June 2, 1931. A. B. ELY ET AL 1,807,590

TYPEWRITING MACHINE

Original Filed Oct. 31, 1925 5 Sheets-Sheet 1

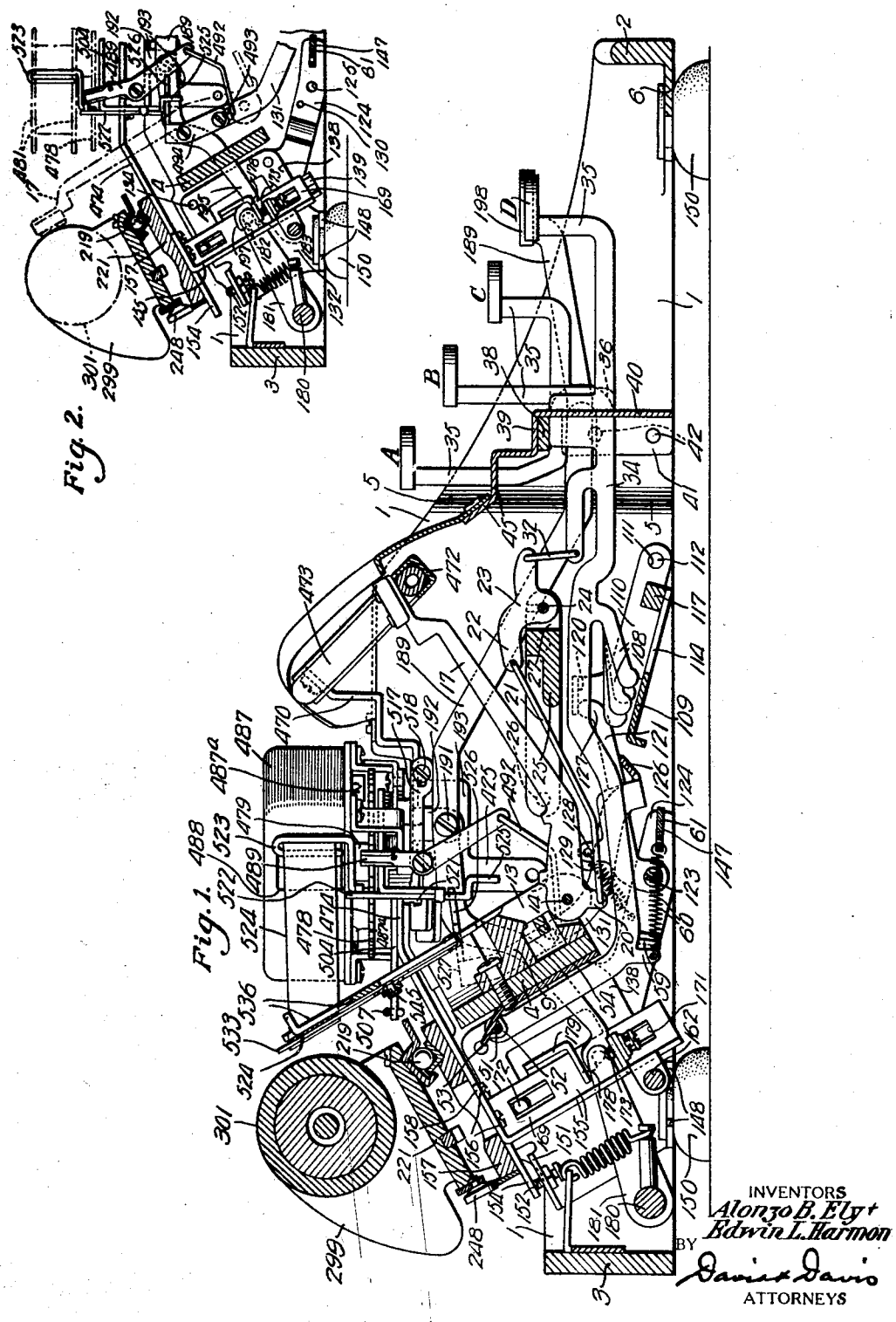


Fig. 2.

Fig. 1.

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Original Filed Oct. 31, 1925 5 Sheets-Sheet 2

Fig. 3.

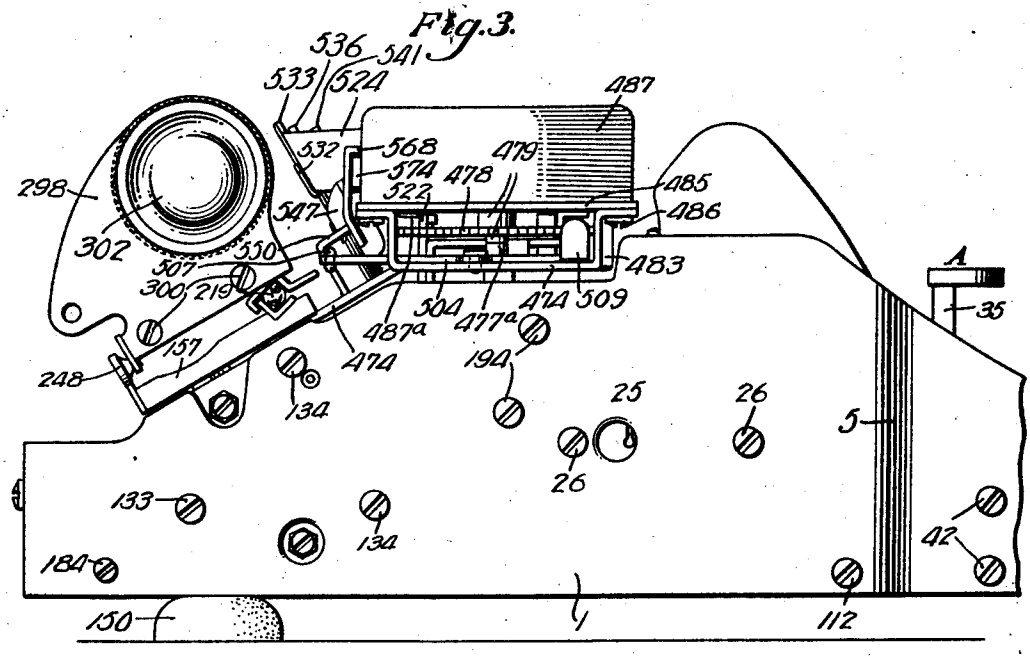
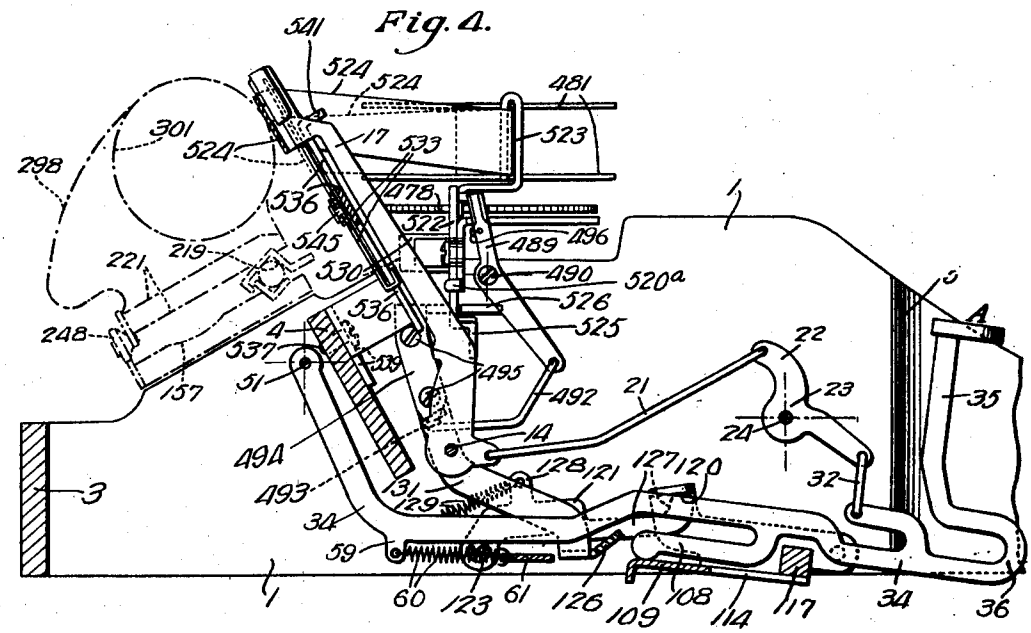


Fig. 4.



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Fig. 5.

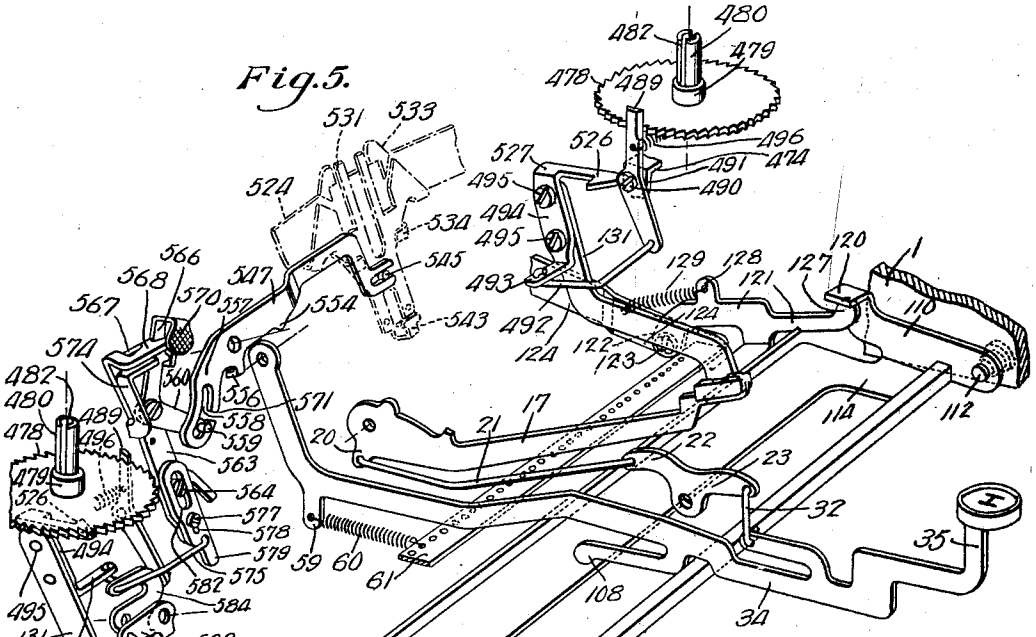


Fig. 6

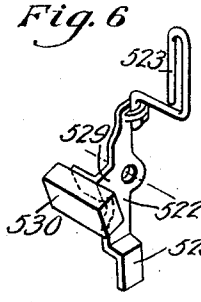
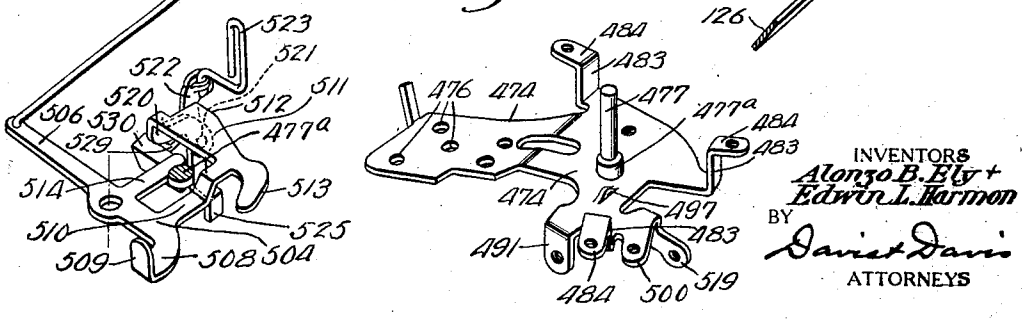


Fig. 7.

Fig. 8.



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TYPEWRITING MACHINE

Original Filed Oct. 31, 1925 5 Sheets-Sheet 4

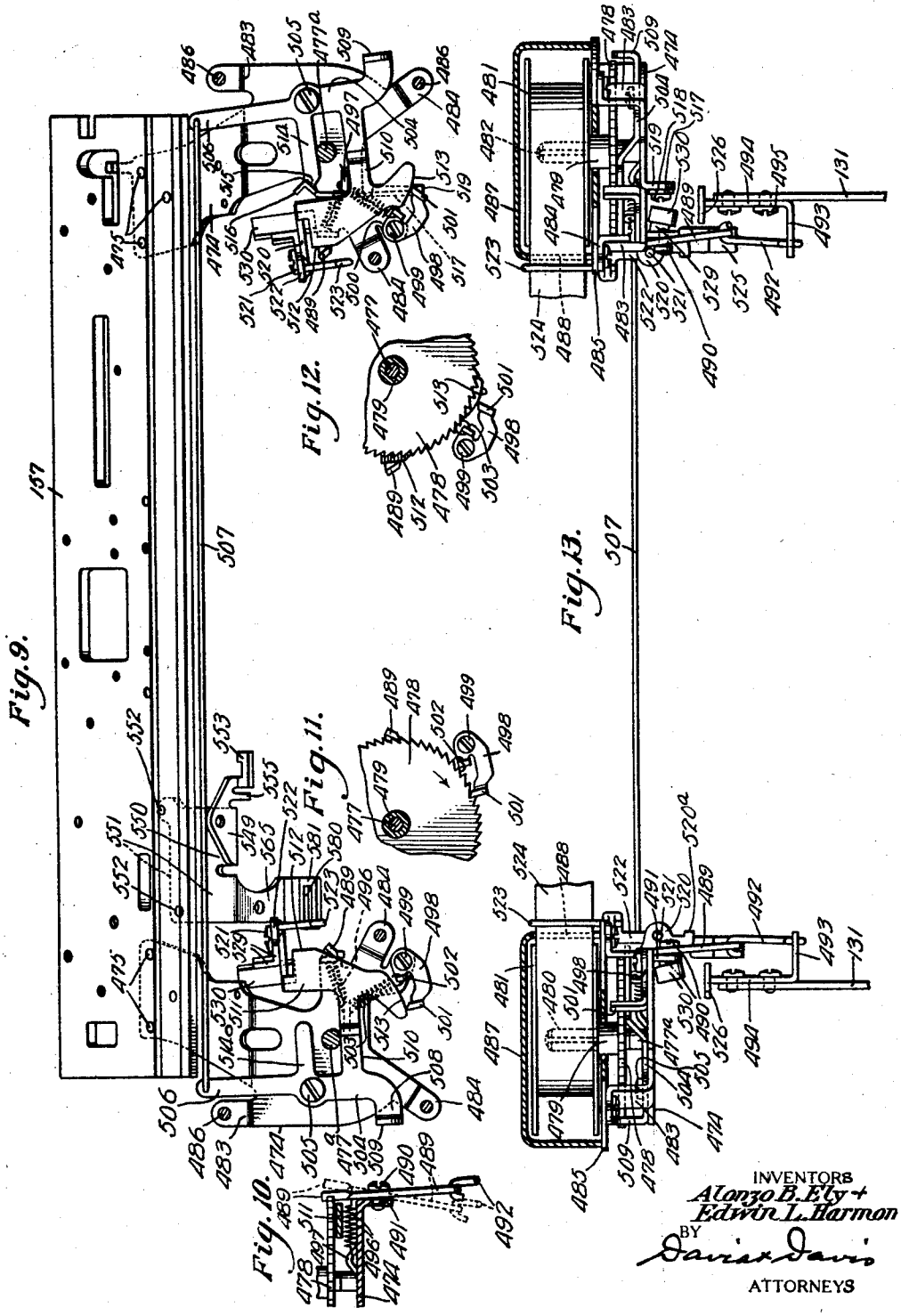


Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

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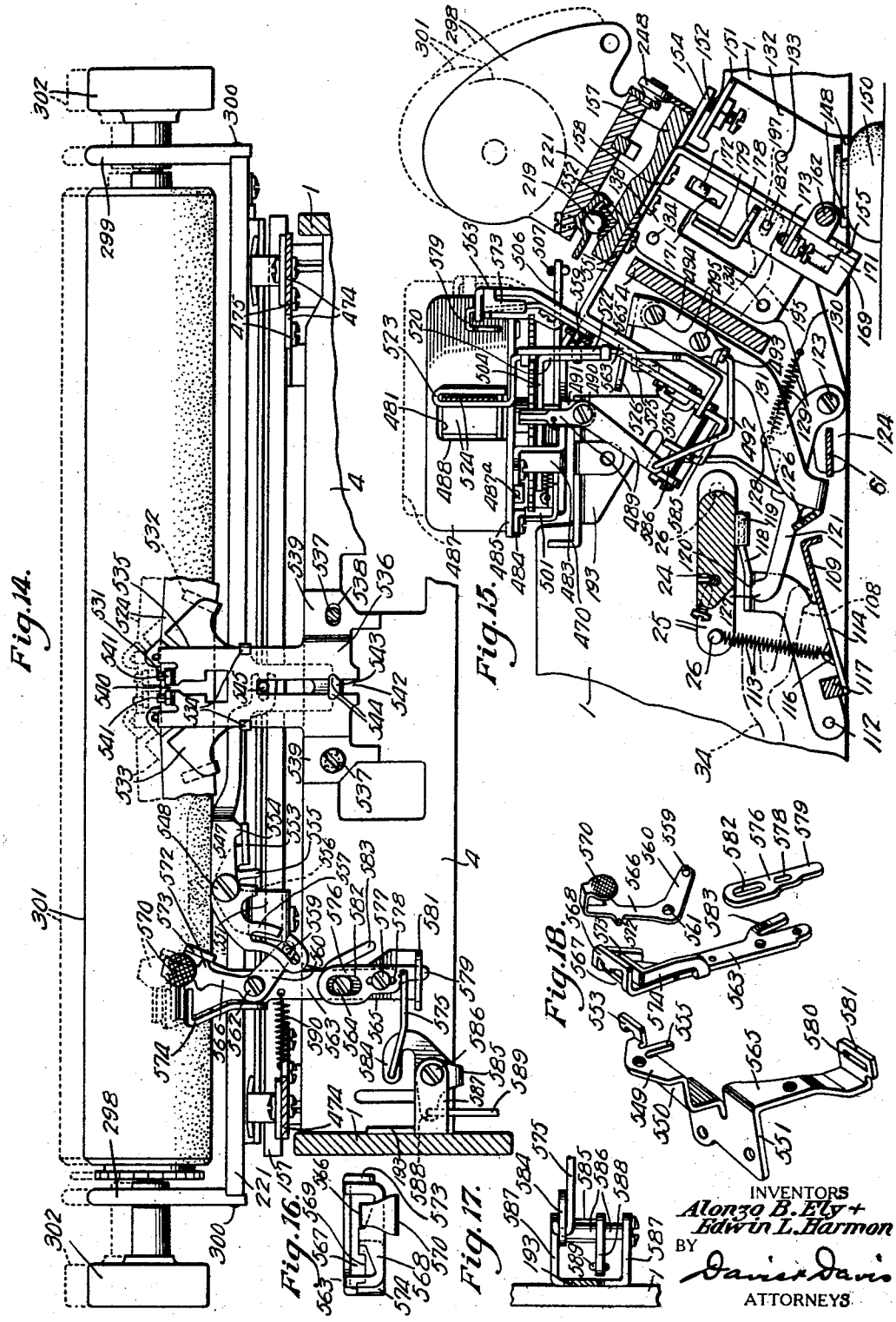


Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

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UNITED STATES PATENT OFFICE

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TYPEWRITING MACHINE

Original application filed October 31, 1925, Serial No. 66,000. Divided and this application filed October 8, 1927. Serial No. 224,903.

The invention has for its objects to provide an efficient ribbon mechanism for typewriting machines; to provide a ribbon mechanism especially adapted for typewriting machines of the kind in which the type strike on the upper front quarter of the platen; to provide a ribbon mechanism (including means for reeling the ribbon from one spool onto another spool and vibrating the ribbon transversely to cover and uncover the printing point) coordinated with the type bar action in such manner as to afford maximum ease of operation of the machine; to provide ribbon vibrating and feeding mechanism and automatic feed-reversing mechanism so constructed and so coordinated with the type bar action as to insure easy action of the machine and positive operation of the vibrating and feeding mechanism and the automatic reversing mechanism; to provide an efficient ribbon mechanism, including vibrating means (preferably with bichrome and stencil control attachment), spool driving means, and automatic feed direction control means, for a three-quarter-strike platen-shift machine in which the spools and ribbon guide shift upward and rearward with the platen in changing from lower to upper case.

Other objects and advantages will appear from the following description of the preferred embodiment of the invention illustrated in the drawings.

This application is a division of an application filed by us October 31, 1925, Serial No. 66,000, which matured December 25, 1928 into Patent No. 1,696,228, for improvements in typewriting machines, only so much of the machine disclosed in said application being herein shown and decribed as is necesary to a full understanding of the subject-matter claimed in the present application.

In the drawings, Fig. 1 is a vertical longitudinal section, approximately through the center of the machine;

Fig. 2 is a vertical longitudinal section of the rear portion of the machine, with many of the parts left off, the shift frame being in upper-case position;

Fig. 3 a fragmentary side elevation of the machine as viewed from the left;

Fig. 4 a vertical longitudinal sectional sectional view showing the ribbon mechanism and a single key lever and type bar, with the type bar at the printing point;

Fig. 5 a perspective view of the ribbon mechanism, illustrated in connection with one key action, the parts being in normal position;

Fig. 6 a perspective view of one of the ribbon-reverse control levers;

Fig. 7 a perspective view of the automatic ribbon-reversing mechanism;

Fig. 8 a perspective view of one of the ribbon-spool brackets carried by the platen shift frame;

Fig. 9 a top plan view showing the carriage bed and associated brackets for supporting the ribbon spools and ribbon vibrator, and also showing the ribbon spool driving and detent pawls and the feed-reversing means in position to cause winding of the ribbon on the left-hand spool;

Fig. 10 is a transverse section showing the left-hand pawl and ratchet in active relation, as shown in Fig. 9;

Fig. 11 a broken-away plan view of the left-hand ribbon-feed ratchet wheel and the associated feed and detent pawls in feeding position, as shown in Fig. 9;

Fig. 12 a similar plan view of the right ribbon-feed ratchet wheel with the feed and detent pawls held out of engagement, as shown in Fig. 9;

Fig. 13 a front elevation of the ribbon spools, the spool-driving devices, and the automatic reverse mechanism, the parts being in the position shown in Figs. 9 to 12;

Fig. 14 a front elevation of the platen carriage and parts of the ribbon vibrating mechanism, with the main frame in section in front of the transverse partition wall;

Fig. 15 a vertical longitudinal section of the rear portion of the machine, showing details of the ribbon mechanism at the left side of the machine;

Fig. 16 a top view of the upper end of the ribbon vibrator lever;

Fig. 17 a plan view of the ribbon vibrator bell-crank sub-lever; and

Fig. 18 a perspective view showing the

parts of the two-part ribbon vibrator lever, the bichrome and stencil control connector device carried thereby, and the supporting bracket for said lever, in disassociated relation.

Referring to the drawings, it will be seen that the main frame of the machine is low and comprises the side walls 1, front wall 2, rear wall 3 and a transverse partition wall 4, all formed as an integral casting. Walls 1 at the middle of the machine are approximately of the height of the rear bank of keys and slope downward toward the front of the machine to join the front wall 2, which stands below the level of the front bank of keys. The side walls 1 also slant down toward wall 3 at an angle of approximately 30° to the horizontal, where the platen carriage shift frame is located, and said wall 3 is approximately the height of the front bank of keys. Walls 1, just back of the rear bank of keys, are off-set at 5, so that the frame swells outward at each side of the keyboard. The lower edges of the main frame walls are all in the same horizontal plane, and the front wall is formed with a rearwardly projecting horizontal flange 6 provided near its ends with key-hole slots in which are engaged the reduced intermediate portions of the two rubber feet 150 for supporting the front end of the main frame.

The flat transverse partition wall 4 inclines upwardly and rearwardly at an angle of 30° to a vertical plane and is located about midway between the back wall and the transverse center line of the frame, with the upper edge of the partition wall lying substantially in the plane of the upper edges of the adjacent portions of the side walls 1 which, at this point, slope downward toward the rear at an angle of 30° to the horizontal. The lower edge of the transverse partition wall is above the level of the lower edges of the other frame walls and approximately level with the upper edge of the front wall, leaving an open space below the partition wall 4 and above the level of the bottom edges of the other walls, as shown in Fig. 1.

A type-bar segment 9 is secured to the front face of the transverse partition wall 4. The segment 9 is provided with the usual radial slots 13 in which the type bars 17 are pivotally mounted upon a curved pivot wire 14. The segment and pivot wire lie in planes parallel with the plane of wall 4. There are 42 type bars in the machine shown, each carrying two type. The heels of the type bars are provided with tail lugs 20 connected by links 21 with arms 22 of sub-levers 23. Sub-levers 23 are pivoted on a curved pivot wire 24 mounted in a radially slotted segment 25 which lies in a horizontal plane and extends transversely of the frame below the forward ends of the type bars, with its concave edge facing rearwardly and its sub-lever slots 27 converging rearwardly. Segment 25 is secured at its ends to the main frame side walls 1 by screws 26.

Sub-levers 23 have their forward arms connected by vertical links 32 with the key levers 34. Key levers 34 are formed with upstanding key stems 35 supporting four banks of character keys, A, B, C and D, the key levers supporting keys of any one bank being of uniform length, and the key levers supporting keys in different banks varying in length, as indicated in Fig. 1.

The heads of the type bars are supported on a type rest 472—473 mounted on bracket arms 470 forming part of brackets 193, hereinafter described. This arcuate rest lies in a transverse plane inclined rearward from the vertical and supports the bars in upwardly and forwardly inclined position with the heads of all the bars below the level of the platen 301.

The key levers are guided in a slotted comb 40 and have portions adapted to cooperate with a cushion stop pad 38 serving as a key lever stop against the bottom of which all the key levers are held when in normal inactive position.

Pad 38 is cemented on the under side of a horizontal step 39 on the comb 40. Comb 40 is provided with lugs 41 at its ends, which lie against the inner faces of the frame walls 1, just in front of the bends 5 in the walls, and are held to said walls by screws 42. The forward or main body portion of comb 40 depends vertically from the forward edge of step 39 and is provided with vertical guide slots for guiding the key levers. It will be noticed that the stems of the upper or rear bank of keys A do not extend upward in front of the main vertical portion of the comb 40 but, on account of the reverse loops 36 (which extend through certain of the vertical guide slots), said stems extend upward back of the pad 38 through a rearwardly extending horizontal shelf portion 45 of the comb which is provided with a series of fore-and-aft extending guide slots for the key stems of the rear bank of keys A.

The main portions of the key levers 34 all extend substantially horizontally rearward from the key stems under the sub-lever segment 25 and partition wall 4, and then upward and rearward behind wall 4. The rear upper ends of all of the key levers are pivotally supported on a transverse fulcrum rod 51 supported in punched-out loops 52 on the under side of the rearwardly bent upper portion 53 of a sheet metal fulcrum supporting plate 54, the main flat body portion of which is secured to the rear face of wall 4.

Key levers 34 are provided adjacent the rear ends of the main horizontal portions thereof with depending ears 59 connected by springs 60 with a sheet metal anchor bar 61. Springs 60 are all of the same normal length

and tension, before being connected up in the machine, and ears 59 are located at slightly different distances from the bar 61, according to the lengths of the key levers for the different banks of keys, so that, when assembled in the machine, springs 60 for the different banks of key levers supporting key banks A to D are stretched progressively greater extents, the springs under greatest tension being connected to the longest bank of key levers. Bar 61 is held in slots 147 in bracket arms 124 by the tension of springs 60.

The platen 301 is supported for impact of the type on the upper front quarter thereof, and for case-shift movement in a plane parallel with the plane of the type bar pivot wire 14 and wall 4, so that the printing point shifts in changing case in a plane inclined rearward at 30° to the vertical. On each of the side walls 1, just back of the partition wall 4, sheet metal brackets 132 are secured to the side walls by screws 133 and 134 which pass through walls 1 and enter suitable holes in the brackets. Screws 133 are threaded directly into the brackets 132, while screws 134, after passing through holes in the brackets, are threaded into sheet metal plates 138 which are provided with V-shaped grooves or ball races 139 lying at an angle of 30° to the vertical, i. e. parallel with wall 4.

Brackets 132 are provided with forwardly projecting arms 124 which extend forward under wall 4 and are provided with the threaded holes 125 for the pivot screws of the ribbon-operating rocking frame, and also with the open slots 147 in which the anchor bar 61 is held by the tension of the return springs 60 for the key levers. Brackets 132 are also provided with inwardly projecting lugs 148 which are disposed in a horizontal plane and are provided with key-hole slots in which are engaged the reduced intermediate portions of the two rear rubber supporting feet 150 for the main frame. Brackets 132 are further provided with inwardly bent lugs 151 which lie in a plane at right angles to the plane of shift of the platen and are provided with stop screws 152. The stop screws 152 cooperate with rearwardly projecting lugs 154 formed on sheet metal brackets 155. Brackets 155 are secured by screws 156 to the under side of the flat carriage bed 157 at opposite ends of the bed, said brackets being provided with angle pieces 158 through which the screws 156 pass and being held in spaced parallel relation by a tie rod 162.

The shift frame brackets 155 are provided with integral forwardly projecting angle pieces 169 provided with elongated apertures 171 extending in a plane at an angle of 30° to the vertical, i. e. parallel with wall 4 and type-bar pivot wire 14, to form raceways for the balls 172 projecting into the apertures 171 and rolling in the V-grooves 139 of the race members mounted on the side walls 1 of the main frame. In this manner a ball bearing support is provided for the platen shift frame, which permits shifting of the platen 301 and its traveling carriage in a plane at an angle of 30° to the vertical and parallel with the plane of type-bar pivot wire 14. Stop screws 152, previously referred to as adapted to engage the lugs 154, limit the downward movement of the shift frame to determine the normal lower-case position of the platen. The upper-case shifting movement of the platen and shift frame is limited by stop screws 173 which are secured to brackets 155. Stop screws 173 are adapted to engage the under sides of rearwardly projecting lugs 178 extending from the lower edge of inwardly projecting arms 179 formed as part of the wall brackets 132. A rock shaft 180 is provided with forwardly projecting rock arms 181 carrying laterally projecting studs 182 engaged in slots 183 in the angle portions 169 of the shift frame brackets 155. The rock shaft 180 is journalled on pivot screws 184 threaded through the side walls 1 of the main frame.

The platen carriage and shift frame are adapted to be shifted from normal lower-case position (shown in Fig. 1) to the upper-case position (shown in Fig. 2) by means of a shift key lever 189 which is pivotally mounted on a screw 191 secured in an ear 192 projecting downward from the inwardly overhanging upper portion of the right-hand one of a pair of brackets 193, which are secured to the side walls 1 by suitable screws 194. The rear arm 195 of shift key lever 189 extends rearwardly and downwardly through a suitable aperture in the transverse partition wall 4 and the extreme rear end of the key lever arm 195 is forked at 197 to engage the laterally projecting stud 182 on one of the rock arms 181, so that power may be applied to the shift frame for shifting the platen through shaft 180 and arms 181 carrying studs 182, by depressing shift key 198.

The carriage is mounted to travel transversely of the machine, suitable bearings 219 and 248 being interposed between the carriage and the carriage bed 157.

The platen carriage comprises the base plate 221 and end plates 298 and 299, the lower ends of the end plates being secured to the ends of the base plate 221 by screws 300. The shaft of the platen 301 is rotatably mounted in the carriage end plates and is provided with the usual finger wheels 302.

Universal bar mechanism is mounted on the main frame for operating the ribbon mechanism of the machine, and will be now described. A key-lever-operated universal bar comprising a sheet metal plate 109, formed with forwardly extending end portions 114 carrying integral bar-like side arm portions 110 disposed edgewise in vertical fore-and-aft planes, is mounted for downward and up-

ward rocking movement under the main horizontal portions of the key levers, being pivotally supported on pivot screws 112 threaded through the side walls 1 of the main frame and projecting through pivot holes 111 in the forward ends of the side arms 110 of the universal bar. The plate portion 109 of this universal bar is wide fore and aft of the machine and underlies the sub-lever segment 25. It is normally held in an upwardly and rearwardly inclined position by a return spring 113 attached at its lower end to an eye 116 in the left-hand extension 114 of said plate portion and hooked at its upper end to the inwardly projecting end of the forward left-hand fastening screw 26 for the sub-lever segment. The universal bar 109—110 is braced transversely of the machine with a stay rod 117 rigidly secured to the side arms 110 and to the extensions 114 by welding, brazing or otherwise. The side arms 110 are provided with inwardly extending lugs 120 at their forward ends, the lug 120 on the left-hand arm being formed with a rearwardly extending finger 118 covered with a piece of rubber tubing 119 and normally engaging the under side of the sub-lever segment 25, as shown in Fig. 15.

The inwardly projecting lugs 120, bent over from the upper edges of the universal bar side arms 110, engage over the forward ends of the fore-and-aft extending supporting arms 121 of a sheet metal rocking frame. The rocking frame or actuator is located forward of the plane of main frame wall 4 and rocks on pivot screws 123 threaded through screw-threaded holes 125 in bracket arms 124 which extend forwardly under wall 4 adjacent opposite sides of the machine, the inner journal ends of said pivot screws engaging in bearing holes 122 in the rear ends of arms 121. Frame arms 121 are connected together by a transversely extending bar 126 formed integrally therewith, and are formed with rounded upturned ends 127 engaging under lugs 120 on the universal bar, and with upwardly projecting ears 128 forward of their pivots, from which ears springs 129 extend rearwardly to holes 130 in the bracket arms 124. The bar 126 is provided with integral upwardly and rearwardly extending arms 131 which vibrate fore and aft of the machine and are adapted to operate the ribbon-spool-driving devices, the automatic means for rendering the driving and detent devices for a single spool at a time effective, and also the ribbon guide vibrating mechanism, as hereinafter described.

The springs 129 are adapted to restore the bail to normal position and hold the forward ends 127 of the side arms 121 in engagement with the under sides of the overhanging lugs 120, so that at each operation of the key levers, when the universal bar 109—110 will be depressed or moved downward, the rocking frame will be rocked by the engagement of the lugs 120 with the arms 121. The key levers are provided with fingers 108 extending rearwardly and downwardly from their lower edges with their rear ends overlying and normally spaced uniformly slightly above the wide transverse plate portion 109 of universal bar 109—110. The rear ends of fingers 108 are arranged in four transverse rows, those connected with key levers supporting keys in bank A being nearest the rear edge of the universal bar and those connected with key levers supporting keys in banks B, C and D being arranged in rows progressively nearer the fulcrum axis of the universal bar to afford uniform depression of the universal bar by key levers of different key banks.

The ribbon mechanism, including means for vibrating a bichrome ribbon transversely and feeding it longitudinally and automatically reversing the direction of feed, is supported on the carriage bed and shiftable therewith, said several means being arranged for operation by the universal bar 109 through the ribbon mechanism actuator or rocking frame 121—126—131, previously described, in both case positions of the shiftable carriage bed. Right and left ribbon spool brackets 474 are secured to the under side of the carriage bed 157 near the ends thereof, by screws 475 which pass through screw holes 476 in the brackets and enter the under side of the carriage bed, as will be seen in Figs. 8, 9 and 14. The brackets 474 extend upwardly and forwardly parallel to the plane of the carriage bed, for a short distance, and then forward horizontally, as will be seen in Figs. 1, 2, 3 and 9. The horizontal portions of brackets 474 closely overlie and extend on opposite sides of the inwardly off-set portions of side walls 1 in rear of the transverse plane of the ends of the type rest. The horizontal portions of brackets 474 are provided with fixed upwardly extending vertical posts 477 which are adapted to rotatably support the ratchet wheels 478, which form parts of the spool-driving devices and are loosely mounted on the posts and provided with hubs 479 seated on shoulders 477[a] on the posts and carrying upwardly extending split tubes 480 of smaller diameter than the hubs. Tubes 480 form spring arbors upon which the barrels of the respective ribbon spools 481 are mounted. The spring action of the split tubes 480 is adapted to frictionally hold the ribbon spools in place and the barrels of the respective spools are seated on the upper ends of hubs 479 and are preferably provided with inwardly projecting teats (not shown) adapted to enter the slots 482 of the respective split tube arbors 480 and thereby assist the friction grip of the arbors to prevent independent rotation of the ribbon spools relative to the associated ratchet wheels 478. The brackets 474 are each provided with three upwardly

extending lugs 483 spaced around the post 477 thereon and having their upper ends bent outwardly to form horizontal ears 484 to which disks or plates 485 are secured by means of screws 486, as will be seen in Figs. 9 and 13. The plates 485 are adapted to cover the mechanism mounted on the brackets 474 below the respective spools, and each plate is adapted to support a sheet metal ribbon-spool-covering cup 487, as will be seen in Figs. 13 and 15. The guard cups 487 are each provided with a slot at 488, through which the ribbon from the respective spools is adapted to pass. Cups 487 are detachably held to plates 485 by hook lugs 487ª thereon forced through suitable slots in the plates by springing the cup walls.

Spool-driving pawls 489 for rotating the ratchet wheels 478 are loosely mounted on screws 490 threaded into downwardly bent ears 491 on the brackets 474, as will be seen in Fig. 10, and said pawls are connected below their pivots by links 492 with inwardly bent arms 493 carried by the upper ends of the rock lever arms 131, previously described as adapted to be operated by the universal bar 109 (see Fig. 5). The arms 493 are formed as part of sheet metal brackets 494 secured to the upper ends of the rock arms 131 by screws 495. As is indicated in Fig. 10, the ratchet wheel driving pawls 489 normally stand upright and are mounted to wobble laterally on the screws 490; and the forward beveled edges of the upper ends thereof are adapted to be held in engagement with the respective ratchet wheels 478 by springs 496 which extend outwardly from the upper arms of the pawls below the ratchet wheels to eyes 497 pushed upward from the brackets 474, as will be seen in Figs. 9 and 10. Detent pawls 498 are pivotally mounted on screws 499 threaded into ears 500 extending from the brackets 474. The detent pawls 498 are provided with upwardly bent noses 501 adapted to cooperate with the teeth of the respective ratchet wheels 478 for preventing reverse motion of the wheel whose driving pawl 489 is in effective driving relation therewith. The detent pawls 498 are provided with ears 502 with which springs 503 are connected at one end, the opposite ends of the springs being secured to the eyes 497 previously referred to. From this arrangement it will be seen that each time the universal bar 109 is operated the rock arms 131 will be vibrated fore-and-aft of the machine and will move the ratchet wheel driving pawls 489 so that the upper ends thereof will move back and forth in such manner as to be adapted to rotate the respective ratchet wheels 478 in different directions. The driving of the ratchet wheels 478 by pawls 489 takes place only on the return or rearward movement of the rock arms 131, as will be seen by the arrangement of the lever and link connections thereto just described, and any advance of the particular ratchet wheel being driven by its associated feed pawl 489 will be maintained by the nose 501 of the associated detent pawl 498.

It will be understood that the ratchet wheel 478 of only one ribbon spool can, or is intended to, be driven at one time although both driving pawls 489 rock each time the universal bar is actuated, the driving pawl and detent pawl for the ratchet wheel of the other spool being held out of operative engagement with their associated ratchet wheel, so that the ribbon spool connected with the last-mentioned ratchet wheel will be free to rotate in a direction opposite to that in which it is adapted to be driven by its pawl and ratchet driving means to thereby permit unwinding of the ribbon therefrom. In order to provide means for throwing out of operation one or the other of the sets of driving and detent pawls associated with the ratchet wheels 478, right and left cam levers 504 are pivotally mounted on the brackets 474, on vertical screws 505 which are threaded into the respective brackets 474, as indicated in Fig. 9. The sheet metal feed-reversing cam-levers 504 are provided with rearwardly extending arms 506 back of their pivots, which arms are connected together by a wire rod or link 507, so that the two cam levers are adapted to be operated simultaneously. Each cam lever 504 is provided with a forwardly and laterally projecting arm 508 provided with an upwardly extending lug 509 forming a finger piece for manually moving the cam levers horizontally from one feed-controlling position to the other. The cam levers are provided with inwardly projecting arms 510 having fore-and-aft extending heads 511 provided at their inner edges with cams at 512 and 513 adapted to cooperate, respectively, with the upper ends of the driving pawls 489 and with the detent pawl noses 501, as will be seen in Fig. 12. The cam heads 511 of the cam levers 504 are rights and lefts,—that is, both of them face inward toward the middle of the machine and are located outside of the adjacent driving and detent pawls, so that when one set of cams 512—513 is in position to hold the associated pawls 489 and 498 out of engagement with their associated ratchet wheel 478, as shown in Fig. 12, the other set of cams is shifted inside the bases of the teeth of their associated ratchet wheel to permit the adjacent pawls 489 and 498 to engage in the teeth of said wheel, as shown in Fig. 11. The reversing motion of the cam levers 504 is adapted to be limited in one direction by the engagement of the cam arms 510 with the enlarged lower 477ª end of the ribbon spool post 477, as shown in Fig. 9. The cam levers 504 are also provided with inwardly extending fingers 514 adapted to cooperate with the enlarged lower ends of posts 477 on the oppo-

site side from the arms 510 to limit movement of the cam levers in the opposite direction, and one of these fingers 514, that is the one associated with the cam lever 504 on the right side of the machine, is provided with a double-bevel nose 515 adapted to cooperate with a V-shaped end 516 of a flat detent spring 517 secured by means of a screw 518 to a depending lug 519 on the front end of the right-hand bracket 474, as will be seen in Figs. 1 and 13. The V-shaped spring detents 516, in cooperating with the double-bevel nose 515 as indicated in Fig. 9, is therefore adapted to yieldably hold the cam levers 504 in one or the other of the ribbon-feed-controlling positions,—that is so that the driving pawls will reel the ribbon upon one spool or the other, as may be desired.

As previously indicated, the reverse of the ribbon feed may be effected manually by manipulation of the finger pieces 509, but it is desirable to also provide an automatic ribbon reverse. For this purpose it is necessary to provide means for automatically shifting the cam levers 504 which control the direction of feed of the ribbon. Each of the cam levers 504 is provided with a downwardly and inwardly extending lug or ear 520 at the rear end of its cam head 511, as will be seen in Figs. 7 and 9. Vertically disposed levers 522 are pivotally supported on the ears 520 by screws 521 to swing transversely of the machine, and the upper ends of said levers are provided with wire loops 523 through which the ribbon 524 passes. The depending arms of levers 522 are provided with forwardly off-set lower end portions 525, thus providing two vertically disposed surfaces located in planes one behind the other for cooperation with the rear edges of actuating dogs 526 formed on the front ends of arms 527 which are formed integral with and extend forward from the upper ends of the brackets 494, as previously referred to as secured to the upper ends of rock arms 131, as will be seen in Figs. 5 and 7. The arms 527 and dogs 526 are located in fore-and-aft planes outside of the depending arms of levers 522 and are, therefore, adapted to be vibrated fore and aft of the machine each time the universal bar 109 is actuated by the type key levers, normally without either dog 526 engaging one of said levers 522. The arrangement is such that upon the return movement (toward the rear) of the dogs 526, if the depending arm of lever 522 associated with the spool from which the ribbon is unwinding is swung outward into the path of the adjacent dog 526, said lever 522 will be pushed bodily rearward, carrying the associated cam lever 504 with it and, through the connecting rod 507, moving the cam head 511 of the other cam lever 504 and the lever 522 thereon forward. In order to throw the lower arm of the lever 522, which is in advanced position and is associated with the unreeling spool, into position to be engaged by the adjacent dog 526 upon exhaustion of the ribbon 524 from the unreeling spool, the ribbon is provided near its ends with eyelets 528 adapted to engage against the wire loops 523 and rock the levers 522 on their pivots 521. Obviously only one eyelet 528 is exposed at a time, and when it operates its lever 522 the dog 526 on that side of the machine will move the associated cam lever 504 rearward and in so doing move the cams 512 and 513 thereof out of the field of the associated driving and detent pawls. Simultaneously through the connecting rod 507, the corresponding cams 512—513 for the other ribbon spool will be moved forward into position to force and hold the driving and detent pawls of the other ratchet wheel out of engagement with the ratchet wheel.

The stepped formation of the lower arms of the ribbon-operated reverse-control levers 522 is for the purpose of providing for the engagement of the forwardly offset lower ends 525 of the lever arms by the associated reversing dogs 526 when the shift frame is in lower-case position, and for engagement of the upper portions of said depending lever arms by said dogs when the shift frame is in upper-case position, to afford equal movement of the reversing devices by the dogs in both case positions, as it will be obvious that the levers 522 will move rearward as well as upward when the platen is shifted to upper-case position. Levers 522 are provided with outwardly projecting arms 529 to which metal blocks or weights 530 (Fig. 6) are welded, for the purpose of normally holding the levers 522 substantially vertical, as shown in Fig. 13, with their depending arms out of the field of the operating dogs 526, the inner edges of the depending lever arms being normally held by the weights against rearwardly projecting stop lugs 520[a] on ears 520.

The ribbon 524, in passing from one spool 481 to the other, passes through guide slots 531 and over loops 532 formed in the upper end of the sheet metal ribbon vibrator and unreeler 533 which is provided at its side edges with ears 534 folded over in front of a type guide 536 to slidably support the vibrator behind said guide 536, which guide has vertical side edges 535 cooperating with ears 534 to guide the vibrator. The type guide 536 is secured by screws 537 to the front face of the transverse partition wall 4, as indicated in Fig. 14. The screws 537 pass through transversely elongated openings 538 in the rearwardly off-set ears 539 at the lower end of the type guide, said ears and screws supporting the type guide 536 at an angle of 30° to the vertical in front of the platen 301. The upper part of the guide 536 is formed with an open slot 540, and is provided with upwardly and forwardly extending and out-

wardly beveled lugs or ears 541 at each side of the upper end of the slot, for guiding the type heads of the type bars 17 to the printing point. The lower part of the type guide 536 is provided with a vertical slot 542 in which a tongue 543 on the lower end of the ribbon vibrator 533 slides, the tongue 543 being provided with outwardly projecting lugs 544 extending over the edges of the slot 542 and sliding on the front of the guide 536. This arrangement provides for free sliding movement of the ribbon vibrator 533 on the type guide 536 in a plane parallel with the plane of shift of the platen.

The ribbon vibrator 533 is provided with a rearwardly projecting stud or headed rivet 545, the shank of which fits loosely in the forked inner end of the transversely extending arm of a bell-crank ribbon vibrator lever 547. The lever 547 is pivotally supported upon a screw 548 extending perpendicular to the plane of wall 4 and threaded into the upwardly and rearwardly bent end 549 of a bracket arm 550 formed integral with a bracket 551 which is secured to the under side of the carriage bed 157 by screws 552, as shown in Figs. 9 and 14. The end 549 of bracket arm 550 is provided with a forwardly and inwardly projecting lug 553 (Figs. 14 and 18) adapted to cooperate with the depending teat-like projection 554 on the lower edge of the transverse arm of vibrator lever 547 to limit the downward movement of the vibrator. Lug 553 is bendable up and down for purposes of adjustment. The end 549 of bracket arm 550 is also provided with a downwardly projecting stop finger 555 adapted to cooperate with an ear 556 extending rearward from the depending arm 557 of the lever 547, for limiting the upward throw of the lever when the throw-control is adjusted for carrying the lower half of the ribbon over the printing point. Finger 555 is bendable transversely of the machine for purposes of adjustment.

The arm 557 of the vibrator lever 547 extends downward parallel with wall 4 and is provided with an arcuate slot 558 curving downward and outward, in which engages a stud 559 projecting forwardly and upwardly from the inwardly extending arm of a bell-crank throw-control member 560. The adjustable member 560 is pivoted at 561 on a screw 562 threaded into the upper arm of a lever 563. The lever 563 lies in a plane parallel with wall 4 and is pivotally mounted on a screw 564 threaded into an arm 565 extending downward and forward from the bracket 551, as indicated in Figs. 14 and 18. Screw 564 is perpendicular to the plane of wall 4. The other arm 566 of the bell-crank throw-control member 560 extends upward through an aperture 567 in the forwardly and upwardly bent end 568 of the lever 563. The upper end of the arm 566 is spring tempered and bent so as to normally spring forward into one or the other of two notches 569 in the bent-over lever end 568, and a finger piece 570 formed on arm 566 is adapted for springing said arm backward out of the notches 569 and moving the member 560—566 about its pivot to shift the stud or pin 559 to one end or the other of the arcuate slot 558.

The arrangement is such that when the stud 559 is in the position shown in Fig. 14 and the lever 563 is rocked, the throw of the ribbon vibrator 533 will be only such as to bring the upper half of the ribbon 524 in front of the printing point. If, however, the finger piece 570 is pushed backward and the member 560—566 moved to engage arm 566 thereof in the left-hand notch 569 in lever end 568, the stud 559 will be thrown to the upper end of the arcuate slot 558 thereby bringing the stud 559 closer to the pivot of the vibrator lever 547 and providing for a greater throw of the ribbon vibrator or slidable ribbon guide 533, which will bring into the path of the type the lower half of the ribbon 524. In this manner provision is made for employing a bi-chrome ribbon or for using the full width of the ribbon. When the spring lever arm 566 is placed in central position between notches 569, the stud 559 will be in position to pass through a gap 571 in the lever arm 557 at the inner edge of slot 558 without actuating the vibrator lever 547, and when so positioned the machine is adapted for writing stencils. The pressure of spring arm 566 on the projection between notches 569 will hold the control member in central position. The spring arm 566 is preferably provided with laterally projecting lugs 572 adapted to cooperate with bent-over lugs 573 and 574 on the upper end of the lever 563 to limit the movement of the stud 559 in either direction, said lugs 573 and 574 being bendable transversely of the machine for purposes of adjustment.

The lever 563 is adapted to be vibrated by means of a link 575, connected to a vertically adjustable arm member 576 secured below the pivot screw 564 to the lower arm of the lever 563 by a screw 577, the shank of which passes through a slot 578 in arm member 576 and permits sliding adjustment of the arm member 576 to vary the length of the lower arm of the two-part lever 563—576. The extreme lower end 579 of the adjustable arm member 576 passes through a transversely extending guide slot 580 in an ear 581 bent forward and upward from the lower end of the bracket arm 565, as will be seen in Figs. 14 and 18. The upper end of the adjustable arm member 576 is provided with a vertical slot 582 adapted to cooperate with the head of the pivot screw 564 to prevent relative pivotal movement between the parts of the lever 563—576. The lever 563 is also provided with an inwardly and downwardly pro-

jecting finger 583 extending below and to the right of the pivot screw 564, as will be seen in Fig. 14, and adapted to cooperate with the inner edge of the bracket arm 565 to insure uniform throw of the lever 563 at all times, said finger being bendable transversely of the machine for purposes of adjustment.

The link 575 extends outwardly from lever 563—576 and is connected at its outer end to the upwardly extending arm 584 of a bell-crank sub-lever 585 pivotally mounted on a screw 586 in ears 587 projecting inwardly from the lower end of the left bracket 193 on the main frame, as will be seen in Figs. 14, 15 and 17. The sub-lever 585 is provided with an outwardly projecting lever arm 588 connected by a downwardly and forwardly extending link 589 with the left-hand ribbon-operating frame arm 121, as will be seen in Figs. 5 and 15. The bell-crank lever arms vibrate in planes parallel with wall 4, pivot screw 586 being perpendicular to said wall. A spring 590, connected between the upper arm of lever 563 and the left ribbon spool supporting bracket 474, as will be seen in Fig. 14, is adapted to restore the lever and associated parts to their normal position, in which they are shown in Fig. 14, after each operation of the character key levers. From this arrangement it will be seen that the sub-lever 585, being pivoted in the main frame of the machine, remains in fixed position relative to the lever 563 and the associated parts, including the ribbon vibrator 533, which are shiftable with the platen carriage, as indicated by dotted lines in Fig. 14. The connecting link 575, extending transversely of the machine, is so disposed that case shifting of the platen carriage does not affect the throw of the ribbon vibrator, which will remain the same for both lower and upper-case positions, lever arm member 576 being adjusted so that the inner end of link 575 swings between points equal distances above and below the horizontal plane of the outer end of the link. It will also be evident that the ribbon unreeling action of the vibrator, hereinafter described, will be the same in upper case as in lower case, since the vibrator and spools remain in constant relation during case shifting of the platen.

The platen and its carriage, and the shift frame and its guiding means, are located forward of the vertical plane of the back wall 3 and in rear of the plane of the type-bar pivots, the shift frame and its guiding means extending into the space between the back wall 3 and partition wall 4 in rear of the upturned rear ends of the character key levers.

The arrangement of the key levers and type bars is such as to afford ample space above the key levers and under the type bars for the operating connection between said key levers and type bars.

The ribbon vibrating, reeling, and feed-direction-controlling means, together with the universal bar mechanism for actuating the same, are all located forward of the plane of the partition wall.

The ribbon spools are supported on vertical axes at opposite sides of the system of type bars below the level of the top of the platen, said spools overlying the upper edges of the inwardly off-set rear portions of the side walls of the main frame. The ribbon-guiding head 533 of the reciprocating ribbon vibrator is located to the rear of and between the ribbon spools and is guided on the type guide 536 to move in an oblique plane parallel with the plane of shift of the platen so as to carry the ribbon rearward as well as upward relatively to the spools. The plane of movement and normal position of the vibrator is such that the portion of the ribbon between the spools normally extends slightly downward from the spols to the vibrator and, when the vibrator covers the printing point, extends slightly upward to the vibrator. This arrangement affords a minimum vertical movement of the covering portion of the ribbon 524 relatively to the spools and also provides an arrangement whereby the vibrator or reciprocating guide on its upward and rearward covering movement will draw off a little of the ribbon from the free or unreeling spool on an easy draft line with minimum resistance to movement of the vibrator, minimum wear on the edges of the ribbon, and minimum liability of folding or creasing of the ribbon, the reeling spool being held against unreeling movement by its detent pawl.

Upon depression and release of a character key the machine operates as follows:

During the first slight downward movement of the key against resistance of its return spring 60, the head end of the connected type bar 17 rises about 5/8 of an inch from the type rest 473, whereupon finger 108 on the key lever comes in contact with universal bar 109. Continued downward movement of the key depresses universal bar 109 against the resistance of its return spring 113 and rocks the ribbon-actuating frame 121—126—131 against the resistance of its return springs 129 in a direction to cause the nose of the active spool-driving pawl 489 to swing rearward one tooth space relatively to the adjacent ratchet wheel 478, connected with the spool upon which the ribbon 524 is being wound, by the time the type bar strikes the platen, and also to cause the ribbon vibrator actuating mechanism to move against the resistance of return spring 590 and shift the ribbon guide or vibrator upward and rearward relatively to the spools to carry the ribbon over the printing point in advance of the impact of the type against the platen. The upward and rearward movement of the vibrator shifts the upper ribbon guiding por-

tion thereof from its normal printing point uncovering position to a printing point covering position in which it is farther from the spools and draws a little of the ribbon off the free or unreeling spool, withdrawal of ribbon from the reeling spool being prevented by the detent pawl 501 acting on the ratchet wheel connected with said reeling spool. As the head of the type bar reaches the highest point of its throw, i. e. a point in a vertical plane transversely of the machine through its pivot, its further movement toward the platen is assisted by the action of gravity.

When pressure on the key is relieved the key moves upward, the type bar moves back toward the rest, under the influence of the several springs 60, 113, 590 and 129 referred to, and also under the action of gravity after the type bar head reaches the highest point in its throw.

On the return movement of rocking frame or actuator 121—126—131 the active spool-driving pawl rotates the ratchet of the reeling spool one tooth space to wind the ribbon slightly thereon as the ribbon vibrator moves downward and forward. The downward and forward movement of the vibrator leaves a substantial slack in the ribbon which is only partly taken up by the one-step turn of the reeling spool so that the ribbon stands normally somewhat slack. As the unreeling spool is free the ribbon is never stretched tightly across the point of impact of the types in printing operations. The power of the ribbon take-up or reeling action of the active spool-driving pawl is derived from springs 129, assisted somewhat by spring 590.

If the ribbon should happen to be exhausted from the unreeling spool by the upward and rearward movement of the vibrator, the pull of the vibrator on the ribbon draws the exposed eyelet or other usual ribbon abutment 528 against the guide loop 523 of the adjacent trip lever 522 and swings the lower end of said lever behind and slightly back of the adjacent feed reversing dog 526 as shown in Fig. 4, so that after a very slight return movement of said dog it engages the trip lever and forces it backward to operate the feed-reversing cams, as shown in Fig. 7. The slight preliminary free backward movement of dog 526 allows time for the ribbon vibrator to drop slightly down and forward to ease a little slack into that portion of the ribbon between the vibrator and the exhausted spool, and the backward movement of the trip lever 522 by the dog (which is transverse of this leg of the ribbon) takes place as the vibrator continues down and forward to normal position and thereby progressively slackens said leg of the ribbon as it is bowed rearwardly by the rearward movement of lever 522 and its guide loop 523, whereby the reverse is effected substantially without resistance from the ribbon. The power for effecting the reverse of the feed is derived from springs 129, assisted somewhat by spring 590.

It will be evident that projections 127 on the side arms of the ribbon actuating rock frame move under lugs 120 on universal bar 109 progressively closer to the axis of the universal bar pivots 112 as a key is depressed, so that the motion of the rock frame is started easily and is accelerated during the down stroke of the key.

What we claim is:

1. In a typewriting machine, a pair of ribbon spool rotating ratchet wheels adjacent opposite sides of the machine, means supporting said ratchet wheels to rotate about vertical axes, a pair of upright ratchet wheel driving pawls arranged to engage said ratchet wheels at their upper ends, means supporting said pawls intermediate their ends to vibrate fore and aft of the machine, an upright U-shaped rocking frame pivotally supported at its lower end to vibrate about a horizontal axis extending transversely of the machine, links connected at their rear ends with the upright side arms of said rocking frame and connected at their forward ends with the lower ends of said pawls, said rocking frame having a pair of forwardly extending arms; a universal bar extending transversely of the machine forward of said rocking frame and having side arms extending forwardly therefrom pivotally supported at their forward ends to rock about a horizontal axis extending transversely of the machine, said universal bar arms having laterally extending lugs engaging over the forwardly extending arms of the rocking frame; a spring normally urging the universal bar upwardly; a spring normally urging said rocking frame rearwardly; and key levers arranged to depress said universal bar.

2. The typewriting machine as claimed in claim 1, in which the pawls are laterally tiltable on their pivots and spring-urged into engagement with the ratchet wheels, and ribbon-controlled mechanism is provided operable by said rocking frame for tilting and holding one pawl out of cooperative relation with its ratchet and allowing the other pawl to move into cooperative relation with its ratchet when the ribbon is exhausted from a spool.

3. The typewriting machine as claimed in claim 1, having detent pawls for holding each ratchet against reverse rotation; ribbon-controlled means operable by the rocking frame upon exhaustion of the ribbon from a spool to move and hold the driving and detent pawls for the other spool out of cooperative relation with their associated ratchet wheel and allow the driving and detent pawls associated with the ratchet wheel for the exhausted spool to move into cooperative

relation with their associated ratchet wheel; and a vibratory ribbon guide actuated from said rocking frame and having a ribbon-guiding portion movable upon forward movement of the rocking frame from a normal printing point uncovering position to a printing point covering position farther from the spools.

4. In a typewriting machine, the combination of a main frame; a platen; a platen carriage; a type bar guide fixed on the main frame; a ribbon guide slidably held to the type bar guide to move up and down in front of the platen; a bell-crank lever having a horizontal arm extending transversely of the machine and pivotally connected at its inner end with the ribbon guide and having a depending slotted arm at its outer end; means pivotally supporting said bell-crank lever for rocking movement about an axis perpendicular to the path of movement of the ribbon guide; a second lever extending downwardly outside of the depending arm of the bell-crank lever; means pivotally supporting said second lever intermediate its ends to rock about an axis parallel with the axis of said bell-crank lever; a throw-control device adjustably held to the upper arm of said second lever and carrying a pin engaging in the slot in the bell-crank lever at different distances from the pivot of the bell-crank in different adjusted positions of said control device; and key-operated means connected with the lower arm of said second lever for swinging said arm outwardly on the down stroke of the keys.

5. In a typewriting machine, the combination of a main frame; a platen; a platen carriage; a type bar guide fixed on the main frame; a ribbon guide slidably held to the type bar guide to move up and down in front of the platen; a bell-crank lever having a horizontal arm extending transversely of the machine and pivotally connected at its inner end with the ribbon guide and having a depending slotted arm at its outer end; means pivotally supporting said bell-crank lever for rocking movement about an axis perpendicular to the path of movement of the ribbon guide; a second lever extending downwardly outside of the depending arm of the bell-crank lever; means pivotally supporting said second lever intermediate its ends to rock about an axis parallel with the axis of said bell-crank lever; a throw-control device adjustably held to the upper arm of said second lever and carrying a pin engaging in the slot in the bell-crank lever at different distances from the pivot of the bell-crank lever in different adjusted positions of said control device; a second bell-crank lever pivoted on the main frame to rock about an axis parallel with the axes of the other levers having an arm extending upwardly at the outer side of the lower arm of the second lever and an arm extending outwardly; a transversely extending link connecting the upwardly extending arm of the second bell-crank with the lower arm of the second lever; and key-operated means connected with the outwardly extending arm of the second bell-crank for exerting a downward pull on said arm on the down strokes of the keys.

6. The typewriting machine as claimed in claim 4, in which the inner wall of the slot in the depending arm of the bell-crank lever is broken away at one point to form a gap and said throw-control device is adjustable to a position in which the pin thereon will move idly in and out in said gap when the key-operated means is actuated.

7. The typewriting machine as claimed in claim 5 in which the platen carriage is mounted on a shift frame movable up and down relatively to the main frame, and the second bell-crank lever and key-operated means are mounted on the main frame, and the first bell-crank lever and second lever are mounted on the shift frame.

8. In a three-quarter-strike typewriting machine, a main frame; and upwardly and rearwardly shiftable shift frame; means for shifting the shift frame; a platen and ribbon vibrator and a pair of ribbon spools all shiftable with the shift frame; means guiding said vibrator to shift upwardly and rearwardly relatively to the spools from printing point uncovering position to a printing point covering position farther from the spools; a rocking actuator on the main frame; a universal bar for rocking said actuator fore and aft of the machine at the key strokes; key-operated type bars each carrying a plurality of types and arranged to strike on the upper front quarter of the platen; a connection between said actuator and said vibrator for moving the vibrator upward and rearward on the down strokes of the keys; pawl and ratchet spool-driving devices associated with the spools and shiftable with the shift frame; connections between said actuator and the spool-driving devices for actuating said devices; detent devices shiftable with the shift frame, cooperative with the spool-driving ratchets to prevent reverse rotation of the spools; control means shiftable with the shift frame and adjustable between two positions for holding the detent device and spool-driving pawl of one spool at a time out of action during operation of the machine; and a pair of devices carried by said control means and shiftable alternately by ribbon-carried abutments into position for movement thereof by the actuator to shift the control means from one position of adjustment to the other.

9. In a typewriting machine, the combination of a platen; type bars; key levers; connections between the key levers and type bars for actuating the type bars to strike the plat-

en on the down strokes of the keys; a ribbon vibrator having a ribbon guiding portion; a pair of ribbon spools; independent driving means for each spool; independent means for holding each spool against reverse rotation; ribbon-controlled feed-reversing means for rendering the driving and holding means for one spool at a time ineffective; a universal bar operable directly by the key levers for actuating said vibrator and spool-driving means and feed-reversing means; connections between the universal bar and the spool-driving means and vibrator for actuating the vibrator to move its guide portion from printing point uncovering position to a printing point covering position farther from the spools on the down stroke of a key to thereby unreel the ribbon from the spool whose driving and holding means are ineffective and actuating the effective spool-driving means to drive the other spool on the up stroke only of a key to thereby reel the ribbon thereon; and means operable by said universal bar for actuating the feed-reversing means on the up stroke of a key upon exhaustion of the ribbon from a spool.

10. In a three-quarter-strike typewriting machine, a main frame; a platen carriage; a platen on the carriage; a carriage bed; case shift means for shifting the bed upward and rearward to change case; type bars mounted on the main frame to strike on the upper front quarter of the platen; key levers fulcrumed on the main frame; connections between the key levers and type bars for actuating the bars to printing position on the down strokes of the keys; a pair of brackets held to the carriage bed adjacent opposite sides of the machine; a pair of ribbon spools rotatably supported on said brackets; an upwardly and rearwardly inclined type guide mounted on the main frame; a ribbon guide slidably held to the type guide to move upward and rearward from printing point uncovering position to a printing point covering position in which the portion of the ribbon passing therethrough is farther from the spools; a third bracket held to the carriage bed between said pair of brackets; a two-armed guide-vibrating lever fulcrumed on the third bracket, having one arm directly connected with and supporting the guide to shift with the carriage bed; spool-driving devices mounted on said pair of brackets and each comprising a ratchet rotatable with the adjacent spool and a pawl cooperative with the ratchet and pivoted on the bracket; an actuator pivoted on the main frame to rock about a horizontal axis extending transversely of the machine and having upstanding rock arms adjacent opposite sides of the machine; connections between said rock arms and the pawls for vibrating the pawls to turn the ratchets on the up strokes of the keys a uniform distance in all case positions of the bed; a connection between said actuator and the other arm of said ribbon guide vibrating lever for rocking said lever to slide the guide upward on the down strokes of the keys a uniform distance in all case positions of the bed; a universal bar connected with said actuator for rocking the same at the key strokes; detent pawls mounted on said pair of brackets cooperative with the ratchets to prevent reverse rotation of the spools; feed-reversing control means mounted on said pair of brackets adjustable between two positions in each of which it prevents cooperation between one ratchet and its driving and detent pawls; a pair of tappets carried by said rock arm having rearwardly facing abutment portions; and a pair of abutment devices on the feed-reversing means adjacent opposite sides of the machine, shiftable alternately by ribbon abutments into the path of the abutment portions of the tappets and movable rearward thereby on the up stroke of a key to adjust the reversing means from one position to the other, said abutment devices each having two abutment faces one above and in rear of the other and arranged for engagement of the cooperating tappet with the upper face when the bed is in lower-case position and the lower face when the bed is in upper-case position.

11. In a three-quarter-strike typewriting machine, the combination of a main frame; an upwardly and rearwardly shiftable platen-shift frame; means for shifting said frame from lower to upper-case position; ribbon spools shiftable with the shift frame; spool-driving devices shiftable with the shift frame; feed-reversing means shiftable with the shift frame; a pair of actuating tappets for the reversing means mounted on the main frame to vibrate fore and aft of the machine; a universal bar for vibrating said tappets at the key strokes; and a pair of abutment devices carried by the reversing means and shiftable transversely of the machine by ribbon abutments alternately into position for establishing an operating connection between the reversing means and different ones of said tappets, said abutment devices each having two stepped contact faces one above and in rear of the other and said tappets being arranged to engage the upper contact faces when the shift frame is in lower-case position, and to engage the lower contact faces when the shift frame is in upper-case position.

12. In a typewriting machine, a main frame; a shift frame; a ribbon guide supporting and vibrating lever extending transversely of the machine and pivotally supported intermediate its ends on the shift frame; a ribbon guide connected with the inner arm of said lever; a two-part extensible and contractible vibrator for said lever, shiftable with the shift frame and extending in an up and down direction; means for lim-

iting the extent of throw of said vibrator; manually adjustable means carried by the upper part of said two-part vibrator for connecting the same with the outer arm of said lever at points located different distances from the fulcrum of the lever; a universal bar on the main frame; a connection between said universal bar and the lower part of said two-part vibrator for imparting a full throw to said vibrator in all case positions of the shift frame; and means for locking the two parts of said vibrator together in different longitudinally adjusted positions of said parts.

13. In a visible writing typewriting machine having a platen, depressible character keys, and types coactive with the platen and movable to a common printing point on the down strokes of the character keys, the combination of a pair of ribbon spools, an inked ribbon connected with said spools for reeling from one to the other, a combined ribbon vibrator and unreeler normally holding the ribbon in a position exposing the printing point and shiftable to carry the ribbon over the printing point, ribbon reeling means settable for turning one spool at a time in a direction to reel the ribbon thereon, holding means settable for preventing turning of one spool at a time in a direction for unreeling the ribbon therefrom, feed direction controlling means for setting the reeling means for turning a selected spool and setting the holding means to hold said spool against unreeling movement and free the other spool for unreeling movement, and a universal bar operable from the keys and connected with said combined vibrator and unreeler and said ribbon reeling means to actuate said combined vibrator and unreeler to carry the ribbon over the printing point and simultaneously unreel a portion of the ribbon solely from the free spool during the down stroke of a character key and to actuate the ribbon reeling means to turn the other spool in reeling direction only during the up stroke of the key to take up slack in the ribbon during return of the vibrator and unreeler to normal position, and means operated by the universal bar for automatically actuating the feed direction controlling means on the up stroke of a character key upon exhaustion of the ribbon from either spool, said direction controlling means including means shiftable by the ribbon for effecting an operating connection between the direction controlling means and said universal bar operated means.

14. In a three-quarter strike typewriting machine, the combination of a main frame, a case shift frame, a pair of ribbon spool driving ratchets supported on the shift frame, a pair of driving pawls associated with said ratchets and mounted on the shift frame, a universal bar on the main frame connected with said pawls for operating the pawls uniformly in all case positions of the shift frame, a pair of tappets operable by the universal bar to move fore and aft of the machine in a fixed path irrespective of the case position of the shift frame, a pair of cams pivoted on the shift frame to turn about up and down extending axes and interconnected for throwing and holding one pawl at a time out of action, and a pair of trip devices, one pivoted on each cam to swing transversely of the machine and each movable about its pivot by one of two ribbon abutments located adjacent opposite ends of a ribbon reeled on spools rotatable by the turning of said ratchets, said trip devices each moving into the path of one of said tappets when moved by a ribbon abutment and having points of contact for its tappet in the upper and lower case positions respectively of the shift frame located one below and in advance of the other for uniform actuation of said trip devices by the tappets irrespective of the case position of the shift frame.

In testimony whereof we hereunto affix our signatures.

ALONZO B. ELY.
EDWIN L. HARMON.