Feb. 18, 1941. E. F. WATSON 2,232,155

PRINTING TELEGRAPH APPARATUS

Filed Aug. 17, 1938 3 Sheets-Sheet 1

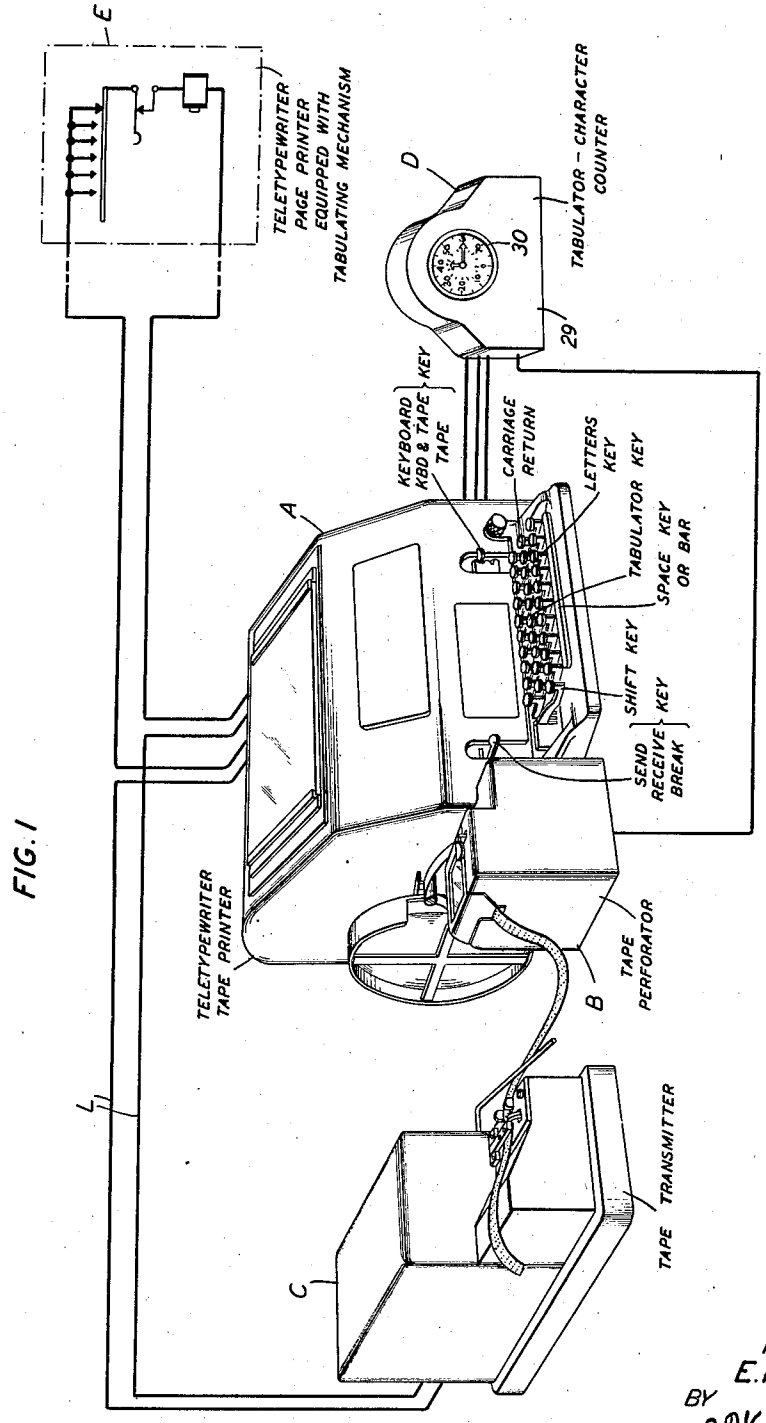


FIG. 1

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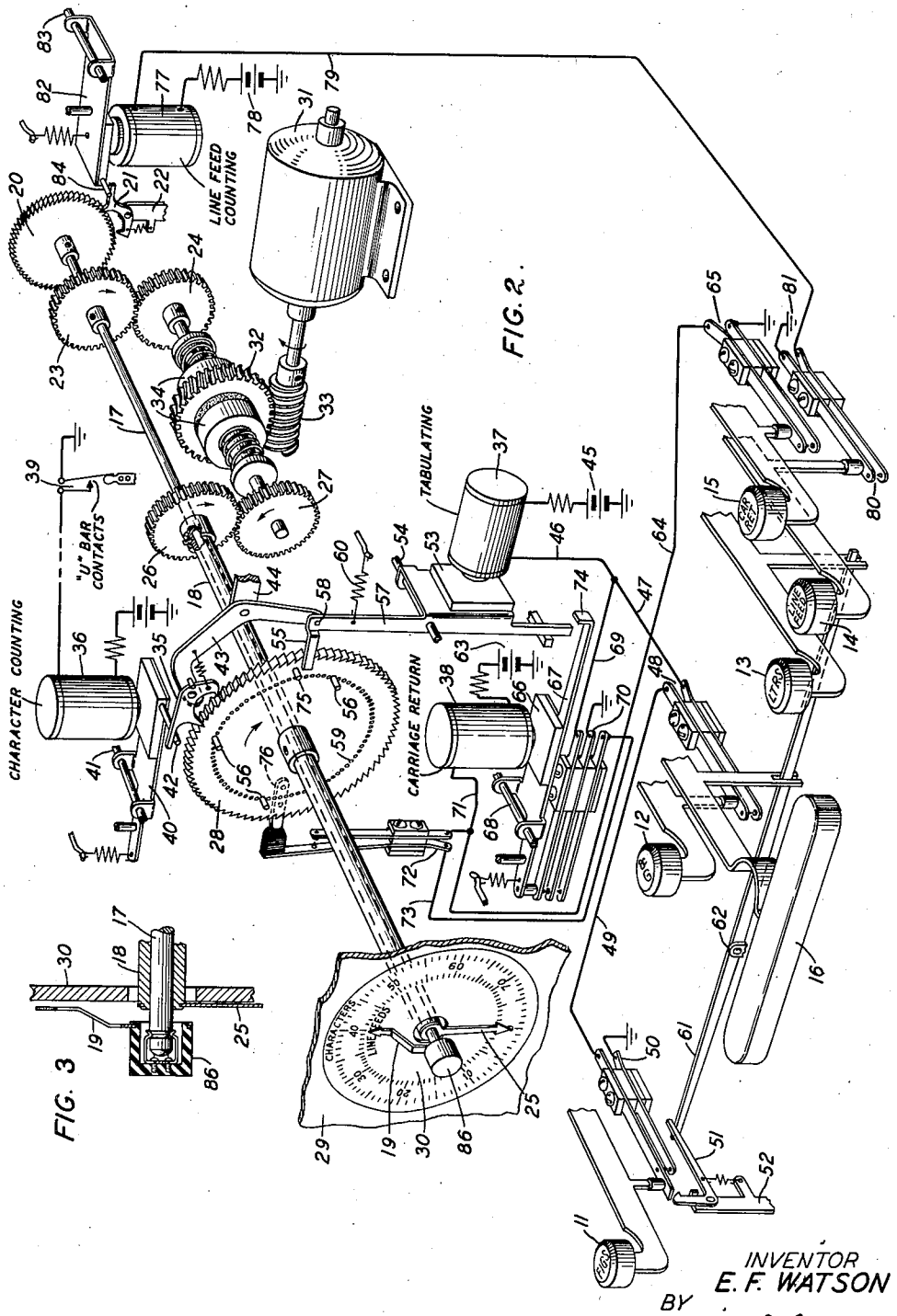


FIG. 2.



FIG. 3

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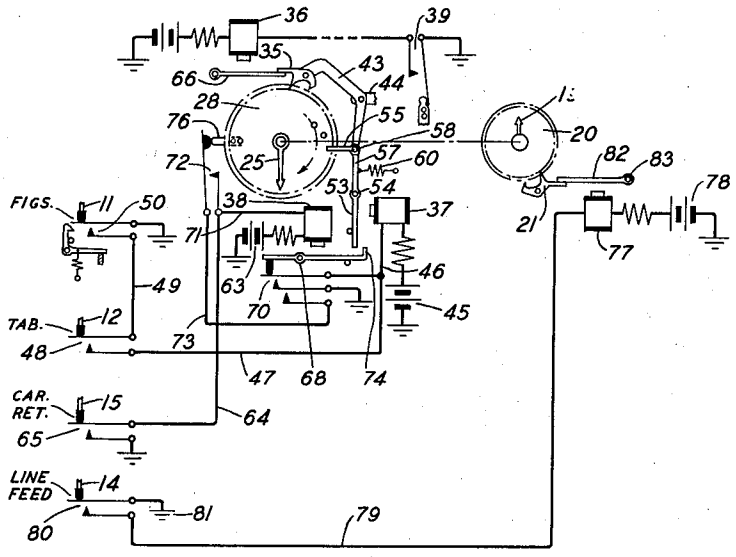
FIG. 4

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Patented Feb. 18, 1941 2,232,155

# UNITED STATES PATENT OFFICE

2,232,155

## PRINTING TELEGRAPH APPARATUS

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Application August 17, 1938, Serial No. 225,412

16 Claims. (Cl. 178—2)

The present invention relates to printing telegraph apparatus and more particularly to improvements in tabulating and line feed signaling counting mechanisms, associated therewith.

More specifically the invention relates to indicators, or counters, and particularly to indicating and counting mechanisms controlled directly by the keys of a teletypewriter or perforator.

An object of this invention is to provide an efficient and smoothly operating mechanism directly responsive to key operation for, first, progressively indicating the count of printing and spacing functions performed in each line of a message and perforated in a tape for transmission, by the operation of the printing, spacing and tabulating mechanisms, and, secondly, for progressively indicating the count of line feed signaling functions performed on a sheet that is to receive the message.

Another object is to provide facility for preparing an accurate record in the form of a perforated tape without requiring a typed record on an organized form sheet before the transmitting operator, for the automatic control of a tape transmitter employed in transmitting to a remote point where the transmitted information is recorded on an organized form sheet such as is used for shop orders, invoices, bills of lading, etc. in intercommunication systems.

Still another object is to provide a character counting and a line feed signal counting device for use with a key board perforator-transmitter, which is equipped for both counting characters, isolated spaces and consecutive spaces of one or more groups in a line of the message, and counting line feed signals transmitted for said message, that is to be recorded at the receiving end by a page printer.

Still another object of the present invention is the provision of a keyboard perforator and a counter that is positive in action and one that will show at all times during the perforating operation the exact position of every printing and every spacing function in every line of a message and the total number of characters and the spacing signals in each line as they are produced as perforations on a tape, as well as the number of line feed signals that are employed in the transmission of the message.

Still another object is to enclose both the character counter including the tabulating and counting mechanism, and the line feed signal counter in a unitary structure that may be detachably connected to the housing of a keyboard perforator, at the transmitting end of a communication line.

Printing telegraph keyboard perforator transmitting stations comprise complete unitary structures including transmitting mechanism controlled by a keyboard or a perforated tape, which serves to issue permutation code signals over a line, and receiving mechanism connected to the same line which is responsive to signals of a line character issuing from a distant transmitter. The printing mechanism of each unit is usually responsive to both incoming signals which are transmitted from the remote station and the outgoing signals transmitted from the local keyboard or perforated tape and transmitting apparatus so that the printed record at each station includes a complete entry of the whole intercommunication. Since the difficulty of coordinating the keyboard perforator-transmitter and the page printer located at a distant point presents a problem only to the transmitting operator employing the keyboard perforator, the application of the present invention is requisite particularly with a perforated tape transmitting medium. If it is desired to maintain a visual indication of a cumulative record for a transmitting operator, the present invention or the character counter may be readily employed for such purpose. It is noted therefore that while the present invention will be described in connection with the particular object of coordinating the two classes of devices that are at present in commercial use, that its utility is by no means limited thereby, but that it is intended as an improvement having general application as a counter for electrical impulses.

The tabulating function is effected through the medium of code selector bars in a manner similar to that required for operating the type levers. Cooperating with the code selector bars is a tabulator bar which extends across the front of a teletypewriter machine and which is pivotally carried by brackets, and may swing toward and away from the type carriage. The tabulator bar carries a number of adjustable stop members which determine the position at which the type carriage comes to rest after consecutive spacing during the tabulating cycle. The spacing mechanism of the printing apparatus comprises a three-toothed ratchet adapted to cooperate with a pair of pawls which are actuated by the printing bail to function as an escapement mechanism so that upon each revolution of the main shaft of the spacing worm gear associated with the spacing bracket, it is permitted to rotate one-third of a revolution. Thus by moving the ad-

justable stop members to any desired position, the type carriages at both the transmitting and receiving printers may be moved for any stop member any number of consecutive spaces in one direction. For a more detailed description of the tabulating function, reference may be made to United States Patents 2,023,121 and 2,076,864, respectively granted to C. W. Burcky et al. on December 3, 1935, and to Albert H. Rieber on April 13, 1937. In neither of these patents is there disclosed a counter for recording the total number of characters, isolated spaces and groups of consecutive spaces that may be contained in a line of a message that is recorded on a page printer at the distant end.

The tabulating function is usually associated with upper case "G" on the keyboard which normally carries the "&" character. The operation of a tabulating key in the keyboard of a teletypewriter equipped with tabulating mechanism causes type carriages of all similarly equipped teletypewriters connected to a communication line to move smoothly and rapidly across the page to a position predetermined by any of the settings of the adjustable stop members. The tabulating mechanism is of a particular advantage to operators who transmit a substantial amount of tabulated material, particularly in typing on form sheets. It may be useful in locating addresses or columns of tabulated information. It relieves the operator of the care required to bring the type carriage to a desired point with the repeat space operation which is occasioned by the possibility of over-spacing thereby necessitating returning the carriage and starting again. When the tabulating mechanism is used with tape perforator transmitters, it is necessary for the operator in perforating a tabulation signal to follow such signal by one "blank" or "letters" signals. Then the transmitter is held till the type carriage reaches the desired point.

Also, there is known a character counter which is in the results produced, somewhat similar to the line feed signal counting device of the present invention. Such character counter comprises an electrically controlled device having two types of indicators, one of which is a recording indicator and displays progressively the sum total of signals that are transmitted subsequent to its previous resetting, while the other is an alarm signal in the form of an incandescent electric lamp which indicates the recordation of a predetermined number of the aforementioned signals. Both of the indicators coact in response to the same signals as may be made to record either the received signal, the transmitted signal, or both, although as stated above, the recordation of the transmitted signals is the general commercial practice. The character counter makes use of a dial or other class of index that is capable of recording and indicating successive signals in every line of a transmitted message, which signals are impressed upon a stepping magnet electrically and thereafter communicated to the dial mechanically. Another magnet is adapted upon energization by a circuit to close, through the operation of the carriage return key, to thereby release the dial and permit it to be restored to zero, or normal position. A detailed description of the aforementioned character counter may be had by referring to United States Patent 2,018,368, granted to R. A. Lake on October 22, 1935.

According to the present invention a counting indicator is provided wherein is combined in one instrument, the features of a line feed counter and a tabulator-indicator, adapted for use with a perforator-transmitter or direct keyboard transmitter employed in teletypewriter intercommunicating systems. The tabulator-indicator is similar to the character counter in that it counts space functions along a line of a message to be subsequently recorded by a page printer of the type illustrated in U. S. Patent 2,076,864, supra. The character counter differs in that it is responsive to the operations of only those keys of a keyboard which cause transmission of a single character, single punctuation and a single space. The tabulator-indicator counts not only the single characters and spaces but also the spaces skipped over during any tabulator operation. The tabulator-indicator is particularly useful in typing orders on form sheets where tabulated information is to be recorded. There is provided a single dial having indicator arms similar to clock hands and respectively associated with two concentrically arranged graduated scales. The inner scale is for the line feed count and the outer scale for the horizontal space count. The line feed indicator arm is fixedly mounted on the end of a solid shaft which is rotatable in a rotatable tubular, or sleeve, shaft. On the end of the tubular shaft is fixedly mounted a tabulating indicator arm in close proximity to the line feed indicator arm. Separate mechanisms rotate the two indicator arms independently of each other. The line feed indicator arm may be integrally formed as part of a knurled knob fixedly mounted on the end of the solid shaft so that the line feed indicator arm may be manually reset to zero at any time during the operation of the perforator-transmitter, as for instance, before perforating the material to be typed on a new, or succeeding form sheet in case the line feed indicator arm is not at the zero point at the time of starting the new sheet.

The proposed tabulator-indicator may be applicable to systems employed by private organizations, wherein it is desired to transmit orders, invoices, bills of lading, or the like between branch houses, manufacturing centers and warehouses within the organization. In other words, among its applications are systems generally identified as intercommunicating teletypewriter systems. The tabulator-indicator is particularly adaptable for systems wherein the transmitting is done from perforated tape and the receiving is had on a page printer. In systems of this character it is very often necessary that the transmitting operator perforate tape "blind," that is, without the use of a monitoring page from which the message can be read, transmitted and then received at a distant end as a record printed on a page corresponding in form and size to a monitoring page at the transmitting end. With the use of the tabulator-indicator the transmitting operator is informed at all times during preparation of the message tape of the position of the type carriage of the page printer at the receiving end, the position of the type carriage being determined with respect to the line on the sheet and the character in the line.

The above and other objects of this invention will be fully set forth in the following description and claims and will be more readily understood by reference to the accompanying drawings in which:

Fig. 1 is a schematic arrangement of a teletypewriter system wherein is shown a perspective view of a keyboard-perforator and a tape transmitter connected with a transmitting and receiving unit

similar to the one disclosed in U. S. Patent 1,745,633, issued to S. Morton et al. on February 4, 1930, together with a showing of an application thereto of an indicator which embodies the features of the present invention.

Fig. 2 is a fragmentary perspective view of the operative structure of the tabulator-indicator and the line feed indicator counting device;

Fig. 3 is a detailed view, in cross-section, of the arrangement of the indicator arms with respect to the dial shown in Fig. 2; and

Fig. 4 is a schematic arrangment of the operating circuit employed in the tabulator-indicator and the line feed indicator counting device of Fig. 2.

Referring to Fig. 1, the letter A designates a transmitting and receiving typewriter; letter B, the tape perforator controlled by the keyboard shown in front of printer A; letter C, a tape transmitter; and letter D, a tabulator and character counter. Transmission line L is connected to both the tape transmitter C and the transmitter (not shown) of the tape printer A in order that the transmission of signals over the line may be either from the tape transmitter C or the printer A. If from the printer, transmission will be direct from the keyboard to the line and if from the tape transmitter, transmission will be from the keyboard to the perforator, then from the perforated tape and tape transmitter to the line. The change from one form of transmission to the other may be effected by means of a key on the printer. The key commonly called "the keyboard, the keyboard and tape, and the tape" key is well known in the art and is illustrated in United States Patent 2,173,551, granted to K. E. Fitch on September 19, 1939. The line L extends to a remote point where it terminates in a transmitting and receiving page printer of the type disclosed in United Statss Patents 2,023,121 and 2,076,864, supra, which is equipped with tabulating mechanism.

Referring to Fig. 2, the reference characters 11, 12, 13, 14, 15 and 16 represent generally the keyboard of a tape perforator-transmitter, the base casting, or structure, for which is not shown. Reference characters 11, 12, 13, 14, 15 and 16 respectively indicate the shift key, the tabulator key which is usually the "G" key, trip latch key usually identified as the "letters" key, a line feed key, a carriage-return key and a space key, or bar. These keys together with the remaining keys, not shown, control, in addition to their usual functions, the operations of one or the other of rotatable shafts 17 and 18. Shaft 17 is of a solid material and is suitably supported by the base structure, not shown. The shaft 18 is tubular, or sleeve, in form and is mounted on shaft 17 in the manner shown in the drawing so that one may rotate independently of the other.

Fixedly mounted on the end of shaft 17 is a knurled knob 86 with which may be integrally formed a line-feed indicator arm 19. Fixedly mounted on the opposite end of shaft 17 is a line-feed ratchet wheel 20 which is normally engaged by escapement pawl 21 pivotally supported by upright 22 of the base structure. In proximity to line feed ratchet wheel 20 and securely fastened to shaft 17 is a driven gear 23 which is meshed with driving gear 24.

Fixedly mounted on one end of tubular shaft 18 is a tabulator-indicator arm 25. Securely fastened at the opposite end of shaft 18 is driven gear 26 which is in mesh with driving gear 27. Intermediate driven gear 26 and the tabulator-indicator arm 25 is tabulator-indicator ratchet wheel 28 fixedly mounted on shaft 18. Securely fastened in the housing 29 of the device is dial 30 which shows the relative positions of the line-feed counting and the character counting graduated scales.

A continuously operating motor 31 drives worm gear 32 by means of worm 33. On each side of worm gear 32 is a friction clutch 34 through which driving gears 27 and 24 may be rotated whenever their respectively associated ratchet wheels 28 and 20 are in released condition. Ratchet wheel 28 is normally locked by escapement pawl 35.

Three counter magnets, namely, character magnet 36, tabulator magnet 37 and carriage-return magnet 38 are provided to release the ratchet wheel 28 as desired and to thereby allow tabulator-indicator arm 25 to advance under the action of driving gear 27 in accordance with the function, or signal, perforated in the tape. Character magnet 36 is connected in a manner similar to stepping magnet 27 shown in Fig. 7 of United States Patent 2,018,368, granted to R. A. Lake on October 22, 1935. The contacts 39 shown in the operating circuit for magnet 36 corresponds to contact 73 shown in the Lake patent and will momentarily close each time a character, punctuation or single space signal is perforated in the tape. Each time magnet 36 operates, its armature 40 which is pivotally mounted on rod 41, moves upward to withdraw by means of pin 42, the left end of escapement pawl 35, from engagement with ratchet wheel 28. Pawl 35 is pivotally mounted on the upper end of lever 43. Lever 43 is pivotally mounted on a supporting member 44 which is securely fastened to the base structure. Magnet 36 operates momentarily when a character or punctuation key, or spacing bar, that is, a key or bar that is referred to hereinafter as a spacing function key, is operated to perforate the corresponding signal in the tape and to cause the momentary upward movement of pin 42 forcing the right end of pawl 35 into engagement with ratchet wheel 28 but only after the ratchet wheel has rotated in a clockwise direction through the action of driving gear 27, the distance of one-half tooth, the release of magnet 36 effecting the rotation of ratchet wheel the complete distance of a tooth. Thus, indicator arm 25 will have stepped over one graduation on the outer scale of dial 30. When magnet 36 deenergizes through the opening of contact set 39, armature 40 is restored to normal and the left end of pawl 35 again engages the teeth of ratchet wheel 28 to retain the wheel in its advanced position until the next spacing function key is operated.

Tabulator-magnet 37 is connected to the circuit extending from grounded battery 45, through the winding of the magnet, over conductors 46 and 47, over normally opened contact set 48, conductor 49, normally opened contact set 50 to ground. The purpose of the tabulator-magnet is to permit the rotation of ratchet wheel 28 through a distance equal to two or more steps without interruption and the purpose of the function is to permit the type carriage of the page printer at the receiving end of the transmission circuit to skip over two or more spaces in a line of a message without interruption in response to a single tabulation signal or its corresponding combination of perforations in a transmitting tape. Indicator arm 25 on

scale 30 accordingly rotates without interruption over two or more graduations corresponding in number to the spaces skipped, or to be skipped if perforated signals are employed, in a message line by the type carriage of the page printer when the tabulator signal is received at the receiving end. Indicator arm 25 thereby registers the total number of spacing functions transmitted or perforated either singly, that is, as tallied by means of counter magnet 36, or in groups, as tallied by tabulator-magnet 37, for each line of a transmitted message that is to be received on a page printer. Tabulating functions are generally selected on upper case "G" by momentarily operating tabulator key 12. It is, however, necessary in initiating the tabulating function to arrange a set of contacts 50 to be closed by operating shift key 11 before operating key 12. When key 11 is operated contact set 50 closes. The upper spring member of contact set 50, in closing, rides down the cam surface of latch member 51 which is pivotally mounted on a support 52 securely fastened to the base structure, and locks in the notch of member 51 to retain the operated spring members of contact set 50 in a closed condition. Immediately following the operation of key 11, key 12 is operated and the spring members of contact set 48 are momentarily closed in series with the operated spring members of contact set 50 to close the operating circuit for tabulator-magnet 37. In this way the tabulator-magnet will receive an impulse only when key 11 has been operated prior to the operation of key 12. Magnet 37, in operating, causes its armature 53 which is pivotally mounted on rod 54 to move to the right its full distance to engage the core of magnet 37. The armature 53, in moving its full distance to the right, in a counter-clockwise direction, completes two functions, first, escapement pawl 35 is withdrawn from engagement with the teeth of ratchet wheel 28 to permit the wheel to rotate under control of driving gear 27 and, secondly, tabulator stop 55 is projected inward, or leftward, to stop the rotation of ratchet wheel 28 when the tabulator stop engages the next tabulator stop control pin 56 which approaches stop post 55. The two functions are effected by the linkage arrangement of extension arm 57 and lever 43 which members are interconnected loosely (pin in slot) at pin 58, tabulator stop 55 being fixedly mounted on extension arm 57. The rightward, or counter-clockwise, movement of armature 53 in response to the operation of tabulator-magnet 37 alone, is for its full distance in contradistinction to its movement in response to the joint operation of carriage-return magnet 38 and tabulator-magnet 37 as will be hereinafter described.

There is provided on ratchet wheel 28 a circular row of apertures 59 which is arranged concentrically with the axis of the wheel. Into these apertures may be inserted tabulator stop control pins 56 at any desired position around the ratchet wheel 28. These control pins serve the same purpose as the tabulator stop members 86 shown in both of Figs. 1 of United States Patents 2,023,121 and 2,076,864, supra. Thus, in order that a control pin 56 may contact tabulator stop 55 and thereby prevent further rotation of ratchet wheel 28, it will be noted that tabulator stop 55 must be moved inward, or leftward, its full distance to make the necessary contacts.

The release of key 12 causes tabulator-magnet 37 to deenergize. Magnet 37 in deenergizing simultaneously permits extension arm 57 to yield to the tension of spring 60 thereby withdrawing tabulator stop 55 from engagement with a control pin 56 and the reengagement of escapement pawl 35 with the teeth of ratchet wheel 28 to hold the wheel against further rotation until a spacing function or a tabulating function is again perforated in a tape.

Immediately after a tabulating function has been automatically completed by the operation of shift key 11, and tabulator key 12, in sequence, the operation of "letters" key 13 or space key, or bar, 16 will depress the right-hand end of lever 61 which is pivotally fastened to upright 62 fixedly mounted on the base structure. By means of the pivotal connection to upright 62, the left end of lever 61 is moved upward to actuate latch member 51 out of engagement with the upper spring of contact set 50 so that contact set 50 returns to its normal open condition. Key 12 may then be operated to perforate the tape for transmitting a lower case character. This arrangement is in accordance with a general practice whereby most of the teletypewriters now in use are arranged to unshift on "letters" combination only, or "letters" and space combinations.

The carriage-return magnet 38 is connected in a circuit extending from grounded battery 63, through the magnet winding, conductors 71 and 64, normally opened contact set 65 to ground. The purpose of carriage-return magnet 38 when operated coincidentally with the perforation of a carriage-return signal combination is to rotate the ratchet wheel uninterruptedly in a clockwise direction to the end of its revolution. Transmission of the carriage-return signal causes the type carriage of the page printer at the receiving end to be automatically returned to its normal position so that another line of the message may be started. In other words, should the last single character or punctuation in the message not be at the end of a line, the function of the carriage-return magnet would be similar to that of the tabulator-magnet in that ratchet wheel 28, in response to the operation of the carriage-return magnet, is rotated uninterruptedly over a plurality of consecutive spaces to the end of its revolution.

The operating circuit for carriage-return magnet 38 is closed by depressing carriage-return key 15. Magnet 38 in operating draws both armature 66 and its extension arm 67 upward. Armature 66 and extension arm 67 are pivotally supported on rod 68 and thereby in operating closes parallel circuits, one extending from grounded battery 45 through the winding of tabulator-magnet 37, conductors 46 and 69, upper closed contacts of set 70 to ground and the other from grounded battery 63, through the winding of carriage-return magnet 38, conductor 71, closed contacts of set 72, conductor 73, lower closed contacts of set 70 to ground. Thus when carriage-return key 15 is operated tabulator-magnet 37 operates to pull armature 53 in a counter-clockwise direction around pivot rod 54 and pawl 35 is consequently withdrawn from engagement with the teeth of ratchet wheel 28. Ratchet wheel 28 is then permitted to rotate uninterruptedly. Armature 53, in being pulled in a counter-clockwise direction at this time, is restricted in its movement to a limited distance because extension arm 67 is in an operated position and its upturned portion 74 prevents the armature from reaching its maximum

operated position. The restricted movement of armature 53 causes tabulator stop 55 to move inward, or leftward, a limited distance, that is, not as much as when the tabulator-magnet 37 alone was operated as hereinbefore described. Fixedly attached to ratchet wheel 28 is stop post 75 which is shown located at the starting, or normal, position of wheel 28, and is in closer proximity to the periphery of the wheel 28 than the circular row of apertures 59 in which the tabulator stop control pins 56 are inserted. As soon as the tabulator-magnet 37 is operated, wheel 28 advances until stop post 75 engages tabulator stop 55. Also, at the beginning of perforations for the start of any line in a message to be transmitted, element 76 which is securely fastened to the rear side of wheel 28 and is normally in engagement with the left-hand spring member of contacts 72, moves out of engagement with the left-hand spring member of contact 72 to close the contact set 72. Closing of the hereinbefore-mentioned other parallel circuit at contact set 72, establishes locking circuit for carriage-return magnet 38 and magnet 38 is maintained operated after the carriage-return key 15 is released until contact set 72 opens when post 75 engages stop 55.

Ratchet wheel 28 when it is released by escapement pawl 35 because of the joint operation of magnets 38 and 37, that is, after the carriage-return key is operated, is permitted to rotate uninterruptedly until stop post 75 engages tabulator stop 55. Also, at the end of the revolution of wheel 28 the contacts of set 72 are again opened by element 76 to deenergize magnet 38 and to subsequently release magnet 37. The release of magnet 37 causes escapement pawl 35 to again engage the teeth of ratchet wheel 38 and tabulator stop 55 to be withdrawn from engagement with stop post 75. When ratchet wheel 28 is brought to a stop at the end of its revolution, indicator arm 25 is at zero, its starting point, as shown in the drawings.

The line feed magnet 77 is connected in a circuit extending from grounded battery 78, through the winding of the magnet, conductor 79, lower contact 80 of set 81 to ground. This circuit is closed by the operation of line feed key 14. The purpose of the line feed function is, as well known in the art, to advance the page, bulletin or sheet at the page printer at the receiving end of a transmission circuit, to the next line so as to resume the message. In the present invention there is an additional purpose of the line feed function and that is to keep an accurate count at the transmitting end where the tape is being perforated of the lines perforated and skipped, as the case requires, by automatically stepping indicator arm 19 one step around the inner graduated scale on dial 30 every time a new line is started in the message that is to be received at the receiving end. Magnet 77, in operating causes its armature 82 to rotate downward in a counter-clockwise direction around rod 83 on which it is pivotally mounted. Fixedly supported by armature 82 is pin 84 which is always in engagement with escapement pawl 21. Escapement pawl 21 is pivotally mounted on upright 22, a part of the base structure. Escapement pawl 21 is normally in engagement with ratchet wheel 20 and normally prevents rotation of ratchet wheel 20 against the influence of the right-hand friction clutch 34. When pin 84 moves downward with armature 82 it withdraws the right end of escapement pawl 21 from engagement with the teeth of ratchet wheel 20 and wheel 20 is now free to rotate under the influence of right-hand clutch 34, driving gear 24 and driven gear 23 until the left end of escapement pawl 21 is pivoted upward to engage the next tooth of the wheel. The rotation of ratchet wheel 20 in steps individual to the operation of key 14 steps the shaft 17 and incidentally indicator arm 19 accordingly around the inner graduated scale of dial 30 so that when indicator arm 19 comes to its last graduation it shows the page has been completed and the machine will be ready to begin a new page, bulletin or sheet. Indicator arm 19 may be reset manually at any time by turning knurled knob 86 which is frictionally mounted on the left end of shaft 17 in the manner shown in Fig. 3.

Fig. 4 shows a schematic of the circuit arrangement of the device shown in Fig. 2. The operated parts shown in Fig. 4 are designated by reference characters similar to those used on the corresponding parts shown in Fig. 2. No description of the circuit shown in Fig. 4 is deemed necessary in view of the description hereinbefore given for Fig. 2.

What is claimed is:

1. An indicating device comprising operable keys, stepping members controlled by said keys, means responsive to the operation of certain of said keys for stepping one of said members one step in one direction for each operation of any one of said certain keys, means responsive to the operation of a plurality of other of said keys for stepping said one of said members a plurality of steps uninterruptedly in said one direction, means responsive to the operation of another of said keys for stepping the other of said members one step in said one direction for each operation of said other one of said keys, and means for indicating at any time the number of steps taken by each of said members.

2. An indicating device comprising operable keys, stepping members coaxially arranged with each other and controlled by said keys, means responsive to the operation of certain of said keys for stepping one of said members one step in one direction for each operation of any one of said certain keys, means responsive to the operation of a plurality of other of said keys for stepping said one of said members a plurality of steps uninterruptedly in said one direction, means responsive to the operation of another of said keys for stepping said one of said members one or more steps uninterruptedly in said one direction to its starting position for each operation of said another one of said keys, means responsive to the operation of still another of said keys for stepping said other member one step in said one direction, a pointer mounted on each of said members and a dial common to said pointer for indicating at any time the number of steps taken by each of said members.

3. A keyboard controlled indicator comprising indicators in movable relation with respect to scales, controlling mechanisms for causing the advancement of said indicators independently of each other, actuating means for said mechanisms, key levers and a circuit controlled thereby for controlling a particular actuating means for one of said mechanisms, other key levers operated jointly and a circuit controlled by their joint operation for controlling another of said actuating means for said one of said mechanisms, another key lever and a key circuit controlled by said other key lever for controlling still another of said actuating means together with said other actuating means for another of said mech-

anisms, still other key levers and means cooperating therewith for disabling said other of said actuating means after said other jointly operated key levers are operated jointly, and still another key lever and a circuit controlled thereby for controlling a fourth actuating means for another of said mechanisms.

4. A keyboard operated device comprising a plurality of operable keys, electromagnetic means responsive to the operation of certain of said keys, a second electromagnetic means responsive to the joint operation of two other of said keys, a third electromagnetic means arranged to operate in conjunction with said second electromagnetic means in response to the operation of one other of said keys, a fourth electromagnetic means responsive to the operation of still another of said keys, rotatable shafts coaxially arranged one within the other, ratchet wheels fixedly mounted on said shafts, respectively, continuously operated means for rotating said shaft, a pawl normally in engagement with each of said ratchet wheels for respectively controlling the rotation of said shafts, armatures included in each of said electromagnetic means, said armature of the first-mentioned electromagnetic means including a lever for causing one of said ratchet wheels to rotate one step in response to the operation of each of said certain keys, said armature of said second electromagnetic means including leverage means for causing said one ratchet wheel to rotate through successive steps in response to the operation of said two other keys, said armature of said third electromagnetic means including leverage means for causing, in conjunction with the operation of the leverage means of said second electromagnetic means, said one ratchet wheel to complete a revolution in response to the operation of said one other key, and said armature of said fourth electromagnetic means including leverage means for causing the other of said ratchet wheels to rotate one step in response to each operation of said still other key, and manually operated means frictionally attached to the end of the rotatable shaft supporting said other ratchet wheel for restoring at will said other ratchet wheel to its normal position.

5. A stepping device comprising rotatable shafts concentrically arranged to each other, a ratchet wheel fixedly mounted on each of said shafts, electromagnetic means and an operating circuit therefor for causing one of said ratchet wheels to rotate one step each time said circuit is energized, a second electromagnetic means and an operating circuit therefor for causing said one ratchet wheel to rotate through consecutive steps without interruption when the second-mentioned circuit is energized, a third electromagnetic means and an operating circuit therefor for causing said one ratchet wheel to complete its revolution when the third-mentioned circuit is energized, a fourth electromagnetic means and an operating circuit therefor for causing the other of said ratchet wheels to rotate one step when the fourth-mentioned circuit is energized, and a dial and index pointers arranged thereon as clock-hands, for indicating the steps taken by each of said ratchet wheels respectively.

6. A stepping device according to claim 7, wherein said ratchet wheel comprises a plurality of stop posts securely fastened to said wheel, arranged in a circle concentric with the center of rotation of said wheel and separated from each other at angular distances arbitrarily determined, and another stop post fixedly mounted on said wheel at a point between the path of said removable stop posts and the periphery of the wheel, and wherein said second electromagnetic means comprises an element for engaging any one of said removable stop posts to stop rotation of said wheel when said second electromagnetic means is in one operated condition and for engaging said other stop post to stop said wheel at the end of its revolution when said second electromagnetic means is in another operated condition.

7. A stepping device according to claim 5, wherein said third electromagnetic means comprises circuits and multicontacts responsive to the operation of said armature thereof, for establishing a condition of partial operation of said second electromagnetic means and a locked condition for said third electromagnetic means for a predetermined interval.

8. In a communication system, a source of signals, a recorder for receiving signals from said source, means in said recorder responsive to individual character signals and other individual signals having spacing functions received from said source for operating said recorder in one of two directions, a distance equivalent to one individual step of operation, other means in said recorder responsive to a special signal from said source for operating said recorder uninterruptedly in said one of two directions through a distance equivalent to two or more individual steps, as desired, still other means in said recorder responsive to another special signal from said source for operating said recorder in the other of the two directions a distance equivalent to one individual step of operation, a registering means at said source of signals for showing at any time during preparation of signals at said source the total number of steps including those which said recorder will subsequently be operated in said one of two directions in response to said individual character signals and said other individual signals having spacing functions and those signals through which said recorder will subsequently be operated in said one of two directions in response to the first-mentioned special signal and the total number of steps through which said recorder will subsequently be operated in said other of the two directions in response to the second-mentioned special signal.

9. In a communication system according to claim 8, wherein said registering means is a single unitary device having clock-like index arms and graduated scales over which said arms move in a clockwise direction to separately furnish at said source of signals, during preparation of signals at said source, the total number of steps taken by said recorder in one of said two directions, and the total number of steps taken by said recorder in the other of said two directions.

10. In a communication system, a recorder comprising a platen arranged to rotate in individual steps and a type carriage in engageable relation therewith and movable normally one character space for each recording operation, a perforator-transmitter and an indicator located at a point distant from said recorder, said indicator comprising a character counting mechanism, a tabulating counting mechanism and a line feed counting mechanism, means responsive to each operation of said character counting mechanism for causing said type carriage to advance one space for each character

perforated, other means responsive to each operation of said tabulating counting mechanism for causing said type carriage to advance uninterruptedly through a plurality of spaces from one recording position to another, still other means responsive to each operation of said line feed counting mechanism for rotating said platen one step, and an indicating dial located at said indicator for informing the operator of said perforator-transmitter at all times during the operation of said perforator-transmitter of the corresponding position of said type carriage with respect to each character signal and each spacing function signal being perforated in each line of the message (received by said recorder) and of the corresponding position of said platen with respect to the first line of the message.

11. In a telegraph system comprising a source of telegraph signals of spacing and non-spacing characters, a perforator-transmitter for preparing for transmission signals of one and two or more spacing functions in length, and line feed signals, and a device comprising two indicating instrumentalities for respectively indicating at all times during the operation of said perforator-transmitter the total number of signals of one and two or more spacing functions in length and the total number of line feed signal functions prepared by said perforator-transmitter.

12. In a telegraph system, a source of telegraph signals, a perforator-transmitter having keys for preparing signals of spacing and non-spacing character, and a counting device comprising two ratchet wheels, a continuously operating motor having two driving elements for respectively operating said ratchet wheels independent of each other, electromagnetic means responsive to the operation of certain of said keys whereby the operation of said certain keys prepares signals of a single spacing character and whereby one of said ratchet wheels is caused under control of one of said driving elements to rotate one step only, a second electromagnetic means responsive to certain others of said keys whereby the operation of said certain others of said keys prepares signals of two or more spaces duration and whereby said one ratchet wheel is caused to rotate uninterruptedly under the control of said one driving element, two or more steps as desired, a third electromagnetic means responsive to one of said keys, whereby the operation of said one key prepares a signal of non-spacing character and whereby said one ratchet wheel is caused to rotate uninterruptedly under control of said one driving element to the end of its revolution, a fourth electromagnetic means responsive to another of said keys, whereby the operation of said other key prepares a signal of non-spacing character, and whereby the other of said ratchet wheels is caused to rotate under the control of the other of said driving elements one step only, a signal indicating device having arms rotatably mounted with said ratchet wheels, respectively, for indicating the operated positions of said ratchet wheels with respect to their respective normal positions and manually operated means for restoring one of said rotatable arms to its normal position at any time during the operation of said perforator-transmitter.

13. In a keyboard transmitter, a counting device comprising in combination a line feed counter and a tabulator-indicator, an indicator disc common to said counter and said indicator, index hands and graduated scales therefor respectively individual to said counter and said indicator, selectively operated motor driven means for said index hands, a series of operable keys for controlling said motor driven means, frictionally controlled mechanism included in said motor driven means selectively responsive to the operation of said keys for respectively moving said index hands independent of each other, manually operated means for restoring said index hand of said line feed counter to normal at any time during operation of said tabulator-indicator, and other means responsive to the operation of one of said keys for causing said motor driven means to restore said index hand of said tabulator-indicator to normal, as desired.

14. In a signaling system, a tape perforator for perforating permutation code signal combinations for later transmission, a receiving machine arranged to advance one space in one direction in response to each of certain of said combinations, a plurality of spaces in said one direction in response to another of said combinations, one space in another direction in response to another of said combinations, one space in another direction in response to still another of said combinations and to restore to normal in response to still another of said combinations, an indicator comprising a plurality of pointers having a common center of rotation and controlled by the perforator in a manner to advance themselves independently of each other, a single dial over which said pointers are arranged to advance, one of said pointers being arranged to advance one step in one direction in accordance with each of said certain combinations and a plurality of steps in said one direction in accordance with the first-mentioned other of said combinations and to advance in said one direction to its normal position in accordance with the third-mentioned other of said combinations to indicate to the perforator operator, while perforating, the position on a message line to be assumed by the controlled receiving printer and the other of said pointers being arranged to advance one step in said one direction in accordance with the second-mentioned other of said combinations to indicate to the perforator operator, while perforating, the position of each message line with respect to the starting line of said message.

15. In a signaling system, a tape perforator for perforating permutation code signal combinations for later transmission, a receiving machine arranged to advance one step in one direction in response to each of certain of said combinations and a plurality of spaces in said one direction in response to another of said combinations, and to advance one space in still another direction in response to another of said combinations, a keyboard comprising operable keys for controlling said perforator, certain of said keys arranged to cause the perforation of said signal combination for advancing said receiving machine in one direction one step for each of said certain combinations, other of said keys for causing the perforation of another of said signal combinations for advancing said receiving machine a plurality of steps in said one direction for each of said other signal combinations and still another of said keys for causing the perforation of another of said signal combinations for advancing said receiving machine one step in another direction for each of the signal combinations caused to be perforated by the second-mentioned other of said keys, a registering device comprising two pointers having a com-

mon center of rotation and a common dial therefor, said pointers being arranged to respectively indicate to the perforator operator, while perforating, the position on a message line with reference to the beginning of the line and the position of the message line with reference to the starting line to be assumed by the controlled receiving machine when said machine receives said signal combination.

16. In a signaling system, a tape perforator for perforating permutation code signal combinations for later transmission, a receiving machine arranged to advance one step in one direction in response to each of certain of said combinations, a plurality of spaces in said one direction in response to another of said combinations, one space in another direction in response to a second other of said combinations and to restore to the normal position in response to a third other of said combinations, a keyboard comprising operable keys for controlling said perforator, certain of said keys arranged to cause the perforation of said signal combination for advancing said receiving machine in one direction one step for each other of each of said certain combinations, other of said keys for causing the perforation of another of said signal combinations for advancing said receiving machine a plurality of spaces in one direction for each of said other combinations, another of said keys for causing the perforation of another of said signal combinations for advancing said receiving machine one step in another direction, still another of said keys for causing the perforation of one of said signal combinations for restoring said receiving machine to a starting position, a register comprising a pointer for each direction through which said receiving machine is advanced and a dial common to said pointer, means controlled by said keys for advancing said pointers independently of each other to indicate to the perforator operator, while perforating, the position of the receiving machine with reference to the starting point of each line, and to the starting line of each message when said machine receives said signal combination.

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