H. DREWELL.

SHIFTING DEVICE.

APPLICATION FILED JUNE 26, 1908.

953,988.

Patented Apr. 5, 1910.

4 SHEETS—SHEET 1.

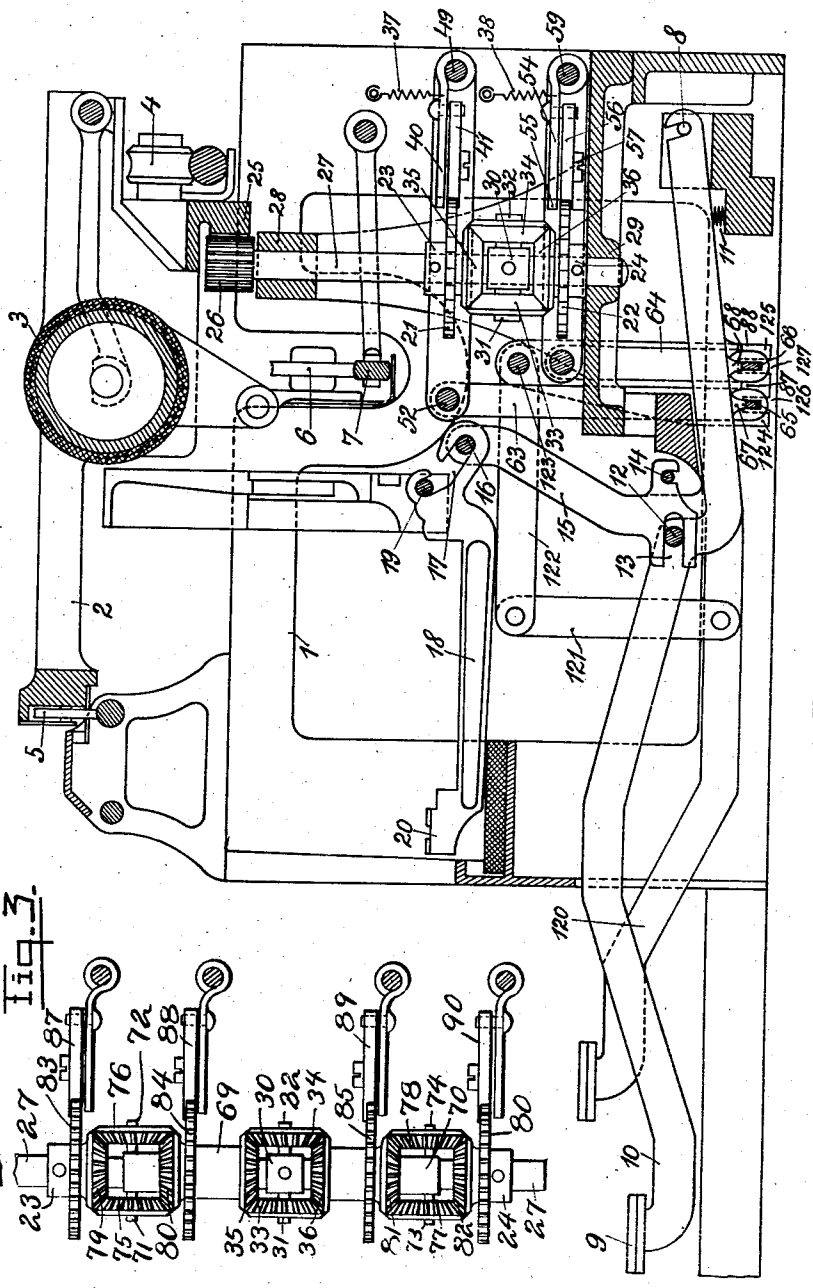

Fig. 1.

Fig. 3.

WITNESSES

Edw. D. Spring.

W. T. Smith.

INVENTOR

Heinrich Drewell

BY

ATTY.

H. DREWELL.

SHIFTING DEVICE.

APPLICATION FILED JUNE 26, 1908.

953,988.

Patented Apr. 5, 1910.

4 SHEETS—SHEET 2.

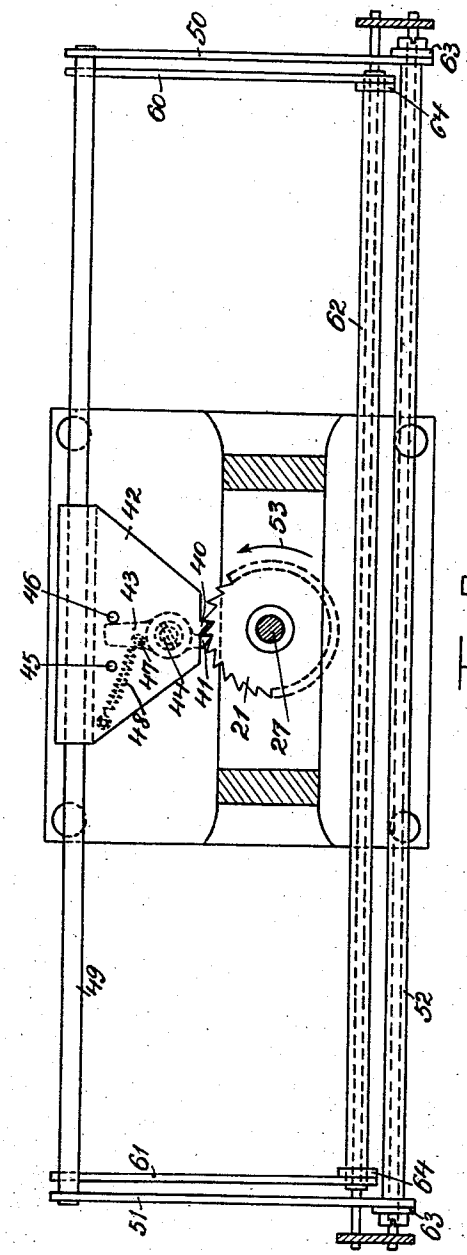

Fig. 2.

WITNESSES

Edward D. Spring

W. T. Smith

INVENTOR

Heinrich Drewell

BY Munn & Miller ATTY.

H. DREWELL.

SHIFTING DEVICE.

APPLICATION FILED JUNE 26, 1908.

953,988.

Patented Apr. 5, 1910.

4 SHEETS—SHEET 3.

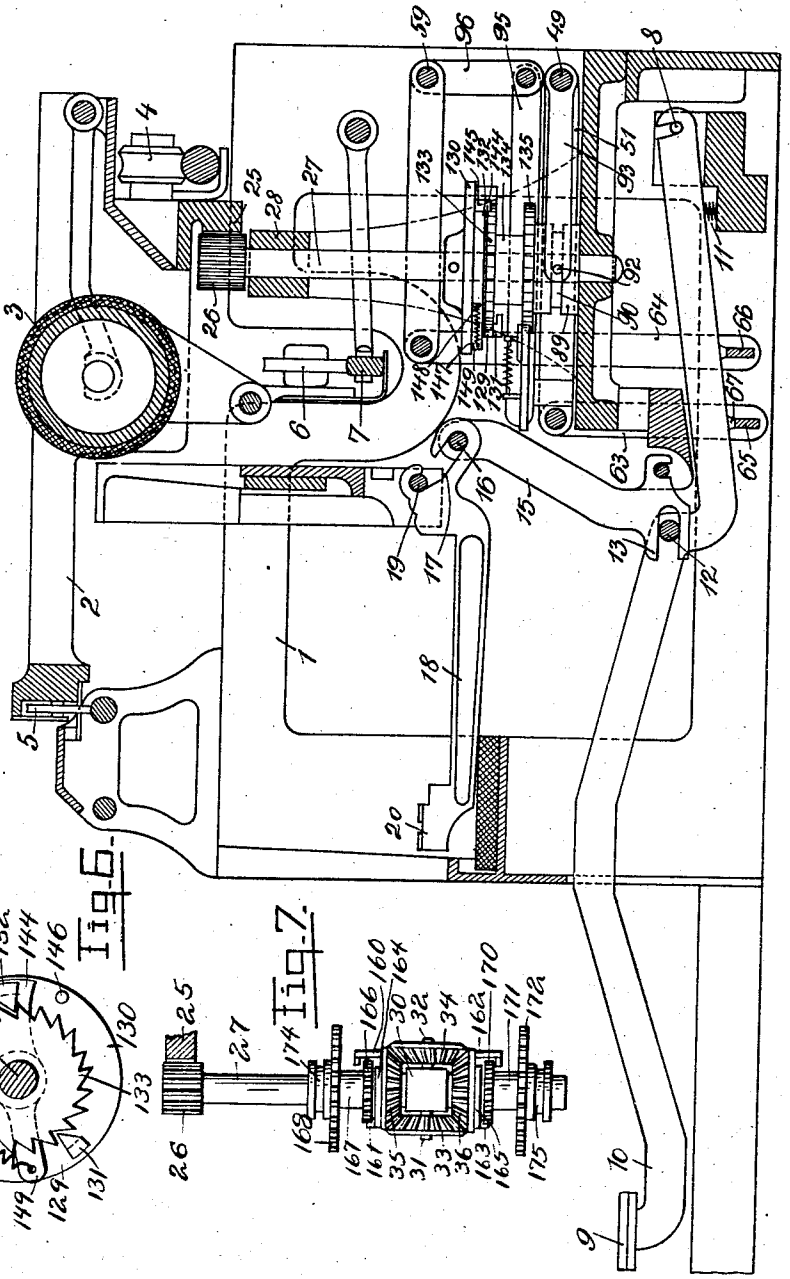

Fig. 4.

Fig. 6.

Fig. 7.

WITNESSES

Edw. D. Spring

W. J. Smith

INVENTOR

Heinrich Drewell

BY Wm. F. Wallace Mills ATTY.

H. DREWELL.

SHIFTING DEVICE.

APPLICATION FILED JUNE 26, 1908.

953,988.

Patented Apr. 5, 1910.

4 SHEETS—SHEET 4.

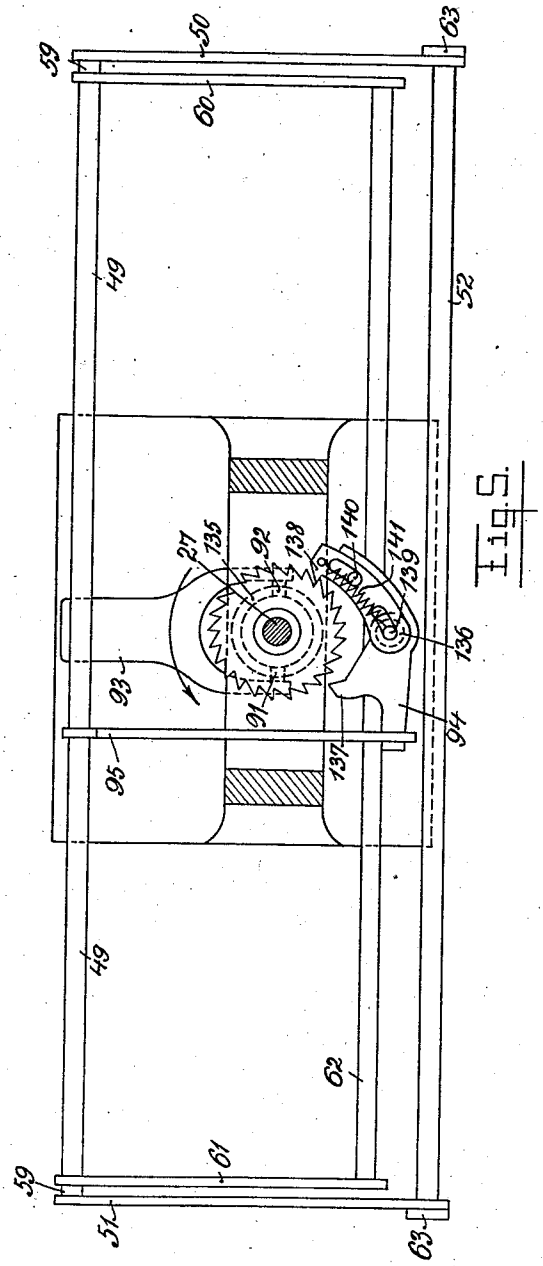

Fig. 5.

WITNESSES

Edw. D. Spring.

W. G. Smith.

INVENTOR

Heinrich Drewell

BY

ATTY.

UNITED STATES PATENT OFFICE.

HEINRICH DREWELL, OF CHARLOTTENBURG, GERMANY, ASSIGNOR TO SCHNELLSETZ-MASCHINENGESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG, OF BERLIN, GERMANY.

SHIFTING DEVICE.

953,988. Specification of Letters Patent. Patented Apr. 5, 1910.

Application filed June 26, 1908. Serial No. 440,589.

To all whom it may concern:

Be it known that I, HEINRICH DREWELL, subject of the German Emperor, residing at Charlottenburg, near Berlin, Germany, have invented new and useful Improvements in Shifting Devices, of which the following is a specification.

This invention relates to shifting devices such as are employed in typewriters, type space indicators, line justifying devices, band perforating mechanisms and the like.

Shifting devices known hitherto for shifting the paper carriage of typewriters and the like different distances depend, generally speaking, on a pawl being operated when a key is depressed. This pawl is then placed against movable stops. Each time a key is depressed one of these stops is brought into the path of the pawls. According to the breadth of the letter which corresponds to the key which is struck, the stop brought in the path of the pawl is at a different distance from the normal position of the pawl. In this manner the part to be shifted is moved correspondingly each time. Such devices, however, have the disadvantage that the individual members which come into operation very easily get out of order. For in order to shift the paper carriage as rapidly as possible, the movable parts of the shifting device must be made as light as possible. Therefore even only slight wear and tear causes defective working, on account of bent parts and other defects. This is made still worse by toothed wheels and racks being necessary for shifting different degrees, the pitch of which wheels and racks must correspond to the smallest possible difference of two extents of shifting which are used. Also a comparatively large number of single parts are required in order to obtain a suitable number of steps, because a special stop has to be adjusted for each step, and, moreover, the movable pawls controlling the extents of shifting have to be released.

Now an important object of the present invention is to do away with these defects.

The fundamental idea of the invention does not consist in one single pawl and ratchet mechanism with different extents of shifting being used as in known shifting devices, but in providing a plurality of pawl and ratchet mechanisms acting independently one of another and each having one single extent of shifting. This independence is obtained by the movement of the pawl and ratchet mechanism being transmitted by one central member to the paper carriage. This central member makes movements which are dependent on two or more different pawl and ratchet mechanisms. The amount of the movement of the central member results from the summation of the movements made by the individual pawl and ratchet mechanisms. Thus two pawl and ratchet mechanisms give three different extents of shifting. When more than two pawl and ratchet mechanisms are employed, an optionally large number of extents of shifting is obtained corresponding to the number of the possible combinations of the individual mechanisms.

In order that the invention may be clearly understood, reference is made to the accompanying drawings in which a plurality of embodiments are represented by way of example, and in which:—

Figure 1 is a vertical sectional elevation of one form having two pawl and ratchet mechanisms and one differential gear; Fig. 2 is a horizontal section showing part of the device according to Fig. 1; Fig. 3 is an elevation of a modified form of part of the apparatus according to Fig. 1, four pawl and ratchet mechanisms being shown; Fig. 4 is a vertical sectional elevation of an apparatus of simplified form as compared with that shown in Fig. 1; Fig. 5 is a horizontal section showing part of the apparatus according to Fig. 4, and Fig. 6 is a plan, as seen from below, showing a detail of the device according to Fig. 4; Fig. 7 is an elevation showing a modified form of part of the device according to Fig. 4, this being a modified form of the detail according to Fig. 3.

The invention is represented in the above described figures as applied to a typewriter according to the Underwood system, but it is clear that the invention can also be employed in all other corresponding typewriters and machines which are used for similar purposes, as, for example, in apparatus for making register bands for controlling type setting machines and the like.

Referring to the drawing, in the form according to Figs. 1 to 3, 1 is the frame of the machine, 2 the paper carriage, 3 the platen roll, and 4, 5 and 6 are guide wheels for the paper carriage. Under the wheel 6 is arranged the rail 7 by means of which

the platen 3 can be raised for the purpose of changing to a different sort of type.

9 is the key by depressing which the key-lever 10 is moved. The latter has its fulcrum at 8 in the frame of the machine. A spring 11 normally presses the lever 10 upward. A pin 12 attached to this lever 10 engages in the slot 13 of a bell-crank lever 15 which is mounted at 14. On the bell-crank lever 15 there is a pin 16. This engages in the slot 17 of the type-lever 18. The latter is pivoted at 19 and carries on its end the type-bar 20. Further, on the frame 2 of the paper carriage there is attached the rack 25 in which a pinion 26 engages. The purpose of this pinion is to move the frame of the paper carriage farther on and consequently to bring into operation the arrangement forming the subject-matter of the present invention. The axle 27 of this toothed wheel is revoluble in bearings 28 and 29 in the frame of the machine. The axle 27 carries a ring 30 carrying two pivots 31 and 32. These pivots carry the bevel wheels 33 and 34 which can rotate around the two pivots as axles. Further, below and above the ring 30 there are arranged in addition the two bevel wheels 35 and 36 which on their part are firmly connected with the two ratchet wheels 21 and 22. The previously mentioned ring 30 on the one hand, and two regulating rings 23 and 24 on the other hand, prevent these parts being moved in an axial direction. The four bevel wheels 33, 34, 35, 36 form a differential gear. The movement of the two outside wheels 33 and 34 is determined by the motion which is imparted to the wheels 35 and 36 by means of the ratchet wheels 21 and 22 in the manner which will now be explained. Pawl and ratchet mechanisms are used for this. Each of these consists of two pawls which can both be displaced in the direction of the axle 27 and which alternately engage with or disengage from the wheels 21 and 22.

The shifting mechanism of the wheel 21 consists of the two pawls 40 and 41. The pawl 40 is formed by a tooth arranged fixed in the plate 42, whereas the pawl 41 is the end of a lever 43. The latter is revoluble on the stem of a screw 44 inserted in the plate 42. The lever 43 moves between two stops 45 and 46 and carries a pin 47. A spring 48 is attached to the latter and tends to place the lever 43 against the stop 45. The driving spring of the paper carriage which is not represented in the drawing acts against this spring 48 in such manner that it tends to rotate the wheel 21 in the direction of the arrow 53. (Fig. 2.) The plate 42 is rigidly attached to the rod or axle 49 of a feeding frame which is formed in addition of the end members 50 and 51 and the rod 52. Another pawl and ratchet mechanism acts on the wheel 22 in the same manner as on the wheel 21; this mechanism consists of the plate 54 with the tooth 55, the lever 56, screw 57 and the other corresponding parts. The plate 54 is attached on the axle 59 of a feeding frame which consists in addition of the ends 60 and 61 and the rod 62. Vertical connecting rods 63 and 64 are attached to the ends of the rods 52 and 62. These connecting rods carry the universal bars 65 and 66 situated below the keys. Opposite these universal bars there are stops 67 and 68 on the key-levers 10. When one of the keys 9 is depressed, that universal bar 65 and 66 is moved downward which is opposite to the corresponding stop 67 or 68 of the depressed key-lever 10. If the universal bars 65, for example, is moved downward by a corresponding key being depressed, the rod 52 follows this movement, the frame 52, 51; 50 and 49 being rocked on the axle 49. The plate 42 participates in this movement. Consequently the pawl 40 moves downward into a gap between the teeth of the wheel 21. The pawl 41 is disengaged from the wheel 21, so that this wheel is now locked by the pawl 40. As soon as the pawl 41 on the lever 43 is disengaged from the wheel 21, it follows the action of the spring 48 and moves about the width of one tooth in the direction opposite to that in which the wheel 21 rotates, until the lever 43 lies against the stop 45. When the key 9 is released, the bar 65 together with the frame 49, 50, 51, 52 is returned into its normal position by springs 37 and 38 which are attached to the plates 42 and 54, which plates are revoluble with the axles 49 and 59 respectively. The pawl 40 comes away from the ratchet wheel 21 and the pawl 41 engages in the same wheel. As the ratchet wheel 21 is now under the action of the driving spring of the paper carriage, it tends to rotate against the checking action of the pawl 41. The pawl 41 now yields until the lever 43 lies against the stop 46, the wheel 21 having rotated about the angle given by one width of a tooth. The pawl and ratchet mechanism which is at the wheel 22 acts in the same manner as soon as the bar 66 is moved downward by pressure on a corresponding key.

Instead of the pawl and ratchet mechanism here described any other form which is customary in typewriters may also be employed.

In consequence of the toothed wheel 21 rotating, the bevel wheels 33 and 34 and the pivots 31 and 32 rotate around the axle 27, and, as long as the wheel 22 is stationary, half the amount of the angle of rotation of the wheel 21. The same takes place when the pawl and ratchet mechanism at the wheel 22 operates and the wheel 21 is stationary. The pitch of the two wheels 21

and 22 is entirely independent of one another, so that in this manner two entirely independent different extents of shifting the paper carriage can be obtained. A third extent of shifting results from the two ratchet wheels 21 and 22 and their pawl mechanisms being able to be operated simultaneously. In this case the wheels 33 and 34 rotate with the axle 27 an amount which is equal to the sum of half the angles of rotation of the two wheels 21 and 22, or, which is the same, to the arithmetical mean of these angles of rotation. This third rotatory movement is thus dependent on the amount of the two others. The rotation of the axle 27 is transmitted by the driving pinion 26 and the rack 25 to the paper carriage 2 and is converted into a motion of transmission. The latter motion thus corresponds constantly to the rotatory motion of one of the ratchet wheels 21 and 22 when these move singly. It corresponds to the sum of the concerned angles of rotation when the ratchet wheels rotate simultaneously.

Fig. 3 shows one arrangement of the pawl and ratchet mechanism having a larger number of ratchet wheels; in this figure 25 again denotes the rack of the paper carriage, 26 the pinion, 27 the axle on which the latter is placed. The bearings 28 and 29 are not shown here. The axle 27 carries in its center a ring 30 which is provided with pivots 31 and 32. On the latter rotate the bevel wheels 33 and 34, with which again bevel wheels 35 and 36 engage. The latter however carry sleeves or bushes 69 and 70. These latter rotate loosely on the axle 27 and these bushes, as well as the parts connected with them, are prevented from being shifted longitudinally of the axle by the fixed rings 23 and 24. Each of the bushes 69 and 70 carries two pivots 71, 72 and 73, 74 on which bevel wheels 75, 76 and 77, 78 rotate. Further, with the latter there engage bevel wheels, namely 79 and 80 above, and 81 and 82 below. Each of the last mentioned four bevel wheels carries one of the ratchet wheels 83, 84, 85, 86. Each individual ratchet wheel can be switched by one of the pawl and ratchet mechanisms 87, 88, 89, 90 in optional manner corresponding to that described above. The ratchet wheels 83 and 86 are held in position by regulating rings 23 and 24 as shown in Fig. 1. The manner in which this arrangement operates is as follows:—If one of the ratchet wheels 83 or 84 is moved on one tooth, the corresponding bevel wheel 75 or 76 is rotated half the angle of rotation of the ratchet wheel. The bush 69 and the bevel wheel 35 rotate simultaneously with the bevel wheels 75 or 76; in the same manner the bush 70 and the bevel wheel 36 rotate with the bevel wheels 77 and 78. The movement of the bevel wheel 35 or 36 follows the movement of the bevel wheel 33 and 34, and the pivots 31 and 32 of these wheels rotate with the axle 27 half that amount which one of the wheels 35 or 36 rotates. If one of the ratchet wheels 83, 84, 85, 86 is rotated, the axle 27 rotates the fourth part of this amount. If two of the ratchet wheels, for example 83 and 84, are shifted, the angle of rotation of the bush 69 is equal to half the sum of the angles of rotation of these two ratchet wheels, and the angle of rotation of the axle 27 is equal to half this half sum. If all four ratchet wheels are rotated, the angle of rotation of the axle 27 is equal to the fourth part of the angle of rotation of all the ratchet wheels. It follows from the above that in every case the angle of rotation of the axle 27 is equal to the fourth part of the sum of the angles of rotation of all the ratchet wheels 83, 84, 85, 86, if it is taken into consideration that the wheels, the pawl mechanisms of which are not moved, rotate an amount zero. The distances which the ratchet wheels 83, 84, 85, 86, are shifted are independent of one another; thus four optional gradations can be obtained. Further gradations are obtained by the optional combination of these distances of shifting. If the proportion of the gradations is selected as 1:2:4:8, all distances of shifting from one to fifteen units measured according to optional units are obtained. Thus with the aid of four ratchet wheels, fifteen different gradations are possible. Since the very small distances, which in the above given combination would amount to one or two units, are not as a rule used in practice, it is consequently preferable to begin with a greater step, so that it is not necessary to make the ratchet wheels with too fine teeth. For practical purposes, the widths of teeth 3, 4, 5, 6, for example, are used, from which moreover the following steps are obtained: 7, 8, 9, 10, 11, 12, 13, 14, 15, 18.

The above described shifting devices are particularly adapted for employment in typewriters. The universal bars 65 and 66 are preferably situated under the key-levers opposite the stops 67 and 68 on the latter. In machines without a shift key, the universal bars cannot be displaced in the longitudinal direction of the key-lever 10. Each lever 10 carries one or two shoulders or stops 67, 68, according to the amount of shifting which is required, namely according to the breadth of the character which it has to write.

In machines with a shift key, generally speaking, the characters combined on one type-lever are not equally broad when types of different width are employed. An alteration in the extent of shifting corresponding to each lever is then required, as soon

as the machine is changed to another character by pressing the shift key. For this purpose a device which is also represented in Figs. 1 and 2 can be employed. With the shift key 120 there is then connected a link 121 which is connected with a horizontal lever 122. This lever is attached on an axle 123, at the end of which are arranged two vertically pendent guide arms 124 and 125. Each of these guides has at its lower end two slots 126 and 127. In these slots slide the lengthened ends of the universal bars 65 and 66 in such manner that these universal bars are not prevented from moving downward, but are compelled to follow a lateral displacement of the guides 124 and 125. This lateral displacement occurs as soon as the shift key is pressed. The universal bars 65 and 66 are shifted parallel to their longitudinal direction so far that they are no longer opposite the stops 67 and 68, but are opposite a second row of stops 87 and 88. This second row of stops can be arranged optionally on the key-levers 10 independently of the first row in such manner that the extent which the paper carriage is shifted by the individual levers 10 after the shift key is depressed is independent of that before the shift key is moved.

Figs. 4 to 6 represent another constructional form of the invention. The same numerals as in Figs. 1 and 2 here denote the parts which are also shown in these figures. Here also there is attached on the frame 2 of the paper carriage a rack 25 which is moved by a pinion 26 on the axle 27. On the latter there is also a disk 130. This disk is specially represented with its appertaining parts in Fig. 6. On the disk there are arranged two pawls 131 and 132. These engage alternately in a ratchet wheel 133, this alternation being brought about by an axial displacement of the wheel 133. Further, there is attached to the wheel 133 the sleeve or bush 134 which on its part carries another ratchet wheel 135. The latter is checked in its movements by pawl mechanism consisting of two pawls 137 and 138 which are revoluble around the pivot 136 (see particularly Fig. 5). The pawl 138 can also be displaced longitudinally on the pins 139 and 140, in addition to rotating around the pivot 136. In the normal position the pawl 138 engages in the wheel 136. As soon as a key is depressed, the engagement of the pawls 137 and 138 is changed, the pawl 137 entering into a gap in the teeth of the wheel 135 while the pawl 138 leaves the wheel. The latter pawl is now pulled back by a spring 141 so far that it does not engage in the same gap as before, when the engagement of the pawls changes again, but in a gap situated to the rear in the direction of rotation. Consequently the ratchet wheel 135 can rotate one tooth against the action of the spring 141. This wheel is rotated by the driving spring of the carriage, the pull of which is transmitted through the rack 25 and the pinion 26 to the axle 27, the disk 130, and further, by means of the pawls 131 and 132, to the wheels 133 and 135. Likewise the axle 27 can also be rotated by displacing the wheels 133 and 135 axially. During this displacement, the wheel 135 is held by the pawl 138, since this pawl is so broad that it does not become disengaged from the wheel 135. The pawls 131 and 132, however, change in their engagement with the wheel 133. The pawl 131 (Fig. 6) is attached on a rod 129 on the plate 130 and cannot change its position with respect to the wheel 130. The pawl 132, on the contrary, is arranged on a plate 144 which is revoluble around the axle 27. The rotation of this plate is limited by two stops 145 and 146 which are attached to the disk 130. The play of the plate 144 between these stops is so great that the pawl 132 can rotate the breadth of one tooth of the wheel 133. In the normal position the pawl 132 engages in the wheel 133, and, in consequence of the action of the driving spring of the carriage, is so rotated that the plate 144 lies against the stop 145. The driving spring of the carriage acts against a spring 147 which is attached on the one hand to the pin 148 on the plate 130, and on the other hand to the stop 149 on the plate 144. As soon as the wheel 133 is displaced axially, the pawl 131 in the first place engages in the wheel 133. The pawl 131 then leaves the wheel 133, and the disk 130 now rotates under the action of the driving spring of the carriage until the plate 144 lies against the stop 145.

The bush or sleeve 134 has at its lower end an extension 89 with an annular groove 90. In this groove there slide two pins 91 and 92 which do not prevent the bush rotating but are able to displace it axially. These pins are mounted on a fork-shaped arm 93 which can rotate around the axle 49. On the two ends of the latter there are two arms 50 and 51 which carry vertically pendent rods 63 at their front ends. The arms 50 and 51 are also connected at their front ends by a rod 52, forming with the axle 49, a feeding frame. At the bottom end of the rod 63 there is a universal bar 65 situated below the key-lever 10. When pressed by a corresponding key, this universal bar is moved downward by a stop or nose 67 attached to the key-lever. This downward motion is transmitted to the rod 63, lever 93, and bush 89 with the toothed wheels 133 and 135.

The pawl mechanism of the wheel 135 (Fig. 5) is operated as follows: The pawl 137 has a shoulder 94 which is engaged by

a connecting rod 95. The latter is attached to the bottom end of a lever 96 which rotates around the axle 59. The latter carries at its ends two arms 60 and 61 which are connected with a universal bar 66 by the vertical rods 64 and are also connected at their front ends by a rod 62 forming a feeding frame. When the universal bar 66 is moved downward (Fig. 4) the axle 59 is rotated so that the lever 96 moves the pawls 137 and 138 by means of the connecting rod 95.

For obtaining a larger number of extents of shifting the paper-carriage, more than two shifting mechanisms may be connected one with another. This may be done in many ways. For example, instead of the disk 130 being attached to the axle 27, this disk may be arranged on a bush revoluble loosely around the axle 27, and a ratchet wheel may also be placed on this bush, the wheel being shifted by mechanism such as is represented in Fig. 6. Instead of this ratchet wheel, the disk which is then opposite the ratchet wheel can be made displaceable axially in suitable manner. Another device for shifting the paper-carriage a large number of different extents is had when the arrangement according to Figs. 1 to 4 is combined with that according to Figs. 5 to 7. In this manner an arrangement is obtained like that shown in Fig. 7. In this case four or more ratchet wheels can be employed collectively. Here again 26 is the pinion which engages in the rack 25 of the paper carriage. 27 is the axle of this mechanism which carries a ring 30. On the latter are two pivots 31 and 32 on which bevel wheels 33 and 34 rotate. On the axle 27 there rotate, further, two bevel wheels 35 and 36 which however are not firmly connected with it. At each of the latter wheels there are two pawls, namely at the wheel 35 the pawls 160 and 161, and at the wheel 36 the pawls 162 and 163. The pawls 161 and 163 are not pivoted directly on the wheels 35 and 36, but on arms 164 and 165 which can rotate a small amount with regard to the wheels 35 and 36. The pawls 160 and 161 engage alternately in a ratchet wheel 166. The latter is attached on a sleeve or bush 167 which rotates loosely on the axle 27 and carries a second ratchet wheel 168. In the normal position the pawl 161 engages in the wheel 166 and prevents the bevel wheel 35 rotating independently of the ratchet wheel 166. The latter, together with the bush 167 and the wheel 168, is displaceable rather more than the breadth of the wheel 166 in the longitudinal direction of the axle 27. When a suitable key is depressed, the system 166, 167, 168, is shifted in the longitudinal direction of the axle 27 by means of a suitable combination of levers. The pawl 160 then engages in the wheel 166 and the pawl 161 is disengaged from the same wheel. These pawls act in like manner as the device just described and represented in Fig. 4. On account of the pawls 160 and 161 engaging alternately, the wheel 35 is released so that it can rotate the width of one tooth of the wheel 166. The wheel 35 is rotated by the action of the driving spring of the carriage which acts on the pinion 26, axle 27, bevel wheels 33 and 34, and the wheel 35. The bevel wheels 33 and 34 then roll on the bevel wheel 36 which is to be considered stationary at present. They therefore cause the pivots 31 and 32 and with them the axle 27 to rotate half the amount which the wheel 35 has rotated. On the ratchet wheel 168 there is an ordinary pawl mechanism, not shown in the figure, with pawls which engage alternately in the wheel 168, somewhat like that represented in Fig. 5. When this pawl and ratchet mechanism is operated the wheel is shifted forward the breadth of one tooth. The pawls are so broad that when the wheels 166 and 168 are displaced longitudinally, the pawls remain in unchanged engagement with the wheel. When the wheel 168 rotates it of course also rotates the wheel 166 firmly connected with it and likewise the wheel 35. The latter is rotated in consequence of the motion transmitted by the pawl 161 which is in the teeth of the wheel 166. Half the amount of this rotation is also transmitted to the axle 27. If the pawl mechanism, acting on the wheel 168 is operated, and if the wheels 168 and 166 are simultaneously displaced longitudinally, both the wheel 168 is shifted on one tooth forward and also the pawl 161 in the wheel 166, namely in its relative position to the wheel 166. The bevel wheel 35 is rotated an amount which is equal to the sum of the two rotations which the wheel 168 makes relatively to its pawl mechanism and to the wheel 166. Half the sum of these rotations is transmitted to the axle 27, so that in this case the rotation of the axle is equal to half the sum of the two individual amounts of rotation.

At the wheel 36 there is a device corresponding to that last described consisting of the pawls 162 and 163, the ratchet wheel 170, sleeve or bush 171 and ratchet wheel 172. The ratchet wheels 170 and 172 are displaceable with the bush 171 in the longitudinal direction of the axle 27, and, when displaced, rotate the wheel 36 relatively to the wheel 170. Further the wheel 172 is shifted by a special pawl mechanism. Here also there are two possibilities of shifting which can be used each by itself and also both simultaneously.

The sleeves or bushes 167 and 171 with their corresponding wheels are shifted axially by the ends 174 and 175 of these bushes which are provided with annular grooves. In these grooves there engage, in known manner, pins which are moved by

the keys by means of suitable lever transmission gearing. The extents which the wheels 166, 168, 170 and 172 are shifted are perfectly independent of one another, so that four different possibilities of shifting are had by operating each ratchet wheel. These four possibilities can be further combined in optional manner if several ratchet wheels operate simultaneously. Fifteen different extents of shifting are obtained in all, of which eleven can be obtained as the sum of two or more of the four independent movements.

Besides being employed for typewriters, the herein described invention may also be used for making perforated bands which are to be used for type setting or for automatic telegraphy. In apparatus for making perforated bands for type setting machines there must be connected with the perforating apparatus a device which adds together the breadth of the different letters within one line and indicates the total at any moment to the composer. This is a so-called type space indicator. In this manner either a typewriter of suitable construction, such as that described in my American Letters Patent No. 851,504 of April 23, 1907, may be used with the perforating apparatus, which typewriter is then to be provided with a shifting apparatus according to the present invention, or there may be connected with the perforating apparatus a special letter-counter which allows the total breadth of letters in one line to be read on a rectilinear or circular scale.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a variable-feed mechanism, the combination with a frame, a plurality of key-levers, carrying stops, pivoted on the frame, and an axle, carrying a pinion, journaled in the frame, of a differential gear, carrying two ratchet wheels, on said axle, two feeding frames mounted to rock on the former frame, pawl mechanism on said feeding frames for actuating said ratchet wheels, universal bars suspended from said feeding frames and transversely of said key-lever normally under one group of said stops, and levers, substantially as shown, for shifting said bar under the other group of said stops.

2. In a variable-feed mechanism, the combination with an axle to be rotated in steps of different extent, of a central differential gear adapted to drive said axle, two differential gears, each provided with two ratchet wheels, mounted loose on said axle, one at each side of, and adapted to drive, said central differential gear, and pawl mechanisms for actuating each of said ratchet wheels, substantially as shown.

3. In a typewriter, the combination with a frame, and an axle journaled in the frame, of a disk, carrying pawls, attached to said axle, a sleeve having an annular groove loose on said axle, a ratchet wheel on said sleeve adapted to be engaged by said pawls, a second ratchet wheel on said sleeve, pawl mechanism engaging the latter ratchet wheel, two feeding frames mounted to rock on the former frame, an arm on one feeding frame slidable in the groove of said sleeve, a rod, carrying said pawl mechanism, attached to the other feeding frame, a key-lever having two noses pivoted in said frame, two universal bars arranged under said noses transversely of said key-lever, and rods connecting one bar with one feeding frame and the other bar with the other feeding frame.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HEINRICH DREWELL.

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.