No. 891,047. PATENTED JUNE 16, 1908.

J. C. DOANE.

TYPE WRITING MACHINE.

APPLICATION FILED JUNE 11, 1907.

8 SHEETS—SHEET 1.

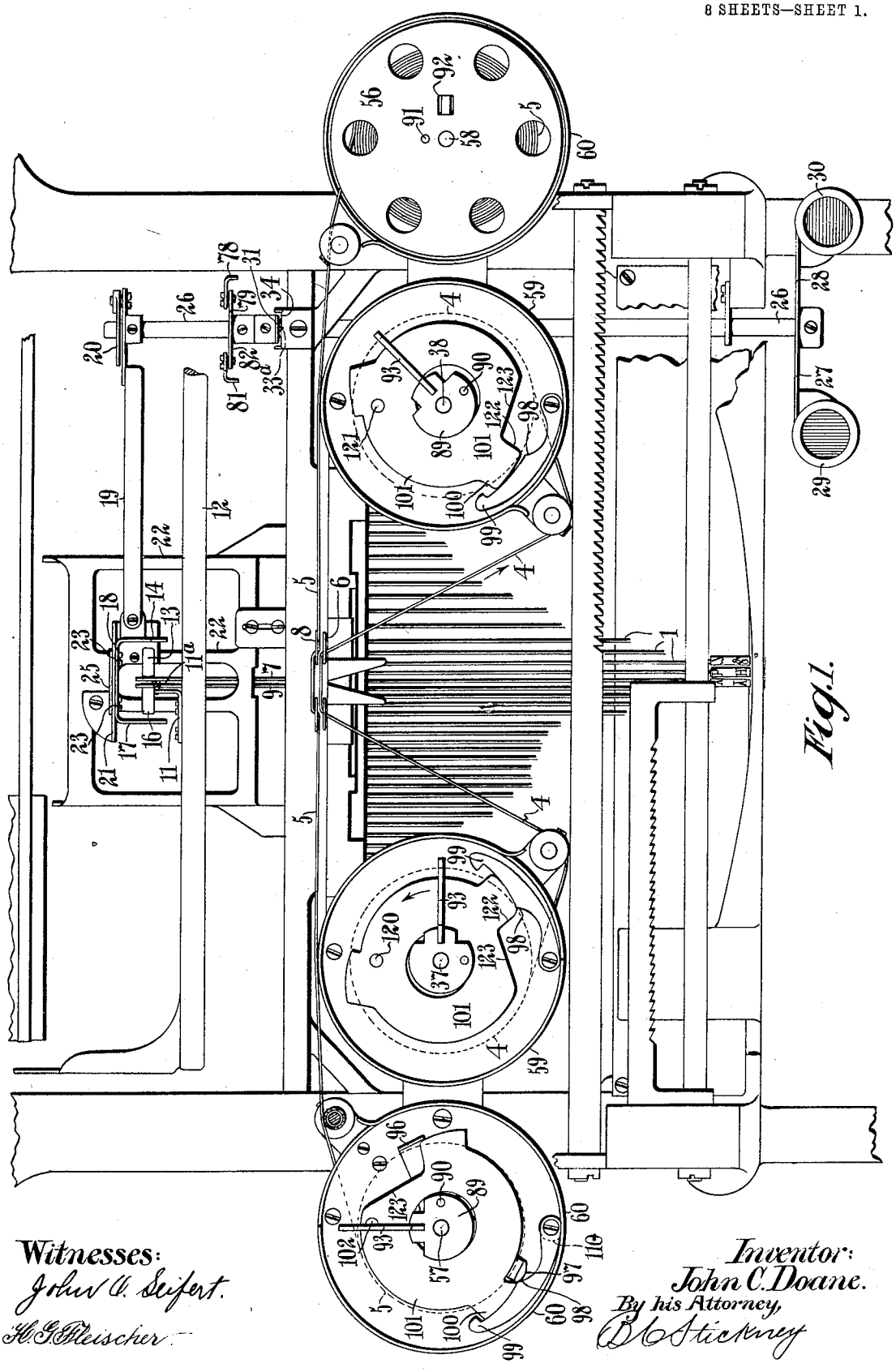

Fig. 1.

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H. G. Fleischer.

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By his Attorney,
B. Stickney

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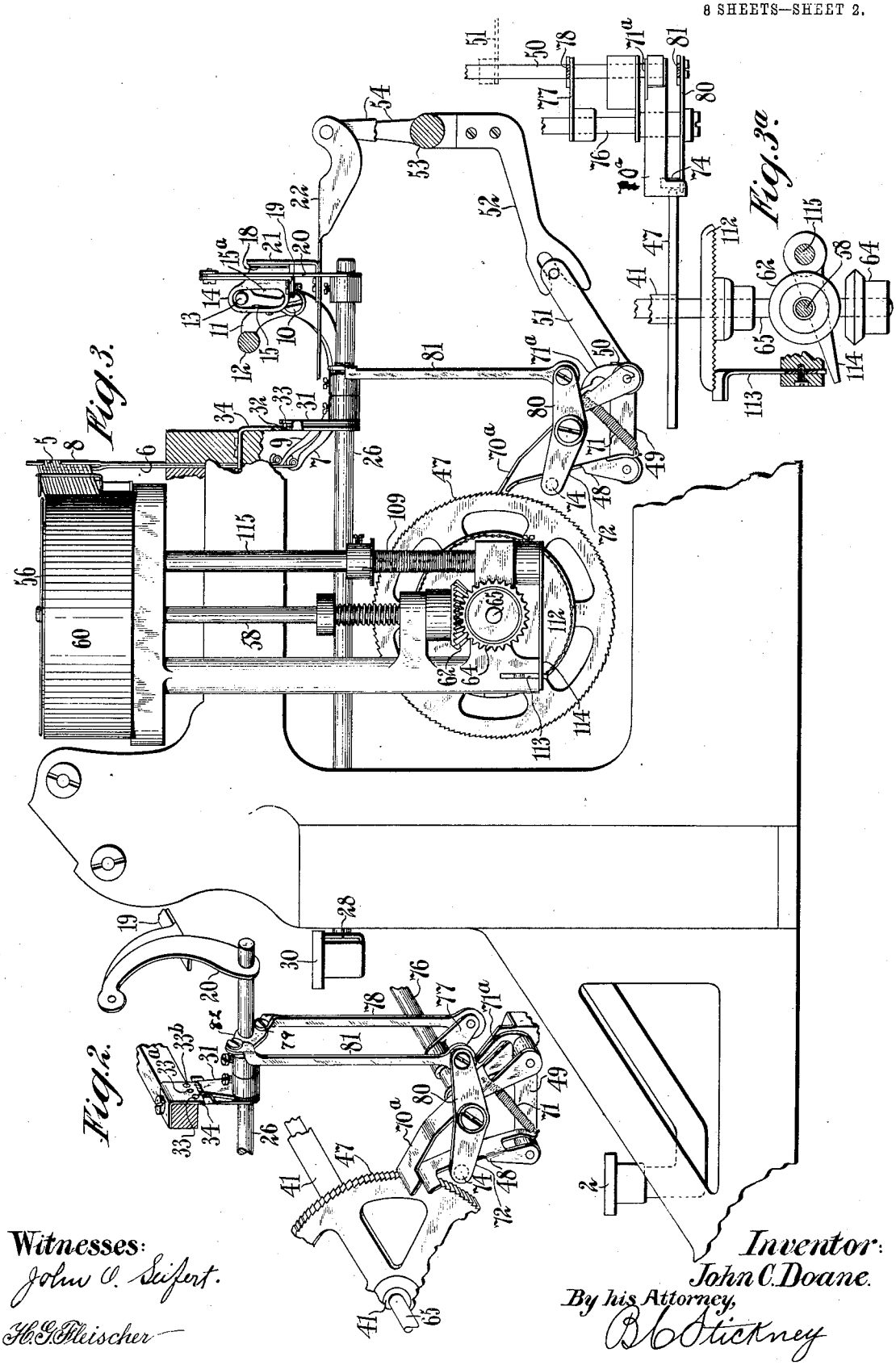

Witnesses:
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H. G. Fleischer

Inventor:
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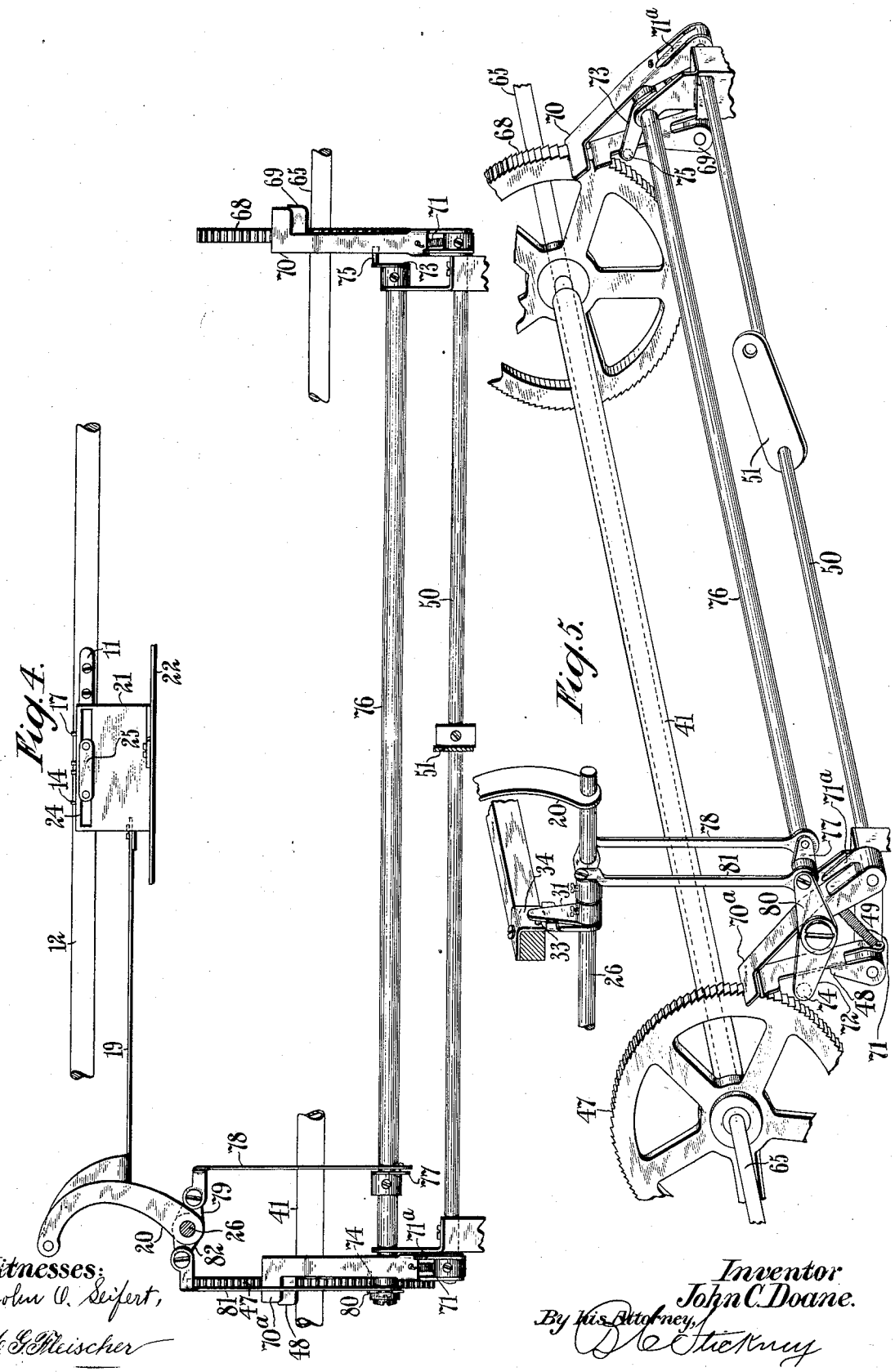

Fig. 4.

Fig. 5.

Witnesses:
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D. C. Fleischer

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8 SHEETS—SHEET 4.

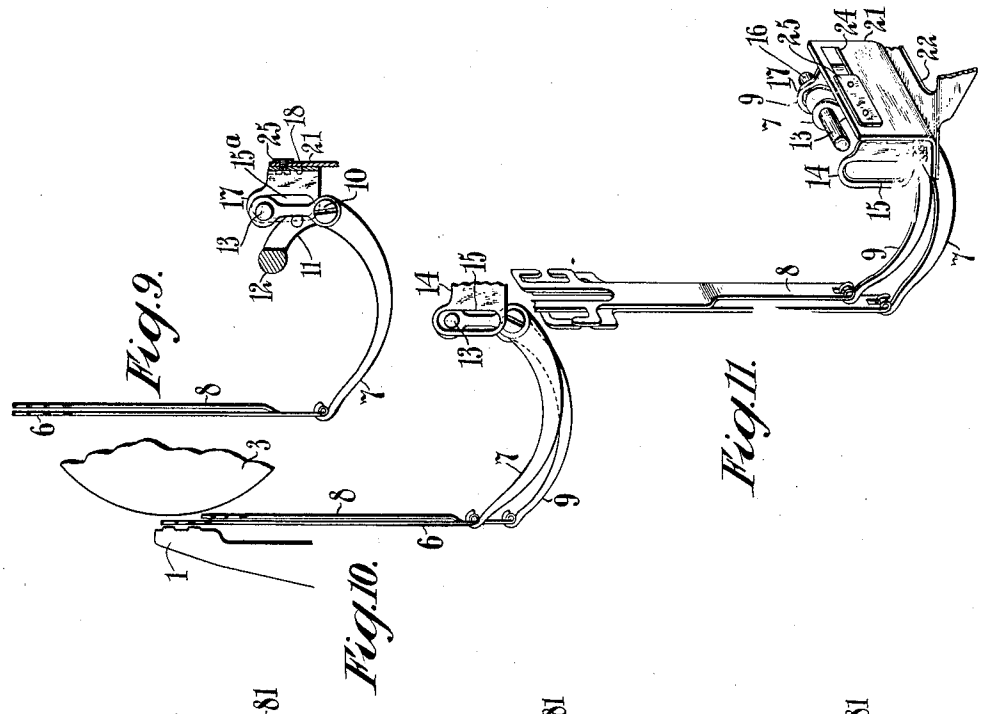

Fig. 9.

Fig. 11.

Fig. 10.

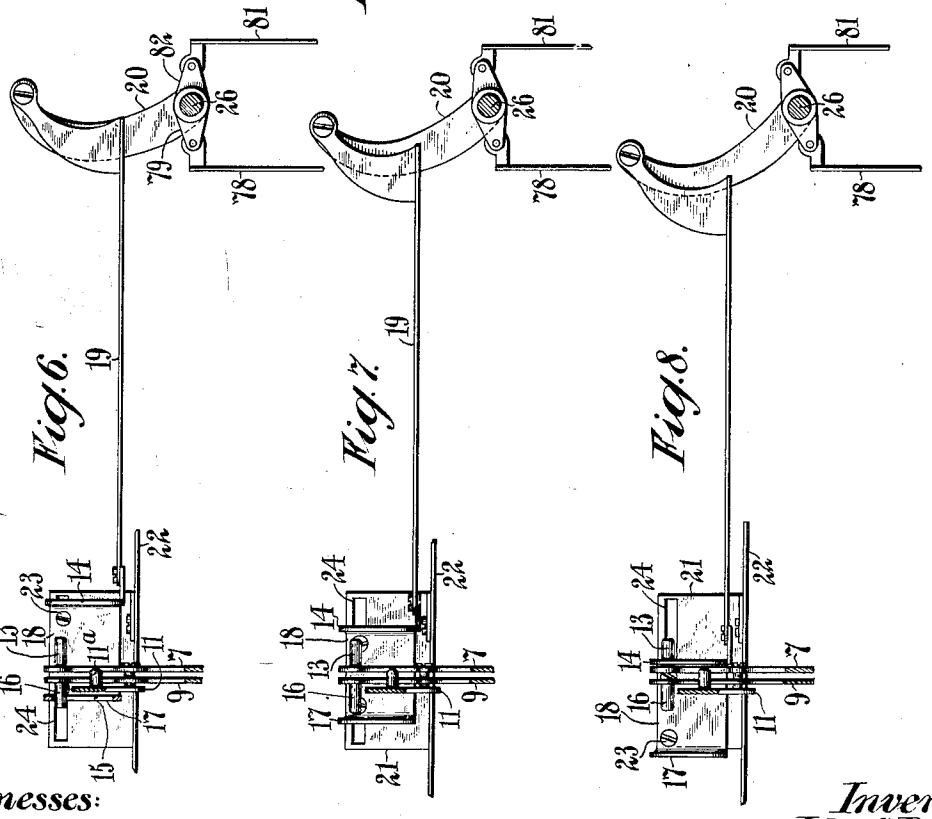

Fig. 6.

Fig. 7.

Fig. 8.

Witnesses:

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Inventor:

John C. Doane.

By his Attorney,

O. C. Stickney

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8 SHEETS—SHEET 5.

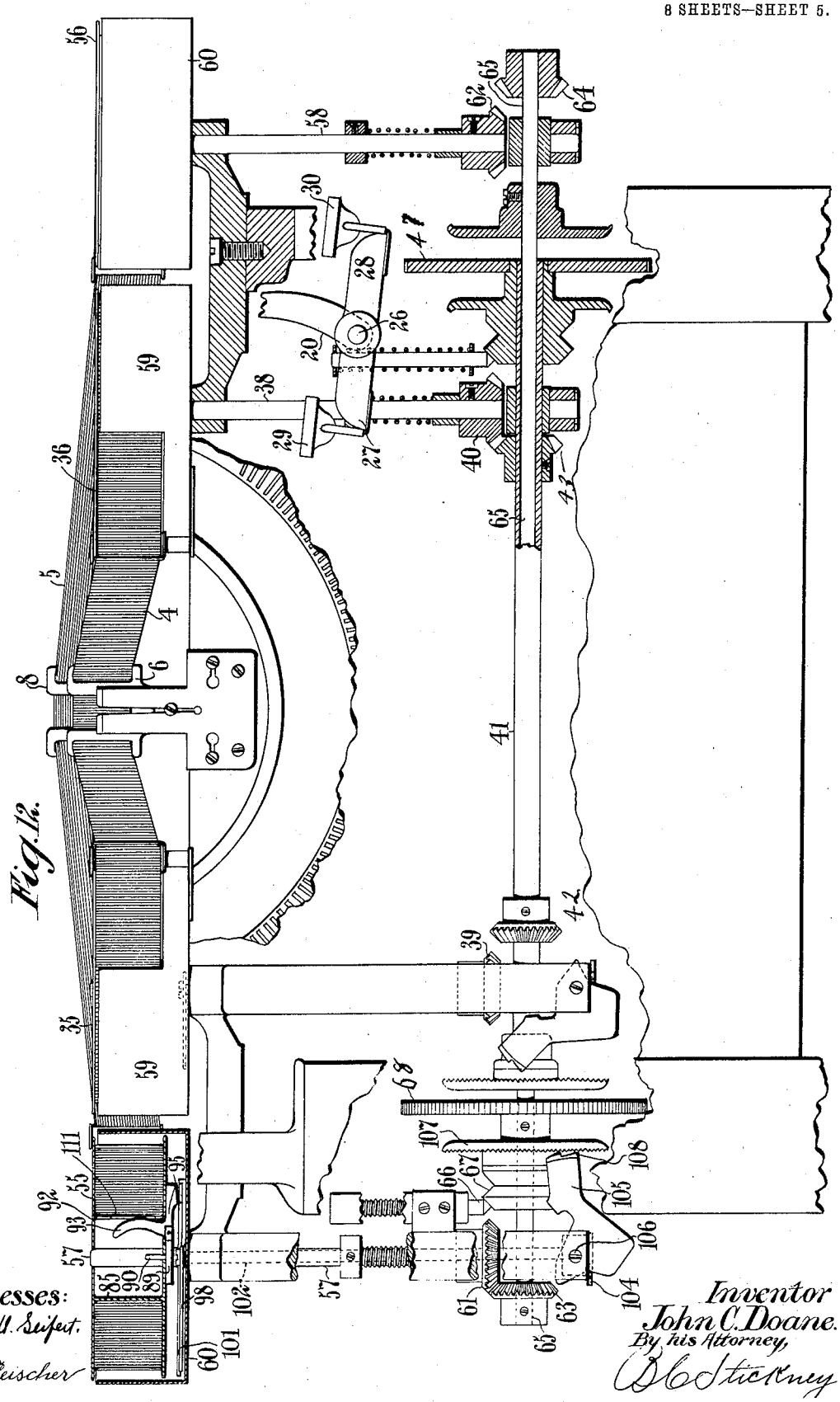

Fig. 12.

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8 SHEETS—SHEET 6.

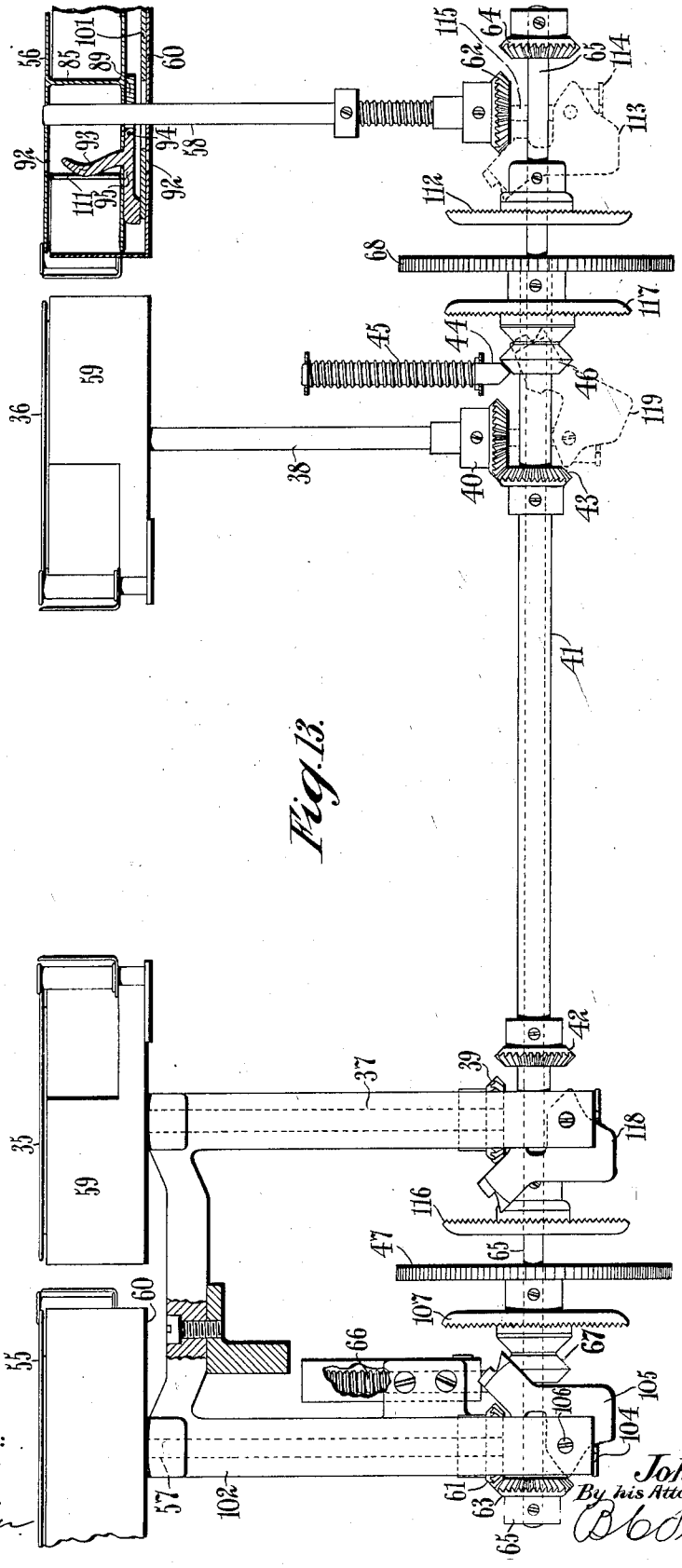

Fig. 13.

Witnesses:
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B. C. Stickney

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8 SHEETS—SHEET 7.

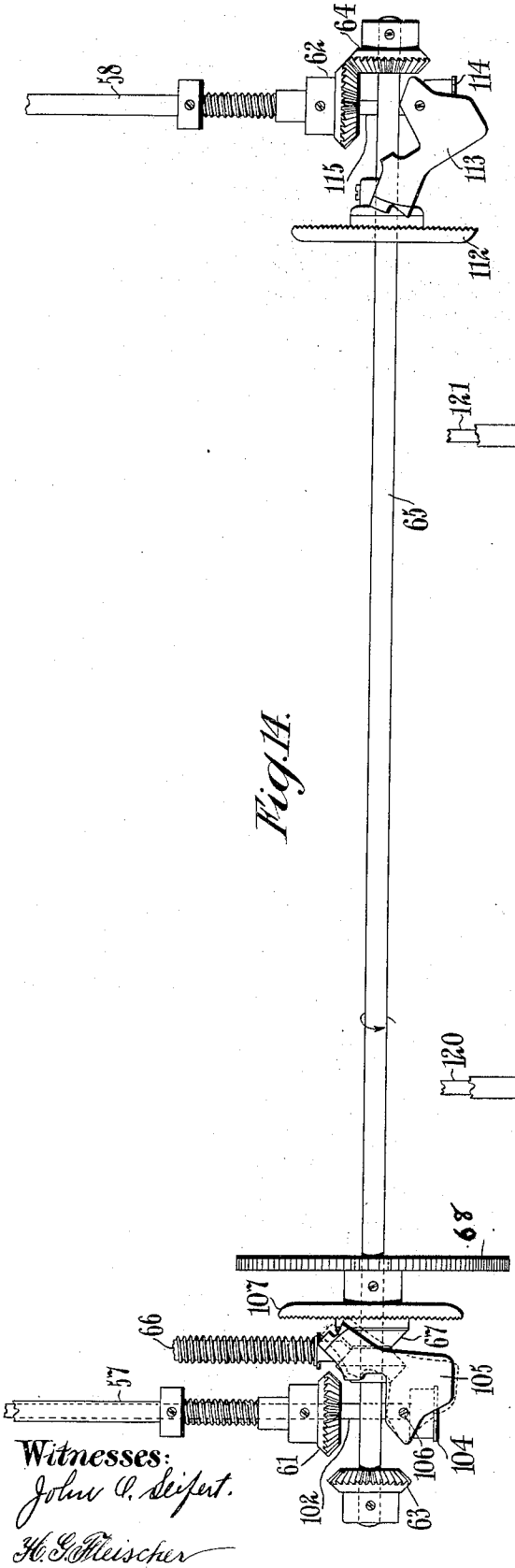

Fig. 14.

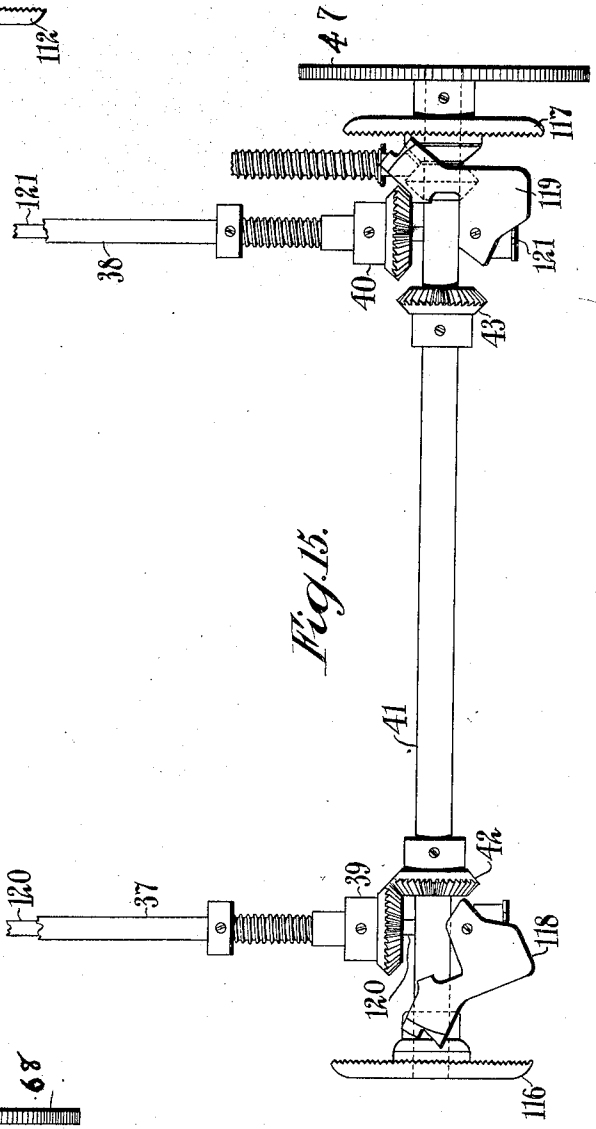

Fig. 15.

Witnesses:
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8 SHEETS—SHEET 8.

Fig. 19.

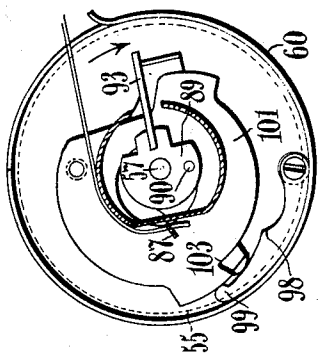


Fig. 18.

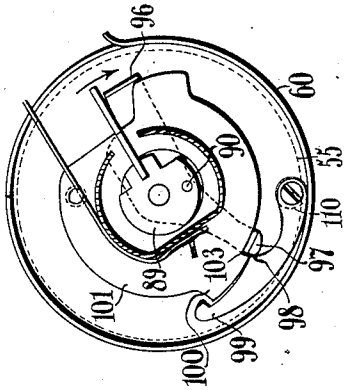


Fig. 17.

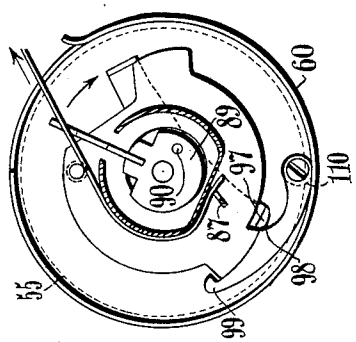


Fig. 16.

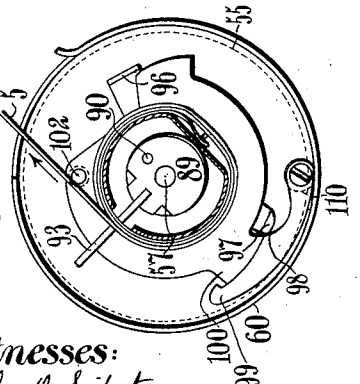


Fig. 25.

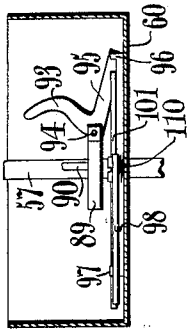


Fig. 22.

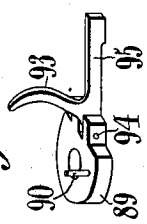


Fig. 21.

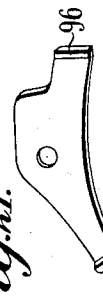


Fig. 20.

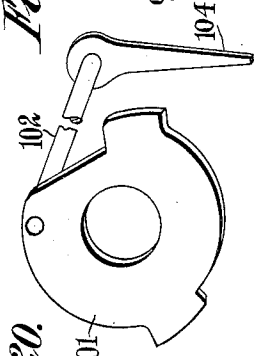


Fig. 24.

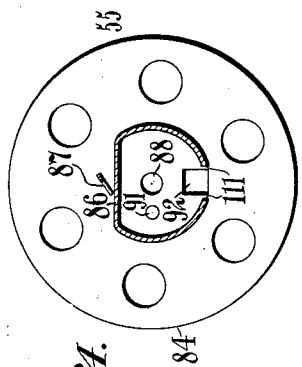
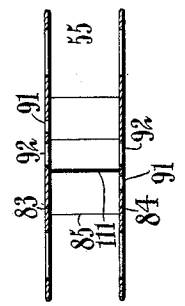


Fig. 23.



Witnesses:
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H. G. Fleischer

Inventor:
John C. Doane.
By his Attorney,
B. B. Stickney

UNITED STATES PATENT OFFICE.

JOHN C. DOANE, OF HARTFORD, CONNECTICUT, ASSIGNOR TO UNDERWOOD TYPEWRITER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

TYPE-WRITING MACHINE.

No. 891,047. Specification of Letters Patent. Patented June 16, 1908.

Application filed June 11, 1907. Serial No. 378,357.

To all whom it may concern:

Be it known that I, JOHN C. DOANE, a citizen of the United States, residing in Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

This invention relates to the ribbon winding and vibrating mechanisms of typewriting machines, and especially those of the "visible writing" class, and has reference principally to machines in which two independently vibrating ribbons are employed.

My improvements are illustrated as applied to the well known "Underwood" front-strike writing machine, and the ribbons are shown carried upon two pairs of spools lying in front of the platen, each spool mounted upon a separate vertical shaft.

The object of the invention is to simplify and improve the spool-winding mechanism, and also the means for causing either ribbon to wind and vibrate at the type strokes, while the other ribbon remains idle.

I provide for each pair of spools a separate horizontal driving shaft, and cause either driving shaft to be rotated at the type strokes, while the other is silenced. The spools in one pair are preferably located one on each side of the printing point, and provided with a long driving shaft; and the spools in the second pair are located between the spools of the first pair and operated by a short driving shaft; all of the spool shafts being in line across the machine, and the long driving shaft mounted within the short driving shaft, the latter being of tubular construction. By this arrangement, I effect an important economy of room, while simplifying and improving the construction and operation, and also making it practicable to effect automatic reversing of each ribbon by simple and reliable means.

Other features and advantages will hereinafter appear.

In the accompanying drawings, Figure 1 is a plan of an Underwood typewriting machine embodying my improvements, the carriage being omitted. Fig. 2 is a perspective view of a portion of the mechanism for rendering either ribbon active and the other inactive at the type strokes; the parts being shown in a position corresponding to Fig. 8. Fig. 3 is an elevation of the front portion of the right-hand side of the machine. Fig. 3ª is a plan of shaft-winding and reversing devices. Fig. 4 is a rear elevation of the means for switching either ribbon into use and the other out of use; the parts being shown in a position corresponding to Fig. 7, in which both ribbons are silenced at the type strokes. Fig. 5 is a perspective diagram of the parts seen at Fig. 4, and showing said parts from the rear. Fig. 6 is a front sectional view of the ribbon-switching mechanism, showing the parts in position to cause the rear ribbon to be both vibrated and wound at the type strokes. Fig. 7 is a similar view, but showing both ribbons silenced. Fig. 8 is a similar view, but showing the parts in position to render the front ribbon active at the type strokes. Fig. 9 is a sectional side elevation of the ribbon vibrators and levers, showing them in normal positions. Fig. 10 is a similar view, but showing the front ribbon vibrator as elevated to cause the ribbon to cover the printing point. Fig. 11 is a rear perspective view of the parts seen at Fig. 10. Fig. 12 is a front sectional elevation of the ribbon mechanism, showing particularly the automatic reversing devices. The rear ribbon is shown as elevated above normal position, for the sake of clearness. Fig. 13 is an elevation, showing parts seen at Fig. 12. Fig. 14 is a front elevation of the automatic reversible ribbon-winding mechanism which controls the rear ribbon. Fig. 15 is a view of similar mechanism which controls the front ribbon. Figs. 16 to 19 are diagrammatic plans illustrating successive stages in the operation of ribbon-controlled devices whereby the winding mechanism of the rear ribbon is caused to shift from the Fig. 14 position to the position seen in Figs. 12 and 13. Figs. 20 to 22 show details of parts seen in Figs. 16 to 19. Fig. 23 is an elevation, and Fig. 24 is a sectional plan of a ribbon spool. Fig. 25 is a sectional elevation of the spool cup and ribbon-reversing devices therein.

Types 1, Fig. 10, are caused by keys 2, Fig. 3, to strike against the front side of a platen 3, as usual in said Underwood machine. Front and rear ribbons 4 and 5 are arranged in front of the platen, and as will presently be explained, both ribbons stand normally below the printing point, and either may be thrown up to cover the printing point at the type strokes, while the other remains idle;

or both may remain in normal positions at the type strokes.

The front ribbon 4 is carried upon a vibrator 6, which is connected to the forward end of a lever 7. The rear ribbon 5 is mounted upon a rear vibrator 8, which is connected to the forward end of a lever 9. Said levers are fulcrumed side by side upon a shoulder screw 10 projecting from a bracket 11, which is secured to the usual rail 12 upon which the platen frame runs; said rail usually shifting up and down together with the platen to enable different kinds of types to print, and being shown in the drawings in elevated position. The levers rest upon a pin 11^a. Either lever may be brought into use to vibrate its ribbon at the type strokes, while the other lever is silenced, or both levers may be silenced concomitantly. A wrist 13 on lever 7 is adapted to be operated by an arm 14 having a vertical slot 15 to receive said wrist; the slot accommodating the up and down movements of the levers at the platen shifting operation. From the lever 9 projects a wrist 16 to be operated by an arm 17 having a slot 15.

At Fig. 7, it will be seen that the arms 14 and 17 are sufficiently separated to clear both wrists 13 and 16, so that the levers are not operated at the type strokes. Said arms project forwardly from a vertical plate 18, which is operated by a link 19 and a crank arm 20, the link being connected at one end to the plate and at the other end to said crank. Said plate is carried upon a bracket 21 erected upon a universal bar frame 22, which in said Underwood machine is reciprocated backwardly and forwardly at the type strokes, whereby the arms 14 and 17 are enabled to vibrate the ribbon levers 7 and 9. Screws 23 pass through a horizontal guiding slot 24 in the bracket 21, and are threaded into a keeper or washer 25 at the back of said bracket, Figs. 1 and 11. When the crank 20, link 19, and slide 18 are drawn to the right, as at Fig. 6, the arm 17 engages the wrist 16, to vibrate the lever 9, and the ribbon 5 at the type strokes. When said parts are moved to the left, as at Fig. 8, the arm 14 engages the wrist 13 to vibrate the lever 7 and the ribbon 4 at the type strokes. At the midway position, Fig. 7, both levers and ribbons are silenced. The crank 20 is mounted upon a horizontal rock shaft 26 extending to the keyboard of the machine and provided with arms 27, 28, carrying keys 29, 30, corresponding to the colors of the ribbon, the depression of either key causing its associated vibrator 6 or 8, as the case may be, to be reciprocated at the type strokes. When the arms 27, 28 are in a midway position, the connected parts are brought to the idle position at Fig. 7. Upon the rock shaft 26 is secured a yielding detent arm 31, Fig. 2, having a projection 32, to spring into any one of three holes 33, 33^a and 33^b, formed in a fixed bracket 34, thereby detaining the parts in any of the Figs. 6, 7, and 8 positions.

The front ribbon 4 is wound upon a pair of spools 35, 36, lying one on each side of the printing point and in front of the platen 3, said spools mounted respectively upon vertical shafts 37, 38 carrying at their lower ends bevel gears 39, 40, Fig. 15. Upon a horizontal driving shaft 41 are mounted corresponding bevel gears 42, 43, said driving shaft being shiftable endwise to connect with either spool gear 39 or 40 to wind the ribbon in either direction, this movement being preferably accomplished automatically, as will presently be explained. The driving shaft is seen at Fig. 13 as yieldingly detained with its gear 43 in engagement with gear 40, by means of a detent 44 in the form of a plunger and pressed down by a spring 45, the shaft having a double bevel collar 46 capable of forcing the detent up when the shaft is thrust endwise, the reaction of the spring 45 causing the detent to act upon the bevel of the collar 46, to complete the endwise shifting of the driving shaft 41, as in moving the latter from the Fig. 13 to the Fig. 15 position, or vice versa.

The driving shaft 41 is provided at one end with a ratchet wheel 47 turned by a pawl 48, which is carried upon an arm 49 extending forwardly from a horizontal transverse rock shaft 50, an arm 51 extending back from the latter, this arm being vibrated at the type strokes, thereby winding the ribbon 4. The arm 51 is operated by a vibrating arm 52 extending from a rock shaft 53 usually provided upon the Underwood machine, and carrying upright arms 54 attached at their upper end to the rear end of the reciprocating universal bar frame 22.

The rear ribbon 5 is wound upon spools 55, 56, lying in front of the platen one at each side of the printing point mounted upon vertical shafts 57, 58; the four spools lying edge to edge, and the pair designated as 35, 36, lying between the spools 55, 56. The inner spools are confined in cups 59 and the outer spools in cups 60. The shafts 57, 58 carry upon their lower ends gears 61, 62, which are in a line with the gears 39, 40, and are adapted to mesh with gears 63, 64, fixed upon a transverse guiding shaft 65 extending loosely through tubular driving shaft 41, said shafts 41 and 65 being revoluble independently of each other. They are also shiftable endwise independently of each other. The shaft 65 may be shifted from the Fig. 12 position in which 63 meshes with 61 to the Fig. 14 position in which 64 meshes with 62, this movement being accomplished either by pressing on the ends of the shaft or automatically in the manner presently to be explained. A spring pressed detent 66 coöperates with a double bevel collar 67 at the endwise move-

ments of the shaft 65 in the manner already explained in respect to detent 44. Upon one end of the shaft 65 is secured a ratchet wheel 68, which is operated by a pawl 69, Fig. 5, riveted upon an arm extending forwardly from the rock shaft 50, the pawls 69 and 48 being reciprocated in unison at the type strokes. Said pawls are widened to accommodate the axially shifting movements of the ratchet wheels 47 and 68, as are also the holding pawls 70 and 70[a]. A single spring 71 connects each driving pawl to its holding pawl in a manner to press both towards the ratchet wheel. A stop 71[a] is provided for each of the pawls 70 and 70[a], to prevent the excessive vibration of the same, during rapid operation of the type keys 2.

Either ribbon may be caused to wind while the other is silenced, by the manipulation of arms 72 and 73, carrying pins 74 and 75 to take beneath the pawls 48 and 69 respectively, to lift either one pawl or the other away from its ratchet wheel. The arm 73 is fixed upon a rock shaft 76, extending horizontally across the machine and carrying near its opposite end an arm 77, which is connected by a vertical link 78 to an arm 79 fixed upon the rock shaft 26, which carries the keys 29 and 30 that control the vibration of the ribbons. The throw-off arm 72 is mounted loosely upon the end of the rock shaft 76, so as to be movable independently thereof, and it is also formed with a rearwardly extending arm 80, which is connected by a vertical link 81 with an arm 82 opposite to the arm 79 on the rock shaft 26. Whenever said rock-shaft 26 is turned, one of the throw-off arms 72 and 73 is raised and the other is depressed, thereby releasing one of the pawls 48, 69 and permitting the other pawl to engage its ratchet wheel, so that one ribbon is silenced as to its longitudinal feeding movements, while the other ribbon is caused to wind at the type strokes.

The parts are so connected that when the key 30 is depressed as at Fig. 12, not only are the parts moved to the Fig. 6 position to render the rear ribbon active at the type strokes, but the link 78 is also raised to permit the pawl 69 to fall into mesh with the ratchet wheel 68, so that said ribbon 5 is also wound at the type strokes; the link 81 being simultaneously thrust down to lift the pin 74 and thereby throw the pawl 48 out of mesh with the ratchet wheel 47, so that the front ribbon 4 is silenced as to both longitudinal and vibrating movements. When the key 29 is depressed to bring the parts to the Fig. 8 position, the link 81 is raised to permit the pawl 48 to engage the ratchet wheel 47, while the arm 73 is raised to cast off the pawl 69. When the keys 29 and 30 occupy the middle position to silence both vibrators as at Fig. 7, the arms 72 and 73 are moved to midway positions, in which the pawls 48 and 69 are still held away from the ratchet wheels 47 and 68, as will be understood by reference to Fig. 3, so that neither ribbon winds at the type strokes.

The automatic shifting of the long driving shaft 65 from the Fig. 14 to the Fig. 12 position is caused by the unwinding of the ribbon 5 from the left hand spool 55, Figs. 15 to 19. The spool comprises top and bottom flanges 83, 84, Fig. 23, and an intermediate core 85, which is made of sheet metal, and is in the form of a hollow drum flattened on one side at 86 adjacent to the ribbon catch 87, which usually extends from the top to the bottom flange. The spool has a central perforation 88, Fig. 24 extending through both flanges, to fit upon the shaft 57. The spool rests upon a collar 89 fixed upon the shaft 57 within the cup 60, Fig. 12. A vertical pin 90 projects up from said collar through a hole 91 in the flange 84 within the core 85. The top flange has a similar opening 91, as seen at the right of Fig. 1, so that the spool may be reversed, that is, may be placed either side up upon the shaft 57. Each flange is also provided with a perforation 92 to receive an arm 93, which is pivoted at 94 upon the collar 89, Fig. 22, and projects up from said pivot, so as to be inclosed by the coils of ribbon, Fig. 16, whereby the ribbon-reversing mechanism is rendered ineffective. When the ribbon is all paid off from the spool 55, Fig. 17, a weighted tappet 95 on which the arm 93 is formed, and which normally extends out beneath the spool, Fig. 12, being held up by the coils of ribbon, is permitted to fall; and during its movement to the right, it engages a trip-arm 96, which is pivoted loosely upon the shaft 57, and at its other end has a finger 97 which engages a cam edge 98, formed upon a latch 99, and thereby swings said latch outwardly, Figs. 18 and 19, from a shoulder 100 over which it normally catches. Said shoulder is formed upon a plate 101, which is fixed upon a vertical shaft 102. As the spool continues to unwind and the tappet 95 continues to swing to the right, the finger 97 engages a shoulder 103 upon said plate 101 and swings the same to or past the Fig. 19 position, thereby turning the rock shaft 102, whose function it is to shift the ribbon driving shaft 65 endwise. A crank arm 104 is carried upon the lower end of the shaft 102, and normally holds up a gravity trip-arm 105, which is pivoted at 106 upon the framing, as seen at Fig. 14. It will be understood that the described rocking of the shaft 102 swings the crank 104 towards the left, Fig. 14, to the Fig. 12 position, thereby permitting the trip-arm 105 to drop against a crown toothed wheel 107 secured upon the driving shaft 65. As 65 and 107 continues to turn in the direction indicated by the arrow, Fig. 14, the teeth of the wheel 107 catch the point of the arm 105 and force the

latter to swing outwardly from the dotted line position at Fig. 14, the point of the arm or the tooth 108 upon the end of the arm moving towards the right, as well as downwardly in an arc about the axis 106. The wheel 107 both turns and rides upon the trip-arm 105, and it is moved thereby gradually towards the right, forcing up the detent 66 until the latter passes over the crown of the double bevel collar 67, and by its reaction completes the thrust of the shaft 65 to the right to the Fig. 12 position, engaging the gear 63 with the gear 61, and disengaging the gear 64 from the gear 62. The spool 55 is now caused by said shaft 65 to wind the ribbon 5, and the spool 56 pays off the ribbon. The spool 55 now turns to the left and begins to wind the ribbon, so that the arm 93 is again inclosed by the ribbon and the tappet arm 95 drawn up, thereby releasing the arm 96 and permitting a spring 109 on a shaft 102 similar to shaft 115 shown in Fig. 3 to restore the plate 101 to the normal position, where it is locked by the latch 99, the latter being snapped into position by a spring 110. A recess 111 in the spool core 85 permits the necessary movements of the arm 93, said recess preferably extending from top to bottom of the core, Fig. 23. The ribbon continues to wind upon the spool 55 until the spool 56 is empty, when a similar operation takes place to shift the driving shaft 65 from the Fig. 12 position to the Fig. 14 position, a crown toothed wheel 112 on said shaft being engaged by a trip-arm 113, which is controlled by a crank 114 upon a shaft 115 having a construction and operation corresponding to that of the shaft 102.

The winding of the ribbon 4 is automatically reversed in a similar manner, the driving shaft 41 having trip-wheels 116, 117, to coöperate with trip-arms 118, 119, which in turn are controlled by rock-shafts 120, 121, whose functions correspond to those of 102 and 115 respectively. When the ribbon is all paid off from the spool 36, the parts are shifted from the Fig. 15 to the Fig. 12 position, whereupon the ribbon begins to wind upon the spool 36. When the spool 35 is empty, the shaft 41 is shifted from the Fig. 12 position to the Fig. 15 position, and the ribbon then winds upon the spool 35.

The trip arms 96 are omitted from the spool cups 59 which carry the spools upon which the ribbon 4 is wound; and the outer ends of the arms 93 in said cups are adapted to engage directly the cams 98 on the latches 99 to swing the same outwardly to release the plates 101; the tips of said arms 93 thereupon striking the projections 122 upon the plates 101, and turning the latter past the hooks 99 to swing the rock snafts 120, 121 in alternation. The plates 101 in all four spool cups are formed to support the tappet arms 93 after the latter are released from the ribbon coils, until it is time for said arms to descend to engage either the release arms 96 (of the outer spools) or the cams 98 of the inner latches, as the case may be; the plates 101 having cutaways 123, which permit the arms 93 to drop gradually to working positions, and which may also be of service in raising said arms again as the spools begin to wind.

The latch or lock 99, located in the ribbon spool cup or guard, is for the purpose of guarding against accidental engagement of arm or pawl 105 with the shifting disk 107 during shipment, or at other times, and also to prevent both levers 105 and 113 from becoming simultaneously engaged with the disks 107 and 112.

Variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others.

Having thus described my invention, I claim:

1. In a typewriting machine, a ribbon mechanism comprising two ribbon-winding ratchet wheels, one at each side of the machine, a driving pawl for each wheel, means for reciprocating said pawls in unison, a rock shaft having a key and provided with opposite arms, links depending from said arms, a lever connected to the lower end of one of said links and having means to render one of said pawls ineffective, a second rock shaft extending across the machine and having at one end an arm connected to the other of said links, and an arm upon the other end of the second rock shaft having means to render the other pawl ineffective.

2. In a typewriter ribbon mechanism, the combination of a pair of ribbon spools, a ribbon wound thereon, a ratchet wheel, means for connecting either ribbon spool to said wheel while the other is disconnected therefrom, a second pair of spools, a second ribbon thereon, a second ratchet wheel, means for connecting either spool of the second pair to the second ratchet wheel while the other spool is disconnected from said wheel, driving pawls for said ratchet wheels, and means for rendering either pawl effective while the other is ineffective.

3. In a typewriter ribbon mechanism, the combination of a pair of ribbon spools, one at each side of the printing point, a ratchet wheel, means for connecting either ribbon spool to said wheel while the other is disconnected therefrom, a second pair of spools between the spools of the first pair, a second ratchet wheel, means for connecting either spool of the second pair to the second ratchet wheel while the other spool is disconnected from said wheel, driving pawls for said ratchet wheels, and means for rendering either pawl effective while the other is ineffective.

4. In a typewriter ribbon mechanism, the combination of a pair of ribbon spool shafts,

one at each side of the printing point, a transverse shaft, means for connecting the latter to either of the said spool shafts, a driving wheel for said transverse shaft, a second pair of spool shafts, one on each side of the printing point, the second pair between the shafts of the first pair, a second transverse shaft provided with a driving wheel, means for connecting either of the spool shafts of the second pair with said second transverse shaft, and means for operating said driving wheels.

5. In a typewriter ribbon mechanism, the combination of a pair of ribbon spool shafts, a transverse shaft, means for connecting the latter to either of the said spool shafts, a driving wheel for said transverse shaft, a second pair of spool shafts, a second transverse shaft provided with a driving wheel, means for connecting either of the spool shafts of the second pair with said second transverse shaft, and means for causing either of said driving wheels to operate at the type strokes.

6. In a typewriter ribbon mechanism, the combination of a pair of ribbon spool shafts having gears, a transverse shaft having gears, means for causing the spool-shaft gears to mesh in alternation with the transverse shaft gears, driving means for said transverse shaft, a second pair of spool shafts having gears, a second transverse shaft having gears, means for causing the gears of the second pair of spool shafts to mesh in alternation with the gears of the second transverse shaft, driving means for the second transverse shaft, and means for causing either of said driving means to operate at the type strokes while the other remains idle.

7. In a typewriter ribbon mechanism, the combination of a pair of ribbon spool shafts having gears, and arranged one on each side of the printing point, a hollow transverse shaft having gears, means for causing the spool-shaft gears to mesh in alternation with the transverse shaft gears, driving means for said transverse shaft, a second pair of spool shafts having gears, a second transverse shaft extending through said hollow shaft and having gears on its ends, means for causing the gears of the second pair of spool shafts to mesh in alternation with the gears of the second transverse shaft, driving means for the second transverse shaft, and means for causing either of said driving means to operate at the type strokes while the other remains idle.

8. In a typewriter ribbon mechanism, the combination of a pair of ribbon spools mounted one at each side of the printing point and having gears, a hollow shaft having gears to mesh with said spool gears, a driving wheel upon said hollow shaft, means for causing said spool-gears to mesh alternately with said shaft gears, a second shaft extending through the hollow shaft and having projecting ends provided with gears, a second pair of spools having gears, means for causing the spool gears in the second pair to mesh alternately with the gears on the second shaft, a driving wheel on said second shaft, and driving means operating at the type strokes and shiftable to actuate said driving wheels in alternation.

9. In a typewriter ribbon mechanism, the combination of a pair of ribbon spools mounted one at each side of the printing point and having gears, a hollow shaft having on its ends gears to mesh with said spool gears, a ratchet wheel upon said hollow shaft, means for causing said spool-gears to mesh alternately with said shaft gears, a second shaft extending through the hollow shaft and projecting ends provided with gears, a second pair of spools having gears, means for causing the spool gears in the second pair to mesh alternately with the gears on the second shaft, a ratchet wheel on said second shaft, pawls operating in unison at the type strokes to actuate said driving wheels, and means for rendering either pawl effective and the other ineffective.

10. In a typewriter ribbon mechanism, the combination of a pair of ribbon spools having gears, a hollow shaft having gears to mesh with said spool gears and shiftable endwise to connect with the spool gears in alternation, a second shaft extending through the hollow shaft and provided with gears, a second pair of spools having gears, the second shaft being shiftable endwise to connect with the second pair of spool gears in alternation, and means operating at the type strokes to rotate either of said shafts while the other remains idle.

11. In a typewriter ribbon mechanism, the combination of a pair of ribbon spools having gears, a hollow shaft having gears to mesh with said spool gears and shiftable endwise to connect with the spool gears in alternation, a second shaft extending through the hollow shaft and provided with gears, a second pair of spools having gears, the second shaft being shiftable endwise to connect with the second pair of spool gears in alternation, means for detaining each of said shafts in either position to which it is shifted, and means operating at the type strokes to rotate either of said shafts while the other remains idle.

12. In a typewriter ribbon mechanism, the combination of a pair of ribbon spools having gears, a hollow shaft having gears to mesh with said spool gears and shiftable endwise to connect with the spool gears in alternation, a second shaft extending through the hollow shaft and provided with gears, a second pair of spools having gears, the second shaft being shiftable endwise to connect with the second pair of spool gears in alternation, ratchet wheels upon said shafts, driving pawls for said ratchet wheels, and

means for rendering either pawl effective and the other ineffective.

13. In a front strike writing machine, the combination of a pair of spools, one on each side of the printing point, a second pair of spools between the spools of the first pair, upright shafts for all of said spools, said shafts mounted in a row and each provided at its lower end with a gear, a series of gears to mesh with the shaft gears, said series extending in a horizontal line across the machine, and means for rendering any one of the four horizontal gears effective while the others are idle.

14. In a front strike writing machine, the combination of a pair of spools, one on each side of the printing point, a second pair of spools between the spools of the first pair, upright shafts for all of said spools, said shafts mounted in a row and each provided at its lower end with a gear, a series of gears to mesh with the shaft gears, said series extending in a horizontal line across the machine, means for moving any one of the four horizontal gears into mesh with its spool gear, and means for rotating such meshed horizontal gear.

15. In a front strike writing machine, the combination of a pair of spools, one on each side of the printing point, gears connected to said spools, a horizontal driving shaft having gears to correspond with the spool gears, a second pair of spools between the spools of the first pair and also provided with gears, a second horizontal driving shaft having gears to correspond with the second pair of spool gears, means for causing either driving shaft to rotate at the type strokes and for silencing the other driving shaft, and means for shifting either driving shaft endwise to connect with its spool gears in alternation.

16. In a front strike writing machine, the combination of a pair of spools, one on each side of the printing point, upright shafts connected to said spools and having gears, a horizontal driving shaft having gears to correspond with the spool gears, a second pair of spools between the spools of the first pair and mounted upon upright shafts also provided with gears, a second horizontal driving shaft having gears to correspond with the second pair of spool gears, means for causing either driving shaft to rotate at the type strokes and for silencing the other driving shaft, and means for connecting either driving shaft to its spool gears in alternation.

17. In a typewriting machine, the combination of two ribbon-vibrators, a ribbon-winding mechanism comprising one pawl and one ratchet wheel connected to means to wind in either direction the ribbon which is controlled by one of said vibrators, and another pawl and ratchet wheel connected to means to wind in either direction the ribbon which is controlled by the other of said vibrators, and a finger piece connected to means adjustable to render effective at the type strokes either vibrator and its associated pawl, while the other vibrator and pawl remain ineffective.

18. In a typewriting machine, the combination of two ribbon-vibrators, a ribbon-winding mechanism comprising one pawl cooperating with means to wind back and forth the ribbon which is controlled by one of said vibrators, and another pawl coöperating with means to wind back and forth the ribbon which is controlled by the other of said vibrators, and a finger-piece connected to means adjustable to render effective at the type strokes either vibrator and its associated pawl, while the other vibrator and pawl remain ineffective.

19. In a typewriting machine, the combination of two ribbon-vibrators, a ratchet wheel connected to means for winding back and forth the ribbon which is controlled by one of said vibrators, a ratchet wheel connected to means for winding back and forth the ribbon which is controlled by the other of said vibrators, pawls caused to reciprocate at the type strokes, and a finger-piece connected to means for rendering effective at the type strokes either vibrator while the other vibrator remains ineffective, and for causing one of said pawls to engage the ratchet wheel associated with the effective vibrator, and the other of said pawls to become disengaged from the other ratchet wheel.

20. In a typewriting machine, the combination of two ribbon-vibrating levers, a pawl to coöperate with means for winding back and forth the ribbon which is controlled by one of said levers, a pawl to coöperate with means for winding back and forth the ribbon which is controlled by the other of said levers, means causing the pawls to reciprocate at the type strokes, and a finger-piece connected to means for causing either of said levers to operate at the type strokes while the other lever is silenced, and also connected to means for rendering effective the pawl which is associated with the vibrating ribbon, and for rendering the other pawl ineffective.

21. In a typewriting machine having a universal bar reciprocating at the type strokes, the combination of two ribbon-vibrating levers, a pawl operable by said universal bar and coöperating with means for winding back and forth the ribbon which is controlled by one of said levers, a pawl also operable by said universal bar and coöperating with means for winding back and forth the ribbon which is controlled by the other of said levers, and a finger-piece connected both to means for connecting either of said levers to the universal bar and disconnecting the other therefrom, and to means for ren-

dering effective the pawl which is associated with the vibrating ribbon, and for rendering the other pawl ineffective.

22. The combination of a pair of ribbon spools, a ratchet wheel, means for connecting either ribbon spool to said wheel while the other is disconnected therefrom, a second pair of spools, a second ratchet wheel, means for connecting either spool of the second pair to the second ratchet wheel while the other spool is disconnected from said wheel, driving pawls for said ratchet wheels, a pawl-controlling device including means for rendering either pawl effective while the other is ineffective, and ribbon-vibrators connected to said pawl-controlling device to vibrate the ribbon associated with the effective pawl while the other ribbon remains idle.

23. In a typewriting machine having a universal bar which reciprocates at the type strokes, the combination of two ribbon-vibrating levers, a shifter having a finger key and connected to means for connecting either of said levers to said universal bar, a pair of pawls reciprocating at the type strokes, a pair of ratchet wheels connected to means for winding ribbons which are controlled by said levers, and means controlled by said shifter for engaging one pawl with that one of said ratchet wheels which winds the vibrating ribbon, and for disengaging the other pawl from the other ratchet wheel.

24. In a typewriting machine having a universal bar which reciprocates at the type strokes, the combination of two ribbon-vibrating levers, a rock shaft having a finger key and connected to means for connecting either of said levers to said universal bar and silencing the other lever, a pair of pawls reciprocating at the type strokes, a pair of ratchet wheels connected to means for winding ribbons which are controlled by said levers, and pawl-controllers connected to said rock shaft to disengage the pawl from the ratchet wheel which is associated with the silenced lever.

25. In a typewriting machine, the combination of two ribbon-vibrators, a ribbon-winding mechanism comprising one pawl to wind the ribbon which is controlled by one of said vibrators, and another pawl to wind the ribbon which is controlled by the other of said vibrators, and a finger piece connected to means adjustable either to render effective at the type strokes either vibrator and its associated pawl, while the other vibrator and pawl remain ineffective, or to render concomitantly ineffective both vibrators and both pawls.

26. In a typewriting machine, the combination of two ribbon-vibrators, a ratchet wheel connected to means for winding back and forth the ribbon which is controlled by one of said vibrators, a ratchet wheel connected to means for winding back and forth the ribbon which is controlled by the other of said vibrators, pawls caused to reciprocate at the type strokes, and means controlled by a single finger-piece for either rendering effective at the type strokes either vibrator while the other vibrator remains ineffective, and either causing one of said pawls to engage the ratchet wheel associated with the effective vibrator, and the other of said pawls to become disengaged from the other ratchet wheel, or concomitantly disengaging both pawls from the ratchet wheels and rendering both vibrators ineffective.

27. In a typewriting machine, the combination of two ribbon-vibrating levers, a pawl to coöperate with means for winding back and forth the ribbon which is controlled by one of said levers, a pawl to coöperate with means for winding back and forth the ribbon which is controlled by the other of said levers, means causing the pawls to reciprocate at the type strokes, and a finger-piece connected to means for either causing either of said levers to operate at the type strokes while the other lever is silenced, and rendering effective the pawl which is associated with the vibrating ribbon, and also rendering the other pawl ineffective, or silencing both levers and concomitantly rendering both pawls ineffective.

28. In a typewriting machine having a universal bar which reciprocates at the type strokes, the combination of two ribbon-vibrating levers, a shifter having a finger key and connected to means for either connecting either of said levers to said universal bar or disconnecting both levers concomitantly therefrom, a pair of pawls reciprocating at the type strokes, a pair of ratchet wheels connected to means for winding ribbons which are controlled by said levers, and means controlled by said shifter for either engaging one pawl with that one of said ratchet wheels which winds the vibrating ribbon, and disengaging the other pawl from the other ratchet wheel, or concomitantly disengaging both pawls at the same time that the levers are disconnected from the universal bar.

29. In a typewriter ribbon-vibrating and feeding mechanism, the combination of two ribbon-vibrators, two ribbon-winding ratchet wheels, a driving pawl for each wheel, a device for controlling the driving pawls and vibrators, said device shiftable to one position to render the first pawl and vibrator ineffective while the second pawl and vibrator are effective, and shiftable to a second position to render the second pawl and vibrator ineffective and the first pawl and vibrator effective, and also shiftable to a third position to render both pawls and both vibrators ineffective, and means for detaining said shiftable device in any of said three positions.

30. In a typewriter ribbon mechanism, the

combination of two pairs of ribbon spools, two spool-winding ratchet wheels, one for each pair of spools, a driving pawl for each wheel, a lever or arm to control each pawl, shiftable means connected to said levers to cause them to hold said pawls concomitantly out of engagement with the ratchet wheels, and also to cause either lever to let its pawl into engagement with its ratchet wheel while the other pawl is held out of engagement by the other lever, and a pair of ribbon vibrators connected to said shiftable means either to be both silenced concomitantly with the disengagement of both pawls from the ratchet wheels, or to be caused to vibrate the ribbon which is being wound.

31. In a typewriting machine, the combination of two pairs of spools, two ratchet wheels, one for winding each pair of spools, a driving pawl for each ratchet wheel, a universal bar which reciprocates at the type strokes, two ribbon vibrators, a rock-shaft provided with a key and having means either to silence both vibrators concomitantly or to connect either thereof with the universal bar when the other is silenced, and pawl-controlling levers connected to said rock-shaft to be operated simultaneously thereby, to disengage both pawls from the ratchet wheels when the ribbon vibrators are silenced, or to cause that pawl to engage its ratchet wheel which will wind the ribbon which is being vibrated.

32. In a typewriting machine, the combination of two pairs of spools, two ratchet wheels, one for winding each pair of spools, a driving pawl for each ratchet wheel, a universal bar which reciprocates at the type strokes, two ribbon vibrators, a rock shaft provided with a key and having means either to silence both vibrators concomitantly or to connect either thereof with the universal bar when the other is silenced, arms upon said rock-shaft, links connected to said arms, and pawl-controlling levers connected to said links to be operated simultaneously thereby, to disengage both pawls from the ratchet wheels when the ribbon vibrators are silenced, or to cause that pawl to engage its ratchet which will wind the ribbon which is being vibrated.

33. In a typewriting machine, the combination of a ribbon spool, a vertical shaft upon which the spool is mounted, a pinion upon said shaft, a horizontal driving shaft having a pinion shiftable into mesh with said pinion by an endwise movement of the driving shaft, a wheel upon said driving shaft, a pivoted arm movable into engagement with said wheel to co-act with the latter to shift the driving shaft endwise to bring said pinions into mesh, a vertical rock-shaft having an arm normally restraining said pivoted arm from moving into engagement with said wheel, a latch normally restraining said rock-shaft, a latch-releasing lever having means to turn said rock-shaft, and a tappet arm swiveled upon said vertical shaft to engage and operate said releasing lever, a part being provided upon said tappet arm to be inclosed by the coils of ribbon to enable the latter to restrain the tappet arm.

34. In a typewriting machine, the combination of a ribbon spool, a pinion connected to said spool, a driving shaft having a pinion shiftable into mesh with said pinion by an endwise movement of the driving shaft, a wheel upon said driving shaft, a pivoted arm movable into engagement with said wheel to co-act with the latter to shift the driving shaft endwise to bring said pinions into mesh, an arm normally restraining said shifting arm from moving into engagement with said wheel, a latch normally locking said restraining arm, a latch-releasing lever having means to turn said restraining arm, and a tappet swiveled upon said spool shaft to engage and operate said releasing lever, an arm being provided upon said tappet to be inclosed by the coils of ribbon to enable the latter to restrain the tappet.

35. In a typewriting machine, the combination of a ribbon spool, a driving shaft, a controller for causing said driving shaft to become connected to said spool, an arm normally restraining said controller, a latch normally locking said arm, a latch-releasing lever having means to turn said arm, and a tappet turning with said spool to engage and operate said releasing lever, an arm being provided upon said tappet to be inclosed by the coils of ribbon to enable the latter to restrain the tappet.

36. In a typewriting machine, the combination of a pair of ribbon spools, a winding mechanism, a pawl or driver therefor, means dependent upon the movements of the ribbon for connecting said winding mechanism to said spools in alternation, a second pair of spools, a second winding mechanism, a second pawl or driver therefor, means for connecting the second winding mechanism to the spools of the second pair in alternation, driver-actuating means operating at the type strokes, and means for rendering either driver effective and the other ineffective at will.

37. In a typewriting machine, the combination of a pair of ribbon spools, a winding mechanism, a pawl or driver therefor, means dependent upon the movements of the ribbon for connecting said winding mechanism to said spools in alternation, a second pair of spools, a second winding mechanism, a second pawl or driver therefor, means dependent upon the movements of the second ribbon for connecting the second winding mechanism to the spools of the second pair in alternation, driver-operating means operating at the type strokes, and means for rendering either driver effective and the other ineffective at will

38. In a typewriting machine, the combination of a pair of ribbon spools, a vibrator for the ribbon carried by said spools, a ratchet wheel, a pawl reciprocated at the type strokes for rotating said ratchet wheel, means dependent upon the movements of the ribbon for connecting said wheel to said spools to wind them in alternation, a second pair of spools, a vibrator for the ribbon carried thereby, a second ratchet wheel, a second pawl reciprocated at the type strokes to turn said second ratchet wheel, means for connecting the second ratchet wheel to the spools to wind them in alternation, means for operating the vibrators, and means for silencing either of said ratchet wheels at will and concomitantly silencing the vibrator which is associated with the silenced ratchet wheel, and for rendering the other ratchet wheel and vibrator effective.

39. In a typewriting machine, the combination of a pair of ribbon spools, a ratchet wheel, a pawl operated at the type strokes for rotating said wheel, means dependent upon the movements of the ribbon for connecting said wheel to said spools to wind them in alternation, a second pair of spools, a second ratchet wheel, a second pawl operated at the type strokes to turn said second wheel, means dependent upon the movements of the second ribbon for connecting the second ratchet wheel to the spools of the second pair to wind them in alternation, and means for silencing either of said ratchet wheels at will and rendering the other ineffective.

40. In a front-strike writing machine, the combination of a pair of ribbon spools mounted in front of the platen, a driving wheel for winding the spools, a vibrator for controlling the ribbon carried by said spools, a second pair of spools mounted in front of the platen between the spools of the first pair, a second driving wheel for winding the second pair of spools, a second vibrator for controlling the ribbon carried by the second pair of spools, means operating at the type strokes for actuating said driving wheels and vibrators, means for rendering either driving wheel and vibrator effective and silencing the other driving wheel and ribbon vibrator, and means called into action at or near the completion of the winding of either ribbon in either direction to disconnect its driving wheel from the full spool and connect it to the empty spool.

41. In a front strike writing machine, the combination of a pair of ribbon spools mounted on upright shafts in front of the platen, a transverse driving shaft for said upright shafts, a second pair of spools between the spools of the first pair in front of the platen and mounted upon other upright shafts, a second transverse driving shaft to operate the second pair of upright shafts, a ratchet wheel for each of said transverse shafts, pawls operating at the type strokes for actuating said ratchet wheels, means for silencing either ratchet wheel at will, and means called into action at or near the completion of the winding of either ribbon in either direction to disconnect its driving shaft from the shaft of the full spool and connect such driving shaft to the shaft of the empty spool.

42. In a front strike writing machine, the combination of a pair of ribbon spools mounted on upright shafts in front of the platen, a transverse driving shaft for said upright shafts, a second pair of spools between the spools of the first pair in front of the platen and mounted upon other upright shafts, a second transverse driving shaft to operate the second pair of upright shafts, the first transverse shaft extending through the second, a driving wheel for each of said transverse shafts, means operating at the type strokes for actuating said driving wheels, means for silencing either driving wheel at will, and means called into action at or near the completion of the winding of either ribbon in either direction to disconnect its driving shaft from the shaft of the full spool and connect such driving shaft to the shaft of the empty spool.

43. In a typewriter ribbon mechanism, the combination of a pair of ribbon spool shafts, one at each side of the printing point, a transverse shaft, means dependent upon the movements of the ribbon for connecting the latter to either of the said spool shafts, a driving wheel for said transverse shaft, a second pair of spool shafts, one on each side of the printing point, and both between the shafts of the first pair, a second transverse shaft provided with a driving wheel, means dependent upon the movements of the second ribbon for connecting either of the spool shafts of the second pair with said second transverse shaft, and means for operating said driving wheels.

44. In a typewriter ribbon mechanism, the combination of a pair of ribbon spool shafts, a transverse shaft, means dependent upon the movements of the ribbon for connecting the latter to either of the said spool shafts, a driving wheel for said transverse shaft, a second pair of spool shafts, a second transverse shaft provided with a driving wheel, means dependent upon the novements of the second ribbon for connecting either of the spool shafts of the second pair with said second transverse shaft, and means for causing either of said driving wheels to operate at the type strokes.

45. In a typewriter ribbon mechanism, the combination of a pair of ribbon spool shafts having gears, a transverse shaft having gears, means dependent upon the movements of the ribbon for causing the spool shaft gears to mesh in alternation with the transverse shaft gears,

driving means for said transverse shaft, a second pair of spool shafts having gears, a second transverse shaft having gears, means dependent upon the movements of the second ribbon for causing the gears of the second pair of spool shafts to mesh in alternation with the gears of the second transverse shaft, driving means for the second transverse shaft, and means for causing either of said driving means to operate at the type strokes while the other remains idle.

46. In a typewriter ribbon mechanism, the combination of a pair of ribbon spool shafts having gears, and arranged one on each side of the printing point, a hollow transverse shaft having gears, means for causing the spool-shaft gears to mesh in alternation with the transverse shaft gears, driving means for said transverse shaft, a second pair of spool shafts having gears, a second shaft extending through said hollow shaft and having gears on its ends, means dependent upon the movements of the second ribbon for causing the gears of the second pair of spool shafts to mesh in alternation with the gears of the second transverse shaft, driving means for the second transverse shaft, and means for causing either of said driving means to operate at the type strokes while the other remains idle.

47. In a typewriter ribbon mechanism, the combination of a pair of ribbon spools mounted one at each side of the printing point and having gears, a hollow shaft having gears to mesh with said spool gears, a driving wheel upon said hollow shaft, means dependent upon the movements of the ribbon for causing said spool-gears to mesh alternately with said shaft gears, a second shaft extending through the hollow shaft and having projecting ends provided with gears, a second pair of spools having gears, means dependent upon the movements of the second ribbon for causing the spool gears in the second pair to mesh alternately with the gears on the second shaft, a driving wheel on said second shaft, and driving means operating at the type strokes and shiftable to actuate said driving wheels in alternation.

48. In a typewriter ribbon mechanism, the combination of a pair of ribbon spools mounted one at each side of the printing point and having gears, a hollow shaft having on its ends gears to mesh with said spool gears, a ratchet wheel upon said hollow shaft, means dependent upon the movements of the ribbon for causing said spool-gears to mesh alternately with said shaft gears, a second shaft extending through the hollow shaft and projecting ends provided with gears, a second pair of spools having gears, means dependent upon the movements of the second ribbon for causing the spool gears in the second pair to mesh alternately with the gears on the second shaft, a ratchet wheel on said second shaft, pawls operating in unison at the type strokes to actuate said driving wheels, and means for rendering either pawl effective and the other ineffective.

49. In a typewriter ribbon mechanism, the combination of a pair of ribbon spools having gears, a hollow shaft having gears to mesh with said spool gears, means effective at the completion of the unwinding movement of either spool for shifting said shaft endwise to connect with the other spool gear, a second shaft extending through the hollow shaft and provided with gears, a second pair of spools having gears, means effective at the completion of the unwinding movement of either spool in the second pair to shift the second shaft endwise to connect it with the gear of the other spool in the second pair, and means operating at the type strokes to rotate either of said shafts while the other remains idle.

50. In a front strike writing machine, the combination of a pair of spools, one on each side of the printing point, gears connected to said spools, a horizontal driving shaft having gears to correspond with the spool gears, a second pair of spools between the spools of the first pair and also provided with gears, a second horizontal driving shaft having gears to correspond with the second pair of spool gears, means for causing either driving shaft to rotate at the type strokes and for silencing the other driving shaft, and ribbon-controlled means for shifting either driving shaft endwise to connect with its spool gears in alternation.

51. In a front strike writing machine, the combination of a pair of spools, one on each side of the printing point, upright shafts connected to said spools and having gears, a horizontal driving shaft having gears to correspond with the spool gears, a second pair of spools between the spools of the first pair and mounted upon upright shafts also provided with gears, a second horizontal driving shaft having gears to correspond with the second pair of spool gears, means for causing either driving shaft to rotate at the type strokes and for silencing the other driving shaft, and ribbon-controlled means for connecting either driving shaft to its spool gears in alternation.

52. In a typewriting machine, the combination of a pair of spool-winding gears, a transverse driving shaft movable endwise to connect with either gear, a pair of trip wheels on said shaft, a pair of trip arms normally out of engagement with said wheels, arms upon said spools to be controlled by the ribbon for causing the trip arms alternately to engage with the wheels to shift the driving shaft back and forth, a second pair of spool winding gears, a second transverse shaft extending through the first shaft and movable endwise to engage alternately the spool gears of the second pair, and means for silencing either transverse shaft.

53. In a typewriting machine, the combination of a pair of ribbon-spools and winding gears therefor, a transverse driving shaft movable endwise to connect with either gear, a pair of trip wheels on said shaft, a pair of trip arms normally out of engagement with said wheels, means to be controlled by the ribbon upon said spools for causing the trip arms alternately to engage with the wheels to be actuated thereby to shift the driving shaft back and forth, a second pair of ribbon-spools and winding gears therefor, a second transverse shaft extending through the first shaft and movable endwise to engage alternately the spool gears of the second pair, a pair of trip wheels upon the second shaft, a second pair of trip arms, and means to be controlled by the ribbon upon the second pair of spools to cause the trip arms of the second pair to move alternately into engagement with the trip wheels of the second pair to be actuated thereby to shift the second transverse shaft back and forth independently of the first transverse shaft.

54. In a front strike writing machine, the combination of a pair of ribbon spools in front of the platen and mounted upon upright shafts, a transverse driving shaft having gears on its ends, corresponding gears upon said upright shafts, trip wheels upon said driving shaft, ribbon-controlled trip arms to coöperate with said trip wheels to shift the driving shaft endwise to reverse the winding of the ribbon, a second pair of spools in front of the platen and between the spools of the first pair and mounted upon a second pair of upright shafts, a second transverse driving shaft through which the first driving shaft extends, ratchet wheels fixed upon said driving shafts respectively between said trip wheels, a pair of gears upon the second pair of upright shafts, gears upon the second driving shaft to mesh with the last-mentioned gears, pawls operating at the key strokes to turn the ratchet wheels, and means for silencing either ratchet wheel.

55. In a front strike writing machine, the combination of a pair of ribbon spools in front of the platen and mounted upon upright shafts, a transverse driving shaft having gears on its ends, corresponding gears upon said upright shafts, trip wheels upon said driving shaft between said upright shafts, ribbon-controlled trip arms to coöperate with said trip wheels to shift the driving shaft endwise to reverse the winding of the ribbon, a second pair of spools in front of the platen and between the spools of the first pair and mounted upon a second pair of upright shafts, a second transverse driving shaft through which the first driving shaft extends, ratchet wheels fixed upon said driving shafts respectively and mounted between said trip wheels, a pair of trip wheels upon the second driving shaft between said ratchet wheels, a pair of ribbon-controlled trip arms to coöperate with the trip wheels of the second pair to change the direction of winding of the second ribbon, a pair of gears upon the second pair of upright shafts and between the trip wheels of the second pair, gears upon the second driving shaft to mesh with the last-mentioned gears, pawls operating at the key strokes to turn the ratchet wheels, and means for silencing either ratchet wheel.

56. In a typewriting machine, the combination of a pair of ribbon spools and winding gears therefor, a transverse driving shaft movable endwise to connect with either gear, means for operating said driving shaft, a pair of trip wheels on said shaft, a pair of trip arms normally out of engagement with said wheels, arms upon said spools and controlled by the ribbon for causing the trip arms alternately to engage with the wheels to shift the driving shaft back and forth, a second pair of ribbon spools and winding gears therefor, a second transverse shaft provided with operating means and extending through the first shaft and movable endwise to engage alternately the spool gears of the second pair, a pair of trip wheels upon the second shaft, a second pair of trip arms, arms upon the spools of the second pair and controlled by the ribbon to cause the trip arms of the second pair to move alternately into engagement with the trip wheels of the second pair to shift the second transverse shaft endwise, and means for silencing either driving shaft.

57. In a front strike writing machine provided with a platen, the combination of a pair of spools lying in front of the platen one on each side of the printing point, a winding mechanism for said spools, arms mounted upon the spools to be controlled by the ribbon and connected to means for reversing the direction of operation of said winding mechanism, a second pair of spools lying in front of the platen between the spools of the first pair, an independent winding mechanism for the second pair of spools, and means for silencing either winding mechanism at will.

58. In a front strike writing machine provided with a platen, the combination of a pair of spools lying in front of the platen one on each side of the printing point, a winding mechanism for said spools, arms mounted upon the spools to be controlled by the ribbon and connected to means for reversing the direction of operation of said winding mechanism, a second pair of spools lying in front of the platen between the spools of the first pair, an independent winding mechanism for the second pair of spools, arms upon the spools of the second pair to be controlled by the ribbon and connected to means for reversing the direction of winding of the spools, and means for silencing either winding mechanism at will.

59. In a front strike writing machine pro-

vided with a platen, the combination of a pair of spools lying in front of the platen, one on each side of the printing point, a winding mechanism including a pair of upright shafts upon which said spools are detachably mounted, arms movable within the spools to be inclosed by the coils of ribbon and connected to means for reversing the direction of operation of said winding mechanism, a second pair of spools lying in front of the platen between the spools of the first pair, an independent winding mechanism for the second pair of spools including a pair of upright shafts upon which the spools are detachably mounted, arms movable within the spools of the second pair to be inclosed by the coils of ribbon and connected to means for reversing the winding of the spools, all of said arms being secured upon said upright shafts independently of the spools, and all of the spools having openings to receive said arms, and means for silencing either winding mechanism at will.

60. In a front-strike writing machine provided with a platen, the combination with a pair of spools lying in front of the platen, one on each side of the printing point, a pair of upright shafts upon which said spools are detachably mounted, a driving shaft common to said shafts and provided with trip wheels, arms movable within the spools to be inclosed by the coils of ribbon and connected to trip arms to coöperate with said trip wheels in alternation for reversing the direction of winding of the ribbon, a second pair of spools lying in front of the platen between the spools of the first pair, a second pair of upright shafts upon which said second spools are detachably mounted, a driving shaft common to said second upright shafts and provided with trip wheels, and arms movable within the spools of the second pair to be inclosed by the coils of ribbon and connected to trip arms to coöperate with the trip wheels upon the second driving shaft for reversing the winding of the ribbon; all of said arms being mounted upon said upright shafts, and all of the spools having openings to receive said arms.

61. A reversible ribbon spool provided with a core and top and bottom flanges, a central shaft opening extending entirely through the spool, each flange provided with an opening to receive a crank pin, the core having a recess to receive an arm to be inclosed by the coils of ribbon and to permit said arm to vibrate outwardly from the core when the spool is empty, and said flanges having openings coincident with said recess to receive said arm; means being provided on the opposite side of the core from said recess to catch the end of the ribbon, said core consisting of a drum of sheet metal flattened on the side adjacent to the ribbon catch, and open from top to bottom on the opposite side to form said recess.

62. A ribbon-reversing mechanism comprising a spool shaft, an arm pivoted on said shaft to extend into the spool and be inclosed by the coils of ribbon, a tappet on said arm, a rock-shaft, a plate movable by means of said tappet during the unwinding of the spool to turn said rock-shaft, a crank upon said rock-shaft, a trip arm normally held in idle position by said crank, a trip wheel with which the trip arm engages when released by said crank, a driving shaft whereon said trip wheel is mounted, said wheel and shaft being shiftable axially by the trip arm, and means for enabling the axial movement of said driving shaft to effect connection thereof with said spool shaft.

63. A ribbon-reversing mechanism comprising a spool shaft, an arm pivoted on said shaft to extend into the spool and be inclosed by the coils of ribbon, a tappet on said arm, a rock-shaft, a plate movable by means of said tappet during the unwinding of the spool to turn said rock-shaft, a crank upon said rock shaft, a trip arm normally held in idle position by said crank, a trip wheel with which the trip arm engages when released by said crank, a driving shaft whereon said trip wheel is mounted, said wheel and shaft being shiftable axially by the trip arm, means for enabling the axial movement of said driving shaft to effect connection thereof with said spool shaft, and a spring for returning said rock-shaft to normal position together with said trip arm.

64. A ribbon-reversing mechanism comprising a spool-shaft, an arm pivoted on said shaft to extend into the spool and be inclosed by the coils of ribbon, a tappet on said arm, a rock-shaft, a plate upon said rock shaft, a lock for said plate, said lock releasable and said plate movable by means of said tappet during the unwinding of the spool to turn said rock-shaft, a crank upon said rock-shaft, a swinging trip arm normally held in idle position by said crank, a trip wheel with which the trip arm engages when released by said crank, said trip arm being movable by the trip wheel, and said wheel being shiftable axially by the trip arm, a driver connected to said trip wheel, and means for enabling the axial movement of said trip-wheel to effect connection of said driver with said spool shaft.

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Witnesses:
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