B. C. STICKNEY.

RIBBON MECHANISM FOR TYPE WRITERS.

APPLICATION FILED DEC. 31, 1903. RENEWED JULY 12, 1909.

1,075,996. Patented Oct. 14, 1913.

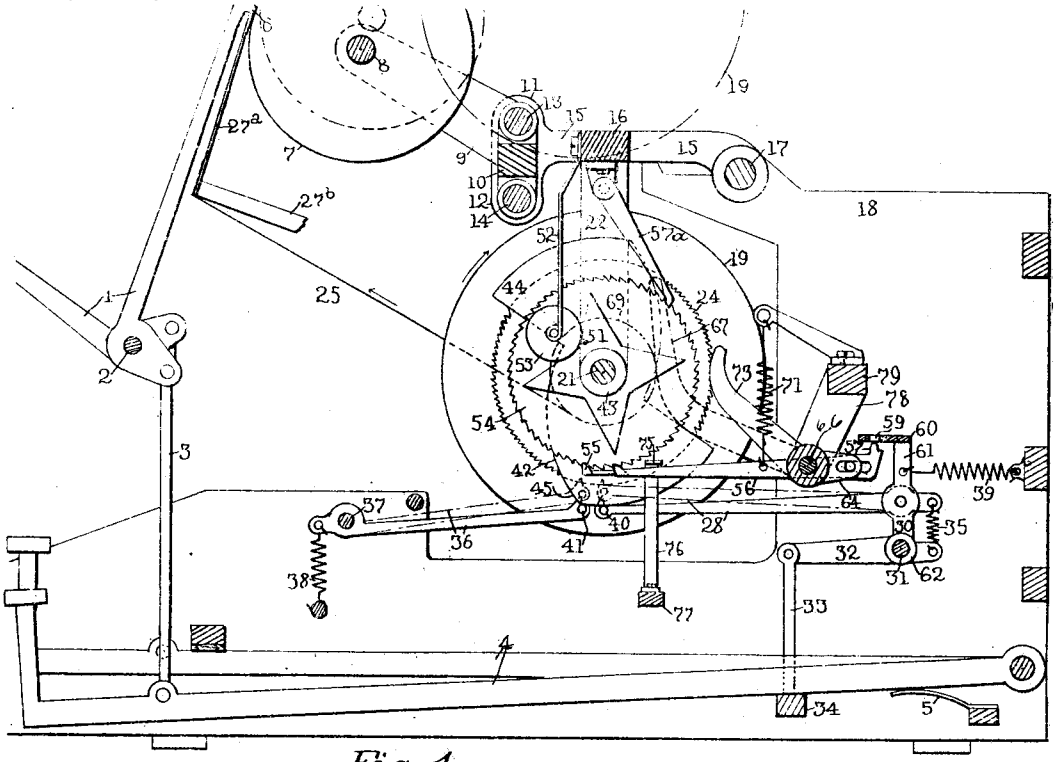


Fig. 1

Fig. 2.

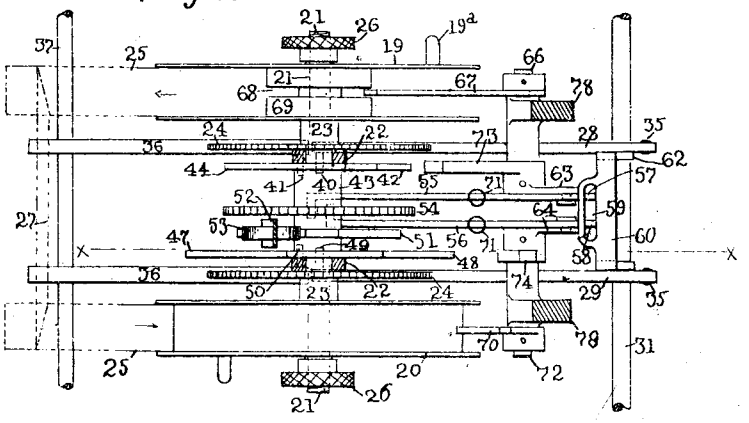
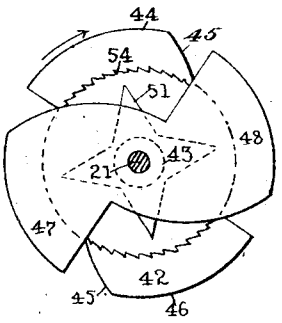


Fig. 3.



WITNESSES

C. H. Hoag

H. A. Gillies

INVENTOR

Burnham C. Stickney

UNITED STATES PATENT OFFICE.

BURNHAM C. STICKNEY, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO UNDERWOOD TYPEWRITER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

RIBBON MECHANISM FOR TYPE-WRITERS.

1,075,996. Specification of Letters Patent. Patented Oct. 14, 1913.

Application filed December 31, 1903, Serial No. 187,362. Renewed July 12, 1909. Serial No. 507,086.

To all whom it may concern:

Be it known that I, BURNHAM C. STICKNEY, a citizen of the United States, residing in Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Ribbon Mechanism for Type-Writers, of which the following is a specification.

This invention relates to writing machines, particularly those of the "front strike" class, and its main object is to improve and simplify the ribbon mechanism, and to provide improved means for automatically reversing the feed of the ribbon.

Other objects will hereinafter appear.

In the accompanying drawings, Figure 1 is a longitudinal central section of a front strike writing machine embodying my improvements. Fig. 2 is a plan, partly in section, of ribbon mechanism seen at Fig. 1. Fig. 3 shows the principal members of a ribbon reverser, whereby the feed of the ribbon is automatically reversed when the ribbon is paid off from either spool.

In the several views, like parts are identified by like signs.

Rearwardly striking type bars 1 are mounted as usual upon a curved fulcrum rod 2, and operated by means of links 3, whose lower ends are attached to key-bearing levers 4 of the second order, provided with returning springs 5. The types 6 upon the bars strike rearwardly against a platen 7, whose axle 8 is mounted upon a frame comprising arms 9 and a bar 10 connecting said arms. At its ends the bar is provided with upper and lower ears 11 and 12, perforated to fit upon guide rods 13 and 14, along which the carriage slides during the usual letter-feeding movements. Said guide rods form a portion of a frame, which further consists of end bars 15, and a bar 16 uniting said end bars; the latter being prolonged rearwardly and hinged upon a pintle 17 which connects the sides 18 of the framework of the machine. By means of the hinge, the frame 15, 16 may be tilted up, to expose the under side of the carriage and other devices carried beneath the frame, as set forth in my pending application No. 153,024, filed April 17, 1903.

Ribbon spools 19 and 20 are loosely mounted upon the ends of a horizontal transverse fixed shaft or axle 21 hung in the ends of hangers 22 pendent from the under side of bar 16; whereby the spools are swung up together with the frame 15, 16, until the spools occupy the dotted line position at Fig. 1, whereby they are rendered accessible for attaching or detaching ribbon or spools. The latter are secured by means of collars 23 to ratchet wheels 24, whereby the spools are wound with the ribbon 25; and the spools with their ratchet wheels may be slipped off the ends of the axle 21, which is provided with nuts 26 which retain the spools. The spools may be otherwise connected to their ratchet wheels, and otherwise detachably supported. The ribbon is by any suitable means guided to the front side of the platen, where it travels across the printing point, and then back to the other spool, the portion at the printing point being indicated diagrammatically at 27, Fig. 2. The ratchet wheels may be driven by pawls 28 and 29, mounted upon upright arms 30 of a vibratory frame, which further comprises a rock-shaft 31 journaled in the side walls 18, and forwardly extending arms 32, from which depend links 33, carrying a universal bar 34 beneath the key levers 4, so that by the depression of any type-operating key, the ribbon-driving pawls may be actuated and the ribbon wound. The pawls are provided with springs 35, tending to keep them in engagement with the ratchet wheels. For the latter holding pawls 36 are also provided, being pivoted upon a cross shaft 37 and provided with springs 38. It will be seen that all of the pawls are beneath the ratchet wheels, and do not interfere with the upward swinging movement of the latter about the frame hinge 17. A spring 39 is provided for returning the universal bar mechanism to normal position.

The pawls 28 and 36 are provided with projections 40 and 41, whereby they are temporarily held out of engagement with the ratchet wheel 24, at Fig. 1, the other pawls being at this time active, and the ribbon winding upon the spool 20, which is almost full. The idle pawls are held down by means of a cam 42, which is in the form of a plate, and is provided with a hub, sleeve or hollow shaft 43, whereby it may turn upon the spool-axle 21. The cam 42 is one of a pair formed upon a single plate, the other member of the pair being indicated as

44; and it will be seen that by turning these cams in the direction of the arrow at Fig. 3, the pawls may be alternately pressed down and released or allowed to fly up into engagement with the ratchet wheels, the cams being diametrically opposite, and alternating with recesses, the latter permitting the upward movements of the pawls. Each cam comprises a cam-surface or wedging surface 45, adapted to wedge the pawls downwardly during the rotation of the cams, and a dead surface 46 concentric with the axis 21, to hold the pawls down during a certain portion of the revolution of the cam. Upon the opposite end of said sleeve 43 is also fixed a second pair of cams, designated as 47 and 48, and similar to those already described, and adapted to hold or press down the pawls 29 and 36 shown at the lower portion of Fig. 2, by means of projections 49 and 50 provided thereon. It will be seen at Fig. 3 that the pairs of cams are set in alternation, so that when one set of pawls is active or effective, the other set is ineffective; and so long as this result is obtained, the cams may have different shapes or may be fewer or greater in number. When four cams are used, as illustrated, each fourth of a revolution throws out one set of pawls and throws in the other set; and hence by rotative movements of the cams in a single direction, the direction of winding or feed of the ribbon may be reversed. Upon said sleeve 43 is also fixed a star wheel 51 of any suitable construction, with which coöperates a detent spring 52, fixed to the bar 16 and carrying a roller 53 which is adapted to fit in the notches of the star wheel, thereby to hold the cams in any one of four positions, one of which is seen at Fig. 1. It will be seen that when the cams are forced around by any means, the roller 53 rides over the adjacent point of the star wheel, thereby flexing the spring 52, which reacts after the point is passed, and completes the feed-shifting movement of the cams, by riding down the succeeding edge of the star wheel and into the notch. The cams, star wheel and spring taken together therefore perform the function of a reverser, whereby the direction of feed of the ribbon may be shifted at any time.

For operating the reverser automatically, I fix upon the sleeve 43 a ratchet wheel 54, for actuating which I provide a pair of pawls 55, 56, either of which may be actuated by the type keys. If desired, the ratchet wheel may be made in two parts, or in the form of two complete wheels, one for each pawl; but for the sake of simplicity the pawls may be of different lengths and provided with lateral teeth as seen at Fig. 2, so that a single wheel may be used. By the use of the term "ratchet wheel" herein I mean to cover a wheel whether made in the form of a single wheel as illustrated, or a double wheel as just described. Said wheel is also provided with a gravity detent pawl 57ª (Fig. 1), suspended from the bar 16 by means of a bracket.

The pawls 55 and 56 are provided with projections 57 and 58, normally standing just below a catch or slot 59 formed in a yoke 60, whose arms 61 are secured by collars 62 upon the rock shaft 31, said arms being preferably continuations of the arms 30 already described. The yoke 60 moves idly during the operation of the type keys, except when the ribbon is paid off or nearly off from either spool; means being controlled by the ribbon for moving the projections 57 into the catch 59, so that through either one or the other of the pawls 55, 56, the ratchet wheel 54 and the ribbon-reverser may be operated. To this end I support the rear end of the pawl 55 by means of a slot and pin upon a rock arm 63, the pawl 56 being similarly supported upon an arm 64. The arm 63 is fixed upon a rock shaft 66, parallel with the spool shaft 21; and upon the outer end of the shaft 66 is fixed a follower arm 67, adapted to rest upon the ribbon as it unwinds from the spool 19, and when the spool is empty, to fall into an annular recess 68 formed in the spool core 69. During this movement of the follower, the arm 63 rises, and the pawl projection 57 enters the catch 59, so that by means of the vibrating yoke 60 the pawl 55 is caused to advance the ratchet wheel 54 and hence the ribbon reverser step by step; this movement continuing until the point of the star wheel passes by the crown of the roller 53, when the spring 52 reacts to complete the movement of the reverser independently of the pawl 55. During this action of the reverser, the pawl 56 is out of action, the arm 64 being depressed, its follower 70 being raised by the ribbon on the full spool 20. Each of the reversing pawls is provided with a lifting spring 71, which is connected to the pawl between its ends, and not only presses the pawl into engagement with the ratchet wheel, but also through the pawl lifts the arm and presses the follower toward the spool axis. It will be understood that the described advance of the reverser operates upon the ribbon-feed pawls to reverse the feed of the ribbon, and that when the latter is paid off from the spool 20, the follower 70, arm 64 and pawl 56 will come into play and effect another advance movement of the reverser in the same direction, again changing the direction of the ribbon feed.

In order to render the reverser-actuating pawl ineffective upon the completion of the reversing movement, I provide the shafts 66 and 72 with throw-off arms 73 and 74, having curved ends lying in the paths of the

reversing cams, as at Fig. 1, so that during the final portion of the movement of the cam, said arm is struck and thrown up, thus carrying the arm 63 or 64 down and freeing the pawl from the catch 59, the follower also rising out of the recess in the spool core.

When the carriage frame is swung up about the hinge 17, the ratchet wheel 54 separates from the pawls, and the spools are also carried away from the followers 67 and 70, so that the latter are not in the way when it is desired to adjust the ribbon or to slip the spools off or on, and are not liable to get bent during the manipulation of the ribbon or spools by the operator. During the upper and lower case shifting movements of the carriage about the hinge 17, as indicated by dotted lines at Fig. 1, the movements of the ribbon pawls and followers are so slight as to be negligible. A guard 75 overlies the pawls 55, 56, to prevent them from rising when the ratchet wheel is lifted, said guide being carried by a standard 76, upon a cross bar 77. The follower shafts 66 and 72 are journaled in the lower ends of hangers 78, cast upon a cross bar 79.

In operation, the key-levers 4 are depressed one after another to actuate the type bars 1. Upon the movement of any key lever, the universal bar 34 is carried down, and through the links 33 actuates the rocker frame 30, 32, actuating the pawls 28 and 29, the former, however, moving idly, being held in ineffective position by the cam 42. The pawl 29 drives the ratchet wheel 24 and spool 20, causing the ribbon to wind in the direction shown by the arrows. When the ribbon is all paid off from the spool 19, the core is uncovered, and the follower 67 falls into the recess 68 in the core, the spring 71 effecting not only said movement of the follower, but also lifting the rear end of pawl 55, so that its projection 57 engages the slot 59 in the rocker frame, and thereafter by means of the key strokes the ribbon reverser is advanced step by step, because of the action of pawl 55 on the ratchet wheel 54. During this movement of the reverser, the ribbon continues to wind upon the full spool; but after the roller 53 passes the point of the star wheel, the spring 52 completes the movement of the reverser independently of the pawl 55, thereby forcing out the feeding pawl 29 and letting in the feed pawl 28; the latter, however, being held in ineffective position by the long dwell 46 on the cam, until the roller 53 is well over the point of the star wheel. The ribbon then rewinds upon the empty spool; and when spool 20 becomes empty, the follower 70 comes into play, and through the pawl 56 the reverser is again advanced in the same direction, and the direction of ribbon feed again reversed.

It will be observed that the revoluble pawl-controller (Fig. 3), disconnects the driver 30 from the full spool and connects it to the empty spool; that ribbon-controlled means enable the key or key-lever to rotate the reverser by means of a ratchet wheel; that the pawl 55 (or 56) alternates with the spring 52 in advancing the reverser; that it is not essential in all cases to use a plurality of pawls to advance the reverser, since the pawls 55 and 56 merely perform the function of a single pawl; that during the completion of the reversing movement, the reverser trips the follower from the empty spool; that the springs 71 tend constantly to render their pawls effective; that the spool-winding mechanism is in separable portions, one portion upon the liftable frame 15, 16, and the other portion upon the framework of the machine; that the feed-reversing mechanism is also in separable portions, one upon said frame and the other upon the framework of the machine; that the followers 67 and 70 become separated from the ribbon when said frame is swung up, the spools thus being movable away from the followers prior to detachment of the spools; and that said frame is hinged in rear of the platen to the framework of the machine. Still other variations may be resorted to within the scope of my invention, and portions of my improvements may be used without others. Certain features herein shown are broadly claimed in my said application.

Other features herein disclosed are claimed in my co-pending applications, in none of which applications, however, is disclosed an automatic ribbon reversing mechanism. Said applications include the following: 163,704, filed June 30, 1903; 475,930, filed February 3, 1909; 580,429, filed September 3, 1910; 673,130, filed January 24, 1912 and Patent No. 1,054,470, February 25, 1913.

Having thus described my invention, I claim:

1. The combination of a pair of ribbon spools, a ratchet wheel for each spool, a step-by-step driving pawl for each ratchet wheel, a revoluble pawl-controller, means for revolving said pawl-controller in a single direction, and a detent for said controller; said means for revolving the pawl-controller being normally motionless during the action of said pawls, and means being provided to cause said revolving means to act only when the ribbon is paid off from either spool, to render effective the pawl of the empty spool and ineffective the pawl of the full spool.

2. The combination of a pair of ribbon spools, a driver, means for enabling said driver to turn either spool, a revoluble controller, a member upon said controller adapted for coöperation with a moving part of the machine, whereby said controller may be

turned in a single direction, ribbon-controlled means for effecting such coöperation, a star-wheel and spring which coöperate to complete the controller movement to a predetermined point, and means whereby such movement of the controller causes said driver to become disconnected from the full spool and re-connected to the empty spool.

3. The combination of a key, a pair of ribbon spools, a driver under the control of said key, means for enabling said driver to turn either spool, a revoluble controller, a ratchet-wheel connected to said controller, a pawl for actuating said ratchet-wheel, ribbon-controlled means for operatively connecting said pawl to said key, a star-wheel and spring for said controller, and feed-reversing means operated by said controller.

4. The combination of a pair of ribbon spools, a ratchet wheel for each spool, a driving pawl for each ratchet wheel, a driver for said pawls, a revoluble controller having cams constructed to operate in alternation, for rendering first one pawl and then the other ineffective, and ribbon-controlled means for rotating said controller always in the same direction.

5. The combination of a key, a pair of ribbon spools, a ratchet wheel for each spool, a driving pawl for each ratchet wheel, a driver for said pawls, said driver being controlled by said key, a revoluble controller having cams constructed to operate in alternation, for rendering first one pawl and then the other ineffective, a ratchet-wheel connected to said controller, a pawl for actuating said controller ratchet-wheel, and ribbon-controlled means for operatively connecting said controller pawl to said driver.

6. The combination of a key, a pair of ribbon spools, a driver under control of said key, means for enabling said driver to turn either spool, a revoluble controller, a ratchet-wheel connected to said controller, ribbon-controlled means, inclusive of a pawl, for enabling said key to actuate said ratchet wheel and controller, and feed-reversing means operated by said controller.

7. The combination of a key, a pair of ribbon spools, a ratchet wheel for each spool, a driving pawl for each ratchet wheel, a driver for said pawls, said driver being controlled by said key, a revoluble controller having alternate cams for forcing said pawls out of operation, a star wheel and spring for said controller, a ratchet-wheel connected to said controller, and ribbon-controlled means, inclusive of a pawl, for enabling said driver to actuate said controller ratchet-wheel.

8. The combination of a key, a pair of ribbon spools, and ribbon-feeding and reversing mechanism inclusive of a revoluble feed-reverser, a ratchet wheel connected to said reverser, and ribbon-controlled means for enabling said key to rotate said reverser by means of said ratchet wheel.

9. The combination with ribbon spools and feeding means, of a feed reverser mounted for revolution in a single direction only, means dependent upon the empty condition of either spool, for revolving said reverser, and a detent for holding said reverser motionless during the winding of the ribbon.

10. The combination with spools and feeding means, of a reverser provided with a ratchet wheel and a detent, a key, a pawl operable by the key for actuating said ratchet wheel, and means dependent upon the movement of the ribbon, for causing said pawl to be operated by the key.

11. The combination with spools and feeding means, of a reverser normally motionless during the winding of the ribbon, key-actuated means controlled by the ribbon for effecting partial revolutions of said reverser, a spring tensioned by the revolution of said reverser by said key-controlled means, and means for enabling said spring to complete the feed-reversing movements of said reverser.

12. The combination with spools and feeding means, of a reverser having alternate operations by means of rotative movements in the same direction, key-actuated means dependent upon the paying off of the ribbon from either spool, for effecting partial revolutions of said reverser in the same direction, a spring tensioned by the revolution of said reverser by said key-actuated means, and means for enabling said spring to complete the feed-reversing movements of said reverser and to hold the reverser motionless during the winding of the ribbon.

13. The combination with spools and feeding means, of a reverser having alternate operations by means of rotative movements in the same direction, a ratchet wheel for said reverser, a pawl for said ratchet wheel, a spring, and means for enabling said pawl and said spring in alternation to rotate said reverser in a single direction, and for enabling said spring to hold said reverser motionless during the winding of the ribbon.

14. The combination with spools and feeding means, of a reverser having alternate operations by means of rotative movements in the same direction, a pawl operated by a key, means dependent upon the longitudinal movement of the ribbon, and including a ratchet wheel, for enabling said key and pawl to rotate said reverser step by step, a spring tensioned by said step by step rotation of said ratchet wheel and reverser, and means for enabling said spring

to complete the action of the reverser and hold the reverser motionless during the winding of the ribbon.

15. The combination with a pair of spools and a pair of ratchet wheels therefor, of pawls for said ratchet wheels, a feed reverser having cams, and ribbon-controlled means for rotating said reverser in a single direction; said cams being formed for rendering said pawls alternately effective.

16. The combination with a pair of spools and a pair of ratchet wheels therefor, of pawls for said ratchet wheels, a feed reverser having cams, and ribbon-controlled means for rotating said reverser in a single direction; said cams being formed for disengaging said pawls in alternation from said ratchet wheels, and said reverser-rotating means including a spring set during the first part of the rotation of the reverser and then operating to rotate the reverser during the pawl-disengaging movement and also to hold the reverser motionless during the winding of the ribbon.

17. The combination with a pair of spools and a pair of ratchet wheels connected thereto, of a feed reverser mounted concentrically with said ratchet wheels and including a pair of cams, driving pawls for said ratchet wheels, said pawls being under the control of said cams and caused to disengage the ratchet wheels in alternation during the rotation of said reverser, a ratchet wheel upon said reverser, a pawl for operating said ratchet wheel, a star wheel upon said reverser, and a spring for said star wheel; said star wheel and spring being so constructed that the spring is set during the operation of the ratchet wheel by the pawl, and then completes the movement of the reverser.

18. The combination with a pair of concentric spools and a pair of ratchet wheels between the spools and connected thereto, of driving pawls for said ratchet wheels, a pair of cams rotatively mounted between said spools and fixed together so as to work in alternation upon said pawls, a ratchet wheel rigid with said cams and provided with ribbon-controlled driving means, and a spring-controlled star wheel also rigid with said cams.

19. The combination with a shaft and means for supporting the same between its ends, of ribbon spools detachably mounted upon the ends of the shaft, ratchet wheels between the spools and connected thereto, a sleeve mounted upon said shaft between said ratchet wheels, cams fixed upon said sleeve, pawls for said ratchet wheels, said pawls being moved in alternation out of engagement with the ratchet wheels during the rotation of said cams, a ratchet wheel and a star wheel upon said sleeve, means for operating the ratchet wheel, and a spring for the star wheel.

20. The combination with ribbon spools and feeding means, of a feed reverser, a ratchet wheel for actuating said reverser, a series of type-operating keys, a universal bar operated by said keys, a pawl operable by said universal bar for actuating said ratchet wheel, and means controlled by the ribbon for rendering said pawl effective.

21. The combination with ribbon spools of ratchet wheels therefor, pawls for said ratchet wheels, a series of type-operating keys, a universal bar operated by said keys, means for enabling said universal bar to operate said pawls, a feed reverser, a ratchet wheel for actuating said reverser, a pawl operable by said universal bar for actuating said reverser ratchet-wheel, and means controlled by the ribbon for rendering said reverser pawl effective.

22. The combination with ribbon spools of spool-turning means, a feed-reverser revoluble in one direction only, a ratchet wheel for operating said reverser, and means actuable by said spool-turning means for actuating said ratchet wheel; said feed-reverser being provided with means effective alternately during its revolution for causing the ribbon to wind upon first one spool and then the other.

23. The combination with ribbon spools of spool-turning means, a feed-reverser, a ratchet wheel for operating said reverser, a pawl for said ratchet wheel, pawl-operating means, and means operating automatically during the final portion of the movement of the ribbon in either direction for causing said pawl-operating means to operate the pawl.

24. The combination of a pair of spools, feeding means, a ribbon-feed reverser, a ratchet wheel for operating said reverser, a pawl for said ratchet wheel, means for actuating said pawl, a follower for the ribbon upon one of the spools, and means brought into action through said follower when the ribbon is paid off from its spool, for rendering said pawl effective.

25. The combination with a pair of spools and winding means, of a feed reverser, a ratchet wheel for operating said reverser, pawls for said ratchet wheel, means for actuating said pawls, followers for the ribbon upon said spools, and means brought into action through each follower when the ribbon is paid off from its spool, for rendering its associated pawl effective.

26. The combination with a pair of spools and winding means, of a feed reverser, a ratchet wheel for operating said reverser, pawls for said ratchet wheel, means for actuating said pawls, followers for the ribbon upon said spools, means brought into action

through each follower when the ribbon is paid off from its spool, for rendering its associated pawl effective, and means connected to said reverser and followers for causing one follower to move away from the empty spool and the other to move toward the full spool.

27. The combination with a pair of spools and turning means, of a revoluble feed reverser provided with means effective alternately during its revolution for causing the ribbon to wind upon first one spool and then the other, a ratchet wheel for operating said reverser, pawls for said ratchet wheel, means for actuating said pawls, followers for the ribbon upon said spools, means brought into action through each follower when the ribbon is paid off from its spool, for rendering its associated pawl effective, and means for enabling said reverser to trip the follower from the empty spool.

28. The combination with a pair of spools having recessed cores, of means for turning said spools, a reverser, a ratchet wheel for operating said reverser, pawls for said ratchet wheel, means for actuating said pawls, followers for the ribbon upon said spools, said followers being adapted to fall into the core recesses, and springs tending constantly to render said pawls effective, said followers being pressed toward said spools by said springs, and the pawls being moved by said springs into effective positions when the followers enter the recesses.

29. The combination with a pair of spools having recesses, of means for turning said spools, a reverser, a ratchet wheel for operating said reverser, pawls for said ratchet wheel, means for actuating said pawls, followers for the ribbon upon said spools, said followers being adapted to enter said recesses, springs tending constantly to render said pawls effective, said followers being pressed toward said spools by said springs and the pawls being moved by said springs into effective positions when the followers enter the recesses, and means for enabling the reverser to trip the follower from the empty spool.

30. The combination with ribbon winding means, of a reverser normally motionless during the winding of the ribbon but mounted for rotation and effective by means of rotative movements in the same direction to cause the feed of the ribbon to be first in one direction and then in the other, ribbon-controlled means for rotating said reverser, and means for enabling said reverser to put said ribbon-controlled means out of action.

31. The combination with a pair of ribbon spools and means for winding the ribbon thereon, of a reverser mounted for rotation and effective by movements in the same direction to cause the winding means to act first in one direction and then in the other, a key, ribbon-controlled devices, one for each spool, connected to means for enabling said key to impart step-by-step advance movements to said reverser, and means for enabling said reverser to put out of action the ribbon-controlled device at the empty spool.

32. The combination with a pair of ribbon spools and means for winding the ribbon thereon, of a reverser mounted for rotation and effective by movements in the same direction to cause the winding means to act first in one direction and then in the other, a plurality of keys, ribbon-controlled devices, one for each spool, connected to mechanism for enabling said keys to impart step-by-step advance movements to said reverser, said reverser-advancing mechanism being inclusive of a pawl-and-ratchet mechanism, and means for enabling said reverser to put out of action the active ribbon-controlled device.

33. The combination of a pair of ribbon spools, a rotary reverser mounted between said spools and concentric therewith, key-operated pawl-and-ratchet mechanism for advancing said reverser, ratchet-wheels one for each spool, pawls for said ratchet wheels, said reverser including cams for putting said pawls alternately out of action, ribbon-followers one at each spool, means controlled by said followers for rendering said reverser-advancing mechanism effective, and arms provided upon said followers in position to be thrown out of action alternately by said cams.

34. The combination with ribbon winding mechanism, including a pair of spools, of a reverser, a ratchet wheel for rotating said reverser, pawls normally out of action for operating said ratchet wheel, a series of keys, a universal bar actuable by any of said keys, and ribbon-controlled devices for connecting said pawls alternately with said universal bar.

35. The combination with a pair of spools and winding means, each spool being provided with a recess, of a reverser, a ratchet wheel for rotating said reverser, a series of keys, a universal bar actuable by any of said keys, a pair of followers one at each spool, pawls for operating said ratchet wheel, one pawl connected to each follower and both normally out of action, and means for enabling the movement of either follower into the recess of its spool to effect a connection of its pawl with said universal bar.

36. The combination with a pair of spools and winding means, each spool being provided with a recess, of a reverser, a ratchet wheel for rotating said reverser, a series of keys, a universal bar actuable by any of said keys, a pair of followers one at each

spool, pawls for operating said ratchet wheel, one pawl connected to each follower and both normally out of action, springs for pressing said pawls into engagement with said ratchet wheel, one spring for each pawl, said springs also operating to press said followers against the ribbon upon the spools, and a part operated by said universal bar and connected to either pawl by the action of the pawl spring, upon the movement of the follower into the recess.

37. The combination with a pair of spools and ratchet wheels therefor, of a series of keys, a universal bar actuable by any of said keys, pawls operated by said universal bar for turning said ratchet wheels, a reverser mounted for rotation and effective by movements in the same direction to put said pawls alternately out of action, and pawl-and-ratchet mechanism operable by said universal bar to advance said reverser.

38. The combination with a pair of spools and ratchet wheels therefor, of a series of keys, a universal bar actuable by any of said keys, pawls operated by said universal bar for turning said ratchet wheels, a reverser mounted for rotation and inclusive of a pair of cam members one for each pawl, for forcing said pawls in alternation away from said ratchet wheels, and ribbon-controlled pawl-and-ratchet mechanism operable by said universal bar to advance said reverser.

39. In a front strike writing machine, the combination of a series of rearwardly striking type bars, a platen, a carriage for said platen, a movable frame whereon said carriage is mounted, ribbon spools mounted upon said movable frame beneath said carriage, means for leading the ribbon from the the spools to the front side of the platen, spool-winding means, and ribbon-controlled feed-reversing means.

40. In a front strike writing machine, the combination of a series of rearwardly striking types, a platen, a platen carriage, a liftable frame whereon said carriage is mounted, ribbon spools mounted upon said liftable frame beneath said carriage, spool-turning mechanism in separable portions, one portion upon said liftable frame and the other portion upon the framework of the writing machine, and feed-reversing mechanism in separable portions, one portion upon the liftable frame and one portion upon the framework of the machine.

41. In a front strike writing machine, the combination of a series of rearwardly striking type bars, a paper-carriage, a hinged support whereon said carriage is mounted, ribbon spools mounted upon said hinged support beneath said carriage and movable with said support to an accessible position, means for guiding the ribbon to the impression point, spool-winding mechanism, and automatic feed-reversing mechanism including a pair of followers, one for each spool, said followers being mounted upon the framework of the machine, and becoming separated from the ribbon when said hinged support is swung up.

42. The combination of a pair of ribbon-spools detachably mounted side by side, ribbon-winding means, feed-reversing means including a pair of followers mounted to ride upon the ribbon upon the spools, one follower for each spool, and a frame whereon said spools are mounted and whereby they may be swung away from said followers.

43. The combination of a pair of ribbon spools detachably mounted, ribbon-winding and reversing means including a pair of ribbon followers one for each spool, and means for supporting the spools so that they may be moved away from said followers prior to detachment of the spools.

44. In a front strike writing machine, the combination of a series of rearwardly striking types, a platen, a carriage whereon said platen is mounted, a frame whereon said carriage is mounted, said frame being hinged in rear of the platen to the framework of the machine, ribbon spools mounted upon said hinged frame below the carriage, means for leading the ribbon to the front side of the platen, a series of keys connected to the types, means for enabling the keys to wind the spools, and a feed-reverser actuable by the keys.

45. In a front strike writing machine, the combination of a series of rearwardly striking type bars, a platen, a frame whereon said platen is mounted, ribbon spools mounted side by side below the platen and in rear of the types, a support whereon said ribbon spools are mounted; said platen frame and said support being movable to permit access to the ribbon spools; a feed-reverser mounted between said spools, and keys connected to said type bars; said ribbon spools and said reverser being actuable by said keys.

46. In a front strike writing machine, the combination of a series of rearwardly striking type bars, keys therefor, a platen, a frame for said platen, an upwardly and rearwardly tiltable hinged frame whereon said platen frame is mounted, ribbon spools detachably mounted side by side upon said hinged frame below the platen and in rear of the type bars, a reverser also mounted upon said hinged frame, ribbon-controlled key-actuated means for operating said reverser, and key-actuated means for turning the spools.

47. In a front strike writing machine, the combination of a series of rearwardly striking type bars, a carriage, a frame whereon said carriage travels, a pair of ribbon spools

mounted side by side upon said frame in an inaccessible position in rear of the type bars, a ratchet wheel for each spool, keys connected to said type bars, pawls actuated by said keys and mounted upon the framework of the machine for actuating said ratchet wheels, said frame being pivotally mounted so as to enable said spools and ratchet wheels to be moved thereon away from said pawls and into an accessible position, a reverser mounted upon said frame, key-actuated pawl-and-ratchet mechanism for operating said reverser, and ribbon-controlled means for rendering said pawl-and-ratchet mechanism effective.

48. The combination with a pair of ribbon spools, of a ratchet wheel for each spool, a driving pawl for each ratchet wheel, a driver for said pawls, a revoluble controller having cams constructed to operate in alternation, for silencing first one pawl and then the other, means normally ineffective during the winding of the ribbon but operable by a part of the general typewriting mechanism for rotating said controller, and ribbon-controlled means for rendering said rotating means effective.

49. The ribbon-winding and reversing mechanism mounted under the rear portion of the carriage, and part mounted to swing up with the carriage away from the remainder, to permit ready detachment of the spools.

50. The combination of a pair of ribbon spools, a ratchet wheel for each spool, a driving pawl for each ratchet wheel, a revoluble pawl-controller, means for revolving said pawl-controller in a single direction, and a detent for said controller; said means for revolving the pawl-controller being constructed so as to be called into operation automatically when the ribbon is paid off from either spool, to render effective the pawl of the empty spool and ineffective the pawl of the full spool.

51. The combination of a pair of ribbon spools, a driver, means for enabling said driver to turn either spool, a revoluble controller, means called into operation automatically when the ribbon is unwound from either spool, for revolving said controller in a single direction to a predetermined point, and means whereby such revolution of the controller to such point causes said driver to become disconnected from the spool and reconnected to the empty spool.

52. The combination with ribbon spools and feeding means, of a feed reverser having alternate operations by means of rotative movements in the same direction, and means called into action by reason of the ribbon being paid out from either spool, for rotating said reverser.

53. The combination with ribbon spools and a pair of ratchet wheels therefor, of driving pawls for said wheels, a feed reverser, means controlled by the ribbon for rotating said reverser in a single direction, and means for enabling said reverser by reason of its rotation to render said pawls effective in alternation.

54. The combination with ribbon spools and a pair of ratchet wheels therefor, of driving pawls for said wheels, a feed reverser, a reciprocatory key, means for enabling said key by its reciprocations to rotate said reverser in a single direction, and means for enabling said reverser to render said pawls effective in alternation.

55. The combination with a carriage, spools and feeding means, of a reverser provided with a ratchet wheel, a key, and a pawl operated by said key for actuating said ratchet wheel.

56. The combination with spools and feeding means, of a reverser, key-actuated means for effecting partial revolutions of said reverser, a spring tensioned by the revolution of said reverser by said key-actuated means, and means for enabling said spring to complete the feed-reversing movements of said reverser.

57. The combination with spools and feeding means, of a reverser having alternate operations by means of rotative movements in the same direction, key-actuated means dependent upon the paying off of the ribbon from either spool, for effecting partial revolutions of said reverser in the same direction, a spring tensioned by the revolution of said reverser by said key-actuated means, and means for enabling said spring to complete the feed-reversing movements of said reverser.

58. The combination with spools and feeding means, of a reverser having alternate operations by means of rotative movements in the same direction, a ratchet wheel for said reverser, a pawl for said ratchet wheel, a spring, and means for enabling said pawl and said spring in alternation to rotate said reverser in a single direction.

59. The combination with spools and feeding means, of a reverser having alternate operations by means of rotative movements in the same direction, a pawl, operated by a key, means dependent upon the longitudinal movement of the ribbon, and including a ratchet wheel, for enabling said key and pawl to rotate said reverser step by step, a spring tensioned by said step by step rotation of said ratchet wheel and reverser, and means for enabling said spring to complete the action of the reverser.

60. The combination with a pair of spools and a pair of ratchet wheels therefor, of pawls for said ratchet wheels, a feed reverser having cams, and ribbon-controlled means for rotating said reverser in a single direction; said cams being formed for dis-

engaging said pawls in alternation from said ratchet wheels, and said reverser-rotating means including a spring set during the first part of the rotation of the reverser and then operating to rotate the reverser during the pawl-disengaging movement.

61. The combination with a pair of ribbon spools and means for winding the ribbon thereon, of a reverser mounted for rotation and effective by means of rotative movements in the same direction to cause the winding means to act first in one direction and then in the other, a pair of devices one at each spool and controlled by the ribbon and movable independently of each other for rendering said reverser effective, and means for enabling said reverser to put out of action the ribbon-controlled device at the empty spool.

62. The combination with a pair of ribbon spools and means for winding the ribbon thereon, of a reverser mounted for rotation and effective by movements in the same direction to cause the winding means to act first in one direction and then in the other, a ratchet wheel connected to said reverser, a key, a pawl operated by said key to engage said ratchet wheel, a pair of devices one for each spool and controlled by the ribbon for rendering said pawl effective, and means controlled by the reverser for rendering said pawl ineffective.

63. The combination with the spool ratchets, and driving pawls, of a controller revoluble in a single direction and having cams constructed to operate in alternation by means of the rotation of said controller for silencing the pawls in alternation.

64. In a typewriting machine, the combination with a platen and types to strike upon the front thereof, of ribbon spools mounted below and behind the platen, the ribbon extending from one spool up to the front of the platen and then down to the other spool, and automatic means, including a pawl-and-ratchet mechanism, for reversing the winding of the ribbon.

65. In a typewriting machine, the combination with a platen and types to strike upon the front thereof, of ribbon spools mounted below and behind the platen, the ribbon extending from one spool up to the front of the platen and then down to the other spool, and automatic means for reversing the winding of the ribbon, said reversing means including travelers to run upon the ribbon, and means being provided to separate the travelers from the ribbon the spools being movable to accessible positions.

66. In a typewriting machine, the combination with a platen and types to strike upon the front thereof, of ribbon spools mounted below and behind the platen, the ribbon extending from one spool up to the front of the platen and then down to the other spool, and automatic means for reversing the winding of the ribbon, said reversing means including travelers to run upon the ribbon, and means being provided to separate the travelers from the ribbon; the spools being detachably mounted upon the machine and movable to accessible positions.

67. In a typewriting machine, the combination with a platen and types mounted to strike upon the front thereof, a rail along which the platen frame runs, spools mounted on edge beneath the rail, a winding and automatic reversing mechanism arranged between said spools, and means detachably retaining the spools, so that they may be slipped sidewise and oppositely away from the winding and reversing mechanism.

68. In a typewriting machine, the combination with a platen and types mounted to strike upon a visible side thereof, of spools mounted on edge below the platen, a ribbon extending up from the spools to the front of the platen and there running over a vibrator, the platen and spools being mounted to move upwardly to give access to the spools, and a spool-winding device mounted upon the framework of the machine and a reversing device disconnected from the spools by such upward movement of the spools.

69. In a typewriting machine, the combination with a platen and types mounted to strike upon a visible side thereof, of spools mounted on edge below the platen, a ribbon extending up from the spools to the front of the platen and there running over a vibrator, the platen and spools being mounted to move upwardly to give access to the spools, and a spool-winding device mounted upon the framework of the machine and a reversing device disconnected from the spools by such upward movement of the spools; the spools being detachably mounted to enable them to be removed independently of their winding and reversing means.

70. In a typewriting carriage, of a pair of spools mounted on edge and side by side beneath the platen carriage, a ribbon carrier in front of the platen over which the ribbon runs between the spools, spool turning devices mounted between said spools, and means in part also between said spools and connected to said spool turning devices for causing the direction of the ribbon travel to be automatically reversed.

71. In a typewriting machine, the combination with a platen carriage, of a pair of spools mounted on edge and side by side beneath the platen carriage, a ribbon carrier in front of the platen over which the ribbon runs between the spools, spool turning devices mounted between said spools,

and means in part also between said spools and connected to said spool-turning devices for causing the direction of the ribbon travel to be automatically reversed; said ribbon reversing means including travelers to run upon the coils of ribbon upon the spools.

72. In a typewriting machine, the combination with a platen carriage, of a pair of spools mounted on edge and side by side beneath the platen carriage, a ribbon carrier in front of the platen over which the ribbon runs between the spools, spool turning devices mounted between said spools, and means in part also between said spools and connected to said spool turning devices for causing the direction of the ribbon travel to be automatically reversed; said ribbon-reversing means including travelers to run upon the coils of ribbon upon the spools; and said spools being detachably connected so as to be removable from the winding devices and from the travelers.

73. The combination with a pair of vertical spools back of the type bars and under the platen, of ratchet wheels for the spools, pawls for the ratchet wheels, said pawls mounted on the machine frame below the spools, means to operate the pawls, and an automatic ribbon reversing mechanism, substantially as set forth.

74. In a typewriting machine, the combination with spools, a universal bar operated by the keys of the machine, said bar being provided with a slot, of pawls to enter said slot, means to hold the pawl out of the slot when a spool has ribbon on it, and means to cause the ribbon to be reversed when a pawl is in the slot, substantially as set forth.

75. In a ribbon reversing mechanism, a reverser, a pawl to turn the reverser in one direction, and a yielding detent having a star-wheel to hold the reverser in a series of positions, substantially as set forth.

76. In a ribbon-reversing mechanism, the combination with a vibrating driver 60, of a pawl normally disconnected therefrom, means dependent upon the ribbon for connecting said pawl to said driver, a ratchet operable by the pawl, and a ribbon-reversing device operated by said ratchet.

77. The combination with a pair of ribbon spools and a vibrating member 60, of three pairs of pawls, and means to enable said pawls to coöperate with said constantly vibrating member to wind the ribbon back and forth and automatically reverse the direction of its travel when either spool becomes filled with ribbon.

78. In a ribbon-reversing mechanism, the combination with a pair of spools and reversing devices, including followers to ride upon the ribbon, of means for effecting a relative separating movement of the spools and the followers, and means for detachably holding the spools in position, whereby, when the spools and followers are separated, the spools may be withdrawn from their supports.

79. In a typewriting machine, the combination with reversible ribbon-winding means, of a series of type-operating keys, and ribbon-reversing devices operable by said keys but normally dormant during the operation of the keys, and including both a member to effect the reversing of the ribbon and a pawl and ratchet for enabling the keys to reverse the winding of the ribbon; said pawl operable by the keys and said ratchet having means to reverse the winding of the ribbon.

80. The combination with ribbon spools and feeding means, of a feed reverser having alternate operations by means of rotative movement in the same direction, means called into action by reason of the ribbon being paid out from either spool, for rotating said reverser, said rotating means comprising a part to run upon the coils of ribbon on the spools, and a frame in which said part is mounted, whereby separations may be effected between the coils and said part to permit detachment of the spools.

81. The combination with a pair of ribbon spools detachably mounted, ribbon-winding and reversing means including a pair of ribbon followers, one for each spool, and means for supporting the spools and the followers, said supporting means including a part movable to permit separation to be effected between said spools and said followers preparatory to detachment of the spools.

82. In a typewriting machine, the combination of ribbon spools, spring-pressed driving devices therefor, and a cam acting to hold said driving devices in either of two positions against the spring pressure.

83. In a typewriting machine, the combination of ribbon spools, spring-pressed driving devices therefor, a cam to force said driving devices alternately out of working positions in opposition to the spring pressure, and means acting when moved in the same way to move the cam to cause said driving devices to be alternately effective.

84. The combination with a pair of ribbon spools, of winding means for each spool, a cam device, means for turning said cam device always in the same direction, and means controlled by said cam device for rendering the winding means effective in alternation.

85. In a typewriting machine, the combination of ribbon spools, driving devices therefor, connections from the driving device of one spool to that of the other spool, a rotatable cam acting on said driving devices to reverse the feed of the ribbon with

every operation of the cam, and a part acting in the same direction to turn said cam from one reverse position to the other, substantially as set forth.

86. In a typewriting machine, the combination of ribbon spools, driving devices therefor, connections from the driving device of one spool to that of the other spool, a rotatable cam acting on said driving devices to reverse the feed of the ribbon, a ratchet wheel connected to the cam, and a pawl acting on said ratchet wheel to move the cam from one reverse position to the other, substantially as set forth.

87. The combination of a pair of ribbon spools, a driver, means for enabling said driver to turn either spool, a revoluble controller, a member upon said controller adapted for coöperation with a moving part of the machine, whereby said controller may be turned in a single direction, means for effecting such coöperation, a star-wheel and spring which coöperate to complete the controller movement to a predetermined point, and means whereby such movement of the controller causes said driver to become disconnected from the full spool and re-connected to the empty spool.

88. The combination of a key, a pair of ribbon spools, a driver under the control of said key, means for enabling said driver to wind either spool, a revoluble controller, a ratchet wheel connected to said controller, a pawl for actuating said ratchet wheel, means for connecting said pawl to said key, and feed-reversing means operated by said controller.

89. The combination of a pair of ribbon spools, a ratchet wheel for each spool, a driving pawl for each ratchet wheel, a driver for said pawls, a revoluble controller having cams constructed to operate in alternation, for rendering first one pawl and then the other ineffective, and means for rotating said controller.

90. The combination of a key, a pair of ribbon spools, a driver, means for enabling said driver to wind either spool, a revoluble controller, a ratchet wheel connected to said controller, a pawl for enabling said key to actuate said ratchet wheel and controller, and feed-reversing means operated by said controller.

91. The combination of a key, a pair of ribbon spools, and ribbon-feeding and reversing mechanism inclusive of a revoluble feed-reverser, a ratchet wheel connected to said reverser, and means for enabling said key to rotate said reverser by means of said ratchet wheel.

92. The combination with a pair of spools and a pair of ratchet wheels therefor, of pawls for said ratchet wheels, a feed reverser having cams, and means for rotating said reverser in a single direction; said cams being formed for rendering said pawls alternately effective.

93. In a typewriting machine, in combination with the main frame thereof, of an auxiliary frame mounted upon said main frame, said auxiliary frame having mounted therein a pair of ribbon spools, reversing driving means whereby the direction of rotation of said ribbon spools may be reversed, and automatic means including a part of said auxiliary frame for reversing the ribbon feed.

94. A ribbon mechanism for typewriters, comprising, in combination, a pair of spools each having a core with an open continuous circumferential slot therein, yieldingly mounted fingers urged against the coils of ribbon thereon, and mounted to be capable of entering the respective slots thereof, means for driving said spools, and means controlled by said yielding fingers for shifting the direction of feed of the ribbon.

95. A ribbon spool having a core containing a continuous circumferential slot, and a finger conformed to enter said slot, and resting yieldingly on the coils of ribbon on said spool, and arranged to enter the slot without resistance when the ribbon is unwound.

96. A ribbon spool having a core containing a narrow continuous circumferential slot, and a finger mounted to enter said slot, and resting yieldingly on the coils of ribbon wound upon said spool, and arranged to enter the slot when the ribbon is unwound.

97. In a typewriting machine, the combination of ribbon-feeding means and reversing means therefor, including a member which is moved in the same direction and reverses the ribbon feed regardless of the direction of movement of the ribbon.

98. In a typewriting machine, the combination of ribbon spools, means for rotating said spools, a member rotatably adjustable for reversing the movement of the ribbon feed, and means for turning said rotatably adjustable member.

99. In a typewriting machine, the combination of ribbon spools arranged at opposite sides of the middle of the machine, means for feeding the ribbon from one spool to the other, a rotatable reversing shaft extending transversely of the machine, and means operated by turning said shaft for reversing the ribbon feed.

100. In a typewriting machine, the combination of ribbon spools, means for feeding the ribbon from one spool to the other, a reversing shaft having an intermittent rotary motion, and means operated by said shaft for reversing the ribbon feed with each rearward movement of said shaft.

101. In a typewriting machine, the combination of ribbon spools, means for feeding

the ribbon from one spool to the other, a reversing shaft having an intermittent rotary motion in only one direction, and means operated by said shaft for alternately changing the direction of the ribbon feed.

102. In a typewriting machine, the combination of ribbon spools, means for feeding the ribbon on the spools, a shaft rotatable in only one direction, and means operated by said shaft for disconnecting the feeding means from one spool and simultaneously restoring the feeding means to the other spool.

103. In a typewriting machine, the combination of ribbon spools, means for feeding the ribbon on the spools, a rotatable shaft, means for rotating said shaft in only one direction, means operated by the rotation of said shaft for reversing the feed of the ribbon, and means controlled by the ribbon and acting to permit said shaft to be rotated when the ribbon is exhausted.

BURNHAM C. STICKNEY.

Witnesses:
C. H. HAIG,
F. A. SILLES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."