No. 747,917. PATENTED DEC. 22, 1903.

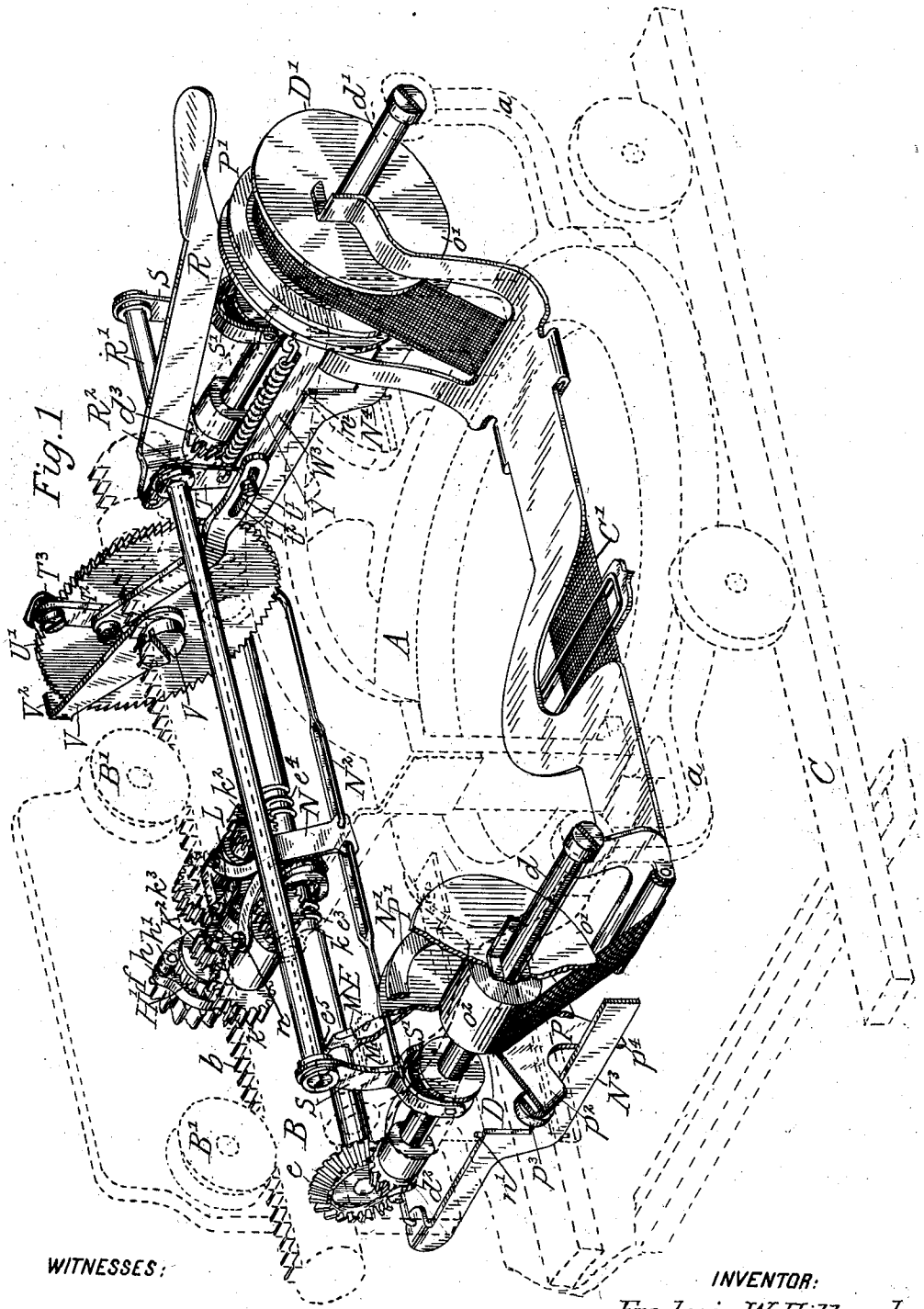
F. W. HILLARD.

RIBBON MOVEMENT FOR TYPE WRITING MACHINES.

APPLICATION FILED MAY 3, 1902.

NO MODEL. 6 SHEETS—SHEET 1.

Fig. 1



WITNESSES:

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Geo. L. Wheelock.

INVENTOR:

Frederic W. Hillard

BY Thomas Ewing, Jr.,

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 747,917. PATENTED DEC. 22, 1903.

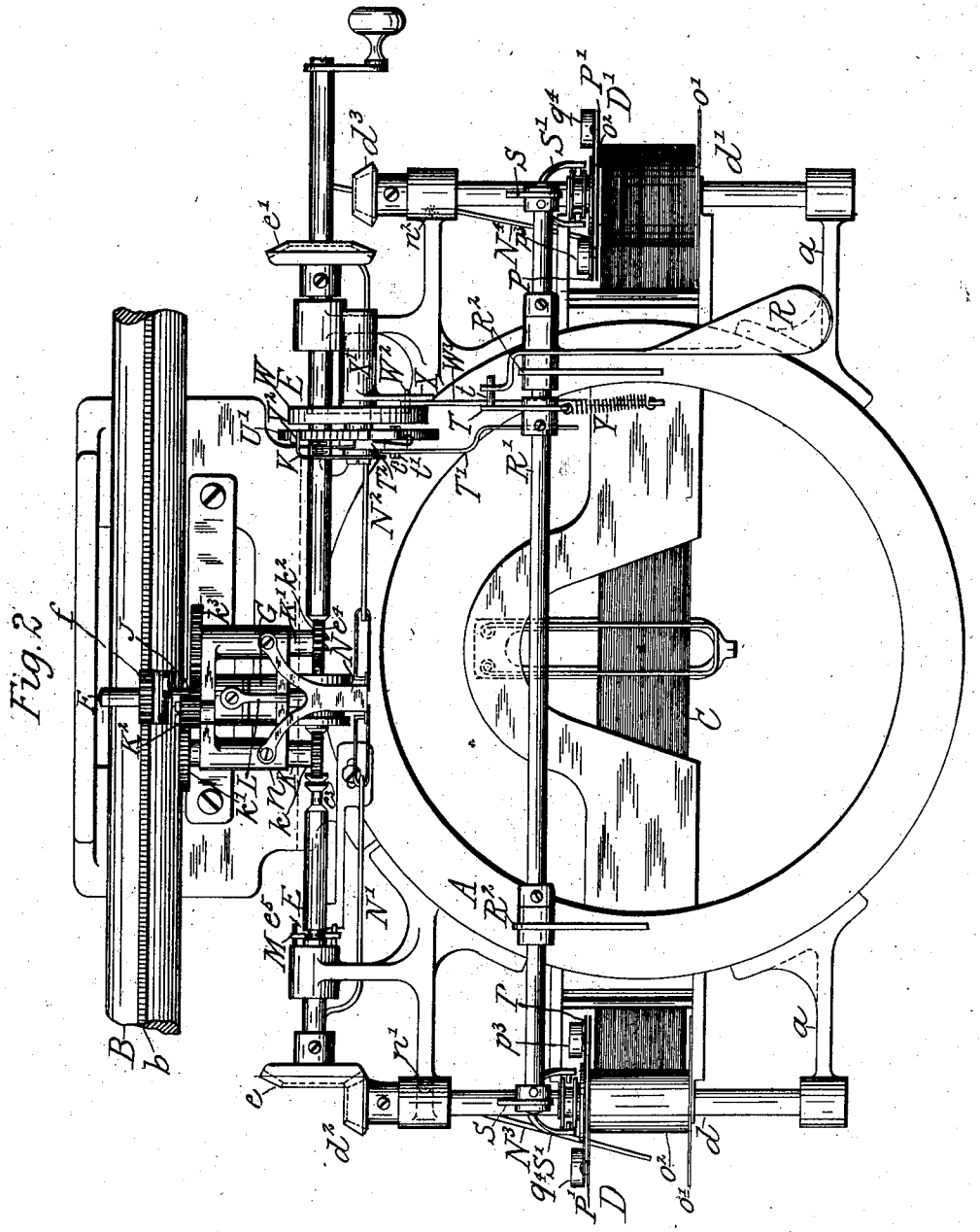
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RIBBON MOVEMENT FOR TYPE WRITING MACHINES.

APPLICATION FILED MAY 3, 1902.

NO MODEL. 6 SHEETS—SHEET 2.

Fig. 2



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RIBBON MOVEMENT FOR TYPE WRITING MACHINES.

APPLICATION FILED MAY 3, 1902.

NO MODEL. 6 SHEETS—SHEET 3.

Fig. 3

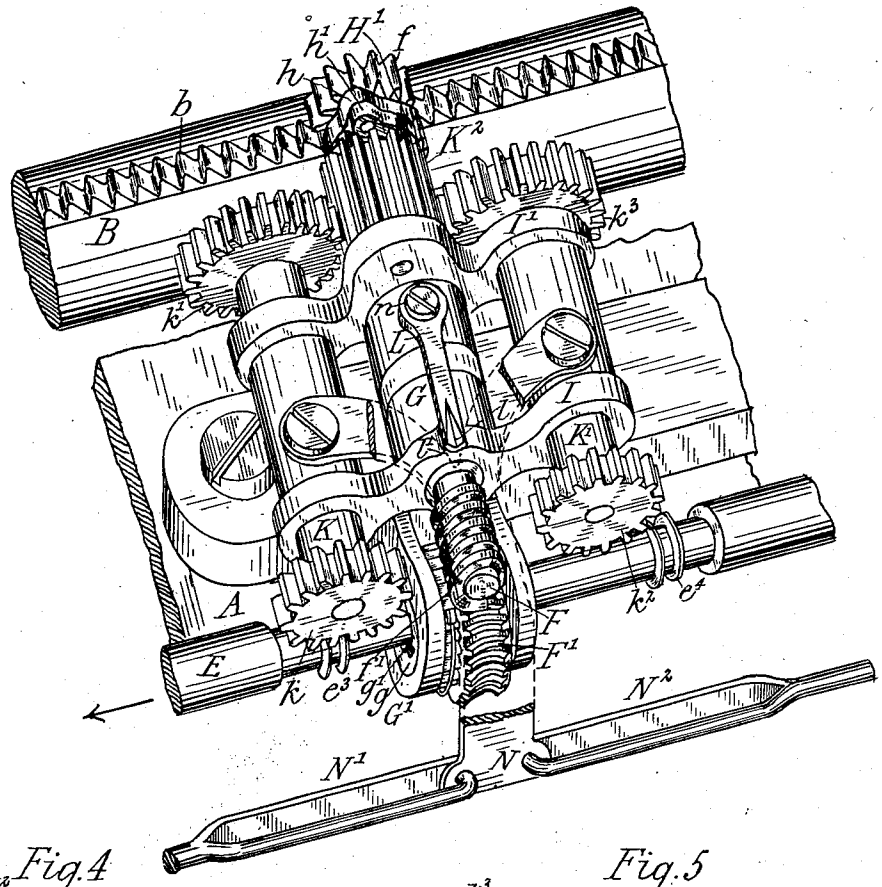


Fig. 4

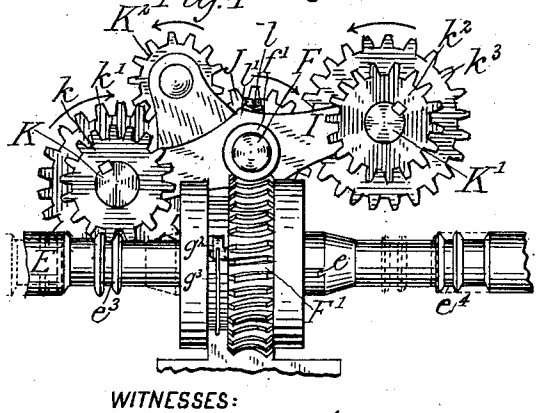
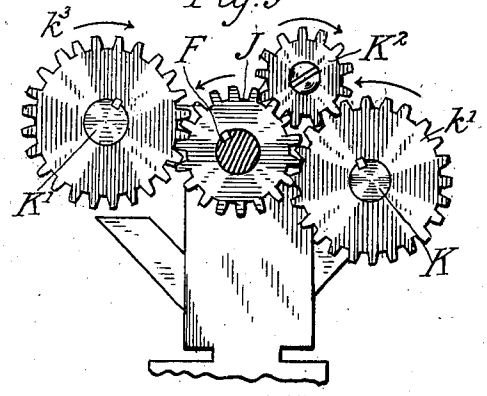


Fig. 5



WITNESSES:

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RIBBON MOVEMENT FOR TYPE WRITING MACHINES.

APPLICATION FILED MAY 3, 1902.

NO MODEL. 6 SHEETS—SHEET 4.

Fig. 8

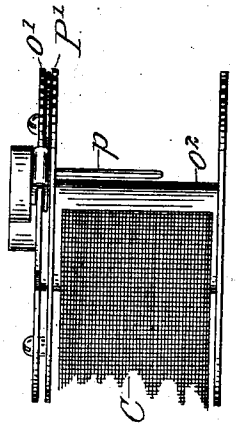


Fig. 9

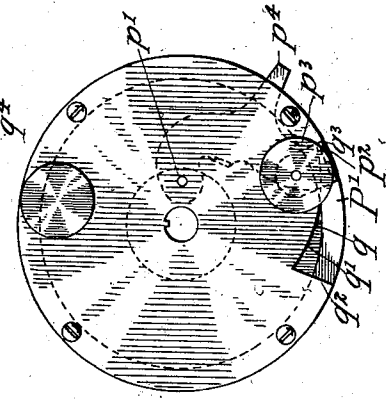


Fig. 10

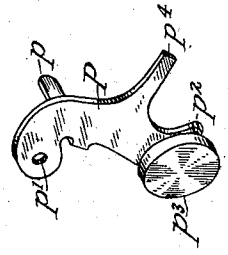


Fig. 11

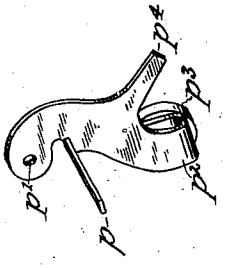


Fig. 6

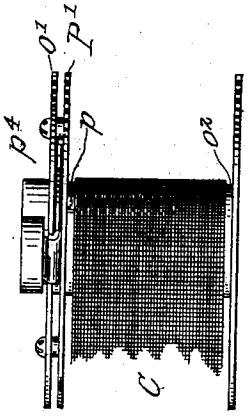
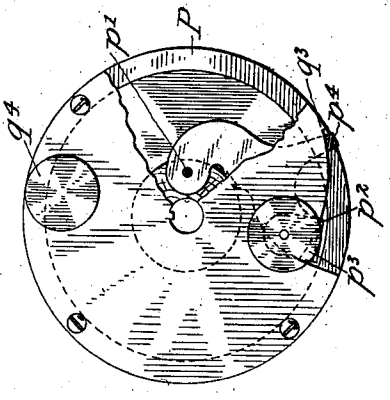


Fig. 7



WITNESSES:

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No. 747,917. PATENTED DEC. 22, 1903.

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RIBBON MOVEMENT FOR TYPE WRITING MACHINES.

APPLICATION FILED MAY 3, 1902.

NO MODEL. 6 SHEETS—SHEET 5.

Fig. 16

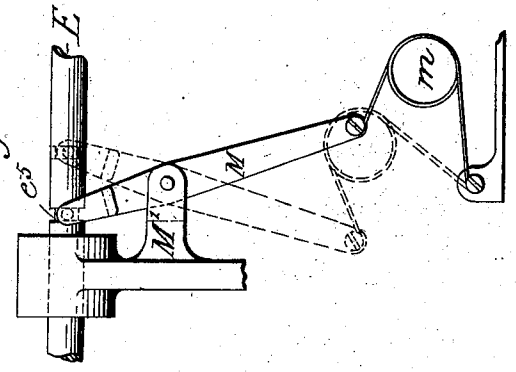


Fig. 13

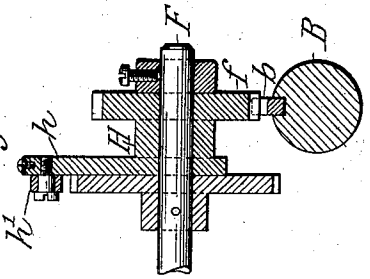


Fig. 15

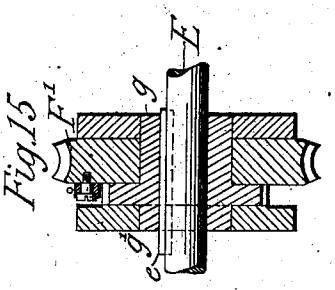


Fig. 12

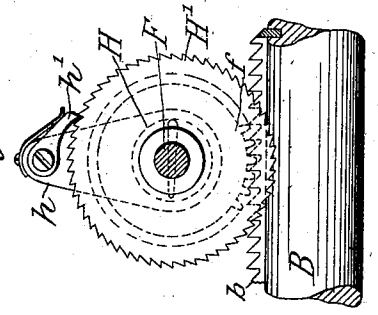
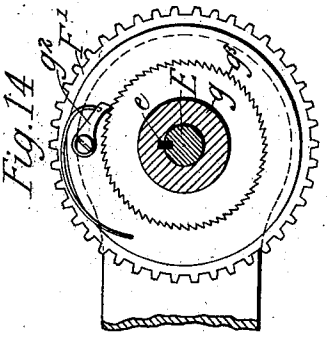


Fig. 14



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No. 747,917. PATENTED DEC. 22, 1903.

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RIBBON MOVEMENT FOR TYPE WRITING MACHINES.

APPLICATION FILED MAY 3, 1902.

NO MODEL. 6 SHEETS—SHEET 6.

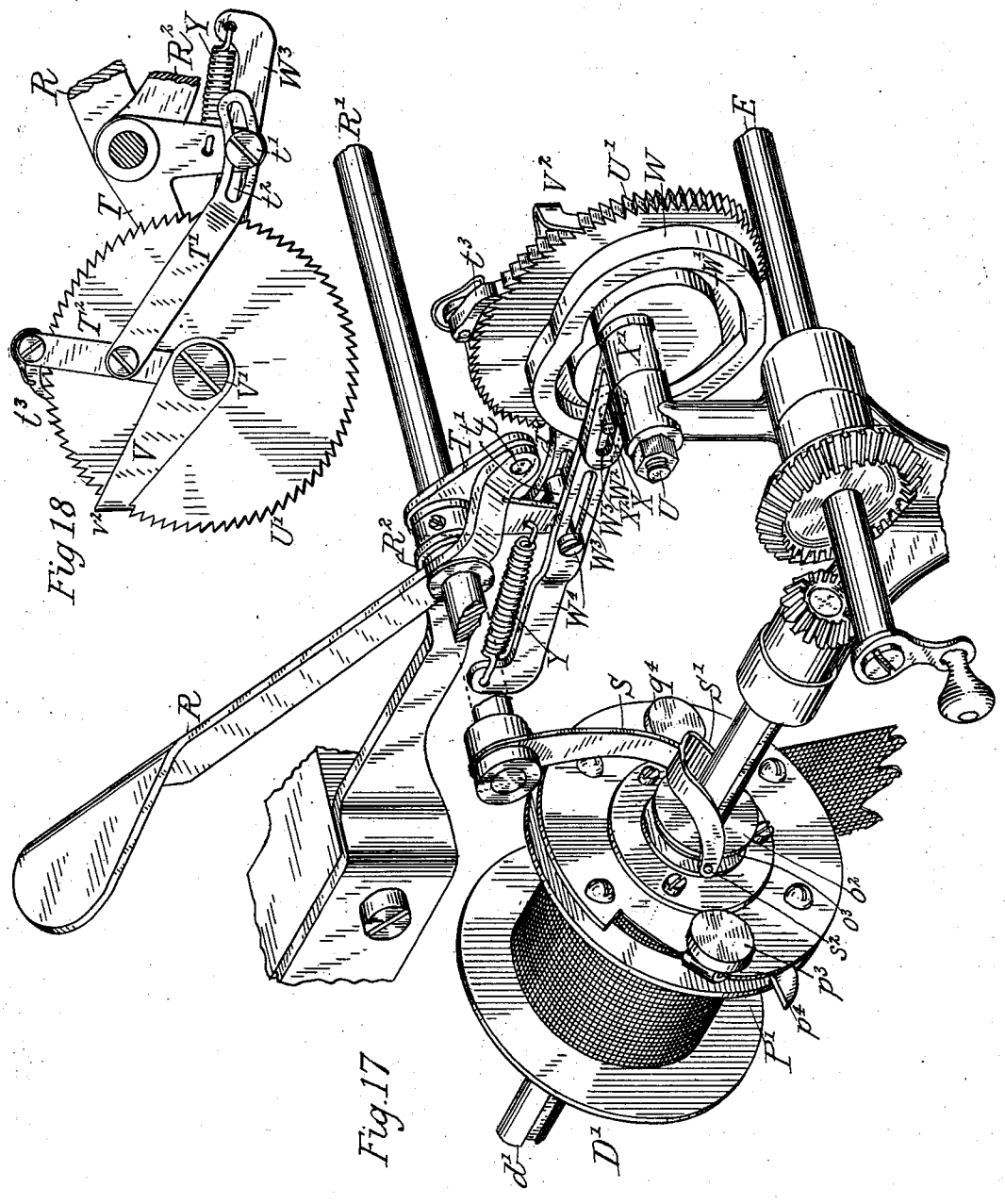


Fig 18

Fig. 17

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No. 747,917. Patented December 22, 1903.

UNITED STATES PATENT OFFICE.

FREDERIC W. HILLARD, OF TOTTENVILLE, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ELLIOTT-FISHER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

RIBBON-MOVEMENT FOR TYPE-WRITING MACHINES.

SPECIFICATION forming part of Letters Patent No. 747,917, dated December 22, 1903.

Application filed May 3, 1902. Serial No. 105,785. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC W. HILLARD, a citizen of the United States of America, and a resident of Tottenville, borough of Richmond, city and State of New York, have invented certain new and useful Improvements in Ribbon-Movements for Type-Writing Machines, of which the following is a specification.

This invention relates to ribbon-movements for type-writing machines, its objects being to provide means for feeding the ribbon lengthwise at each operation of the key-levers, to provide means for automatically shifting the direction of movement of the ribbon when the ribbon has been unwound from one of the spools, and to provide means for shifting the ribbon laterally or moving it transversely when desired, the main aim being to provide a ribbon-movement for the purpose of presenting a different point of contact for successively-actuated printing-type, which movement is reliable in action and which is as simple as is consistent with the multiplicity of functions which the mechanism forming the subject of the present invention is expected to perform.

The invention comprises a mechanism which is actuated during letter or word spacing or the forward movement of the carriage for the purpose of shifting the ribbon longitudinally to obtain a different point of impact for the next striking printing-type, which mechanism is so constructed as that when the ribbon is unwound from a spool or reel a strip which is retained on each spool will be released from the unwound spool and actuate a normally idle portion of the said mechanism to shift a shaft which carries bevel-gears that are alternately in mesh with the bevel-gears of the spools and operatively connect up the shaft of the spool on which the ribbon is to be wound for the purpose of reversing the direction of movement of the ribbon.

The novelty of the invention consists, first, partly in the peculiar construction of the mechanism for accomplishing these ends; second, in the devices which are retained in inoperative position by the ribbon for the purpose of operation when the ribbon is unwound, and, third, in the means for obtaining the transverse movement or cross-feed of the ribbon.

The invention will now be described in detail, and its novel features will appear from the claims.

In the accompanying six sheets of drawings, Figure 1 is a perspective view of the carriage of a type-writing machine, showing my improved ribbon-movement applied to the Elliott book type-writer, parts of the frame being shown in dotted lines. Fig. 2 is a plan view of a portion of a type-writing machine in which the ribbon-movement forming the subject of the present invention is shown. Fig. 3 is an enlarged perspective view of the train of driving and shift gears, which are operated by the engagement of a pinion with a rack-bar. Fig. 4 is a front elevation of the train of driving and shift gears in the act of shifting. Fig. 5 is a rear elevation of the shift-gears alone. Figs. 6 and 7 are an edge and a side view of one of the spools, showing the improved trip in inoperative position as it is held by the wound ribbon. Figs. 8 and 9 are respectively edge and side views of the spool, showing the trip released from the ribbon for the purpose of tripping the mechanism which reverses the direction of movement of the ribbon. Figs. 10 and 11 are perspective views of the trip, the same being viewed, respectively, from opposite sides. Fig. 12 is a detail view, partly in section, showing the pawl and ratchet for preventing the actuation of the train of driving and shift gears during the return movement of the carriage. Fig. 13 is a section at right angles thereto. Fig. 14 is a transverse section through the driving-shaft, showing in detail the pawl-and-ratchet locking device for the worm-gear. Fig. 15 is a longitudinal section taken through the driving-shaft and the center bearing-box to show more clearly the sleeve with which the worm-wheel is adapted to turn. Fig. 16 is a detail view of the shift device for completing the endwise movement of the shaft. Fig. 17 is an enlarged perspective view of the cross-feeding mechanism, and Fig. 18 is a detail side ele-

vation of a portion of the said mechanism viewed from the opposite side.

Referring to Figs. 1 and 2 of the drawings, the carriage A is shown as guided on the rear guide-rod B, formed as a rack-bar, by means of suitable guide-rollers B′, and the frame of the machine C is shown in dotted lines only. The ribbon C′ is wound, as usual, upon the two spools D D′, which spools are provided with shafts d d', that revolve in bearings in suitable brackets a on the carriage and are respectively provided with bevel-gears d^2 d^3, which are adapted to mesh with bevel-gears e e', fixed on a longitudinally-shiftable driving-shaft E, which is arranged counter to the rack-bar B and is journaled in suitable bearings of the carriage, these bevel-gears e e' being located at such distance apart that the shaft E may be shifted longitudinally by hand, if desired, so as to mesh the bevel-gear e with its bevel-gear d^2 or to mesh the bevel-gear e' with its bevel-gear d^3, according to whether the shaft E is shifted in one direction or the other. When the gears e d^2 are in mesh, it is evident that the ribbon C′ may be wound upon the spool D, while when the gears e' d^3 are meshed the ribbon may be wound upon the other spool D′. This part of the mechanism so far as described is present in many type-writing machines in which the direction of movement of the ribbon may be reversed.

The teeth b of the guide-rod B, hereinafter termed a "rack-bar," are engaged by a pinion f, (see more particularly Figs. 3, 4, and 5,) which is mounted loosely on a shaft F, that turns in a box G, fixed suitably to the carriage A, so as to carry the shaft F along with it during the letter and word spacing of the carriage and to thereby through the intermeshing of the pinion f with the rack-teeth b turn the shaft F and in turn cause a worm f' on said shaft, which meshes with a worm-wheel F′, that is mounted on the driving shaft E, to turn the said shaft E and to thereby shift the ribbon longitudinally when the key-levers are actuated. The worm-wheel F′ is mounted loosely on a sleeve g, so that the sleeve, which is mounted loosely in a box G′, may rotate in the latter and the worm-wheel if this is fixed against rotation, and said sleeve is also mounted loosely on shaft E for permitting longitudinal movement of the shaft therein, to which end the shaft is provided with feather e, that is guided in a groove g', cut in the loose sleeve g, so that the shaft may be shifted longitudinally without shifting the sleeve while the sleeve is being rotated. The shaft E is caused to be rotated by the rotation of the worm f', and this rotation is effected through the engagement of a spring-actuated pawl g^2, carried by the worm-wheel, which engages with a ratchet g^3, turning with the sleeve g. By this construction the rotation of the worm-wheel accomplishes the slow rotation of the shaft E, and the shaft is also permitted to turn faster, so as to independently wind up the ribbon without acting on the worm-wheel or any part which meshes therewith.

The driver-pinion f is not fixed directly to the shaft F, but is arranged on a hub or sleeve H, which is provided with a short lug or extension h, to which is pivoted a suitable pawl h', that takes between the teeth of a ratchet H′, fixed on the shaft F, so that in the forward direction of movement of the carriage for letter and word spacing the pinion f will turn the shaft through engagement of the pawl with the working faces of the ratchet, while when the return movement of the carriage is taking place the pinion f will run idly without effect upon the shaft F, the pawl simply riding freely over the inclined faces.

The parts of the invention so far as described cause the feed of the ribbon from one spool onto the other and enable the shaft when the ribbon has been run off of the spool to be reversed by hand.

Mechanism will now be described which causes the automatic reversal of the direction of movement of the ribbon, which mechanism comprises in part some of the devices already described. This mechanism consists in the main of a train of shift-gears located between the driver-pinion f and the shaft E and comprises a rocker having front and back bars I I′, mounted intermediately of their ends upon the shaft F to rock thereon as a center, an intermediate gear-wheel J, fixed to the ratchet-wheel, and hence to the shaft F, and two short parallel shafts K K′, which turn in bearings at the opposite ends of said rocker, of which shaft K has at its opposite ends gears k k', and shaft K′ has at its opposite ends gears k^2 k^3. The gear k^3 is in mesh with the gear J, while the gear k' is driven in a reverse direction to the gear J by the provision of a second intermediate gear K², which meshes both with the gear J and the gear k'. The function of these gears will appear later. The said rocker-bars are spaced a suitable distance apart and with their connected ends form a rocker-frame around the box G. The gears k k^2 are located on opposite sides of the worm-gear previously described, so that through the medium of suitable operating devices the said gears k k^2 may be thrown down on either side of the worm-wheel, so as to bring the gear-teeth in mesh with an annular rack tooth or teeth e^3 or e^4, according to which of the said gears k or k^2 is rocked down toward the shaft E. The distance between the teeth e^3 e^4 is greater than the distance between the gears k k^2, so that when gear k, for instance, is rocked down, so that its teeth will be brought into engagement with the corresponding annular rack-teeth e^3 for the purpose of shifting the shaft E and meshing the bevel-gears on that side, the annular rack-teeth at the opposite side will be thereby drawn under the gear k^2, to be engaged thereby upon the operation of approach of the said gear k^2.

To describe the operation of the shift-gears more fully, the carriage is provided with means for rocking the rocker I I′ to one side or the other as one or the other end of the ribbon has been unwound from its spool, and this is done automatically, as will hereinafter appear, so as to rock either the gear k or k^2 toward the shaft E. The effect of this movement, assuming that the rack-teeth e^3 are located so as to be engaged by the gear k, is to turn the gear k' in the direction of the arrow shown in Fig. 4 upon the movement of the carriage in letter and word spacing, which thereby effects the turning of the gears J K^2 k' by the pawl-and-ratchet connection of the driver-pinion f with the gear J, with the result that the gear k, which is driven in the same direction as the gear k' on the same shaft, is for a moment lowered into mesh with the tooth or teeth at e^5, thereby forcing the shaft E in the direction of the arrow, Fig. 4, and meshing the bevel-gears e and d^2. This results in the rewinding of the ribbon upon the corresponding spool D. It will be noted that when the shaft E has been shifted, as stated, the tooth or teeth e^4 will be brought under the raised gear k^2, this gear k^2 and all the other gears which are mounted on the rocker being held in their rocked position until the ribbon is unwound from the spool D′, whereupon the device which actuates the rocker is brought into place, so as to lower the gear k^2 in mesh with the tooth or teeth e^4, thereby effecting a momentary engagement between these teeth, so that the said gear k^2, which is turned in opposite direction to the gear k, will instantly shift the shaft E in opposite direction to that previously described, whereupon the bevel-gear e is disengaged from the bevel-gear d^2, the bevel-gear e' is brought in mesh with the bevel-gear d^3 upon the shaft of the spool D′, and the ribbon is unwound from this spool.

To assure that the rocker I I′ when rocked to one side or the other be retained in rocked position, there is preferably supported upon the box G a spring L, which is provided at its free end with a V-shaped nose or snap, the apex of which engages on either side of the apex of the V-shaped tooth l', formed on the forward part of the rocker I I′. The apices of the nose l and the tooth l' on the rocker I are so located that immediately the rocker passes to either side of a horizontal position the apex of the nose l will not rest upon the apex of the tooth l', but will snap to one side of the same. Thus if not tending to throw the rocker to one side or the other after an initial movement has been imparted thereto it at any rate serves and is intended to serve as a means to cause the rocker to rock completely to one side or the other and to be set or maintained in its rocked position. This is very essential for evident reasons.

Attention is directed to the fact that the rack-teeth e^2 e^4 on the shaft E are annular—that is to say, they extend completely around the circumferential surface of the said shaft, so that no matter what may be the position of the shaft during its rotation the teeth of the gears k k^2 will at all times engage a portion of the shaft for the purpose of shifting it to one side or the other, according to the gear which is lowered into operative engagement.

For the purpose of maintaining the bevel-gears e e' in mesh with their respective bevel-gears d^2 d^3 on the shaft E a safety device is provided which is shown in Figs. 1 and 2 and in detail in Fig. 16. This safety device comprises a forked lever M, which is pivoted to a bracket M′ on the carriage, the forked end of which lever is in loose engagement in an annular groove e^5 of the shaft E, while the other end of said lever is connected with a suitably-anchored spring m under tension and which during the approximate middle point of shift of the shaft is placed under greater stress, while when the shaft passes its said intermediate point of shift the spring is permitted to exert its full spring action on the lever to cause the shaft to be thrown to the very limit of its endwise movement. This assures the complete disengagement of the shift-gears from the rack-teeth on shaft E and also holds the bevel-gears in mesh.

The rocker I I′ of the shift-gears has suitably fixed thereto, as by a screw n, an angle-arm N, which is connected to links N′ N^2, extending toward opposite sides of the carriage, the outer ends of which links are pivotally connected with actuating-levers N^3 N^4, which are mounted on pivots n' n^2, mounted in suitable bearings in the carriage and ranged at right angles to the shafts of the spools, so that the free ends of the levers N^3 N^4 extend forwardly under or to one side of the two spools. When one of the levers is moved inwardly, the other lever is moved outwardly, or vice versa, this being effectuated by means now to be described.

The cylindrical body of each spool is provided with the flanges o' and the hubs o^2, and the ribbon C when wound upon one or the other of the spools retains a finger p, which is bent inwardly with respect to the spool from a suitable trip P, which is pivoted at p' within the circumferential surface of the spool-body, while the said trip extends outwardly toward the periphery of the adjacent flange and is provided at its free end with an out and in turned guide portion p^2, the extremity of which is located on the outside of the said flange and carries a suitable weight or head p^3, the object of which is to actuate the trip when the finger p is released by the unwinding of the ribbon from the spool, whereupon a trip-pawl p^4 is thrown in the path of the adjacent actuating-lever N^3 or N^4, and the said lever is moved on its pivot, so as to cause the meshing of the bevel-gears of the ribbon movement at that side corresponding with the actuated lever, thus resulting in the reversal of the direction of movement of the

ribbon and the rewinding of the ribbon upon that spool which carried the actuating-trip. The out and in turned portion p^2 is guided at the bend in a flange-recess q, the bottom edge q' of which is formed eccentric to the axis of the spool, but concentric with the pivot p', so that when the trip is released from the unwinding ribbon the said trip may drop, and thus bring its trip-pawl p^4 into the actuating position referred to. The end of the trip in dropping under the release thereof by the ribbon abuts against a stop q^2, formed by one end of the recess q. A corresponding stop q^3 is formed at the other end of the recess for the abutment of the trip when the finger p thereof is wound within the ribbon. The weight or head p^3 on the trip, which causes it to drop, being arranged on the inturned outer end of the said gravity-piece is located outside of the flange and moves inside of the space defined by the periphery of the said flange, at the opposite side of which flange is a counterweight q^4 for preventing slack in the ribbon. It is found in practice that if there be no special provision the edge of the ribbon may catch upon and interfere with the action of the trip, or the latter will interfere with the longitudinal shifting of the ribbon. To prevent this, a guard disk or ring P′ is mounted upon the flange at the trip side of the spool and is separated a slight distance from the flange, so that the trip moves within the space so formed and cannot interfere in the manner stated.

The mechanism for obtaining the cross or transverse feed will now be described. This mechanism provides hand-operated means for effecting the transverse movement of the ribbon for the purpose of rendering the writing visible, and, further, provides, in connection with such hand-operated means, means automatically actuated thereby for effecting a permanent side feed of the ribbon each time the ribbon is given a transverse movement for the purpose of inspecting the work. This construction is shown in Figs. 17 and 18 in detail and comprises means for actuating it, preferably, by means of a hand-operated actuating-lever R, which is fixed on a rock-shaft R′, that is journaled in bearings in brackets R^2 of the carriage. Arms S are mounted on the ends of the rock-shaft R′ and are provided at their lower ends with forks S′, having pins S^2, which are received in an annular groove o^3, located in the hub o^2 of each spool or reel, so that by the rocking of the rock-shaft oscillatory motion is imparted to the arms S and a longitudinal motion of the spools on their shafts produced, while owing to the annular groove o^3 the spools may rotate with their shafts, such rotation being accomplished through a tongue-and-groove connection of the spools with their shafts. In the present invention the motion of the carriage is not employed for effecting the motion of the spools longitudinally of their separate shafts to obtain the cross-feed of the ribbon; but it is effected by independent means of control under the actuation of the lever R, to which end this lever is fixed on the shaft R′. For this purpose the inner end of the actuating-lever R is pivotally connected at t with a bell-crank lever T, which is fixed also on the shaft R′, said bell-crank lever having a pin-and-slot connection with a link T′, which is pivoted to an oscillating arm T^2, pivoted on a short shaft U, fixed on the carriage. The said pin-and-slot connection consists of a pin or set-screw t', which is carried by the bell-crank lever T and which plays in a circular slot t^2, formed in the outer end of the link T′. The actuation of the lever R by hand after a variable amount of upward motion has been imparted to said lever forces the pin or set-screw t' in contact with the closed inner end of the slot t^2, thereby oscillating the arm T^2, causing a spring-actuated pawl t^3 to impart a partial rotation to the ratchet-wheel U′, mounted on the shaft U, for the distance of one tooth.

Retrograde rotation of the ratchel-wheel U′ is prevented by a detent V, which at one end is rigidly secured by a clamping-screw V′ to the shaft U, the outer free end of the detent being bent up in suitable shape, as shown in Fig. 17, to form a toe V^2. The said detent being made of spring metal yields to the forward direction of rotation of the ratchet-wheel, the back rotation of the ratchet-wheel being prevented by the working faces of the teeth contacting with the said toe V^2. The ratchet-wheel U′ remains in its set position until the next actuation of the actuating-lever. The variable amount of the downward motion of the actuating-lever, and hence the amount of play of the pin or set-screw t^2, is obtained by means which will now be described, which define the upper position of the actuating-lever. Arranged on the ratchet-wheel U′ or mounted separately on the shaft U so as to turn with said wheel is a cam W, which is provided with a heart-shaped groove W′ in its face to receive pin W^2, preferably provided with an antifriction-roller, which pin is located on one end of a link W^3, having a pin-and-slot connection with the bell-crank lever T. This pin-and-slot connection is formed by a pin or stud W^4, located on the bell-crank lever T in alinement with the pin or stud t' also thereon, and by a longitudinal slot W^5, which is formed in the link W^3. The length of the slot W^5 depends upon the development of the heart-shaped cam-groove, and the parts are so positioned relatively to each other as that normally the pin or stud W^4 abuts against the closed outer end of the slot W^5, thereby defining the upper position of the actuating-lever, due of course to the varied fixed adjustment of the cam W obtained by the intermittent actuation of the ratchet-wheel U′. Upon depressing the actuating-lever the pin or stud W^4 moves to a greater or less extent in an arcuate path in the slot W^5, due to a certain pivotal movement of the link on its cam-engaging pin or

stud. The pin W^2 is held against displacement from the cam-groove W′ by means of a guard X, having a hub X′, which is confined upon the shaft U, so as to prevent bodily sidewise movement of the guard away from the flat outer surface of the cam. This guard is spaced a distance away from the cam, so as to receive in the space so formed that end of the link W^3 which carries the pin W^2, extended so as to form a pin-and-slot connection at X^2 with the said guard X, which connection permits the radial displacement of the cam-pin, due to the rotation of the cam and the various adjustments thereof, without affecting the action of the cam. For the purpose of moving the actuating-lever as high as the limit formed by the abutment of the link W^3 will allow a lifting-spring Y is connected at one end with the bell-crank lever T and the other end is suitably connected or fixed, preferably, to the extended end of the link W^3.

As will be seen from the described construction, the transverse shift of the ribbon for a distance corresponding to the movement of the cam produced by the movement of the ratchet-wheel for one tooth is accomplished when the operator depresses the actuating-lever to view the work, and the amount of this movement depends upon the defined upper position of the lever, so that in this way the impact of successive strokes of the printing-type may be obtained in a series of parallel lines along the ribbon, due to successive exposures of the work and without the influence of the motion of the carriage. Thus all strains which would otherwise be brought to bear upon the carriage-feeding mechanism are avoided. It is evident that the shift-gears may be shifted not only automatically, but by hand, and this is desirable when two attached ribbons are in use in the machine.

Without restricting myself to details shown and described, what I claim as new and of my invention is—

1. In a type-writing machine, the combination of the ribbon-spools and their shafts, a driving-shaft, gearing for connecting the spool-shafts alternately with the driving-shaft, a rack fixed relatively to the said driving-shaft and arranged counter thereto, a suitably-journaled shaft arranged angularly to the driving-shaft and supporting a suitable driving-pinion meshing with the rack, and a worm-gear connection for the two shafts, substantially as described.

2. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, gearing for alternately connecting the spool-shafts with the driving-shaft, a rack arranged parallel with the driving-shaft, a shaft extending transversely of the rack and driving-shaft, a suitable driving-pinion mounted on the transverse shaft and meshing with the rack, and a worm-gear, the driving-shaft sliding within the worm-wheel and suitably connected therewith for rotation from the transverse shaft, substantially as described.

3. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, gearing for connecting the spool-shafts alternately with the driving-shaft, a worm-gear, means for operating the same, a sleeve held against longitudinal motion and through which the driving-shaft passes for rotation therewith, said sleeve being loose within the worm-wheel, and means for rotating the sleeve and shaft from the worm-gear, substantially as described.

4. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, gearing for connecting the spool-shafts alternately with the driving-shaft, a worm-gear, means for operating the same, a sleeve held against longitudinal motion and through which the driving-shaft passes for rotation therewith, said sleeve being loose within the worm-wheel, and a pawl-and-ratchet connection between the worm-gear and sleeve for imparting rotation to the sleeve and shaft, the said pawl riding freely over the ratchet when the driving-shaft is independently rotated faster than the speed of the worm-wheel, substantially as described.

5. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, gearing for alternately connecting the spool-shafts with the driving-shaft, a rotary sleeve fixed against longitudinal motion and through which the shaft passes, a tongue-and-groove connection between the sleeve and shaft, a worm-wheel within which the sleeve may rotate, means for turning the sleeve from said worm-wheel in one direction, and a suitably-driven worm meshing with the worm-wheel, substantially as described.

6. In a type-writing machine, the combination of the driving-shaft for the ribbon-spools, an angularly-arranged shaft, gearing connecting the shafts, a rack arranged parallel with the driving-shaft, a rack-meshing pinion loose on the angular shaft, and means for turning the angular shaft in one direction of rotation of the pinion and for permitting the angular shaft to remain idle during the opposite direction of rotation of the pinion, substantially as described.

7. In a type-writing machine, the combination of the spools and their shafts, a driving-shaft, gearing for alternately connecting the spool-shaft with the driving-shaft, a shaft arranged angularly with respect to the driving-shaft, and provided with a worm, a worm-wheel meshed by said worm for turning the driving-shaft, a rack arranged parallel with the driving-shaft, a loose pinion on the angular worm-shaft, meshing in said rack, and means for turning the worm-shaft in one direction of rotation of the pinion, and for per-

mitting the said shaft to remain idle during the opposite direction of rotation of the pinion, substantially as described.

8. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, gearing for alternately connecting the spool-shafts with the driving-shaft, means for turning the driving-shaft for rotation of the ribbon-spools to secure longitudinal movement of the ribbon, and shift-gears operatively connected with the means for rotating the driving-shaft, for automatically shifting the direction of rotation of the ribbon-spools, substantially as described.

9. In a type-writing machine, the combination of the longitudinally-shiftable driving-shaft for the ribbon-spools, shift-gears and means for automatically shifting the shift-gears into operative engagement with either of two parts of said shaft, substantially as described.

10. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, gearing for alternately connecting the spool-shafts with the driving-shaft, means for imparting rotation to the driving-shaft, shift-gears, and means for shifting said shift-gears into operative engagement with one or another part of said shaft, substantially as described.

11. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, gearing for alternately connecting the spool-shafts with the driving-shaft, means for rotating the driving-shaft, a rocker, reversely-acting shift-gears mounted on the rocker, and means for rocking the rocker to engage the shift-gears with one or the other of two intermeshing portions of the driving-shafts, substantially as described.

12. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, gearing for alternately connecting the spool-shafts with the driving-shaft, a shaft arranged angularly to the driving-shaft, means for turning the driving-shaft from the angular shaft, a rocker rocking toward either side of the angular shaft, means for rocking the rocker, and shift-gears carried by the rocker and driven in opposite directions for engaging the driving-shaft and shifting the same in one or the other direction, substantially as described.

13. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, gearing for connecting the spool-shafts alternately with the driving-shaft, a shaft arranged angularly to the driving-shaft, means for turning the driving-shaft from said angular shaft, a rocker mounted to oscillate on said angular shaft, shift-gears driven in opposite directions by said angular shaft and carried by the rocker, and means for rocking said rocker to one or the other side, for engaging the shift-gears alternately with corresponding portions of the driving-shaft, substantially as described.

14. In a type-writing machine, the combination of the ribbon-spools and their shafts, a driving-shaft provided with annular rack-teeth at two points, means for rotating the driving-shaft, and means for alternately engaging the rack-teeth at one point or the other for shifting the driving-shaft in both directions, and gearing for alternately driving the spool-shafts from the driving-shaft, substantially as described.

15. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, provided with annular rack-teeth at two points, gearing for connecting the driving-shaft with the spool-shafts, alternately, means for rotating the driving-shaft, and shift-gears turning in opposite directions, and alternately engaging with the annular rack-teeth, substantially as described.

16. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, provided with annular rack-teeth at two points, gearing for connecting the spool-shafts with the driving-shaft, means for rotating the driving-shaft and shift-gears turning in opposite directions and alternately engaging with the annular rack-teeth, the distance between the rack-teeth at the two points on the driving-shaft and the shift-gears being dissimilar, substantially as described.

17. In a type-writing machine, the combination of the ribbon-spools and their shafts, a longitudinally-shiftable driving-shaft, gearing for alternately connecting the spool-shafts with the driving-shaft, a shaft arranged angularly to the driving-shaft, a pinion mounted loosely on the angular shaft, means for rotating the angular shaft from said pinion when rotating in one direction only, means for rotating the driving-shaft from said angular shaft, reversely-rotating shift-gears adapted to alternately engage with two engaging portions of the driving-shaft, and means for rotating said shift-gears from the angular shaft, substantially as described.

18. In a type-writing machine, the combination of the spools and their shafts, a driving-shaft, gearing connected therewith for rotating one or the other spool-shaft, means for rotating the driving-shaft, a rocker, shift-gears thereon for alternately engaging the driving-shaft at one of two points for shifting the same, a spring tending to throw the rocker to one or the other side, and means actuated from the spools for oscillating said rocker, substantially as described.

19. In a type-writing machine, the combination of the ribbon-spools and their shafts, a driving-shaft, gearing for connecting the spool-shafts alternately with the driving-shaft, means for rotating the driving-shaft, means for shifting the driving-shaft length-

wise toward either end, a shaft-thrust lever engaging at one end with the driving-shaft, and an actuating-spring suitably anchored at one end and in constant engagement at its other end with the opposite end of said lever and tending to throw the driving-shaft to its extreme limit of shift in either direction, substantially as described.

20. In a type-writing machine, the combination of the ribbon-spools and their shafts, a driving-shaft, gearing for alternately connecting the spool-shafts with the driving-shaft, a rocker, means connected with said rocker for alternately engaging two bearing-points on the driving-shaft, a rock-arm on the rocker, and means connected with the rock-arm for rocking the same from a part carried by each spool, substantially as described.

21. In a type-writing machine, the combination of the ribbon-spools and their shafts, a driving-shaft, gearing for alternately connecting the spool-shafts with the driving-shaft, a rocker, means connected with said rocker for alternately engaging two bearing-points on the driving-shaft, a rock-arm on the rocker, an actuating-lever adjacent to each spool, links connecting one end of each lever with the said rock-arm, and a trip released automatically from each spool by the unwinding of the ribbon so as to drop the trip automatically into engagement with the free end of the adjacent actuating-lever, substantially as described.

22. In a type-writing machine, the combination of the ribbon-spools, mechanism for shifting the direction of rotation of the spools, means acting automatically on said shifting mechanism and consisting of a pivoted trip provided with a pawl, an eccentric guide portion for the trip, abutments at each end of the guide portion, an out and in turned guide portion on said trip, and a weight on the in-turned end, said trip being retained inoperative by the wound ribbon and released automatically therefrom, substantially as described.

23. In a type-writing machine, the combination of a spool, a trip pivoted to the spool, a laterally-projecting pawl on the trip, an out and in turned portion on the trip guided on one of the spool-flanges, and a ribbon acting on the trip, when wound, to retract the trip and its pawl, substantially as described.

24. In a type-writing machine, the combination of a spool, a trip pivoted to the spool, a laterally-projecting pawl on the trip, an out and in turned portion on the trip guided on one of the spool-flanges, a weight on the in-turned end of the trip, and a ribbon acting on the trip when wound, to retract the trip and its pawl, substantially as described.

25. In a type-writing machine, the combination of a spool, a movable trip, a ribbon, when wound retracting the trip, and a guard between the trip and the ribbon, substantially as described.

26. In a type-writing machine, the combination of a spool, a movable trip, a ribbon, when wound retracting the trip, and an annular guard-flange between the trip and the ribbon, substantially as described.

27. In a type-writing machine, the combination of a ribbon-carrier, means for feeding the ribbon longitudinally, a key, and mechanism acting on the ribbon-carrier and actuated by the key for shifting the ribbon transversely on the depression of the key, and retaining it upon the return of the key in a position different from its position prior to the depression of the key, substantially as described.

28. In a type-writing machine, the combination of a ribbon-carrier, a key, and mechanism actuated by the key for shifting the ribbon transversely on the depression of the key, and for varying the extreme upper position of the said key, substantially as described.

29. In a type-writing machine, the combination of a ribbon-carrier, a key for shifting the ribbon transversely from in front of the printing-point, and mechanism actuated by the depression of the key for varying the extent of the return movement of the ribbon with the key, substantially as described.

30. In a type-writing machine, the combination of a ribbon-carrier, a key connected to the ribbon-carrier, and means actuated by the depression of the key for varying the extreme upper position of the key upon the subsequent return movement of the key, substantially as described.

31. In a type-writing machine, the combination of the spool-shafts, means for rotating the same, spools guided longitudinally on the shafts, a key acting on the spools for shifting the ribbon transversely, and means for varying the extreme upper position of said key, controlled by the depression of the key for examination of the work, substantially as described.

32. In a type-writing machine, the combination of the rotary spool-shafts, the spools guided longitudinally thereon, a rock-shaft journaled transversely of the spool-shafts, rock-arms extending from the said transverse shaft and operatively connected with the spools, a key-lever fulcrumed on the transverse shaft, means for rocking said shaft from the said key-lever, and means actuated by a depression of the key for varying the upper position of the key-lever for transversely shifting the ribbon, substantially as described.

33. In a type-writing machine, the combination of the longitudinally-shiftable ribbon-spools, a cam, means for shifting the said cam, under the actuation of the said key-lever, a limiting device connected with the said key-lever and bearing on said cam for producing a variable position for the key-lever, and means actuated by the key-lever for shifting the spools, substantially as described.

34. In a type-writing machine, the combi-

nation of the longitudinally-shifting ribbon-spools, a key-lever, means between the key-lever and the spools for shifting them, a cam, means for shifting the cam, through each depression of the key-lever, and means between the cam and the key-lever for defining through said cam the upper position of the key-lever, substantially as described.

35. In a type-writing machine, the combination of a shiftable ribbon-carrier, a cam for shifting the position of the carrier and means for driving the cam, and means other than the cam for shifting the position of the carrier to a greater extent than it is shifted by the cam, substantially as described.

36. In a type-writing machine, the combination of a shiftable ribbon-carrier, a cam for shifting the position of the carrier, a key driving the said cam, and means for shifting the carrier from the key to a greater extent than the carrier is shifted by the cam, substantially as described.

37. In a type-writing machine, the transverse or cross-feed mechanism for the ribbon, the same comprising a cam, means for varying the position of said cam, a key for shifting the ribbon-spools, and means controlled by said cam for defining and varying one of the limits of motion of the shifting-key, substantially as described.

38. In a type-writing machine, the combination of a shiftable ribbon-carrier, a cam, a key for shifting the carrier, and means controlled by the cam for varying the position of the key, substantially as described.

39. In a type-writing machine, the transverse or cross-feed mechanism for the ribbon, the same comprising a cam with a heart-shaped groove, a link having a pin retained in said groove, means controlled by said link for shifting the position of the spools, and means controlled by said shifting means for adjusting the position of the cam, substantially as described.

40. In a type-writing machine, the transverse or cross-feed mechanism for the ribbon, the same comprising a cam with a heart-shaped groove, a link having a pin, a guard for retaining the pin in said groove, means controlled by said link for shifting the position of the spools, and means controlled by said shifting means for adjusting the position of the cam, substantially as described.

41. In a type-writing machine, the transverse cross-feed mechanism for the ribbon, the same comprising an actuating-lever, a link, means for setting said link in a varied number of adjusted positions, a part operated by the actuating-lever, and limited by an abutment on the link, and means actuated by the actuating-lever for shifting the spools, substantially as described.

42. In a type-writing machine, the combination of a transversely-shiftable ribbon, means automatically actuated in the operation of the machine and independent of the carriage-feeding mechanism for varying the shifted position of the ribbon, and means for shifting the ribbon to view the work, substantially as described.

Signed at New York city this 1st day of May, 1902.

FREDERIC W. HILLARD.

Witnesses:
M. S. EYLAR,
A. G. OLNEY.