 being the driving member and the sleeve-and-flange element 154 being the driven member. The member 154 is fixed to a stop shaft 155 by means of a pin 156. The stop shaft 155 is mounted in the bearing journals 157 and 158 and is positioned on the axis of the cylindrical assembly of the index pins 143. Fixed to the stop shaft 155 is the index stop arm 159, the length of which is such that when it rotates, its end moves freely under the ends of all non-selected index pins 143 but engages the end of the specific index pin 151 which happens to be in selected position and therefore nearer to the axis of the assembly (see Figure 13). When the stop arm 159 engages the selected pin 151, the stop arm is brought to a sudden stop. In order to prevent rebound when the rotating stop arm 159 is brought suddenly to a stop by engagement with the selected pin 151, the stop arm carries a latch 160 which passes over the end of the selected pin 151 and engages with the opposite side thereof. The latch 160 is mounted pivotally upon the index arm 159 by a pin 161 and is retained in position by a spring 162. The free end of the latch 160 has a cam surface 163 (Figure 14) by means of which the latch 160 rides over the ends of the index pins 143. It will be evident from this description that the motor 25 drives the stop shaft 155 frictionally except when the stop shaft 155 is restrained against rotation by the index arm 159 coming into engagement with a selected index pin.

The stop shaft 155 has slidably mounted thereon a bevel gear 164 as shown in Figure 17. The stop shaft 155 is square in cross section so that when it rotates the bevel gear 164 rotates with it, but the bevel gear 164 may slide longitudinally along the shaft 155. In mesh with the bevel gear 164 is a bevel gear 165 which has a hub 166 integral therewith. The driving bevel gear 164 is held in mesh with the driven gear 165 by an arm 167, as shown in Figure 19, which arm encircles the hub 168 of the gear 164 as a loose sleeve and is fixed to the carriage return body member 169 as by means of a screw 170. The hub 166 is elongated so as to form

a sleeve and is journalled in a bearing 171 mounted in the typewheel carriage 172. The typewheel carriage 172 comprises a base casting 173 and a top plate 174 connected by vertical struts, not shown. The top plate 174 carries a top journal member 175. Slidably mounted in the sleeve 166 and in the top journal member 175 is a vertical shaft 176. The sleeve hub 166 is held in axial alignment by co-operative action of the shaft 176 and the top journal member 175. The vertical shaft 176 carries a type wheel 177 and turns with the bevel gear 165. An arm 178 is secured to the vertical shaft 176 and engages within the forked end of an arm 179 secured to the sleeve hub 166. This provides a means for preventing rotation of the shaft 176 with respect to the sleeve 166.

The typewheel 177 carries a plurality of type which are presented to the surface of the paper 180 in a manner to be described hereinafter. The angular adjustment of the typewheel 177 is effected in the following manner: After the index arm 159 has been latched in engagement with the selected index pin the selector discs 139 are shifted in response to a subsequently incoming code combination of impulses. The shifting movement of the selector discs 139 lifts the selected index pin and selects another index pin in accordance with incoming code combination of impulses. The return to normal of the previously selected index pin releases the index arm 159 and thereby releases the stop shaft 155. The motor 25 acting through the friction clutch 153 then turns the shaft 155, the arm 159 and the typewheel 177 until the index arm 159 engages the newly selected index pin. This arrests the index arm 159, stop shaft 155 and typewheel 177, thus adjusting the typewheel 177 to present the selected type to the paper 180 if a character is to be printed or adjusting the stop shaft 155 to a position corresponding to an operation other than the printing of a character.

It will be evident from the preceding description that the friction clutch 153 continually urges the typewheel 177 to rotate and that the typewheel rotates except when restrained by the stop mechanism controlled by the selected index pin, the typewheel then being stopped in the angular position corresponding to the selected pin.

Printing

Operating in the cam groove 120 of the main cam 119 (Figure 17) is the roller 181 of a printing bail 182 pivoted on a shaft 183. As shown in Figure 20, the bail 182 has extending therefrom an operating arm 184 which carries a pin 185. The pin 185 extends through a slot 186 in one end of a link 187, which, at its other end, is pivotally connected as by means of a screw 188 to an arm 189 of a bell crank 190. The bell crank 190 is fixed to a shaft 191 which is journaled in the frame of the printer and extends across the width of the paper sheet 180. Secured to the arm 192 of bell crank 190 and to a similar arm 192′ (Figure 17) on the shaft 191 is the platen bar 193 which extends across the width of the paper 180, behind the paper, and in position to press the paper throughout the entire line of printing toward the typewheel 177 so that the type character which is presented to the paper will be printed upon the paper regardless of the position of the typewheel along the line of printing when the platen bar 193 is operated. A platen spring 194 extends from a stud 195 on the bell crank arm 189 to a fixed point (not shown) on the frame of the printer and continually urges the platen 193 toward and against the typewheel 177. Except during the short period of the printing impression, the cam groove 120 in the main cam 119 holds the cam follower roller 181 elevated and therefore holds the operating arm 184 depressed pulling downwardly through the link 187 to draw the bell crank arm 189 down against the tension of the spring 194 and to draw the platen 193 away from the typewheel 177.

The link 187 is slotted at 186 to permit excess movement of the operating arm 184. The link 187 has two lugs 196 which form a yoke to span the head 197 of the arm 198 of a bell crank 199 pivoted to the frame of the printer at 200. The bell crank 199 has an operating arm 201 which has pivoted thereto at 202 a push link 203. The other end 204 of the push link 203 is forked and spans a pin 205 on an arm 206 rigidly secured to a square typelock shaft 207. A spring 208 has one end secured to the frame of the printer and the other end secured to the arm 206 at a point 209 and tends to rock the shaft 207 in a direction to cause the pin 205 to push against the push link 203.

Square shaft 207 has secured thereto a typelock flange 210 as shown in Figure 17. A typelock dog 211 is pivoted at 212 upon the typewheel carriage 172 and moves with the carriage. The dog 211 has a pair of jaws 213 which at all times span the typelock flange 210 regardless of the position of the carriage 172, the flange 210 being made of sufficient length for this purpose. The typelock dog 211 is provided with an operating arm 214 (Figure 18) which is adapted to engage within any one of a plurality of notches 215 in the periphery of a typelock wheel 216 which is fixed to the hub 166 of the bevel gear 165. The wheel 216 turns with the typewheel 177 and when the latter comes to a stop the operating arm 214 of the typelock dog 211 may engage within a notch 215 to lock the typewheel in printing position. When the operating arm 214 of the typelock dog 211 engages within a notch 215 to lock the typewheel in printing position, the se-

lected type character on the printing wheel 177 is accurately centered so that a proper impression will be made upon the paper.

In operation, the cam groove 120 depresses the printing bail 182 quickly, raising the operating arm 184 thereof. As the arm 184 is raised the spring 194 rocks the bell crank 190 counter-clockwise as viewed in Figure 20 and the platen 193 presses the paper 180 against the selected type character on the typewheel 177 to perform the printing operation. During the rocking movement of the bell crank 190 the link 187 with the head 197 on the arm 198 of the bell crank 199 rocks the bell crank 199 about its pivot 200, counterclockwise as viewed in Figure 20, and draws the link 203 downward thereby permitting the spring 208 to rock the typelock shaft 207 in a clockwise direction. As the shaft 207 rocks clockwise it operates through the typelock flange 210 (Figure 17) to rock the typelock dog 211 counterclockwise causing the operating arm 214 of the dog 211 to enter the notch 215 by the tension of the spring 208 and the typewheel 177 is held locked during the period of the printing impression.

The typewheel 177 is inked by the inking wheel 217 (Fig. 1) mounted upon an arm 218 pivoted at 219 and pressed against the typewheel by a spring 220.

Thus, printing is effected by the cam groove 120 of the main cam 119 operating the cam follower roller 181 on the printing bail 182 and the latter in turn operating the platen 193 through a mechanical linkage to press the paper 180 against the typewheel 177, the centering and locking of the type character to be printed taking place at the same time.

Letter spacing

The carriage 172 has extending horizontally therefrom two front studs 221 (Figure 1) carrying the front wheels 222 and a rear stud 221′ (Figure 17) carrying a rear wheel 222′. The front wheels 222 rest on a rail 223 and the rear wheel 222′ rests on a rail 223′. The carriage is adapted to be moved along the rails step by step by a spacing mechanism which comprises a toothed rack 224 (see Figure 3) carried by the forwardly extending studs 221, a holding pawl 225 and a driving pawl 226. The holding pawl 225 is pivoted intermediate its ends at a point 227 fixed to the frame of the machine and has a pendant latch 228 pivoted thereto at 229′. The latch 228 engages a latch plate 229 fixed to a rocker shaft 230.

A spring 231 has one of its ends connected to the pawl 225 at 232 and its other end connected to a stationary point 233 on the frame and continually maintains the end 234 of the pawl 225 in engagement with the teeth in the rack 224. The driving pawl 226 is pivoted intermediate its ends on a screw 235 fixed to the end of arm 236 of a bell crank 237 and has a pendant latch 238 pivotally connected thereto at 239. The pendant latch 238 also engages the latch plate 229. A spring 240 has one end connected with the pawl 226 at 241 and its other end is connected to a stud 242 on the arm 236 of the bell crank 237 and continually maintains the end 243 of the pawl 226 in engagement with the teeth of the rack 224.

The bell crank 237 is pivoted to the frame of the printer at 244 and is constantly urged to rock in a counterclockwise direction by a spring 245 one end of which is fixed to the arm 236 of the bell crank 237 at 246 and the other end of which is attached to a fixed point 247 on the frame. The horizontal arm 248 of the bell crank 237 engages the space and shift bail 249. The bail 249 is pivoted to the frame of the printer at 250 (Figure 17) and carries a cam follower roller 251 which rides upon the cam edge 121 of the main cam 119. Just prior to the time of transfer of the setting of the selector levers 95 to the discs 139 the main cam 119 permits the roller 251 to drop. The spring 245 then rocks the bell crank 237 counterclockwise (as viewed in Figure 3) and the driving pawl 226 is carried bodily towards the left, a distance sufficient to bring the end 243 thereof in engagement with the next tooth in the spacing rack 224. As the main cam 119 continues to rotate, the cam edge 121 thereof raises the roller 251 and rocks the bail 249 and the bell crank 237 to draw the driving pawl 226 to the right thereby moving the typewheel carriage 172 to the right through a unit distance in preparation for the printing of the next character. The holding pawl 225 then engages the next tooth in the rack 224 and holds the carriage 172 in its advanced position. In this manner, the typewheel carriage 172 is moved along the rail 223 step by step carrying the typewheel 177 along the line of printing and stopping in each printing position along the line of printing.

To effect the spacing between words in a line, a part of the periphery of the typewheel having no type character thereon is presented to the paper and the same operations take place as in printing a character, thus effecting a spacing without printing.

Case shift

The letters of the alphabet are arranged in the upper row of type faces and are printed when the type wheel 177 is in the lower position as shown in solid lines in Figure 17. The numerals and the other characters are arranged in the lower row of type faces and are printed when the typewheel 177 is in the upper position as shown in dotted lines in Figure 17.

As previously described, there are six selector levers 95 and five of these are effective

in adjusting the selector discs 139 by co-operation with the transfer levers 112. The sixth or shift selector lever 95 cooperates with a shift transfer lever 252 which is of different form as shown in Figure 16 but mounted with the other levers 112 on the pivot shaft 116. The shift transfer lever 252 has a spacing lug 253 to engage the spacing abutment 101 of the sixth selector lever 95 when a spacing impulse has been received as the sixth impulse of the code combination of impulses and a marking lug 254 to engage the marking abutment 100 of the sixth selector lever 95 when a marking impulse has been received as the sixth impulses of the code combination. In Figure 16, the sixth selector lever 95 is shown in its marking position for upper case shift, while other parts are shown in their lower case positions.

Pivotally connected to the end of the shift transfer lever 252 by means of a screw 255 is one end of a link 256 the other end of which is pivoted at 257 to an extension 258 of a shift index bail 259. The shift index bail is pivoted to the frame of the printer at 260 and extends across the front of the printer as shown in Figure 3. When the shift transfer lever has been rocked clockwise into its lower case position, as shown in Figure 16, the shift index bail 259 will have been rocked counterclockwise into its left or lower case position as shown. A jockey 261 is pivoted to the frame at 262 and carries a roller 263 which co-operates with the projection 264 carried by the shift index bail 259. A spring 265 continually urges the roller 263 into engagement with the projection 264 so that the shift index bail 259 will be held in the position into which it is rocked. The shift index bail 259 engages the link 256 at a point opposite to the pin barrel 53 and engages a shift power yoke 266 at a median point as shown in Figure 3.

The shift power yoke 266 is pivotally connected to the end of an arm 267 of the space-and-shift bail 249 by means of a screw 268 as shown in Figures 3 and 17. When the space-and-shift bail 249 is rocked the yoke 266 is moved vertically. Depending upon the direction of rocking of the bail 249, in addition to this vertical motion, the yoke 266 is adapted to undergo a rocking motion about its pivot 268. This rocking motion is effected by the bail 259 as will be described. The yoke 266 is provided with a spacing arm 269 and a marking arm 270 which co-operate respectively with ends 271 and 272 of a straddle plate 273 fixed to a shift shaft 274. According to the position of the shift index bail 259 the shift power yoke 266 may present a spacing arm 269 to the spacing end 271 of the straddle plate 273 to rock the shift shaft 274 into its spacing position as shown in the figure or it may present its marking arm 270 to the marking end 272 of the straddle plate 273 to rock the shift shaft 274 into its alternative position.

The shift shaft 274 is journaled in the frame of the printer and crosses the front of the printer. It carries also a long shift flange 275, the edge of which is spanned by a pair of rollers 276 mounted upon a shift slide 277 carried by the typewheel carriage 172 in a manner to be described. The shift flange 275 is of such length that it will engage the rollers 276 in any position of the typewheel carriage. A jockey 274′ (Figure 15) is pivoted at 275′ and cooperates with the shift flange 275, a spring 276′ being provided to normally urge the jockey in a counterclockwise direction as viewed in Figure 15.

The shift slide 277 is carried by a pair of vertically extending rods 278, only one of which appears in Figure 17. Both of the rods 278 pass through the slide 277 and are locked to it by the nuts 279. The elements 277 and 278 thus form an integral vertical shift frame which may be operated by the shift flange 275. The vertical rods 278 pass through holes in the carriage members 173 and 174 and slide freely therein, being limited in their vertical motion by a stop collar 280 and an adjustable nut 281 provided for each rod. The shift slide 277 has as an integral part thereof an arm 282 (see Figure 19) the forked end 283 of which spans the typewheel shaft 176. Thus when the vertical shift slide 277 is raised and lowered, the typewheel shaft 176 and its fixed typewheel 177 are correspondingly raised and lowered to present the lower and upper rows of type characters for printing.

The operation of the case shift mechanism is as follows: The sixth or shift impulse being positive, the sixth selector lever 95 is adjusted to marking postion as shown in Figure 16. When the pivot shaft 116 descends to perform the transfer operation it carries the shift transfer lever 252 toward the sixth selector lever 95 and the marking lug 254 of the shift transfer lever 252 engages the abutment 100 of the sixth selector lever 95. The point of engagement forms a fulcrum for the shift transfer lever 252 and the further movement of the pivot shaft 116 then furnishes power to rock the lever 252 about the said fulcrum, depressing the operated end 255, drawing the link 256 downwardly and rotating the shift index bell 259 clockwise as viewed in Fig. 16 about its pivot 260 into its alternative position where it is retained by the jockey 261.

Referring now to Figure 17, the clockwise movement of the shift index bail 259 rocks the shift power yoke 266, clockwise about its pivot 268 thereby moving the spacing arm 269 of the yoke 266 out of the path of the spacing end 271 of the straddle plate 273 and moving the marking arm 270 of the yoke 266 into the path of the marking end 272 of the

straddle plate 273. The setting of the sixth selector lever has thus been transferred to the shift index bail 259 and to the shift power yoke 266. Just prior to the time of transfer, the main cam 119 has allowed the shift bail 249 and its arm 267 to rock counterclockwise as viewed in Figure 17 and draw the shift power yoke 266 downward to permit the arm 270 to move under the end 272. Immediately after the transfer operation has taken place the main cam 119 forces the roller 251 upward rocking the bail 266 upward whereby the marking arm 270 drives the marking end 272 of the straddle plate 273 upward. This movement of the straddle plate 273 rocks the shift shaft 274 counterclockwise and lifts the shift flange 275 which acts through the rollers 276 to lift the entire shift slide mechanism including the typewheel 177. The jockey 274′ holds the shift flange 275 up. The typewheel now occupies the position indicated in dotted lines in Figure 17 in which position the lower row of type is presented to the platen in preparation for printing. The slide rods 278 now project above the top plate 174 and the typewheel shaft 176 projects above the top journal member 175. The driven arm 178 on the typewheel shaft 176 is still within the fork of the driving arm 179 rigidly fixed to the bevel gear 165 so that the typewheel 177 may be driven angularly in the same manner as when not shifted.

Carriage return

Referring to Figure 20, the printing bail 182 has in addition to the operating arm 184, another operating arm 284 extending upwardly as shown. The operating arm 284 carries a pivot stud 284′ on which is pivoted a three arm bell crank 285 comprising the arms 286, 287 and 288. The arm 288 carries at its end a stud 289 which extends through a slot 290 in the end of a carriage return link 291, the other end of which is pivoted upon a stud 292 fixed to the end of an arm 293 which in turn is fixed to the carriage return rocker bar 230.

Referring to Figures 22 and 23, the carriage return rocker bar 230 has fixed thereto a lock fin 294 which is arranged to cooperate with a carriage return lock arm 295 and a carriage return lock latch 296. The carriage return lock arm 295 is pivoted to the frame of the printer at 297 and has a notched edge 298 for engaging the fin 294 when the rocker bar 230 is in operated position to hold the rocker bar in its operated position against the tension of its spring 299, as shown in Figure 23. A portion of the frame of the printer shown at 300 forms a back stop for the lock arm 295 and a spring 301 urges the lock arm away from said back stop continually. The lock arm 295 is forced against its back stop 300 by an adjustable stud 302 in the body casting 173 of the typewheel carriage 172. A lock nut 303 is provided for the stud 302 to lock the same in adjusted position. The elements 302, 295, and 300 collectively constitute an adjustable stop to determine the starting position of the typewheel carriage 172 at the beginning of each line of printing.

The carriage return lock latch 296 is pivoted upon the frame of the printer at 304 and comprises a manually operated arm 305, a mechanically operated arm 306 and an operating hook arm 307. The lock fin 294 has an edge 308 which engages the hook of the arm 307 when the rocker bar 230 is in its operated position whereby the latch 296 holds the rocker bar 230 in that position. The square typelock rocker shaft 207 has fixed upon it a striker arm 309 which carries an adjustable striker 310 positioned to engage the mechanically operated arm 306 of the latch 296. A spring 311 normally maintains the arm 306 against the adjustable striker 310.

Referring again to Figure 20, the arm 287 of the bell crank 285 has a lug or testing point 312 projecting therefrom at right angles. Upon the stop shaft 155 is fixed a carriage return striker 313 so positioned upon the shaft 155 that in one of the angular stop positions of the said shaft; namely, the position which corresponds to the code combination for carriage return, the carriage return testing point 312 will engage the carriage return striker 313. The stop shaft 155 carries also a printing stop striker 314. When the stop shaft 155 is in such angular position that the carriage return striker 313 obstructs the return testing point 312, the printing stop striker 314 is in a position to obstruct the arm 315 of the bell crank 199.

Referring to Figure 3, a carriage return arm 316 has one of its ends pivoted to the frame of the printer at 317 and carries at its other end a stud 318 to which is connected one end of a link 319. The other end of link 319 is connected to a stud 320 fixed to the toothed rack 224 of the typewheel carriage 172. A spring 321 has one of its ends connected to a point 322 on the lever 316 and its other end connected to a point 323 fixed to the frame. As the typewheel carriage is drawn to the right in the action of printing, power is stored in the spring 321 to return the carriage when it is released by the pawls 225 and 226.

The operation of the normal carriage return in response to the code impulses is as follows:

In response to codes for letters and spaces, the printing bail 182 operates its arm 284 moving the pivot stud 284′ to the left and then returning it to the right. This motion carries the bell crank 285 bodily without useful effect. The link 291 is rocked about its pivot stud 292, but does not operate the arm 293. At the same time, the stud 289 moves

slightly along the slot 290 but does not engage either end of the slot.

When, however, a signal code for carriage return is received, the stop shaft 155 stops in such position that the striker 313 thereon obstructs the testing point 312 and the striker 314 obstructs the testing arm 315. The first subsequent motion of the operating arm 284 will supply power to the pivot stud 284′ to rock the bell crank 285 pushing the link 291 up.

The motion of the link 291 raises the arm 293 and rocks the carriage return rock bar 230 counterclockwise as viewed in Figure 20. Such rocking motion of the rock bar 230 depresses the latch plate 229 carried thereby (see Figure 3) and the latch plate 229 draws the two latches 228 and 238 down thereby drawing the two pawls 225 and 226 away from the teeth of the rack 224. During the counterclockwise rocking movement of the rocker bar 230 the lock fin 294 is carried into its operated position and is doubly latched, first by the lock arm 295, Figure 22 and second by the lock latch 296, Figure 23. At this time the carriage is free from platen pressure because the striker 314 is positioned to obstruct the testing arm 315 of the bell crank 199 thus holding the arm 198 fixed, which in turn holds the link 187 motionless and the platen 193 does not move. The carriage 172 therefore is mechanically free at all points and moves to the left and engages the plunger 324 of the dash pot 325 (Figure 1) which checks the momentum of the carriage and brings it to rest gently. The dash pot plunger 324 will be reset by the subsequent motion of the carriage 172 by means of the double spring 326 which will engage the enlarged head 327 of the plunger 324.

At the end of the return travel of the carriage 172, the striker 302, Figure 22, shifts the lock arm 295 away from the lock fin 294 and upon the printing of the first character of the new line the square typelock rock shaft 207, Figure 23, and its striker elements 309 and 310 will operate the lock latch 296 and will release the lock fin 294 which will permit the carriage return rocker bar 230 to rock under the power of the spring 299 thus raising the front end of the latch plate 229 and permitting the pawls 225 and 226 to reengage the rack 224 to drive the typewheel carriage 172.

Paper feeding

Referring to Figure 20, the arm 286 of the bell crank 285 is pivotally connected to one end of a link 328 by means of a pivot stud 329. The other end of the link is pivotally connected to the pivot stud 330 on the end of arm 331 of a paper feed bell crank 332 pivoted to the frame at 333. A spring 334 having one of its ends connected with the arm 286 and its other end connected to the frame of the printer tends to turn the bell crank 285 in a counterclockwise direction around its pivot 284′ and thus acts through the link 328 to hold the arm 331 against a stop 335. The bell crank 332 has two other arms 336 and 337. Carried on the end of the arm 336 is a pivot stud 338 which has pivotally mounted thereon a feed pawl 339. A spring 340 has one of its ends connected to the end of the arm 337 and its other end connected to the end of the feed pawl 339. The feed pawl 339 cooperates with the teeth of a feed ratchet 341 fixed to a feed shaft 342. The feed ratchet is held in any printing position by the jockey roller 343 upon the jockey bell crank 344 pivoted to the frame of the printer at 345 and under tension of a spring 346. The spring 346 has one end fixed to the bell crank 344 at 347 and the other end fixed to the frame at 348. An adjustable stop 349 fixed on the frame of the printer limits the stroke of the pawl 339.

The shaft 342 which carries the feed ratchet 341 has fixed thereto a feed roller 350 (see Figure 17). The roller 350 cooperates with a presser roller 351 and together with a paper knife 352 are supported by brackets 353 the assembly being pivoted to the frame of the printer at 354 and being under tension of a spring 355 which urges the presser roller 351 against the feed roller 350. The path of the paper or web 180 is from the supply roll 356 (Figure 1) around the idler roller 357 (Figure 17) then between the platen 193 and the ink guard 358 and then between the feed roller 350 and the presser roller 351 and then over the paper knife 352.

In response to code for letters and spaces the printing bail 182 operates its arm 284 (Figure 20) and moves the pivot 284′ first to the left then to the right. This motion carries the bell crank 285 bodily but without useful effect. The motion of the pivot stud 329 rocks the link 328 about its pivot 330 but does not draw the bell crank arm 331 away from its stop 335.

The paper feed mechanism is operated simultaneously with the carriage return mechanism in response to a signal code for carriage return. The operation of the paper feed is as follows: When the signal code for carriage return is received, the stop shaft 155 stops in such position that the striker 313 obstructs the testing point 312 and the striker 314 obstructs the testing arm 315. The first subsequent motion of the operating arm 284 will supply power to the pivot stud 284′ to rock the bell crank 285 about the testing point 312 as a fulcrum. This rocking motion draws the link 328 down, rocking the bell crank 332 and operating the feed pawl 339 to turn the feed ratchet 341 thus feeding the paper.

Automatic carriage return

Should the sending operator or tape perforating operator omit the carriage return signal, it will be desirable to return the carriage automatically between two words in order that the new line may be begun in much the same manner as though the carriage return signal had not been omitted. The provision of an automatic carriage return carries the further facility, that transmission intended for tape printing without carriage return signals may be received upon the device of this invention and the device automatically will return the carriage and feed the paper to begin a new line at appropriate intervals. To effect this detail of invention, a line-end detector device is caused to become effective during the last letters of the line of printing and a spacing detector is introduced in connection with this line-end detector so that when a space is detected within ten letter steps of the end of the line the function of carriage return and line feed will be added to the function of space, and the carriage will be returned and the paper fed to begin a new line immediately after the specific space thus detected.

A striker 359 is carried by the typewheel carriage 172, (see Figures 1, 20 and 21) and a line-and-space testing arm 360 (Figure 20) is pivoted upon the arm 287 at the pivot 361. One end of arm 360 is positioned between two flat springs 362 and 363 fixed to a lug 364 on arm 287 and limited in movement by a stud 365 on the same arm. The arm 360 has extending at right angles therefrom a lug 366 comprising a testing point. Fixed to the stop shaft 155 for cooperation with the testing point 366 is a striker 367. The striker 367 is so positioned upon the stop shaft 155 that when the stop shaft 155 stops in response to the code for a spacing operation the striker 367 will obstruct the path of the test point 366.

In the normal operation of printing characters at the beginning of a line, the arm 360 is carried upon the arm 287 without motion relative to the arm 287. When operating in response to a code for spacing operations occurring near the beginning of the line, the striker 367 engages the test point 366 and revolves arm 360 upon its pivot 361 causing the spring 362 to yield, but effecting no other result. Also, when the carriage 172 has brought the pin 359 to intersect the plane of the arm 360 then at the printing of a character the upper end of the arm 360 will engage the pin 359 and the arm 360 will rock upon its stud 361 causing the spring 363 to yield but without further result.

However, upon receipt of a code for a spacing operation at a time when the pin 359 is in position to be struck by the arm 360, then the pin 359 will obstruct the upper end of the arm 360 and the striker 367 will obstruct the lower end of the arm 360 by engaging the test point 366, the arm 360 will be held substantially motionless and by its pivot 361 will restrain the arm 287, effecting thereby all of the results which follow the engagement of test point 313 with a striker 312, and the carriage will be returned automatically.

Modified carriage return

In the carriage return mechanism shown in Figure 20 the three-armed bellcrank 285 sometimes rotates about its test point 312 as a fulcrum and sometimes rotates about its stud 361 as a fulcrum. This results in different angles of rotation and in different angular and lineal values in the movements produced in the controlled elements.

To produce a uniform rotation of the member 285′ whenever operated, the modification shown in Figure 25 provides that at all times when operated it shall rotate about its pivot stud 361.

The contour of the member 285′ is unimportant save where it engages its guide stud 375 at which place it is straight. The member 285′ is carried pivotally at 284′ by the operating arm 284*a* and is at all times under tension of the spring 377 which extends from a point 378 on the frame of the receiver to the short arm 379 of an arm 380 which is pivotally attached to the arm 286′ of the member 285′ at the pivot 329. The arm 380 and its function will be described in detail hereinafter. The spring 377 draws the member 285′ at all times against the stud 375.

The member 285′ carries the stud 361 and upon this stud are carried the two loosely pivoted testing arms 360 and 381. The testing arm 381 is provided with a fork 383 which spans a stud 384 fixed in the frame of the receiver and thus normally restrains the member 381 from rotation. The member 381 is provided with a testing point 385 adapted to engage the stud 386 on the carriage 172 and it is provided with a second testing point 387 which corresponds to the testing point 312 carried directly by the arm 287 in Figure 20. The testing point 387 in Figure 25 is adapted to engage the rotary abutment 313 when the abutment 313 has been positioned.

The testing member 360 in Figure 25 is supported pivotally upon the stud 361 and functions, as in Figure 20. However, in the modified construction shown in Figure 25, the means for positioning the member 360 when idle is different from that shown in Figure 20. A flat plate 389 is fixed to the member 285′ by screws 390 and 391, being positioned adjustably by a hole surrounding the screw 391, and an arcuate slot surrounding the screw 390, both screws being tapped into the member 285′. Plate 389 has three upturned stops 392, 393 and 395, which limit the movements of two spring arms 396 and 397 each pivoted on the shouldered screw 391

and both under tension of a spring 399 which draws each of them toward their common stop member 395. The testing member 360 is provided with the testing point 366 for engaging the rotary abutment 367, as in Figure 20.

The arms 396 and 397 when engaging the stop 395 are in such position that they engage also one end of the testing member 360 and determine the unoperated position of the member 360.

The operation of the modified mechanism for carriage return is as follows:

(A) By received code: The predetermined code will position the abutment 313 in the path of the testing point 387. The operating arm 284*a* then moves counterclockwise carrying the power stud 284′ to the left thus moving the member 285′ and its associated parts until the testing point 387 engages the abutment 313. The member 381 then is restrained at 313 and also at 384, thus holding the stud 361 fixed. The power stud 284′ moves further and rotates the member 285′ clockwise about the now fixed stud 361, pushing upward the link 291 and drawing downward the link 380. The upward movement of the link 291 effects the return of the carriage in the manner previously described in connection with Figure 20.

(B) By line-end-and-space control: When the printer is adjusted to a maximum line of 50 characters and spaces, the striker 359 on the carriage 172 will obstruct the testing arm 360 when the carriage is in position to print any character or space from the 41st to the 50th, inclusive. The rotary abutment 367 on the shaft 155 will be positioned to obstruct the testing point 366 when operating for a space without printing, at any position in the line.

When the testing point 366 engages the abutment 367, the stud 361 moves farther and rotates the member 360 counterclockwise about the abutment 367 as a fulcrum, causing the member 360 to rotate upon the stud 361 and causing the end of the member 360 to rotate the arm 397 about its pivot 391 against the tension of its spring 399. As the stud 361 moves back the members 360 and 397 return to their normal positions under power of the spring 399.

When the free end of the testing arm 360 engages the striker 359 on the carriage, the stud 361 moves farther and rotates the member 360 clockwise about the striker 359 as a fulcrum, causing the member 360 to rotate upon the stud 361 and causing the end of the member 360 to rotate the arm 396 about its pivot 391 and against the tension of the spring 399. As the stud 361 moves back, the members 360 and 396 return to their normal positions, under power of the spring 399.

When operating for space after the 40th character position, the arm 360 engages both of the strikers 367 and 359, the stud 361 is held immovable, the member 285′ rotates about stud 361 as a fulcrum and pushes the link 291 upward which results in the return of the carriage as has been described.

(C) By post-ultimate line-end control: When the carriage passes to the first position beyond the predetermined maximum length of line, the striker 386 on the carriage enters the plane of the testing point 385 on the member 381 and restrains the member 381. The first subsequent operation of the power arm 284*a*, whether for space, character or function, will rotate the member 285′ about the axis of the now fixed stud 361, regardless of the angular position of the stop shaft 155, and the carriage return will be effected. In this case it is of importance to note that the stud 361 restrains a printing-suppression arm and thus keeps the printing platen free from the typewheel, so that the carriage is free to return, even though the typewheel may be positioned to print a character. This print suppression feature will now be described.

Referring to Figure 27, the three armed print-suppression bell crank 199′ of the modified carriage return mechanism is, except for two distinctions, of the same construction as the bell crank 199 of Figure 20. One distinction is in the articulation between the arm 198 of the bell crank 199 and the vertical link 187. In Figure 27, a fork 400 on the arm 198′ of the bell crank 199′ spans the eccentric head of a screw 401 which is threaded into the link 187. An adjustment is effected by turning the screw 401 and then locking with the locknut 402 (Figure 28). The other distinction is that in Figure 27 the testing arm 315′ is provided with a testing point 403 which is located in the plane of the several rotary abutments 314 on the stop shaft 155. Should the test point 403 engage an abutment 314 the arm 315′ would be stopped and the articulated connection of fork 400 with link 187 by screw 401 would suppress any effective movement of the printing link 187. This may be effected by any desired signal codes such as for figure and letter shifting, each such variant code operating to position one of the several abutments 314 in the path of the test point 403.

The stud 361 on arm 287 normally moves at the same time as the arm 315′, but should the stud 361 be stopped, the arm 315′ also will be stopped and printing would be suppressed. The arm 287 is stopped during functioning for carriage return, so that by the addition of the articulation between members 315′ and 361 the operation of the printing platen is suppressed during the return of the carriage from any source of control.

Details of the assembly of the stud 361 are shown in Figure 29. The stud 361 is a shouldered screw which is threaded into the arm

287 of the bell crank 285′, and is locked by the long hexagonal lock nut 404. The lock nut 404 is made partly cylindrical and of reduced diameter to present a uniform surface to the testing member 315′. Around the shoulder of the screw 361 are pivoted loosely the two testing members 360 and 381 separated by the loose washer 405 to prevent friction between them.

Modified paper feed

In the modified construction shown in Figure 25, the paper feeding arm 380 constitutes a composite of the driving dog 339 and the link 328 of Figure 20. The arm 380 is pivoted adjustably at 329 to the arm 286′ of the member 285′. The spring 377 exerts power not only to draw the arm 286′ against its guide stop 375 but also to rotate the arm 380 counterclockwise about its pivot 329, thus urging the upper end of the arm 380 toward the left.

The paper feeding arm 380 is provided with an internal guide edge 406 which surrounds a fixed stud 407 to be described in detail hereinafter. A dog 408 formed on the arm 380 is adapted to engage a tooth in the ratchet wheel 341. The spring 377 constantly urges the arm 380 into engagement either with the stud 407 or with the ratchet wheel 341.

The operation of the modified paper feeding mechanism is as follows:

At every operation of the member 285′, the link 291 is pushed upward to effect the carriage return and the arm 380 is drawn downward to effect paper feed.

The arm 380, urged by the spring 377, causes the right lower edge of the internal guide 406 to follow the stud 407 resulting in a down-and-left motion of the dog 408 whereby the dog enters a notch in the ratchet wheel 341. When the dog 408 has bottomed the notch, the further movement of the arm 380 will be governed by the articulation of the driving dog and the turning ratchet wheel 341 resulting in a down-and-right-motion of the dog 408 during which the upper right edge of the internal guide 406 will approximate contact with the stud 407. When the arm 380 has reached its lowest position, the top apex of the internal guide 406 will engage the fixed stud 407 and the dog 408 will be locked so that the next tooth of the ratchet wheel 341 will engage the dog 408 and the ratchet wheel will be stopped against overthrow by inertia. The power stud 284′ now moves to the right, rotating the member 285′ counterclockwise about its now fixed stud 361 and raising the arm 380. As the arm 380 begins to rise the spring 377 urges the dog 408 against the succeeding tooth of the ratchet wheel 341, resulting in an up-and-right motion of the dog and of the arm 380 in which the internal guide 406 approximates contact with the fixed stud 407. When the dog 408 passes the end of the tooth, the spring 377 will rotate the arm 380 counterclockwise about its pivot 329 and will click the lower-right edge of the internal guide 406 against the fixed stud 407, after which the lower right edge of the internal guide will result in an up-and-right movement of the dog 408 until the dog has cleared the circumscribed circle of the ratchet wheel 341 and the lowest apex of the internal guide is resting against the fixed stud 407. When the dog 408 thus clears the ratchet wheel 341, the shaft 342 will be free to be turned manually. The complicated movement of the dog 408 is effected with but one unit of two correlated guides other than the dog and its ratchet wheel.

The adjustable stud 407 (Figure 30) comprises a polygonal body 409 drilled axially to clear the hexagon-head screw 410 and carrying the eccentric shoulder stud 407′. A smooth washer 411 and a split spring lock ring 412 are provided. The adjustment is effected by turning the body member 409 and then holding the body member with one wrench while the screw 410 is tightened with another wrench or with a screwdriver, the adjustment being maintained thereafter by the lock ring 412.

The jockey roller 343 (Figure 25) on bell crank 344, pivoted to the frame of the receiver at 345, has the pivot 345 so located that the line 413 through the axis of the pivot 345 and through the axis of the jockey roller 343 shall be perpendicular to the line 414 through the axis of the jockey roller 343 and through the apex of the notch of the ratchet wheel 341 whose two sides are engaged by the roller 343. One side of the notch is approximately radial to render the dog 408 effective. The other side of the notch may be at any desired angle. The described geometrical relation of the locus of the pivot 345 effects this result, that when the shaft 342 is turned manually by its knob 415 the reaction of the jockey will be equal at all times whether the roller is turned clockwise or counterclockwise.

In the mechanism shown in Figure 17, the two presser rolls 351 are controlled by one spring 355 which may produce in one roll a considerably greater pressure than in its companion roll, resulting in irregular or twisting feeding of the paper. In the modified mechanism shown in Figures 31 and 32, each presser roll has its individual spring and manual means is provided to lift both presser rolls by one manual operation. It is provided further that the normal operation of lifting the presser rolls shall not disengage the teeth of their feed gears, although they may be lifted further when desired.

In the frame 416 of the receiver are fixed two pivot studs 417 and 418. Each such pivot stud supports pivotally one presser arm 419 and 420 respectively, and also one

end of the paper knife 421. To prevent movement of the presser arms 419 and 420 other than rotation, the arms are of yoke form through which the pivot studs 417 and 418 pass twice, and the heads of the studs 417 and 418 retain the arms 419 and 420 near the frame 416. Individual springs 422 and 423 extend from the presser arms to spring posts 424 in the frame and urge the presser arms counterclockwise.

Each presser arm has a fixed pivot stud 425 comprising a shouldered screw with a nut 426 and a split lock washer 427. Upon the stud 425 is sleeved a presser roller comprising the body 428 the contact annulus 429 and the gear 430 all rigidly united and rotating together. The paper roller 350 has fixed to it two gears 431 which mesh with the two gears 430. The spring 422 rotates the presser arm 419 to cause the presser roller surface 429 to engage the roller 350 and to cause the gears 430 and 431 to mesh.

The paper knife 421 is pivotally mounted by surrounding the heads of the two pivot studs 417 and 418. Two stop arms 432 and 433 are formed integrally with the paper knife 421 also two manual operating arms 434. The arms 432 and 433 pass under their springs 422 and 423 respectively, which prevents the knife 421 from rocking unduly counterclockwise and both arms 432 and 433 may engage the shaft 342, which prevents the knife 421 from rocking unduly clockwise. The arms 432 and 433 engage the presser arms 419 and 420 at the point 434′ and lift both presser rollers from the paper roller 350 when the paper knife is rocked clockwise. The arm 433 is adapted to engage the shaft 342 before the gear 430 has disengaged from the gear 431. The presser roller may be lifted further and may disengage the gears if operated by grasping the presser arm directly rather than by operating through the medium of the paper knife.

Modified case shift

In Figure 16, the sixth selector lever 95 which has been adjusted by a sixth impulse over the line 32 by means of a sixth pair of pins on the pin barrel 53, operates the transfer arm 252 to operate in turn the shift index bail 259. In the modification now to be described, the case shift is effected by the full signal code. Accordingly the sixth signal over the line 32 is not required, the sixth signal lever 95 is not used, the sixth pair of pins on the pin barrel 53 are omitted and the remaining five pairs of pins are set at new angles as shown in Figure 34. The special transfer arm 252 and the link 256 are omitted and the transfer index bail 259 is operated by two testing members on the operating arm 284*a* which cooperate with two rotary abutments on the stop-start shaft 155. The receiver thus becomes suitable for a system of five-unit transmission.

Referring to Figures 33 and 35. The operating arm 284*a* is provided with two testing cranks, the letter shift crank 435 and the figure shift crank 436, both pivoted upon the stud 437, both limited in their movement by the adjustable stud 439 fixed in the arm 284*a* and each having its spring 440 extending from the crank to a spring post 441 fixed to the arm 284*a* by a screw 442 threaded into the arm 284*a* and by a clamping screw 443 with nut 444 (Figure 25) which passes through the arcuate slot 445 to provide for the adjustment of the tension of the two springs 440.

The testing crank 435 cooperates with the rotary abutment 455 and the testing crank 436 cooperates with the rotary abutment 456.

The crank 435 carries a stud 459 spanned by the forked end of a link 460 which has its other end pivoted at 461 to the transfer index bail 259 at a point above the pivot 260.

The crank 436 (in Figure 33 where it is largely concealed by the crank 435) has a stud similar to stud 459 spanned by the forked end of a link 465 which has its other end pivoted at 466 to the transfer index bail 259 at a point below the pivot 260.

The operation of the printer when thus modified to shift by the full code is as follows:

A full figure-shift code received over the line 32 positions the figure-shift abutment 456 to obstruct the crank 436. The operating lever 284*a* rotates counterclockwise, carrying the stud 437 to the left and the crank 436 engages the abutment 456. The operating arm 284*a* by its further movement supplies power through the stud 437 to rotate the crank 436 upon the stud 437 with the abutment 456 as a fulcrum, and thereby the stud (similar to 459) of the crank 436 is moved to push the link 465 to rotate the transfer index bail 259 clockwise. This is followed by the operation of the shift power yoke 266 (Figure 17) as previously described in connection with Figure 17, and the shift upward of the printing wheel 177 is effected. To return the printing wheel 177 a full letter-shift signal code received over the line 32 will position the letter-shift abutment 455 to obstruct the crank 435. The operating lever 284*a* will rotate, the stud 437 will move to the left, the crank 435 will engage the abutment 455, the crank 435 will rotate upon the stud 437 with the abutment 455 as a fulcrum, the stud 459 will be moved to push the link 460, the transfer index bail 259 will be rotated counterclockwise, and then the shift power yoke 266 will operate and lower the typewheel 177.

When receiving the full code for shift, no character is printed, yet the operation of the arm 267 (Figure 3) to move the shift

power yoke 266 will move the arm 248 also and thus with the assembly shown in Figure 3 would produce a space step of the carriage. The message "2B" would be recorded "2 B". To suppress the space when shifting, the modification shown in Figure 36 may be used.

The mechanism of Figure 36 differs from the mechanism of Figure 3 in the following respects: The space-suppression arm 470 is added and is pivoted to the frame at 471. The spring 472 extending from a point 473 on the arm 470 to a point 474 on the frame urges the arm 470 counterclockwise about its pivot 471 and against a fixed stop 475. An adjustable striker 476 is added upon the typelock flange 210 in such position that when the typelock flange is operated in the process of printing, the striker 476 engages the arm 470 and moves it from its stop 475 against the tension of its spring 472. The short arm 241 of the driving pawl 226 is extended at 241′ and the end 477 of the arm 470 is turned at an angle to meet and engage the end 241′.

The operation is as follows: When spacing after printing, the pivot 235 is moved to the right and then to the left, carrying the pawl 226. As the pawl 226 is carried to the left, the end 241′ engages the end 477, the pawl 226 is rotated about its pivot 235 and the operating tooth 243 is withdrawn from the rack 224. As shown in Figure 36 the notch 478 of the rack 224 has been used. The parts when thus at rest offer two possible alternative operations. First, a movement of the typelock flange 210 may move the striker 476 to move the arm 470 to release the end 241′ and the spring 240 will rotate the pawl 226 to engage the dog 243 with the notch 479 of rack 224, after which the movement of the bellcrank 237 will effect spacing. Second, should the typelock flange 210 not operate, as is the case when shift codes are received, the bellcrank 237 will move the pivot stud 235 while the end 241′ is still restrained by the end 477. The dog 243 will be carried to the right as it rises so that it will engage the sloping edge of the notch 478 and spacing will not be effected. When a character is being printed the typelock flange is operated and spacing ensues. When spacing without printing is desired, the member 210 is operated as described in connection with Figure 3, thus operating the member 470 to release the end 241′.

Print-suppression prevents the operation of the typelock flange 210. Space suppression therefore results from print-suppression, which may be controlled by the rotary abutments 314. In Figure 35, one abutment 314 is in axial alinement with the abutment 455 and another abutment 314 is in axial alinement with the abutment 456. The simultaneous engagement of the abutments 314 and 456 suppresses spacing and shifts the typewheel upward. The simultaneous engagement of abutments 314 and 455 suppresses spacing and shifts the typewheel downward.

Interchangeable function control member

An important feature of my invention is the interchangeable function control member now to be described. The importance of such a member is manifested in the processes of manufacturing these machines for international commerce. The manufacturer produces but one type of machine aside from the one member for function control. Then shipment may be made to any country or to any customer by affixing the proper abutment members without changing the code cutting of any permutation parts as has been required in the prior art.

Referring to Figure 37, one form of interchangeable function control member 485 is shown comprising the tubular sleeve 486 provided at one end with screw threads 487 and at the other end with a polygonal head 488; two or more spacing sleeves 490, 491; three or more abutment disks 492, 493, and 494; and the lock nut 495, all of the parts rigidly united by solder or spelter 496. Splining, keying and clamping have been found not sufficiently rigid, whereas soldering or brazing have been found satisfactory. These abutments are subjected in normal operation to a long continued hammering which will loosen anything short of molecular integrity.

The member 485 thus constitutes a unitary member which is assembled in the complete receiver by passing as a sleeve over the end of the start-stop shaft 155, abutting the journal element 497 which abuts the shoulder 498 of the square shaft 155, then being clamped by the nut 499 and lock nut 500 with the washer 501.

It may be desirable in some installations (e. g. in England) to add the function of letter shift or downward shift to the spacing operation, thus saving one keyboard operation when letter shift and spacing operations occur together. At the same time such a message as "2B" requires the letter shift without spacing. To produce this result, a rotary abutment 502 is added to the disk 492, thus producing the function control member 503 of Figure 38. When figure shift code is received, the abutments 456 and 314 are engaged, the shift is effected and spacing is suppressed. When letter shift code is received, the abutments 455 and 314 are engaged, the shift is effected and spacing is suppressed. When spacing code is received the abutments 367 and 502 are engaged, spacing is effected and the typewheel is shifted to letters when and if found in its position for figures.

It may be desirable in other installations (e. g. in Spain) to omit the transmission of

spacing alone and to effect the spacing by either of two signals, one of which is "figure shift and space" and the other of which is "letter shift and space". This result may be produced by omitting the space-suppression rotary abutments 314, omitting the space detector abutment 367 from the disk 493 and adding the disk 504 with its two space detector abutments 505 and 506, thus producing the function control member 507 of Figure 39.

In operation, when either shift code is received, spacing is effected because it is not specifically suppressed and shift is effected if required.

When letter shift code is received, the abutments 455 and 505 are engaged, spacing is effected because it is not specifically suppressed and shift is effected if required. The abutment 505 is effective only under the condition of carriage return by line-end-and-space control as described elsewhere herein.

When figure shift code is received, the abutments 456 and 506 are engaged, spacing is effected, shifting is effected if required, and the abutment 506 is effective only for line-end-and-space control.

Miscellaneous adjustments, modifications and details

In order that the gear 39 (Figure 3) may be adjusted to an accurate position between the gears 40 and 152, and to compensate for variations in the dimensions of the body of the motor 25, the motor may be adjustably mounted in the following manner.

A subbase strip 514, shown in Figures 40 and 41, is secured to the front of the integral base 515 of the motor 25 and the rear of the base 515 is supported by two posts 519. A screw 520, is threaded into the subbase strip 514 and has an integral annular flange 521 which engages the upper surface of the base 522 of the receiver. The slotted head of the screw 520 enters a hole 523 in the base 522. A clamp 525 locks the screw 520 against turning when it is drawn tight by its clamp screw 526.

One of the posts 519 is shown in detail in Figure 42. It is tapped internally at one end and has a threaded shank 527 at the other end. The motor 25 is attached to the two posts 519 by the two screws 529 and the two posts are attached to the base 522 by the nuts 530 on the two shanks 527 which pass through the base 522.

To remove the motor 25 from the receiver, the set screw 532 is loosened, the gear 39 is removed, the nuts 530 are removed, and the clamp 525 is loosened. The motor at first is lifted slightly to withdraw the shanks 527 and the screw 520 from their holes in the base 522. Then the motor may be drawn away from the gears 40 and 152 and then lifted from the receiver without disturbing the adjustment of the screw 520 in the subbase strip 514. The motor may be replaced in the receiver and fastened in place by the nuts 530 and the clamp 525 without losing the adjustment of the height of the shaft and of the gear 39.

Figure 43 shows a modified form of typewheel elevator. According to this modification, the shift slide 277 is substantially of the same form as in Figure 17, except that its arm 282 surrounds the shaft 176 at the point 535 as shown in Figure 44 instead of spanning it as shown in Figure 19. The rods 278 of Figure 17 now are not used, nor the nuts 279, and for them the shouldered screws 536 with spacing collars 537, two of each, are substituted, threaded into the cast body 173 of the carriage 172. The shift slide 277 is supported at the three points 536, 536 and 535, sliding with the shaft 176 and sliding upon the two screws 536, its upper and lower positions being determined by its engagement with the two collars 537 and with the heads of the two screws 536, respectively and alternatively. The nut 538 clamps the arm 178 and the shouldered bushing 539 tightly to the shaft 176 and the arm 282 surrounds the bushing 539 loosely so that the arm 178 may drive the shaft 176 angularly and so that the shaft 176 may turn in the arm 282.

The manner of attaching the typewheel 177 to the shaft 176 is shown in modified form in Figure 43 and in Figure 45. Instead of being clamped upon a flange by a nut, the typewheel is attached to the flange by three screws at variant angles from each other with respect to the axis of the shaft 176 as a center of radii. The shaft and flange are positioned, approximately, by properly meshing the teeth of the gear 165 (Figure 17) into the teeth of the gear 164. Minor angular adjustment for final accuracy then is made by turning the typewheel 177 as permitted by the arcuate slots 541 (Figure 45) after which the screws 542 are tightened in the flange 543 and the adjustment thus attained is held by the split lock rings 544.

A modified support for the inkwheel 217 is shown in Figures 45 and 46. The yoke 550 is sufficiently yielding to admit the shaft of the inkwheel 217. The yoke with its inkwheel is placed upon the headless pivot stud 551 which is fixed in the horizontal arm 552 of the shift slide 277. Upon the stud 551 is pivoted the crank 553 having the hook 554, the projection 555 the manual arm 556 and the spring 557 extending to the spring post 558 on the shift slide 277. The arm of the yoke 550 passes the end of the hook 554 and rests against the body of the crank 553. The spring 557 draws the crank 553 clockwise, hooking 554 around the lower arm of the yoke 550 and rotating the yoke until the inkwheel 217 engages the typewheel 177. The hook 554 prevents the inkwheel from rising on the stud 551. To change inkwheels,

the crank arm 556 is operated manually to the right, the used inkwheel is lifted off, the new inkwheel is dropped upon the stud 551 and the arm 556 is released. The projection 555 engages the arm 552 and prevents too much rotation of the crank 553 if manually released without an inkwheel.

To render the ink guard 358 more readily detachable, the modified mounting of Figures 43 and 47 may be substituted for the mounting shown in Figure 17. In Figure 17 the ink guard 358 is clamped under the back stud 221'. In Figures 43 and 47 it is clamped by two screws 561 and it is cut at 562 to clear the back stud 221' so that the ink guard may be removed without disturbing any other parts.

Modified forms of platen shaft and platen arms are shown in Figure 43, wherein the shaft 191 is made square. The platen 193 and two arms 192' are formed of an integral piece of metal and attached to a flat face of the square shaft 191 by screws 564, resulting in a more rigid structure at the junction with the shaft 191 where the strain is greatest.

The dash-pot 325 (Figure 1) has no spring. This has the advantage of no dash effect on a short return where dash effect would be not only useless but objectionable. When the carriage has moved five steps, the carriage return spring 321 is still weak. Carriage return from that point will have no dash effect to oppose the weak spring 321 because the air compression in the dash-pot 325 from so short a stroke is negligible. When the carriage has moved ten steps the dash effect is small. Only when the carriage has moved 15 steps or 30 per cent of its total travel of 50 letters as built and operated, does the dash effect become full value.

It may be desirable, in some installations, to provide a means for receiving an audible signal or an electrical break signal. One form of such means is shown in Figure 35. The rotary abutment 565 is provided for co-operation with a testing point 566 similar in shape and mounting to the member 435 which cooperates with the member 455. For an audible signal the testing point 566 is arranged to strike a gong and for an electrical break signal the testing point 566 is arranged to operate an electrical switch. A specific full code is sent to position the abutment 565 in the path of its testing point.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. Also it is obvious that many of the features herein disclosed may be applied to machines of related arts such as, for example. manually operated typewriter machines. The present disclosure is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What I claim as new and desire to secure by U. S. Letters Patent, is:—

1. In combination, a movable carriage, a typewheel supported on said carriage, a pivotally mounted platen, means responsive to code combinations of impulse conditions for rotating said typewheel to various positions, power driven mechanical means for rocking said platen into engagement with said typewheel, and means for moving said carriage step by step.

2. In combination, a movable carriage, a rotatable typewheel supported on said carriage, a pivotally mounted platen, means for selectively rotating said typewheel to various positions in accordance with received code combinations of impulse conditions, means for rocking said platen into engagement with said typewheel, and solely mechanical means for moving said carriage step by step.

3. In combination, a movable carriage, a rotatable typewheel supported on said carriage, a pivotally mounted platen, means for rotating said typewheel to various positions in accordance with received code combinations of impulse conditions, power mechanically driven means for rocking the platen into engagement with said typewheel, and power driven means for moving said carriage step by step.

4. In combination, a movable carriage, a rotatable typewheel supported on said carriage, a rockable platen, case shift mechanism for raising and lowering said typewheel, means for setting said typewheel in accordance with received code combinations of impulse conditions, means responsive to a predetermined condition in a code combination of impulse conditions for operating said case shift mechanism, and power driven means for rocking said platen into engagement with said typewheel for performing a printing operation.

5. In a printing telegraph machine, a movable carriage, a typewheel carried thereby, a platen in operative relation with said typewheel, means for moving said carriage step by step in one direction, selecting mechanism, means operable in response to a predetermined operation of said selected mechanism for effecting return of said carriage, and means for maintaining the platen out of engagement with said typewheel during the carriage return movement.

6. In a printing telegraph machine, a movable carriage, means for moving said carriage step by step, a rack secured to said carriage, a stepping pawl co-operating with said rack, a bell crank for operating said stepping pawl, power driven means for operating said bell crank, selecting mechanism, and

means responsive to a predetermined operation of said selecting mechanism for effecting a return movement of said carriage.

7. In a printing telegraph machine, a movable carriage, a rack secured to said carriage, means co-operating with said rack for moving said carriage in one direction step by step, selecting mechanism responsive to a predetermined operation of said selecting mechanism for effecting a return of said carriage, and additional means responsive to a different operation of said selecting mechanism for effecting a return of said carriage, said last mentioned means being effective only near the end of the range of movement of said carriage.

8. In combination, a movable carriage, means for moving said carriage step by step in one direction, selecting mechanism, means responsive to a predetermined operation of said selecting mechanism for effecting the return of said carriage, and additional means responsive to a different predetermined operation of said selecting mechanism for effecting a return of said carriage, said last mentioned means being effective only through a limited portion in the range of movement of said carriage.

9. In combination, a movable carriage, a typewheel supported thereby, a platen in operative relation with said typewheel, means for supporting a paper web between said platen and said typewheel, paper feeding means, carriage return means, selecting mechanism operable in response to code combinations of impulses, and means controlled by said selecting mechanism for operating said paper feeding means and said carriage return means.

10. In combination, a movable carriage, a typewheel supported thereby, a platen in operative relation with said typewheel, means for supporting a paper web between said platen and said typewheel, feeding means, carriage return means, selecting mechanism operable in response to code combinations of impulses, means controlled by said selecting mechanism for operating said platen to press said paper against said typewheel, and means controlled by said selecting mechanism for operating said paper feeding means and said carriage return means.

11. In combination, a movable carriage, a rotatable typewheel supported thereby, a rockable platen in operative relation with said type wheel, means for supporting a paper web between said platen and said typewheel, paper feeding means, carriage return means, means for moving said carriage step by step, selecting mechanism operable in response to code combinations of impulses, means controlled by said selecting mechanism for rocking said platen to press said paper into engagement with said typewheel, and means controlled by said selecting mechanism for operating said paper feeding mechanism and said carriage return mechanism simultaneously.

12. In a printing telegraph machine, a movable carriage, a rotatable typewheel supported thereon, a rockable platen in operative relation with said typewheel, means for supporting a paper web between said platen and said typewheel, paper feeding means, carriage return means, selecting mechanism operable in response to code combinations of impulses, means controlled by said selecting mechanism for operating said typewheel, means for rocking said platen to press the paper against the typewheel, means controlled by said selecting mechanism for operating said paper feeding means and said carriage return means, and means for moving said carriage step by step.

13. In combination, a rotatable typewheel, selector mechanism responsive to received code combinations of impulses and controlling said typewheel, a rockable platen in operative relation with said typewheel, means for supporting a paper web between said typewheel and said platen, case shift mechanism for raising and lowering said typewheel, an operating cam, means for rotating said cam to various positions in accordance with the operation of said selector mechanism, means controlled by said cam for rocking the platen to press the paper web into engagement with the typewheel, and means controlled by said cam for operating said case shift mechanism.

14. In a printing telegraph machine, a selecting mechanism responsive to received code combinations of electrical impulse conditions, a rotatable typewheel controlled by said selecting mechanism, a case shift mechanism for said typewheel, a power driven cam, means operative by said cam for actuating said case shift mechanism, and means operated by said cam for moving said platen with respect to said typewheel.

15. In a printing telegraph machine, a movable carriage, a rotatable typewheel supported thereby, a rockable platen, means for supporting a paper web between said typewheel and said platen, a paper feeding means, carriage return means, and a single element for controlling the operation of the platen, paper feeding means and the carriage return means.

16. In a printing telegraph machine, a movable carriage, a rotatable typewheel carried by said carriage, a movable platen, means for supporting a paper web between said typewheel and said platen, a paper feeding mechanism, a carriage return mechanism, and a power driven cam for controlling the operation of said platen, paper feeding mechanism and carriage return mechanism .

17. In combination, a type carrying element, a platen movably mounted adjacent

said type carrying element, resilient means tending to move said platen into engagement with said type-carrying element, and mechanical power driven means for moving said platen out of engagement with said type carrying element in opposition to said resilient means.

18. In combination, a rotatable typewheel, a platen rockably mounted adjacent said typewheel, a spring tending to move said platen into engagement with said typewheel, and a power driven cam for moving said platen out of engagement with said typewheel in opposition to said spring.

19. In combination, a rotatable typewheel, a rotatable stop shaft geared to said typewheel, a power driven member, a friction clutch connecting said power driven member with said stop shaft whereby said stop shaft continually rotates except when restrained, an arm secured to said stop shaft, selector mechanism operable in response to received code combination of impulse conditions, said mechanism comprising a plurality of selector pins, one of said pins normally co-operating with said arm on said stop shaft to restrain the rotation thereof, and selector mechanism operative in response to received code combinations of impulses for moving said pin out of the path of said arm and moving another pin into the path of said arm.

20. In combination, a selector mechanism operated in response to received code combinations of impulses, a stop shaft, power driven means continually tending to rotate said stop shaft, means for moving said stop shaft to various positions in accordance with the operation of the selector mechanism, a typewheel operated in accordance with the operations of said stop shaft, a carriage for supporting said typewheel, means for moving said carriage step by step, said means comprising a rack supported by said carriage and a plurality of pawls, and means secured to said stop shaft for releasing said pawls from said rack.

21. In a printing telegraph machine, selector mechanism responsive to received code combination of impulses, a stop shaft controlled by said selector mechanism, a driving gear slidably mounted on said stop shaft and rotatable therewith, the driven gear cooperating with said driving gear, said driven gear having an elongated hub, a typewheel shaft slidably mounted in said hub, a typewheel carried by said typewheel shaft, means for transmitting the rotary movement of said hub to said typewheel shaft while permitting longitudinal movement of said typewheel shaft with respect to said elongated hub, and means for reciprocating said typewheel shaft with respect to said hub.

22. In a printing telegraph machine, selector mechanism responsive to received code combinations of impulses, a stop shaft controlled by said selector mechanism, a driving gear slidably mounted on said stop shaft and rotatable therewith, a driven gear cooperating with said driving gear, said driven gear having an elongated hub, a typewheel shaft slidably mounted in said hub, a typewheel carried by said typewheel shaft, and means for transmitting the rotary movement of said hub to said typewheel shaft while permitting longitudinal movement of said typewheel shaft with respect to said elongated hub.

23. In combination, a movable carriage, a typewheel supported on said carriage, case shift mechanism for raising and lowering said typewheel, a plurality of selector elements, means for positioning said selector elements in response to a code combination of impulse conditions, means operated in accordance with the position of all but one of said selector elements for rotating said typewheel to a predetermined position, and means operating in response to the remaining one of said selector elements for operating said case shift mechanism.

24. In combination, a rotatable typewheel, selector mechanism responsive to received code combinations of impulses and controlling said typewheel, a rockable platen in operative relation with said typewheel, means for supporting a paper web between said typewheel and said platen, mechanism for feeding said paper web step by step, case shift mechanism for raising and lowering said typewheel, an operating cam, means for rotating said cam to various positions in accordance with the operation of said selector mechanism, means controlled by said cam for rocking said platen to press the paper web into engagement with said typewheel, means controlled by said cam for operating said paper feeding mechanism, and means controlled by said cam for operating said case shift mechanism.

25. In combination, a rotating sleeve comprising a plurality of pairs of marking and spacing cams, selector levers, one for each pair of marking and spacing cams, a motor, means for transmitting power from said motor to said rotating sleeve, means responsive to received code combinations of impulse conditions for operating said rotating sleeve whereby said selector levers are variably operated, a rotatable typewheel, a rockable platen, means for supporting a paper web between said platen and said typewheel, an operating cam, a cam mechanism controlled by said rotating sleeve for starting said operating cam into operation, means controlled by said operating cam for rotating said typewheel to various positions in accordance with the operation of said selector levers, and means controlled by said operating cam for rocking said platen to press said paper

against the selected character on said typewheel.

26. In combination, a first set of selector members variably operated in accordance with received code combinations of impulse conditions, a second set of selector members, a movable carriage, a rotatable typewheel supported on said carriage, a rockable platen in operative relation with said typewheel, means controlled by said second set of selector members for variably operating said typewheel, a power driven cam for controlling the transfer of power from said first set of selector members to said second set of selector members, means operated by said cam for rocking said platen into engagement with said typewheel, and means operated by said cam for moving said carriage step by step.

27. In combination, a movable carriage, a rotatable typewheel supported on said carriage, a shift frame carried by said carriage for shifting said typewheel, a pair of rollers on said shift frame, a rockable shift shaft, a shift flange secured to said shift shaft and having an edge extending between said rollers, a straddle plate secured to said shift shaft, said straddle plate comprising two arms, a yoke having two arms cooperating with the arms of the straddle plate, power driven means for operating said yoke vertically up or down, and means for selectively bringing one of the arms of the yoke into cooperation with one of the arms of the straddle plate.

28. In combination, a movable carriage, means tending to maintain said carriage in a predetermined position, a toothed rack carried by said carriage, a pair of pawls co-operating with said toothed rack, means for normally maintaining said pawls in engagement with said rack, power driven means for operating one of said pawls to step the carriage, latch levers pivotally mounted on said pawls, a latch plate normally co-operating with said latch levers, a bail to which said latch plate is secured, and means responsive to code combinations of impulses for rocking said bail to move said pawls out of engagement with said rack whereby the first mentioned means returns the carriage to the said predetermined position.

29. In a combined sender and receiver, a base structure, supports secured to said base, a shaft journaled in said supports, a code sending control element mounted on said shaft, a gear on said shaft for driving said element, a receiver mechanism comprising a unitary structure superimposed on the base structure with a gear thereof in mesh with the first mentioned gear, said receiver mechanism being readily removable from the base structure.

30. In a printing telegraph machine, a movable carriage, means for moving said carriage step by step in one direction, carriage return mechanism, means movable with said carriage for conditioning said carriage return mechanism for operation, and means operating in response to an independent operation of the machine for operating the carriage return mechanism.

31. In a printing telegraph machine, a movable carriage, printing means carried by said carriage, means for moving said carriage step by step in one direction, carriage return mechanism, means movable with said carriage for conditioning said carriage return mechanism for operation, means operating in response to an independent operation of the machine for operating the carriage return mechanism, and means for preventing operation of said printing means during the carriage return movement.

32. In combination, a rotatable typewheel, a plurality of selector elements, means for positioning said selector elements in accordance with received code combinations of impulse conditions, case shift mechanism for effecting case shift movement of said typewheel, said case shift mechanism being operated in accordance with the operation of one of said selector elements.

33. In combination, a selector mechanism operated in response to received code combinations of impulses, a stop shaft, power driven means continually tending to rotate said stop shaft, means for stopping said stop shaft in predetermined positions in accordance with the operation of the selector mechanism, a typewheel operated in accordance with the operations of said stop shaft, a case shift mechanism for raising and lowering said typewheel, and means on said stop shaft for controlling the operation of said case shift mechanism.

34. In combination, a selector mechanism operated in response to received code combinations of impulses, a stop shaft, power driven means continually tending to rotate said stop shaft, means for stopping said stop shaft in predetermined positions in accordance with the operation of the selector mechanism, a movable carriage, means for moving said carriage step by step in one direction, carriage return mechanism, and means on said stop shaft for controlling the operation of said carriage return mechanism.

35. In combination, a selector mechanism operated in response to received code combinations of impulses, a stop shaft, power driven means continually tending to rotate said stop shaft, means for stopping said stop shaft in predetermined positions in accordance with the operation of the selector mechanism, a typewheel operated in accordance with the operations of said stop shaft, a case shift mechanism for raising and lowering said typewheel, means on said stop shaft for controlling the operation of said case shift mechanism, spacing means, and means for

suppressing operation of the spacing means during case shift operations.

36. An interchangeable function control member comprising a main sleeve, a plurality of abutment discs mounted at spaced points along the length of said main sleeve, a spacing sleeve between each abutment disc, and its adjacent abutment disc and means for rigidly uniting the main sleeve, the abutment discs and the spacing sleeves.

37. In a printing mechanism, a carriage, a typewheel shaft supported in said carriage, a typewheel fixed to said shaft, a plurality of guide posts secured to said carriage, and a shift slide having an opening through which said shaft extends and other openings through which said posts extend.

38. In combination, selector mechanism operated in response to received code combinations of impulses, a stop shaft, power driven means continually tending to rotate said stop shaft, means for stopping said stop shaft in predetermined positions in accordance with the operation of said selector mechanism, an abutment member on said stop shaft, and signal control means controlled by said abutment member.

39. In combination, a movable carriage, a rotatable typewheel supported on said carriage, a pivotally mounted platen, means for selectively rotating said typewheel to various positions in accordance with the received code combination of impulse conditions, means for rocking said platen into engagement with said typewheel, means for moving the carriage step by step, and means controlled by the position of said typewheel for preventing the rocking of the platen.

40. In combination, a selector mechanism operated in response to received code combinations of impulses, a typewheel, a shaft on which said typewheel is mounted, means controlled by said mechanism for stopping said shaft, function elements, and means controlled by said shaft and effective upon the predetermined operation of said mechanism for operating said function elements.

41. In a printing telegraph receiver, a type carrying member capable of reciprocation and rotation, selecting mechanism including a plurality of elements responsive to an equal length letter code for determining the rotative position of said type carrying member, means operative for each rotation of said type carrying member to reciprocate said member, and means controlled by one of said elements to determine the direction of said reciprocation.

42. In a printing telegraph receiver, a typewheel, a rotating shaft on which said typewheel is mounted, means responsive to selecting impulses for determining the rotative position of said typewheel, special function mechanisms, and means mounted on said shaft and effective in accordance with the position of said typewheel for controlling the operation of said special function mechanisms.

In testimony whereof I affix my signature.

HOWARD L. KRUM.