

No. 837,031.

PATENTED NOV. 27, 1906.

A. T. BROWN.
TYPE WRITING MACHINE.
APPLICATION FILED OCT. 16, 1902.

4 SHEETS—SHEET 1.

FIG. 12.

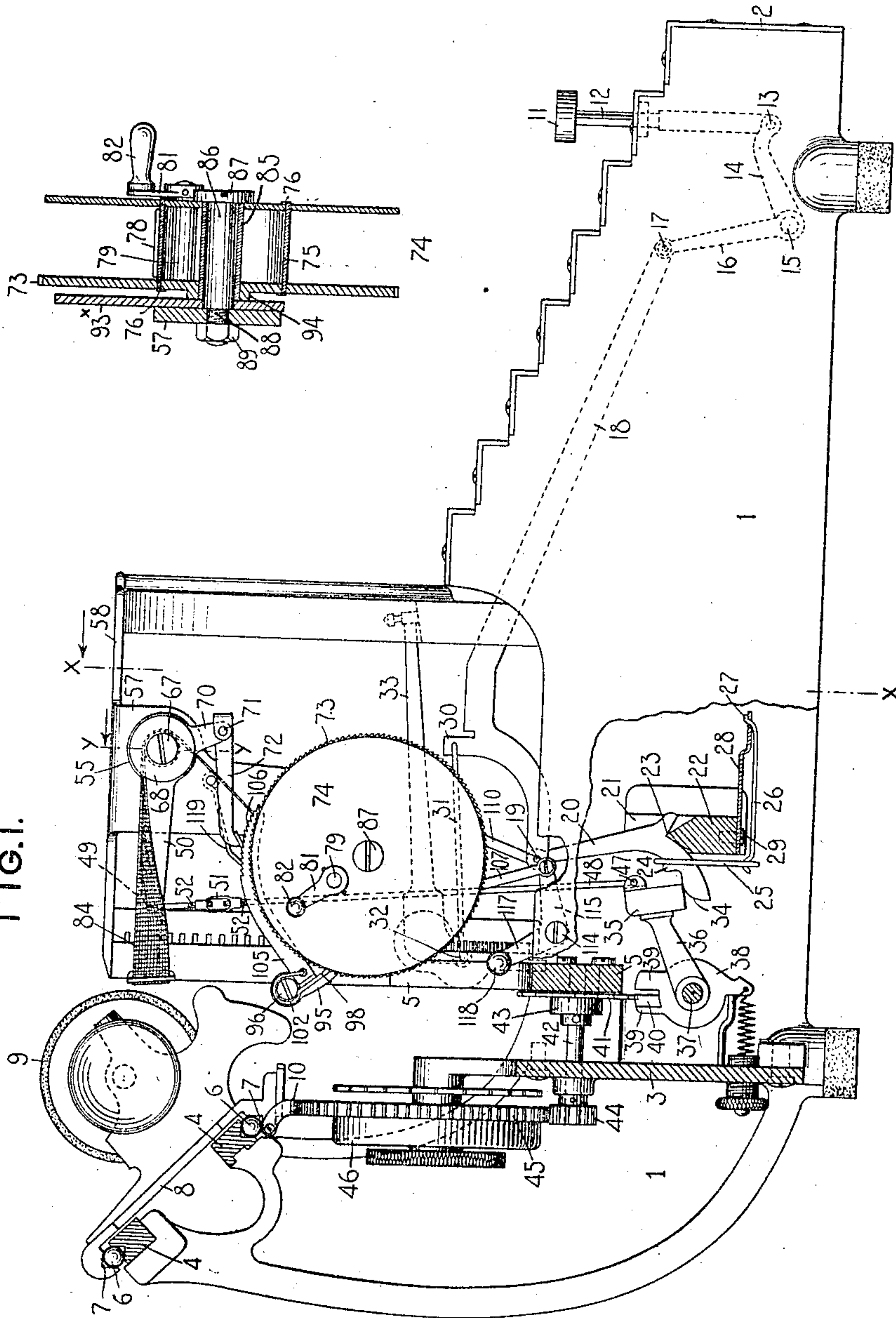


FIG. 1.

WITNESSES:

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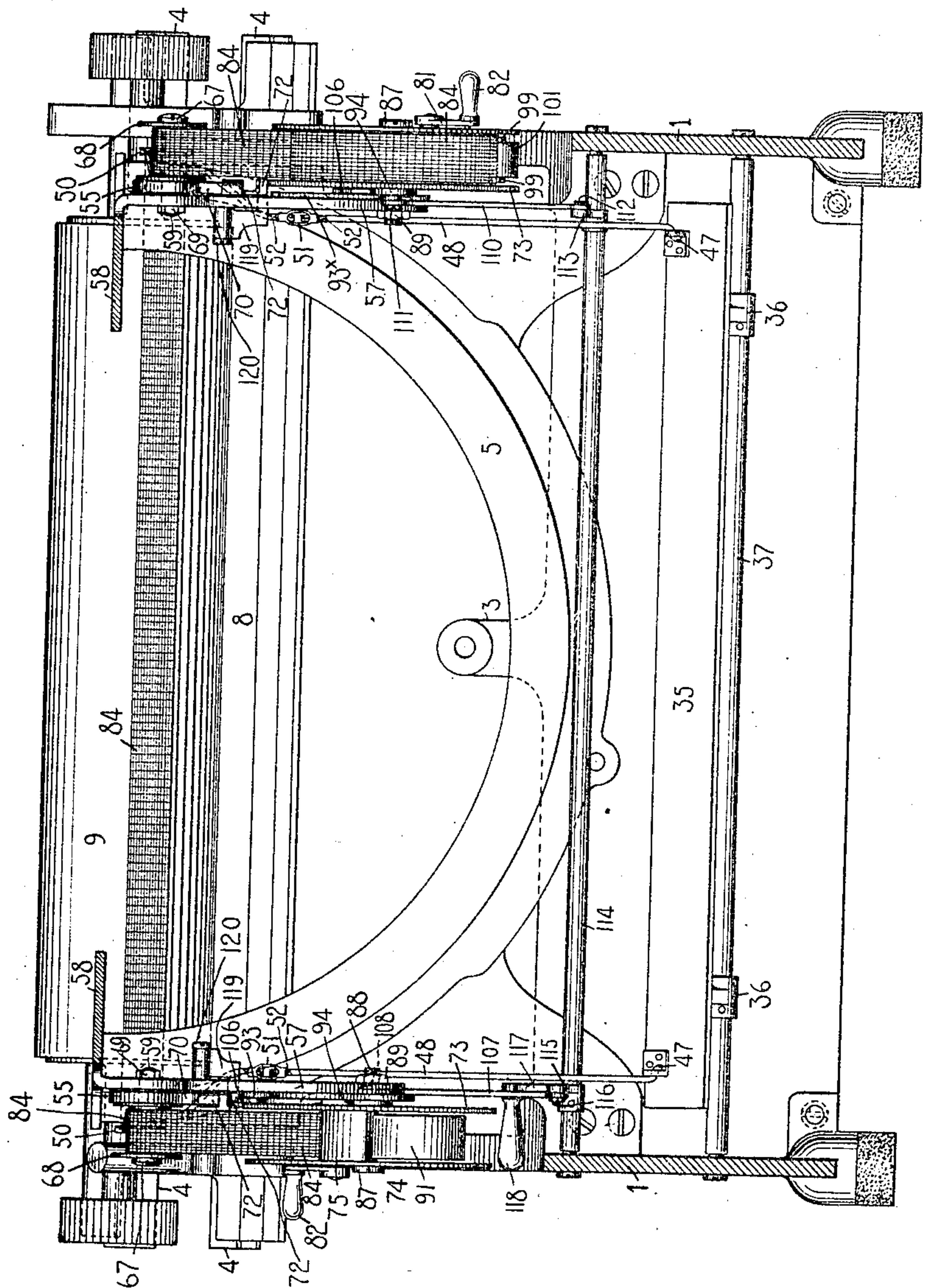
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4 SHEETS—SHEET 2.

FIG. 2.



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4 SHEETS—SHEET 3.

FIG. 4.

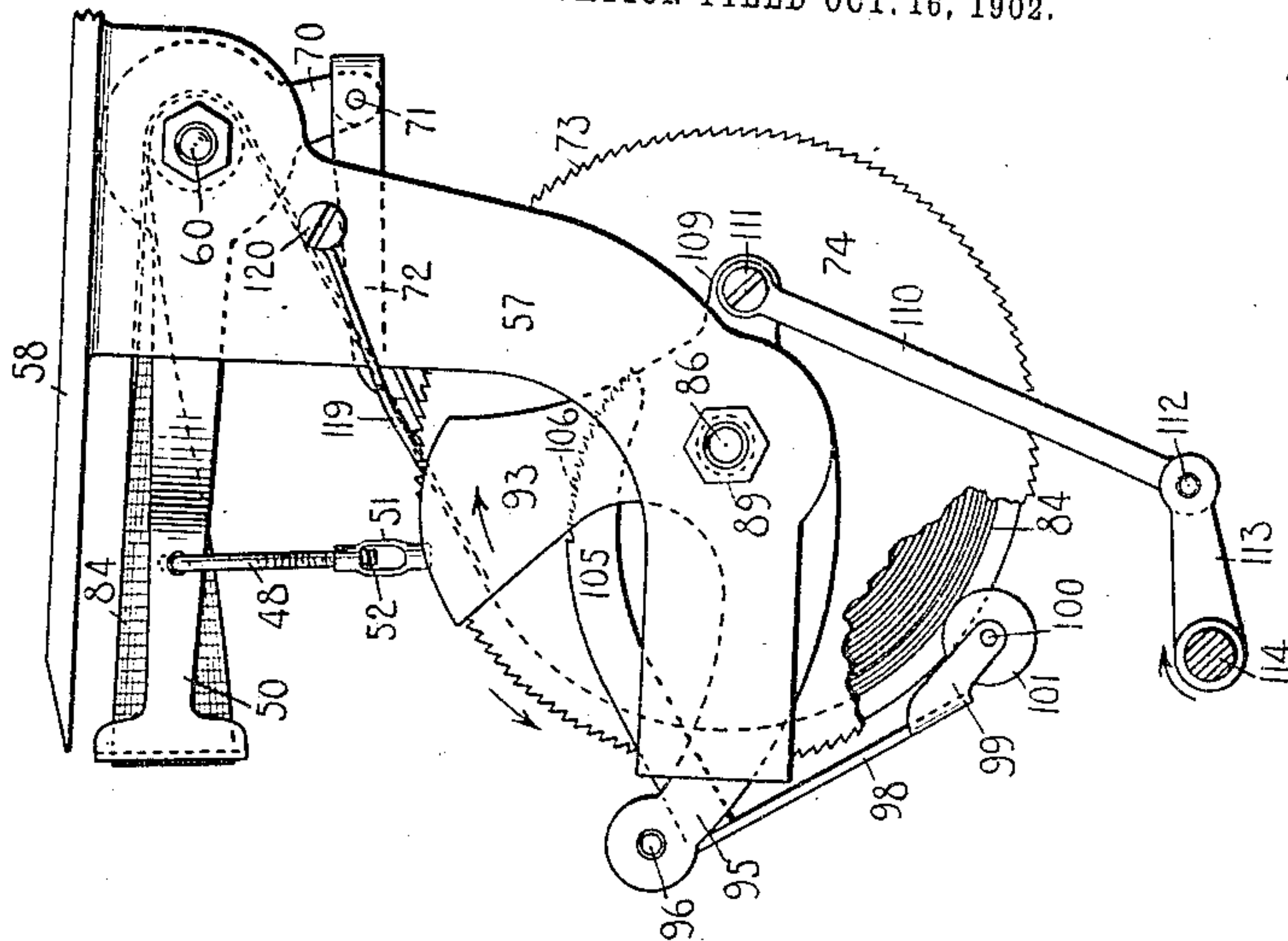
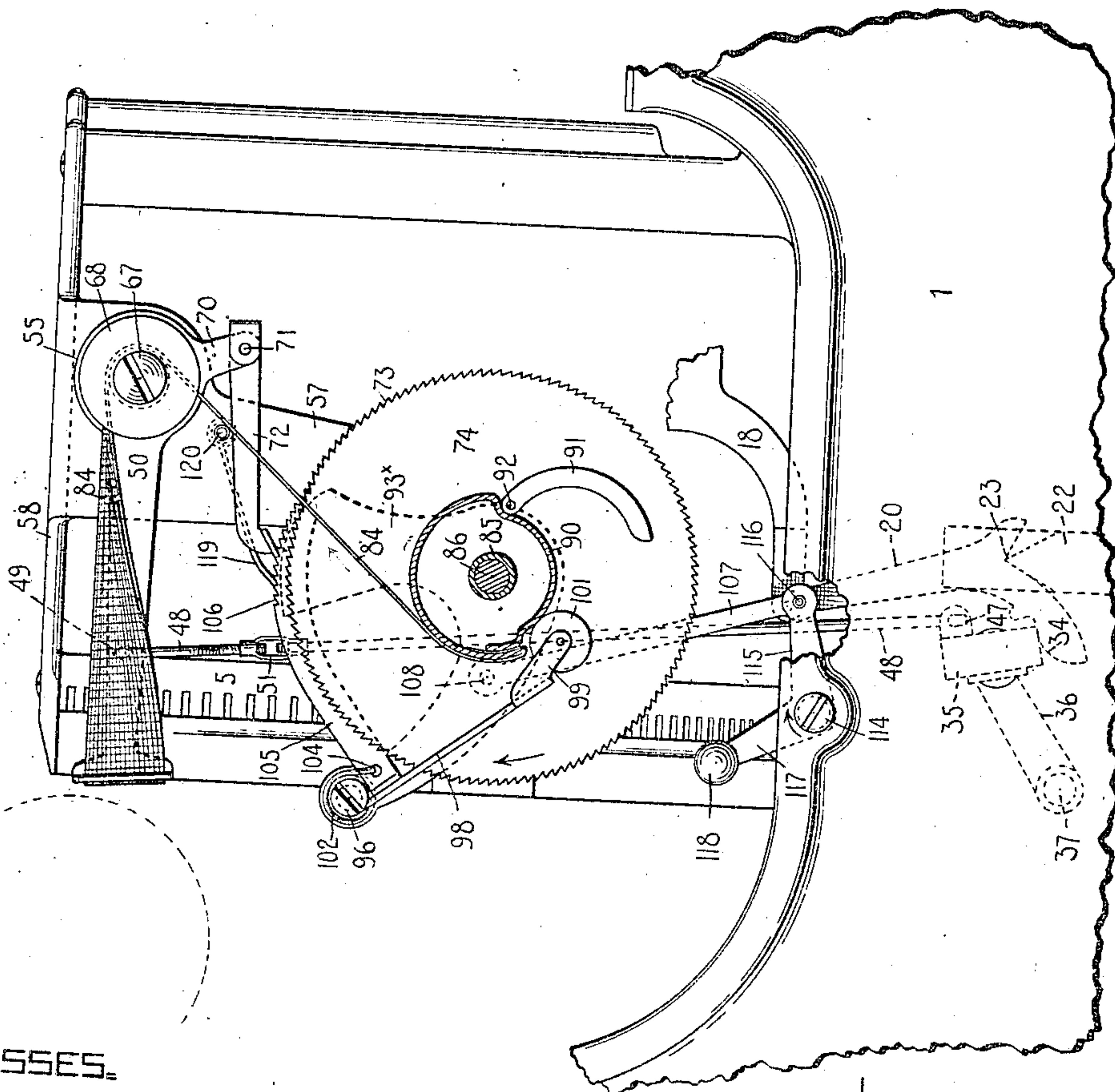


FIG. 3.



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4 SHEETS—SHEET 4.

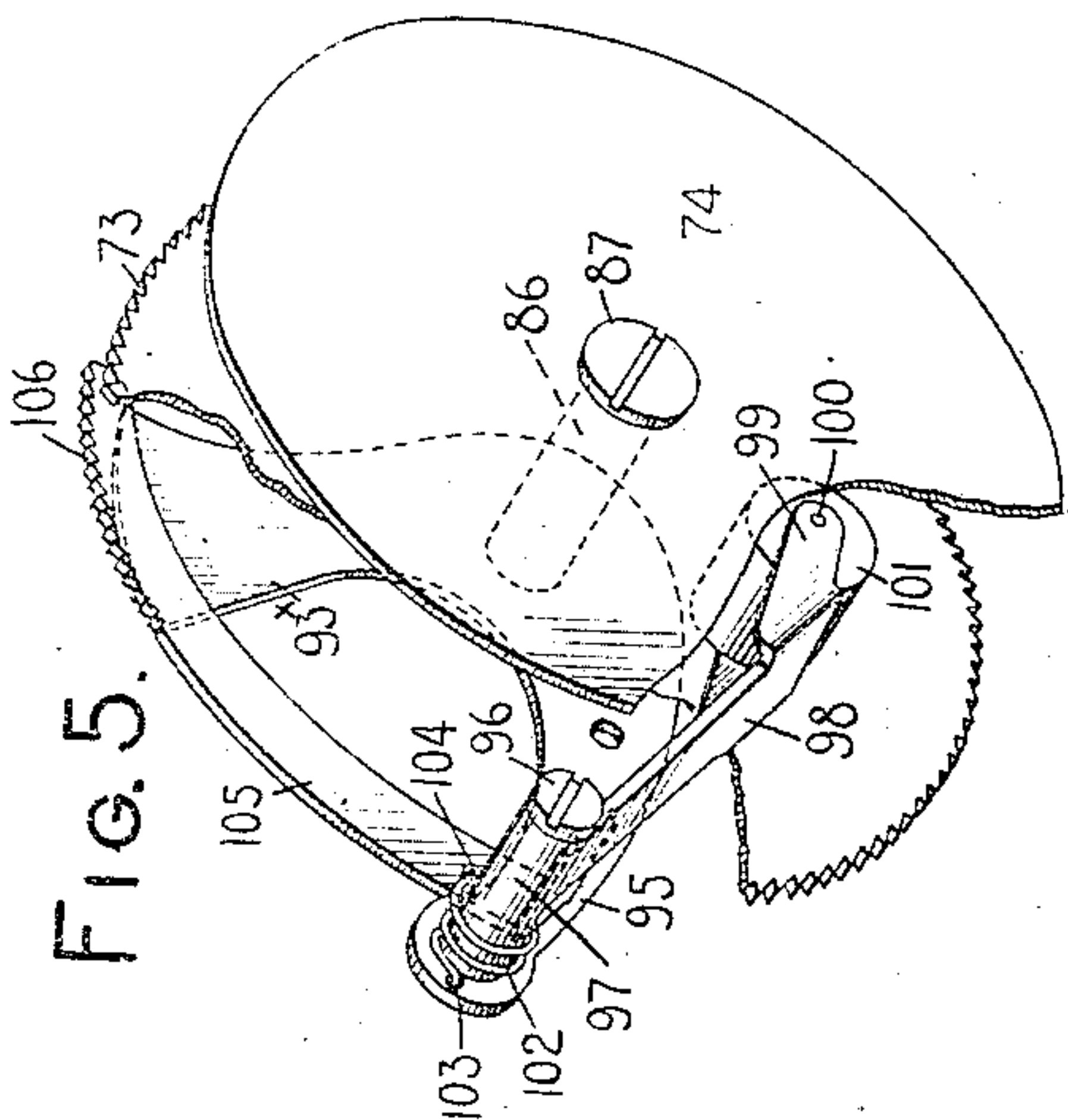
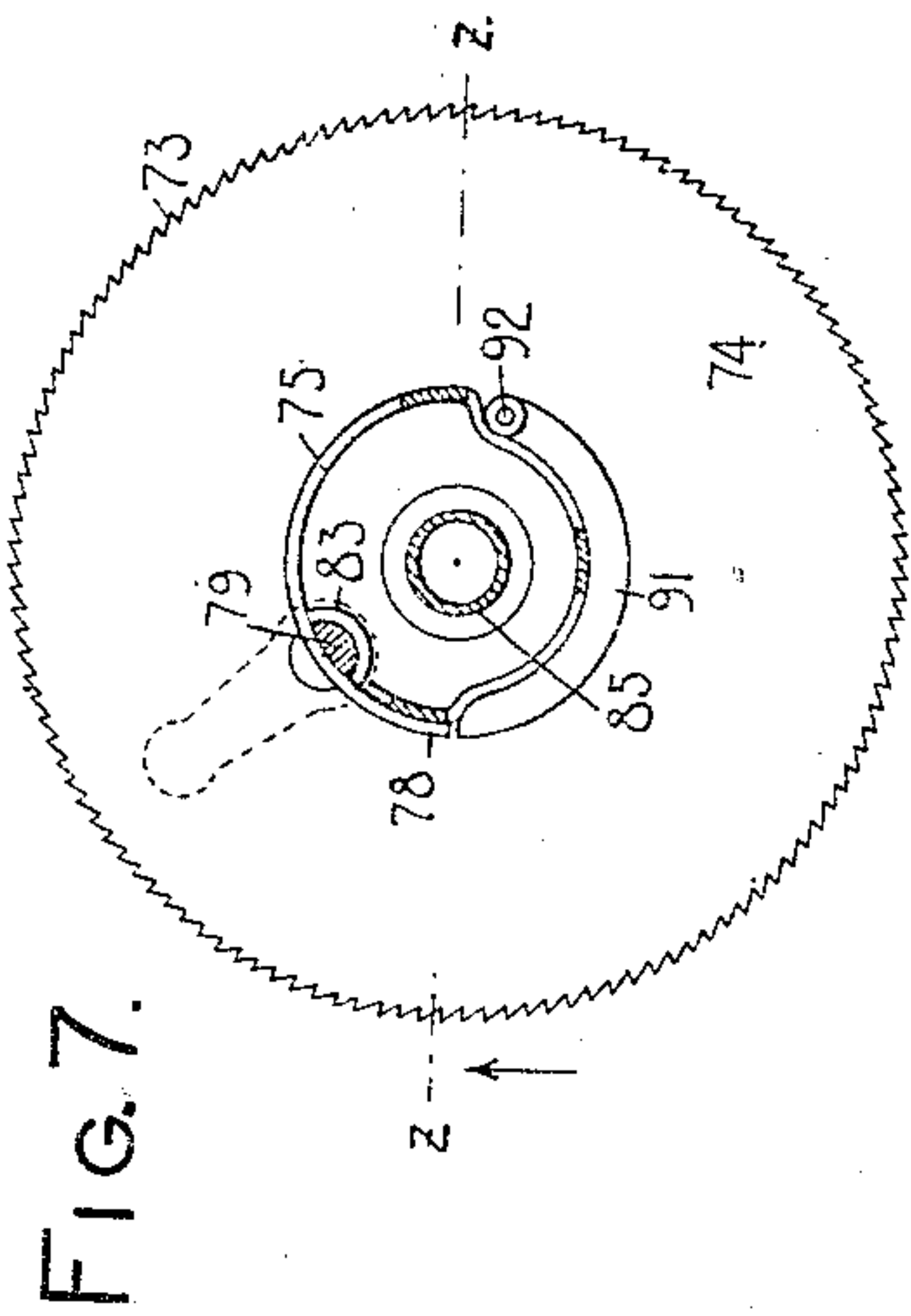
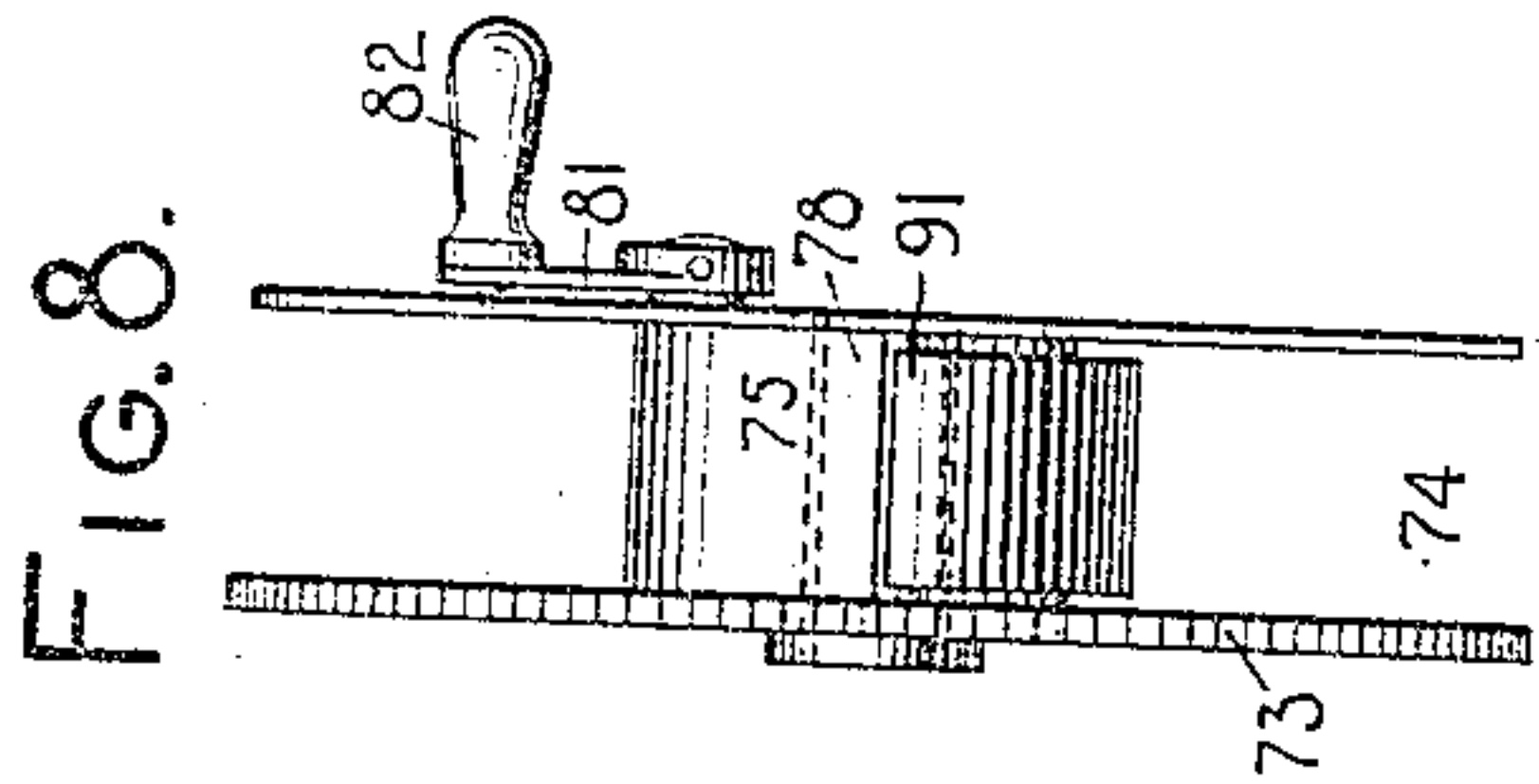
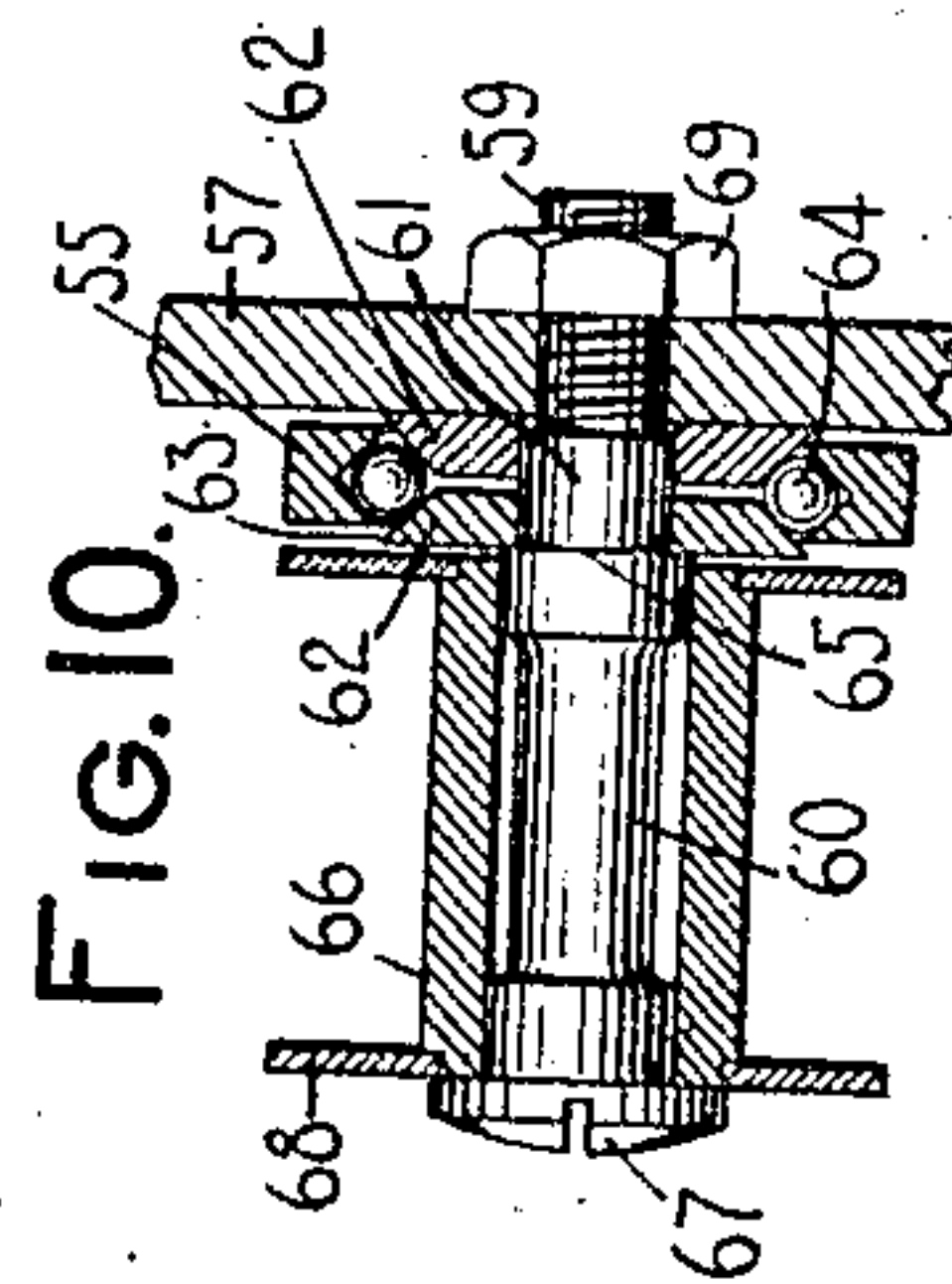
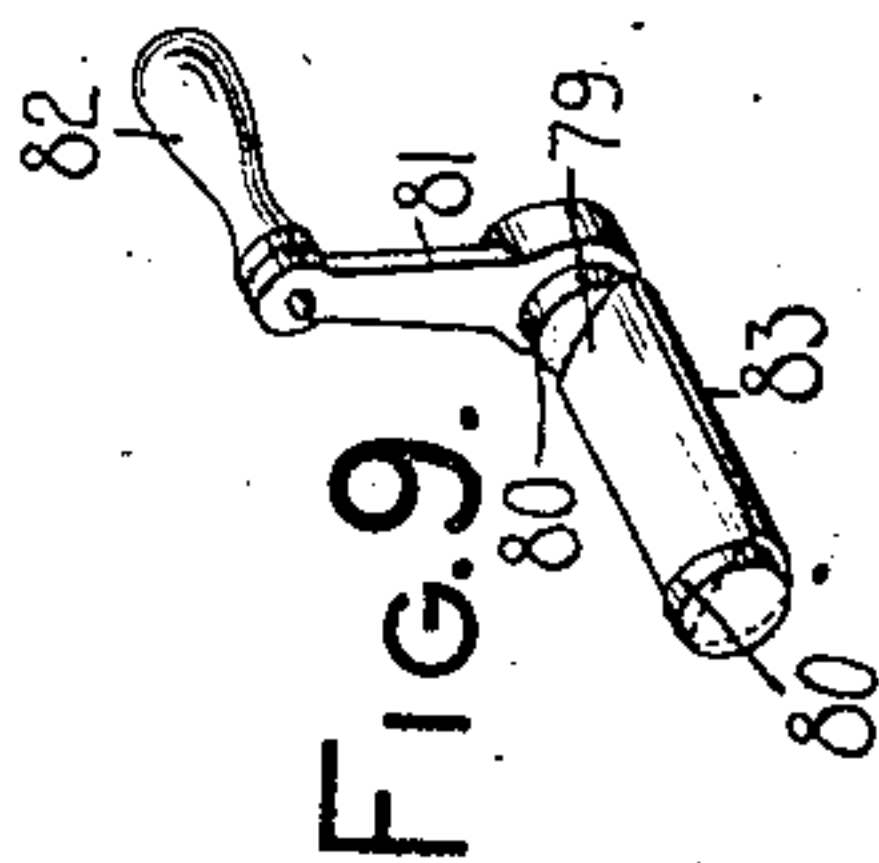
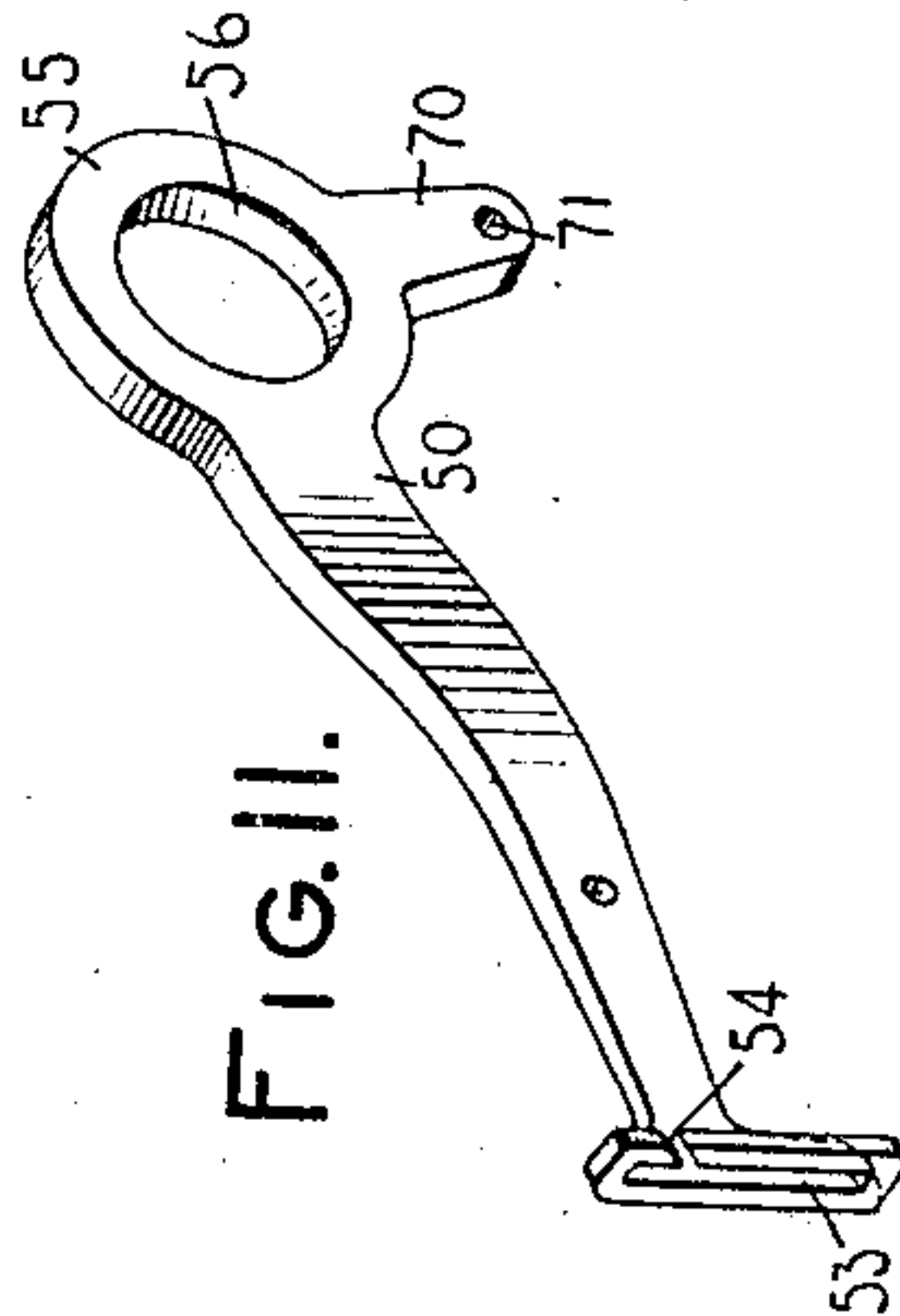
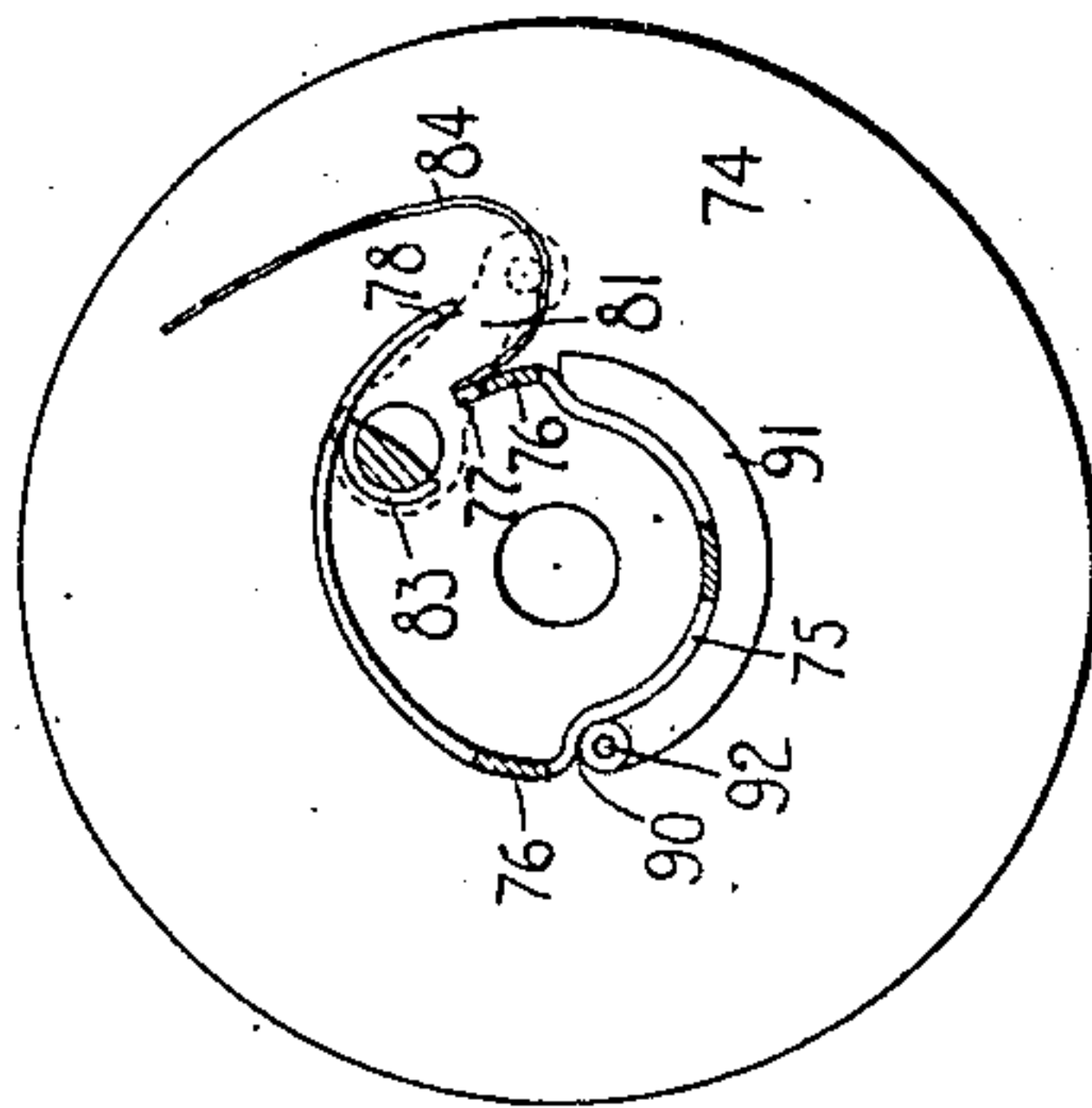


FIG. 6.



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UNITED STATES PATENT OFFICE.

ALEXANDER T. BROWN, OF SYRACUSE, NEW YORK.

TYPE-WRITING MACHINE.

No. 837,031.

Specification of Letters Patent.

Patented Nov. 27, 1906.

Application filed October 16, 1902. Serial No. 127,538.

To all whom it may concern:

Be it known that I, ALEXANDER T. BROWN, a citizen of the United States, and a resident of Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

My present invention relates to ribbon mechanism for type-writing machines; and one of the objects of my invention is to provide simple and efficient mechanism of the character specified.

A further object of the invention is to provide efficient mechanism for automatically reversing the direction of feed of the ribbon when an end thereof is approached.

To the above and other ends, which will hereinafter appear, my invention consists in the various features of construction, arrangements of parts, and combinations of elements to be hereinafter described and claimed.

In the accompanying drawings, wherein like reference characters indicate corresponding parts in the various views, Figure 1 is a side elevation, with parts broken away and in section, of one form of type-writing machines embodying my invention. Fig. 2 is a transverse sectional view of the same, the section being taken on the line *x x* of Fig. 1. Fig. 3 is an enlarged detail side view, with parts broken away and in section, of a portion of the ribbon mechanism. Fig. 4 is a detail side view, with parts broken away, of a portion of the ribbon mechanism at the opposite side of the machine, the view looking in the same direction as in Fig. 3. Fig. 5 is a detail perspective view, with parts broken away, of one of the ribbon-spools and certain of the associated parts. Fig. 6 is a vertical sectional view taken through the core of one of the ribbon-spools and illustrating the ribbon-engaging device in the released position. Fig. 7 is a like view of the same, showing the ribbon-engaging device in the locked or engaging position. Fig. 8 is an edge view of one of the ribbon-spools. Fig. 9 is a detail perspective view of the handle and releasing-cam for one of the ribbon-spools. Fig. 10 is a detail transverse sectional view, on an enlarged scale, through one of the supports for a ribbon-vibrator arm and ribbon-guide pulley. Fig. 11 is a detail perspective view of one of the ribbon-vibrator arms. Fig. 12 is a transverse sectional view of one of the ribbon-

spools, the section being taken on the line *z z* of Fig. 7.

In the various views parts have been omitted or broken away to more clearly illustrate other features of the construction.

While I have shown my invention applied to a front-strike type-writing machine, it should be understood that the various features of the invention may be employed in other characters of writing-machines, and that while certain features of the invention are particularly adapted to "visible-writing" machines other features may be employed in writing-machines of different characters, and that to these ends many changes may be made in the construction without departing from the spirit of my invention.

The frame of the machine comprises side plates 1, which are united by front and rear plates 2 and 3, respectively, by oppositely-grooved cross-rails 4, by a segment 5, and by other parts, as will hereinafter more clearly appear.

The grooved rails 4 are adapted to receive antifriction-balls 6, which are likewise received in grooved trackways 7 in the carriage 8, which supports a platen 9 and carries a depending feed-rack 10, by means of which a feed movement of the carriage is effected from end to end of the machine.

Finger-keys 11 are connected to key-stems 12, which are pivoted at their lower ends 13 each to one arm 14 of a bell-crank lever that is pivoted upon a rock-shaft 15 and has an upwardly-extending arm 16 thereof pivoted at 17 to a draw link or bar 18, the rear end of which is pivoted at 19 to a lever 20. Each of the levers 20 is received in a groove 21, formed in a cross-bar 22, that is supported by the side plates 1 of the machine, and in each groove 21 is contained a knife-edge or scale-bar 23, that receives a bifurcated portion of the lever 20 and affords a bearing therefor on which it may be vibrated fore and aft of the machine. Each lever 20 has a stud 24, over which a loop or link 25 is received, the lower end of which loop receives the hooked end of a restoring-spring 26, that is secured at its opposite end 27 in an opening in the plate 28, the latter being secured to the cross-bar by screws 29. Each substantially horizontal link 18 has an upwardly-extended arm 30, to which one end of a draw-link 31 is connected, the opposite end of each link 31 being connected at 32 to a projection

extending from a type-bar 33. The various type-bars 33 are mounted in the type-bar segment 5 and strike upwardly and rearwardly to the printing-point. The various levers 20 are disposed in a single horizontal plane and have bearing portions 34, that bear beneath the universal bar 35, which is carried upon arms 36, that project from a rock-shaft 37. Connected to the rock-shaft 37 is a dog-rocker 38, having integral feed-dogs 39, that are provided with oppositely-disposed beveled faces 40. The feed-dogs 39 cooperate with an escapement-wheel 41, which is operatively connected to a shaft 42 by means of the usual pawl-and-ratchet mechanism contained within the drum 43. The shaft 42 is received in bearings in the depending portion of the segment 5 and in the rear plate 3 of the machine and extends through the rear plate and has a pinion 44 secured thereto on its rear end. This pinion 44 meshes with a gear 45, which in turn meshes with the feed-rack 10. The gear 45 has an integral drum 46, formed thereon, and the drum contains the driving-spring for the carriage, said spring being secured to a central spindle at one end and to the drum and gear at the other.

From the foregoing description it will be understood that a depression of a finger-key results in the associated type-bar being thrown to the printing-point, and the forward oscillation of the associated lever 20 will cause the universal bar to be elevated, thus rocking the shaft 37 and affording a feed movement of the carriage for a letter-space distance through the escapement-wheel 41, pinion 44, gear 45, and feed-rack 10.

Near each end of the universal bar 35 is pivotally connected at 47 a two-part link 48, which extends upwardly and is connected at its upper end 49 to a ribbon-vibrator arm 50. Each link 48 is provided with means for adjusting the two parts thereof—such, for instance, as a turnbuckle 51, that cooperates with the screw-threads 52 on the two members that constitute each link 48, so that each link may be shortened or lengthened, so that the points of impact of the types on the ribbon may be varied. By reference to Fig. 11 it will be observed that each ribbon-vibrator arm 50 has a guide-receiving ribbon-slot 53 therein; one of the walls of which is split or slitted at 54 for the introduction and withdrawal of the ribbon and at the same time to prevent the accidental escape of the ribbon from the slot. The forward end of each vibrator-arm is provided with an eye 55, that has an internal V-shaped antifriction-roller-receiving groove 56. Each vibrator-arm is supported upon a side of the machine to a depending bracket-plate 57, that is preferably formed as an integral portion of a top plate member 58. Each bracket 57 has a tapped opening therein for the reception of

the threaded end 59 of a supporting-spindle 60. Each spindle is provided with a bearing portion 61, that receives the centrally-apertured bearing disks or washers 62, that have oppositely-beveled faces 63, that form a raceway for the antifriction-balls 64. Each spindle has a circumferential shoulder 65 formed thereon and which is adapted to bear against the outer disk 62, and thus afford an adjustment of the disks toward and away from each other, so as to compensate for wear upon the parts. The outer end portion of each spindle 60 constitutes a bearing for a ribbon-guide pulley 66, and the head 67 of the spindle bears against one of the flanges 68 of the pulley and prevents the withdrawal thereof from the spindle. Lock-nuts 69 may be employed to prevent an accidental unscrewing of the spindles from their bearings in the brackets 57. It will thus be seen that each spindle 60 constitutes a bearing for a vibrator-arm and for a ribbon-guide pulley and that an adjustment of the spindle in its bearing affords an adjustment of the bearing-plates for the antifriction-balls 64. The vibrator-arms extend upon each side of the machine, as indicated in Fig. 2. The rear ends thereof project beyond the rear face of the segment, so that the ribbon passes in a straight length from side to side of the machine between the vibrator-arms and between the segment and the front face of the platen.

From an examination of Fig. 1 it will be seen that each of the guide-pulleys 66 is coincident with the axis of vibration of the vibrator-arms, so that the ribbon in passing from one spool to another passes over these pulleys, and during the movement of the vibrator the ribbon will be moved laterally therewith on the axis of vibration of the ribbon-vibrator and will not be distorted or drawn during the movement of the vibrator to cover and expose the printing-point. In other words, the tension on the ribbon is substantially the same at all times whether the vibrator is moving or at rest.

Each vibrator-arm 50 is provided at the forward end thereof with a depending ear 70, that is pivoted at 71 to a rearwardly-extending bent gravity-feed pawl 72. Each pawl 72 is adapted to bear upon the peripheral ratchet-teeth 73, formed upon one of the heads or flanges of each ribbon-spool 74. The disk-like heads of each ribbon-spool are united by a hollow substantially cylindrical core 75, that is riveted to the heads of the spool, as indicated at 76. From an examination of Figs. 6 and 7 it will be seen that one transverse edge of this core is provided with teeth or serrations 77 and is riveted so as to be fixed with relation to the heads of the spool. The other transverse edge 78 of the core is adapted to overlap the serrated edge 77 and is free to spring by the inherent ten-

sion or resiliency of the metal to the overlapping position (indicated in Fig. 7) when permitted to do so. Extending through the core is a spindle 79, which has bearings 80, that are seated in the heads of the spool; and one of these bearings extends beyond the face of the outer end of the spool, where a crank-arm 81 is secured thereto, the crank-arm being provided with a handle 82, by means of which the spindle may be turned. That portion 83 of the spindle which extends through the hollow hub or core of the spool is eccentric to the axis of the spindle, so that when the spindle is turned by its handle from the position represented in Fig. 7 to that indicated in Fig. 6 the free resilient edge 78 of the core will be forced out of contact with the cooperating edge having the serrations 77. An end of the ribbon 84 may then be introduced between the edges of the core, and the handle may be turned with relation to the spool, so that the crank-arm extends in the position represented in Fig. 7, and the resiliency of the metal will force the free edge of the core to the position shown in Fig. 7, and thus clamp the ribbon in place and securely connect it to the spool.

It will be seen that the crank-arm when in the normal position where the ribbon is engaged by the core extends radially from the center on which the ribbon-spool turns, so that the handle 82 not only constitutes a means for effecting the engagement and disengagement of the ribbon from the spool, but likewise constitutes a handle by means of which the ribbon-spool may be turned. Extending through the hollow core of each spool is a bearing-sleeve 85, that is seated upon a spindle 86, that is provided with a head 87 at one end to prevent the withdrawal of the spool therefrom. The opposite end of the spindle is threaded at 88 and takes in a tapped opening in the lower portion of the associated bracket 57. A lock-nut 89 may be screwed on the threaded end of each spindle to the rear of the bracket-plate in order to prevent the accidental unscrewing of the spindle. The hollow core of each spindle is formed with a depression 90, that receives a segmental plate, gravity device, or latch 91, which is pivoted at 92 to the heads of the spool. The segmental plate 91 and the depression 90 in the core of the spool are so related that when the plate extends into the recess, as represented in Figs. 6 and 7, a core of substantially cylindrical form will be provided for the ribbon. The plate 91 of each spool extends from hub to hub of the spool and is supported within the recess by the layers of ribbon wound upon the core and is permitted to swing on its pivot 92 by gravity, as represented in Fig. 3, when the ribbon has been fully unwound from the spool.

The spindles 86 for the ribbon-spools constitute bearings for cam-plates or disengag-

ing devices 93 or 93^x, each of which is prevented from moving laterally by the associated bracket 57 and a collar 94 on the ribbon-spool, which latter likewise maintains the spool out of contact with the cam-plate. Each cam-plate 93 or 93^x has a forwardly-extending arm 95, that carries a laterally-extending screw pin or pivot 96, that projects across the space between the heads of the associated ribbon-spool, as represented in Fig. 5. Surrounding each fixed pivot 96 is a sleeve 97, that constitutes a portion of an arm 98, formed with bearings 99 at the free end thereof for the reception of the pivot 100 of a bearing-roller 101. A spring 102 is connected at one end 103 to the arm 95 and at its opposite end 104 to the sleeve 97, and the tension of this spring is exerted to force the roller 101 into contact with the outer surface-ribbon on the spool. The arm 98 for each ribbon-spool has an arm or bar 105 secured thereto and the upper edge of the rear end of which is provided with ratchet-teeth 106, that extend in the same direction as the ratchet-teeth 73 on the ribbon-spools, and each arm 105 is adjacent to the head of the associated spool which carries the ratchet-teeth, so that when the arm 105 is turned to the position represented in Figs. 3 and 5 it brings the teeth thereon into position to be acted upon by the associated feed-pawl, and at this time the said pawl is maintained out of cooperation with the teeth 73 on the ribbon-spool. The cam-plate 93^x on the right-hand side of the machine has an upright link 107 pivoted to the forwardly-extending arm thereof at 108, whereas the cam-plate 93 on the left-hand side of the machine has a rearwardly-extending ear 109, to which an upright link 110 is pivoted at 111. The lower end of the link 110 is pivoted at 112 to a crank-arm 113, secured to a rock-shaft 114, that extends from side to side of the machine and is provided with a second crank-arm 115 at the right side of the machine, which is pivoted at 116 to the link 107 and is preferably extended at 117 to form a crank-arm which carries a handle 118, by means of which the rock-shaft and the parts connected thereto may be moved by hand.

From a comparison of Figs. 3 and 4 it will be seen that the links 107 and 110 connect with their cams on the opposite sides of the pivotal centers of the spools, so that a rocking of the shaft 114 will cause the cam at one side of the machine to be vibrated toward the rear of the machine, whereas the cam at the opposite side of the machine will be vibrated forwardly. The effect of these movements is to cause the peripheral cam-like edge of one cam-plate to be moved rearwardly and upwardly into the path of the associated vibrating-pawl 72, as well as into the path of the associated gravity holding-pawl 119, that is pivoted at 120 to the inside face of

the associated bracket 57. This movement of the cam-plate at one side of the machine not only carries it into the path of the associated pawls 72 and 119, but projects the edge of the cam beyond the teeth of the associated ratchet-wheel 73, so that the pawls are moved out of engagement with the ratchet-teeth, as indicated in Fig. 3, and rest upon the smooth edge of the cam. At this time the cam at the opposite side of the machine will, as heretofore explained, be moved to the position represented in Fig. 4, where the associated feed and holding pawls 72 and 119, respectively, are permitted to engage the ratchet-wheel of the associated ribbon-spool. The automatic movement of these cams 93 and 93^x depends upon the bearing-rollers 101. Thus when the ribbon is fully wound upon a spool its associated bearing-roller 101 will be maintained in the position represented in Fig. 4 and will be permitted to move around its pivot 96 toward the pivotal center of the spool as the ribbon is unwound and passes to the other spool. These movements of the bearing-rollers toward the pivotal centers of the ribbon-spools cause the bars or frames 105 to be moved from the position represented in Fig. 4 to that indicated in Fig. 3, the latter position being attained when the ribbon is fully unwound from the associated spool and when the layers of ribbon have uncovered the plate or latch 91 and it is permitted to drop to the position shown. This movement of the arm or bar 105 carries it beyond the peripheral teeth 73 and beyond the cam-like edge of the plate 93 or 93^x, thereby effecting an engagement of the pawls 72 and 119 with the teeth 106 on the arm 105. At the next forward oscillation of the feed-pawls 72 the engaged arm 105 is moved toward the front of the machine, thus moving the associated cam 93 or 93^x to the position shown in Fig. 4, which enables the associated pawls 72 and 119 to engage the teeth 73 of their ratchet-wheel, and the next forward oscillation of the feed-pawl will cause the ratchet-wheel and spool to be rotated in the direction of the arrow in Fig. 4 instead of rotating in an opposite direction, as it was when the spool at the opposite side of the machine was being positively fed by its actuating mechanism. The reversal of the direction of the feed thus brought about first forces the bearing-roller 101, Fig. 3, out of the recess, immediately moving its arm 105 below the teeth of its ratchet-wheel, and a further rotation of the spool causes the plate or latch 91 to drop into its recess by gravity, so that when the recess is again brought opposite the roller the latter is prevented from dropping in this recess, and the further turning of the spool will wind the ribbon over the plate, thus maintaining it in place in the recess until the ribbon is again unwound and the ratchet-teeth 106 are thus

maintained in a position where they cannot be engaged by their pawl 72. During the winding of the ribbon on the empty spool the associated bearing-roller 101 will be gradually moved with its arm 98 around the pivotal center 96, thus further withdrawing the free end of the associated arm 105 toward the pivotal center of the spool, as represented in Fig. 4. It will be understood that an automatic movement of the cam 93 or 93^x at one side of the machine through the feed-pawl 72 engaging the teeth 106 in the manner described will cause a rocking movement of the shaft 114, the direction of movement of the shaft depending on which feed-pawl 72 causes its actuation. Thus, for instance, an actuation of the cam 93^x at the right-hand side of the machine through its ratchet-bar 105 and pawl 72 will depress the link 107 and turn the rock-shaft 114 in the direction of the arrow in Figs. 3 and 4. This movement of the rock-shaft has the effect of throwing the cam 93 at the opposite side of the machine in the direction of the arrow thereon in Fig. 4 and to a position where the associated feed and holding pawls will be forced and maintained out of engagement with the cooperating ratchet-wheel, so that in this manner the direction of the feed of the ribbon is automatically reversed when an end thereof is approached.

Should the operator desire at any time to change the direction of the feed of the ribbon, it is merely necessary to rock the shaft 114 through the handle 118, and thus change the relative positions of the cams or controlling devices 93 and 93^x, thereby throwing the inactive cam to a position corresponding to that indicated in Fig. 4, whereas the opposite cam will be moved to a position corresponding to that indicated in Fig. 3, where the associated pawls 72 and 119 will be prevented from engaging the ratchet-wheel, and the movement of the feed-pawl 72 at this time will merely cause the nose thereof to ride on the face of the cam without engaging the ratchet-wheel.

By my invention it will be observed that I have provided a simple and efficient construction for automatically reversing the direction of feed of the ribbon when an end thereof is approached and which may be reversed by hand at will and that the construction is such that no strain is borne by the ribbon in order to effect a reversal in the direction of the feed thereof, so that there is no opportunity of causing an injury to the ribbon or of maintaining it in a fixed position throughout several strokes of type-bars during the reversing operation, as is usually the case in structures heretofore devised. Furthermore, it will be observed that the entire pressure which is necessary to effect a reversal in the direction of feed of the ribbon is borne by the finger-keys and that no appreciable increase in pressure is necessary to effect the reversal in the

direction of the feed of the ribbon and that the movement of the devices 105 to and from a position where they may be engaged by the feed-pawls 72 is automatically effected without any strain on the ribbon or the finger-keys. It will likewise be seen that there is no dead-center position, so to speak, of the ribbon during the reversal in its feed movements, the change in the direction of the feed being instantaneous. Thus just before the bearing-roller 101 of the right-hand ribbon-spool drops into the recess in the hub or core thereof that same spool is fed in the direction of the arrow thereon in Fig. 3 by the pull of the ribbon on the spool, whereas the next feed movement of the spool will cause the roller to drop into the recess, thereby instantly bringing the ratchet-teeth 106 to a position where they are engaged by the associated feed-pawl 72, so that the next few succeeding movements of the finger-keys will cause the cam 93^x to be depressed or thrown out of the path of the pawl to permit it to engage the teeth 73, and this same ribbon-spool will be fed in an opposite direction.

In ribbon-reversing mechanism heretofore devised considerable difficulty has been encountered by reason of the fact that during the reversing operation it requires several strokes on the finger-keys after the ribbon has ceased to move in one direction before it can be started in the opposite direction, and hence, of course, the ribbon is not fed in either direction. The result is that several types will successively impinge at the same point on the ribbon and either a faint impression or no impression at all will be produced and impressions of different degrees of intensity result. By my invention I overcome these difficulties, as pointed out above.

It will be understood from the foregoing description that the various parts of the ribbon mechanism are readily accessible to the operator and can be readily disconnected without the necessity of dismantling other parts of the machine and that the ribbon mechanism is simple in construction, efficient in operation, and is not liable to be broken or to get out of repair. All of the strain necessary to actuate the reversing mechanism is borne by the universal bar and the key-levers direct and does not interfere with the escapement mechanism, so that even if the ribbon mechanism becomes broken it does not affect other parts of the structure. Again, it will be understood that it is not necessary to rely upon the skill of the operator to connect the ribbon, so that the ribbon-reversing mechanism may be automatically operated, and that no pins or studs need be properly positioned before the reversal can be effected.

From the foregoing description it will be understood that the feed-pawls 72 are actuated by the ribbon-vibrator and constitute means for automatically effecting a reversal

in the direction of the feed of the ribbon when an end thereof is approached; that the ratchets or rack-bars 105 106 constitute spring-pressed pivoted frames controlled by said pawls 72 for effecting a reversal in the direction of the feed of the ribbon; that the cam-like controlling disengaging or shifting devices 93 93^x maintain one of the pawls 72 disengaged when the other is in engagement with its cooperating ratchet mechanism; that the pivoted arms 98 constitute bearing arms, pieces, or devices that are adapted, through their rollers 101, to bear upon the outer surfaces of the ribbon on the spools and to be maintained in the inoperative position thereby; that said arms 98 constitute spring-pressed roller-carrying frames having ratchet-faces 106 thereon; that the bearing-arms 98 bear on the ribbon-spools and move toward the axes of the spools as the ribbon is unwound and are connected to and control the reversing mechanism or devices. In other words, the bearing-arms 98 constitute the primary means which set or render the reversing devices effective. Furthermore, it will be seen that the segmental plates or latches 91 with the ribbon on the spools maintain the roller-carrying arms in the normal positions and the reversing mechanism inoperative until an end of the ribbon is approached, when the reversing mechanism is rendered effective through said roller-carrying arms.

Certain of the features shown are not claimed herein, but are claimed in separate applications filed by me herewith. The paper-carriage construction and mounting herein shown are claimed in my applications, Serial No. 305,053, filed March 9, 1906, and Serial No. 322,699, filed (renewed) June 21, 1906. The type-action construction shown herein is claimed in my application, Serial No. 127,536; filed October 16, 1902.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a type-writing machine, the combination of a ribbon-vibrator, and ribbon-feed mechanism actuated by said ribbon-vibrator and through connections independent of the means for actuating the vibrator.

2. In a type-writing machine, the combination of a ribbon-vibrator, ribbon-feed mechanism actuated through said ribbon-vibrator and by the power applied thereto, and means for automatically effecting a reversal in the direction of the feed of said ribbon.

3. In a type-writing machine, the combination of a ribbon-vibrator, ribbon-feed mechanism actuated by said ribbon-vibrator, and means controlled by said vibrator for automatically effecting a reversal in the direction of the feed of said ribbon when an end thereof is approached.

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

nation of a universal bar, a ribbon-vibrator actuated by said universal bar, and ribbon-feed mechanism actuated directly by the ribbon-vibrator.

- 5 5. In a type-writing machine, the combination of a universal bar, a ribbon-vibrator actuated by said universal bar, ribbon-feed mechanism actuated by the ribbon-vibrator, and means actuated by the ribbon-vibrator
10 for automatically effecting a reversal in the direction of the feed of the ribbon.
6. In a type-writing machine, the combination of a ribbon-vibrator, a ratchet-wheel, and a cooperating pawl directly connected to
15 and actuated by the ribbon-vibrator for feeding the ribbon.
7. In a type-writing machine, the combination of ribbon-spools, a ribbon-vibrator, a ratchet-wheel for each ribbon-spool, and a
20 pawl for each ratchet-wheel, which pawls are operatively connected to and are actuated by the ribbon-vibrator by means independent of the means for actuating the vibrator.
8. In a type-writing machine, the combination of ribbon-spools, a ribbon-vibrator, a
25 ratchet-wheel for each ribbon-spool, a pawl for each ratchet-wheel, which pawls are operatively connected to and are actuated through the ribbon-vibrator by the power
30 applied thereto, and means controlled by the ribbon for automatically rendering one of said pawls ineffective when the other is effective to rotate its ratchet-wheel.
9. In a type-writing machine, the combination of ribbon-spools, a ribbon-vibrator, a
35 ratchet-wheel for each ribbon-spool, a pawl for each ratchet-wheel, which pawls are directly connected to and are actuated by the ribbon-vibrator, and means for automatically
40 rendering one of said pawls ineffective and the other effective to rotate its ratchet-wheel when an end of the ribbon is approached, so as to automatically change the direction of feed of the ribbon.
- 45 10. In a type-writing machine, the combination of a universal bar, a ribbon-vibrator connected to and actuated by said universal bar, ribbon-spools, and pawl-and-ratchet mechanism actuated through the ribbon-vibrator and by the power applied thereto to
50 rotate the ribbon-spools.
11. In a type-writing machine, the combination of a universal bar, a ribbon-vibrator connected to and actuated by said universal
55 bar, ribbon-spools, pawl-and-ratchet mechanism actuated through the ribbon-vibrator and by the power applied thereto to rotate the ribbon-spools, and means controlled by the ribbon to change the direction of feed of
60 the ribbon when an end thereof is approached.
12. In a type-writing machine, the combination of a ribbon-vibrator, a universal bar, a link forming a direct connection between
65 the universal bar and vibrator, ribbon-spools, pawls for rotating said ribbon-spools,

which pawls are connected to and actuated by the ribbon-vibrator, and ratchet-wheels which cooperate with the pawls and are operatively connected to the ribbon-spools.

13. In a type-writing machine, the combination of a ribbon-vibrator, a universal bar,
70 a link which forms a direct connection between the universal bar and vibrator, ribbon-spools, pawls for rotating said ribbon-spools, which pawls are connected to and actuated
75 by the ribbon-vibrator, ratchet-wheels which cooperate with the pawls and are operatively connected to the ribbon-spools, and means for automatically rendering one pawl effective and the other ineffective when an end of
80 the ribbon is approached, whereby the direction of feed of the ribbon is automatically changed.

14. In a type-writing machine, the combination of a ribbon-vibrator, a ribbon-spool, a
85 pressing device that is adapted to bear upon the ribbon on said spool and to move toward the center of the spool as the ribbon is unwound, and a shiftable ribbon-reversing device, means for shifting said reversing device,
90 the reversing device being connected to said pressing device and adapted to be thrown into position to be operated by the means for shifting it when the ribbon unwinds from the spool and an end of the ribbon
95 is approached.

15. In a type-writing machine, the combination of a ribbon-spool, a pressing device that is adapted to bear upon the ribbon on
100 said spool, and a ribbon-reversing device that is connected to said pressing device and is adapted to be thrown into operative position when the ribbon unwinds from the spool and an end of the ribbon is approached and to be
105 actuated by the ribbon-vibrator to change the direction of feed of the ribbon.

16. In a type-writing machine, the combination of a ribbon-vibrator, a movable part that is actuated thereby, a ribbon-reversing
110 device, and means for automatically moving the reversing device into cooperation with the said movable part when an end of the ribbon is approached.

17. In a type-writing machine, the combination of a pair of ribbon-spools, a reversing
115 device for each ribbon-spool, a ribbon-vibrator, means for automatically effecting the movement of one reversing device into operative position and into the path of a part connected to the ribbon-vibrator when the
120 other reversing device is moved out of operative position.

18. In a type-writing machine, the combination of two ribbon-spools, a ratchet-wheel for each ribbon-spool, a pawl for each
125 ratchet-wheel, a ribbon-vibrator which is connected to and actuates said pawls by means independent of the means for actuating the vibrator, and means for disengaging one pawl and effecting an engagement of the other with
130

its ratchet-wheel when an end of the ribbon is approached.

19. In a type-writing machine, the combination of two ribbon-spools, a ratchet-wheel for each ribbon-spool, a pawl for each ratchet-wheel, a ribbon-vibrator which is connected to and actuates said pawls by means independent of the means for actuating the vibrator, a universal bar, a link connecting the vibrator to the universal bar so that a movement of the latter effects a movement of the vibrator, and means for disengaging one pawl and effecting an engagement of the other with its ratchet-wheel when an end of the ribbon is approached.

20. In a type-writing machine, the combination of a vibrator, pawls connected to said vibrator, and means actuated by said pawls for feeding the ribbon and for automatically effecting a change in the direction of its feed when an end thereof is approached.

21. In a type-writing machine, the combination of a pair of ribbon-spools, a pair of ratchet-wheels, one for each spool, a pair of cooperating feed-pawls, a pair of reversing devices with which said pawls likewise cooperate and which are actuated by said pawls to effect the engagement of one and the disengagement of the other from its ratchet-wheel, and means for automatically moving one of said reversing devices into and the other out of the operative position when an end of the ribbon is approached.

22. In a type-writing machine, the combination of a pair of ribbon-spools, a pair of pawls and cooperating means for effecting the feed movement of said spools, and ribbon-reversing mechanism independent of said cooperating means and which is operated by said pawls.

23. In a type-writing machine, the combination of a pair of ribbon-spools, a pair of pawls and cooperating means for effecting the feed movement of said spools, ribbon-reversing mechanism independent of the means for effecting a feed movement of the spools and which is operated by said pawls, and means that enable the reversing mechanism to be actuated by said pawls when an end of the ribbon is approached.

24. In a type-writing machine, the combination of a pawl-and-ratchet mechanism for effecting an intermittent feed of the ribbon, and means independent of said ratchet mechanism and controlled by said pawls for affording an automatic reversal in the direction of the feed of the ribbon.

25. In a type-writing machine, the combination of a pawl-and-ratchet mechanism for effecting an intermittent feed of the ribbon, means independent of said ratchet mechanism and controlled by said pawls for affording an automatic reversal in the direction of the feed of the ribbon, and means for rendering the pawls operative to effect a re-

versal of the feed of the ribbon when an end thereof is approached.

26. In a type-writing machine, the combination of a pair of ribbon-spools, a pair of ratchet-wheels one for each spool, a pair of cooperating feed-pawls, a ribbon-vibrator which actuates said pawls, a pair of reversing devices with which said pawls likewise cooperate and which are actuated by said pawls to effect the engagement of one and the disengagement of the other from its ratchet-wheel, and means for automatically moving one of said reversing devices into and the other out of the operative position when an end of the ribbon is approached.

27. In a type-writing machine, the combination of a pair of ribbon-spools, a pair of pawls for effecting the feed movement of said spools, a ribbon-vibrator which is connected to said pawls and by which they are actuated, and ribbon-reversing mechanism which is operated by said pawls.

28. In a type-writing machine, the combination of a ribbon-vibrator, pawl-and-ratchet mechanism which is actuated by said ribbon-vibrator to effect an intermittent feed of the ribbon, and means controlled by said pawls for affording an automatic reversal in the direction of the feed of the ribbon.

29. In a type-writing machine, the combination of a pawl, a rack-bar with which said pawl cooperates, means for moving said rack-bar into the path of the pawl, and means controlled by said rack-bar for affording a change in the direction of the feed of the ribbon.

30. In a type-writing machine, the combination of a pair of ribbon-spools, a pair of pawls, a ratchet-bar for each pawl, means controlled by said ratchet-bars for rendering one of said pawls effective and the other ineffective to rotate the ribbon-spools, and means for automatically affording an operative engagement between one or the other of said pawls and a ratchet-bar when an end of the ribbon is approached.

31. In a type-writing machine, the combination of a pair of ribbon-spools, a pair of pawls, a ratchet-bar for each pawl, means controlled by said ratchet-bars for rendering one of said pawls effective and the other ineffective to rotate the ribbon-spools, and presser devices which bear on the ribbon on said spools and automatically move one of said ratchet-bars into the path of its cooperating pawl when an end of the ribbon is approached.

32. In a type-writing machine, the combination of a pair of ribbon-spools, a ratchet-wheel for each ribbon-spool, a pawl for each ratchet-wheel, means for actuating said pawls to rotate the ribbon-spools, a ratchet-bar which is adapted to cooperate with each pawl, a pawl-disengaging device for each pawl, which disengaging devices are actuated

by said ratchet-bars, and means for automatically effecting an engagement between one of said pawls and its ratchet-bar when an end of the ribbon is approached.

5 33. In a type-writing machine, the combination of two ratchet-bars, means for automatically moving either of said ratchet-bars to the operative position when an end of the ribbon is approached, means controlled by
10 said ratchet-bars for affording a change in the direction of the feed of the ribbon, and means for engaging said ratchet-bars when they are in the operative positions.

34. In a type-writing machine, the combination of two ratchet-bars, means for automatically moving either of said ratchet-bars to the operative position when an end of the ribbon is approached, means controlled by
15 said ratchet-bars for affording a change in the direction of the feed of the ribbon, a ribbon-vibrator, and means actuated by the ribbon-vibrator for engaging said ratchet-bars when they are in the operative positions.

35. In a type-writing machine, the combination of a pair of ribbon-spools, a ratchet-wheel for each ribbon-spool, a pawl for each
20 ratchet-wheel, means for vibrating said pawls to effect a step-by-step feed of the ribbon, a ratchet-bar for each pawl, a cam-like disengaging device for each pawl, intermediate connections between said disengaging devices, whereby when one disengaging device
25 is moved into the disengaging position the other will be moved into an engaging position, connections between said ratchet-bars and the disengaging devices so that a movement of the former will move the latter, and
30 means for automatically effecting an engagement between one of said pawls and a ratchet-bar when an end of the ribbon is approached.

36. In a type-writing machine, the combination of pawl-and-ratchet mechanism for moving the ribbon in opposite directions,
45 shifting means for maintaining one pawl disengaged when the other is in engagement with its cooperating mechanism, bearing devices, and means controlled by said bearing devices and cooperating with said pawls and
50 which are brought into the path of one or the other of said pawls when an end of the ribbon is approached to afford a movement of the shifting means to change the direction of the feed of the ribbon.

37. In a type-writing machine, the combination of pawl-and-ratchet mechanism for moving the ribbon in opposite directions, a ribbon-vibrator that actuates said pawls, a
55 universal bar to which the ribbon-vibrator is connected, shifting means for maintaining one pawl disengaged when the other is in engagement with its cooperating ratchet mechanism, bearing devices, and means controlled
60 thereby and which are brought into the path of one or the other of said pawls when an end

of the ribbon is approached to afford a movement of the shifting means to change the direction of the feed of the ribbon.

38. In a type-writing machine, the combination of a pair of ribbon-spools, a ratchet-wheel for each ribbon-spool, a pawl for each
70 ratchet-wheel, a ribbon-vibrator which actuates said pawls to effect a step-by-step feed of the ribbon, a universal bar to which the ribbon-vibrator is connected, a ratchet-bar
75 for each pawl, a disengaging device for each pawl, intermediate connections between said disengaging devices, connections between said ratchet-bars and the disengaging devices so that a movement of the former will
80 move the latter, and means for automatically effecting an engagement between one of said pawls and a ratchet-bar when an end of the ribbon is approached.

39. In a type-writing machine, the combination of ribbon-spools, means for moving
85 said ribbon-spools intermittently to effect a step-by-step feed of the ribbon, and a ribbon-reversing device that is adapted to be automatically thrown into the path of the ribbon-
90 moving means to be actuated thereby when an end of the ribbon is approached.

40. In a type-writing machine, the combination of ribbon-spools, spring-pressed rollers that are adapted to bear on the ribbon on
95 said spools, means for moving said ribbon-spools intermittently to effect a step-by-step feed of the ribbon, and ribbon-reversing devices which are actuated by said moving
100 means and which are operatively connected to each of said spring-pressed rollers and the shifting of which into the path of the moving means is automatically determined by said
105 rollers when an end of the ribbon is approached.

41. In a type-writing machine, the combination of ribbon-spools, spring-pressed rollers that are adapted to bear on the ribbon on
110 said spools, ribbon-reversing devices which are operatively connected to each of said spring-pressed rollers and the shifting of which is automatically determined by said
115 rollers when an end of the ribbon is approached, and hand-operated means for actuating said reversing devices independently of the automatically-actuated means.

42. In a type-writing machine, the combination of a pair of ribbon-spools, a spring-pressed roller-carrying frame for each of said
120 ribbon-spools and the rollers of which are adapted to bear upon the ribbon on said spools, a ratchet-wheel for each ribbon-spool, an actuating-pawl for each ratchet-wheel, a
125 ratchet-face carried by each of said frames and which is adapted to cooperate with the actuating-pawls and to be moved thereby, and pawl-disengaging means controlled by
130 said frames, whereby the direction of feed of the ribbon is automatically reversed when an end thereof is approached.

43. In a type-writing machine, the combination of a pair of ribbon-spools, a spring-pressed frame for each of said ribbon-spools and which are adapted to bear upon the ribbon on said spools, a ratchet-wheel for each ribbon-spool, an actuating-pawl for each ratchet-wheel, means for actuating said pawls, a ratchet-face carried by each of said frames and which is adapted to cooperate with an actuating-pawl and to be moved thereby, and pawl-disengaging means controlled by said frames, whereby the direction of feed of the ribbon is automatically reversed when an end thereof is approached.

44. In a type-writing machine, the combination of a pair of ribbon-spools, a bearing-surface pivoted to each ribbon-spool and adapted to be surrounded by ribbon thereon and to hold it in normal position, bearing-arms that bear on the ribbon on the spools and move toward the axes of the spools when the pivoted bearing-surfaces move to the abnormal position, and reversing mechanism controlled by said bearing-arms.

45. In a type-writing machine, the combination of a pair of ribbon-spools, a bearing-piece pivoted to each spool, a roller-carrying presser-arm for each spool and which are maintained in the normal positions by said bearing-pieces and the ribbon on the spools and which are permitted to move to the actuating positions when the bearing-pieces move from their normal positions, and means for automatically effecting a reversal in the direction of the feed of the ribbon when a presser-arm moves to the abnormal position.

46. In a type-writing machine, the combination of a pair of ribbon-spools, a latch pivoted to each spool, a roller-carrying presser-arm for each spool and which are maintained in the normal positions by said latches, and the ribbon on the spools and which are permitted to move to the actuating positions when the latches move from their normal positions, means for automatically effecting a reversal in the direction of the feed of the ribbon when a presser-arm moves to the abnormal positions, and hand-operated means for effecting a reversal of the direction of the feed of ribbon independently of the movement of said presser-arms.

47. In a type-writing machine, the combination of a pair of ribbon-spools, a pair of ratchet-wheels therefor, a pair of actuating-pawls cooperating with said ratchet-wheels, a pair of disengaging devices for said pawls, intermediate connections between said disengaging devices, so that one will be moved to the disengaging position when the other is moved to afford an engagement of its pawl with the associated ratchet-wheel, controlling devices that are automatically interposed in the path of one or the other of said pawls when an end of the ribbon is approached, and

connections between said controlling devices and the disengaging devices.

48. In a type-writing machine, the combination of a pair of ribbon-spools, a pair of ratchet-wheels therefor, a pair of actuating-pawls cooperating with said ratchet-wheels, a ribbon-vibrator which moves said pawls, a pair of disengaging devices for said pawls, intermediate connections between said disengaging devices, so that one will be moved to the disengaging position when the other is moved to afford an engagement of its pawl with the associated ratchet-wheel, controlling devices that are automatically interposed in the path of one or the other of said pawls when an end of the ribbon is approached, connections between said controlling devices and the disengaging devices, and hand-operated means for actuating the disengaging devices independently of the controlling devices.

49. In a type-writing machine, the combination of a pair of ribbon-spools, means for turning said ribbon-spools, controlling devices which are maintained in the inoperative positions by the outer surface of the ribbon on the spools, means which automatically afford an inward movement of said devices toward the center of the spools when either end of the ribbon is approached, and mechanism controlled by said devices and by the means for turning the spools for effecting a reversal in the direction of the feed of the ribbon.

50. In a type-writing machine, the combination of a pair of ribbon-spools, segmental-shaped devices which are pivoted to said spools and fit and are normally retained within recesses in the cores thereof, a bearing-piece adapted to ride on the surface of the ribbon of each spool and to drop in the recess in the core thereof when its segmental device moves to the abnormal position, and means controlled by each of said bearing-pieces for automatically effecting a reversal in the direction of the feed of the ribbon when an end thereof is approached.

51. In a type-writing machine, the combination of a pair of ribbon-spools, segmental-shaped devices which are pivoted to said spools and fit and are normally retained within recesses in the cores thereof, a bearing-piece adapted to ride on the surface of the ribbon of each spool and drop into the recess in the core thereof when its segmental device moves to the abnormal position, means controlled by each of said bearing-pieces for automatically effecting a reversal in the direction of the feed of the ribbon when an end thereof is approached, and hand-operated means for effecting a reversal in the direction of the feed of the ribbon independently of said bearing-pieces.

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

nation of a pair of ribbon-spools, means for moving said ribbon-spools, segmental-shaped gravity devices which are pivoted to said spools and fit and are normally retained within recesses in the cores thereof, a spring-pressed bearing-piece adapted to ride on the surface of the ribbon of each spool and to drop into the recess in the core thereof when its segmental device moves to the abnormal position, reversing mechanism, means controlled by each of said bearings-pieces for automatically engaging the reversing mechanism with the means for moving the ribbon-spools, to effect a reversal in the direction of the feed of the ribbon when an end thereof is approached.

53. In a type-writing machine, the combination of a pair of ribbon-spools, feeding means for effecting a step-by-step feed of the ribbon in the direction of its length, and means that are automatically interposed in the path of said feeding means when an end of the ribbon is approached and are moved thereby to effect a reversal in the direction of the feed of the ribbon.

54. In a type-writing machine, the combination of a pair of ribbon-spools, vibrating means for effecting an intermittent rotation of the ribbon-spools, and means that are automatically interposed in the path of said vibrating means when an end of the ribbon is approached and are moved thereby to effect a reversal in the direction of the feed thereof.

55. In a type-writing machine, the combination of ribbon-spools, a ratchet-wheel for each ribbon-spool, vibrating pawls which cooperate with said ratchet-wheels to effect a step-by-step feed of the ribbon, a cam that cooperates with each pawl to move it out of engagement with its ratchet-wheel, intermediate connections between said cams, a reversing device for each pawl and each of which is adapted to be interposed in the path of its pawl when an end of the ribbon is approached, and connections between said reversing devices and the cams.

56. In a type-writing machine, the combination of ribbon-spools, a ratchet-wheel for each ribbon-spool, vibrating pawls which cooperate with said ratchet-wheels to effect a step-by-step feed of the ribbon, a ribbon-vibrator that actuates said pawls, a universal bar to which said vibrator is connected and by means of which it is moved, a cam that cooperates with each pawl to move it out of engagement with its ratchet-wheel, intermediate connections between said cams, a reversing device for each pawl and each of which is adapted to be interposed in the path of its pawl when an end of the ribbon is approached, and connections between said reversible devices and the cams.

57. In a type-writing machine, the combination of ribbon-spools, a ratchet-wheel for each ribbon-spool, vibrating pawls which co-

operate with said ratchet-wheels to effect a step-by-step feed of the ribbon, a cam that cooperates with each pawl to move it out of engagement with its ratchet-wheel, intermediate connections between said cams, a reversing-ratchet for each pawl and each of which is adapted to be interposed in the path of its pawl, connections between said reversing-ratchets and the cams, and controlling devices that bear upon the ribbon and are effective to move the reversing-ratchets into the paths of the pawls.

58. In a type-writing machine, the combination of ribbon-spools, a ratchet-wheel for each ribbon-spool, vibrating pawls which cooperate with said ratchet-wheels to effect a step-by-step feed of the ribbon, a ribbon-vibrator that actuates said pawls, a universal bar to which said vibrator is connected and by means of which it is moved, a cam that cooperates with each pawl to move it out of engagement with its ratchet-wheel, intermediate connections between said cams, so as to move one to the disengaging position when the other is moved to a position to afford an engagement between its pawl and ratchet-wheel, a reversing-ratchet for each pawl and each of which is adapted to be interposed in the path of its pawl, connections between said reversing-ratchets and the cams, controlling devices that bear upon the ribbon and which are effective to move the reversing-ratchets into the paths of the pawls, and hand-operated means for moving said cams independently of the controlling devices.

59. In a type-writing machine, the combination of a pair of ribbon-spools, a ratchet-wheel for each ribbon-spool, a feed-pawl cooperating with each ratchet-wheel, a pair of pivoted frames, one for each spool, a ratchet-face on each frame that is adapted to be engaged by the associated pawl, a pawl-disengaging device connected to each frame, and means carried by each frame and bearing on the face of the ribbon and controlling the movement of the frame.

60. In a type-writing machine, the combination of a pair of ribbon-spools, a ratchet-wheel for each ribbon-spool, a feed-pawl cooperating with each ratchet-wheel, a pair of spring-pressed pivoted frames, one for each spool, a ratchet-face on each frame that is adapted to be engaged by the associated pawl, a pawl-disengaging device connected to each frame, intermediate connections between said disengaging devices, a presser-roller carried by each frame and bearing against the face of the ribbon and controlling the movement of the frame, whereby when an end of the ribbon is approached a frame is automatically moved to throw the ratchet-face thereon into the path of a feed-pawl to effect a reversal in the direction of the feed of the ribbon.

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

5 nation of a pair of ribbon-spools, a ratchet-wheel for each ribbon-spool, a feed-pawl co-
operating with each ratchet-wheel, ribbon-
vibrator to which said feed-pawls are con-
10 nected and by which they are moved, a uni-
versal bar to which said ribbon-vibrator is
connected and by which it is moved, a pair of
spring-pressed pivoted frames, one for each
spool, a ratchet-face on each frame that is
15 adapted to be engaged by the associated
pawl, a pawl-disengaging device connected
to each frame, intermediate connections be-
tween said disengaging-cams, a presser-roller
carried by each frame and bearing on the face
20 of the ribbon and controlling the movement
of the frame, whereby when an end of the
ribbon is approached a frame is automatic-
ally moved to throw the ratchet-face thereon
into the path of a feed-pawl to effect a rever-
sal in the direction of the feed of the ribbon.

62. In a type-writing machine, the combi-
nation of a pair of ribbon-spools, a pair of
feed-pawls, one for each spool, a pair of mov-
able disengaging-cams for said pawls, a rock-
25 shaft, and intermediate positive connections
between said rock-shaft and cams, which con-
nections are effective to move one cam to the
disengaging position when the other is in a
position to afford an engagement between
30 the associated pawl and ratchet-wheel.

63. In a type-writing machine, the combi-
nation of a pair of ribbon-spools, a pair of
feed-pawls, one for each spool, a pair of mov-
able disengaging-cams for said pawls, a rock-
35 shaft, intermediate connections between said
rock-shaft and cams, which are effective to
move one cam to the disengaging position
when the other is in a position to afford an en-
gagement between the associated pawl and
40 ratchet-wheel, and means actuated by the
pawls to move said cams.

64. In a type-writing machine, the combi-
nation of a pair of ribbon-spools, a pair of
feed-pawls, one for each spool, a pair of mov-
able disengaging-cams for said pawls, a rock-
45 shaft, intermediate connections between said
rock-shaft and cams, which are effective to
move one cam to the disengaging position
when the other is in a position to afford an
engagement between the associated pawl
50 and ratchet-wheel, and hand-operated means
for rocking said shaft to effect a reversal in
the direction of the feed of the ribbon.

65. In a type-writing machine, the combi-
55 nation of ribbon-spools mounted on the sides
of the machine, and ribbon-vibrator arms
which are likewise mounted on the sides of
the machine.

66. In a type-writing machine, the combi-
60 nation of ribbon-spools, ribbon-vibrator arms
which are mounted on the sides of the ma-
chine, and a ribbon which passes from the
ribbon-spools to the vibrator-arms around
the center of vibration of said arms.

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

nation of ribbon-spools, a ribbon-vibrator,
means for moving said vibrator at each print-
ing operation and guide-rollers over which
the ribbon passes from the ribbon-spools to
the vibrator, the pivotal center of said guide-
70 rollers being coincident with the axis of vi-
bration of the vibrator.

68. In a type-writing machine, the combi-
nation of ribbon-spools mounted at the sides
of the machine, independent ribbon-vibrator
75 arms mounted at the sides of the machine,
and guide-rollers over which the ribbon passes
from the ribbon-spools to the vibrator, the
pivotal center of said guide-rollers being co-
incident with the axis of vibration of the vi-
80 brator.

69. In a type-writing machine, the combi-
nation of a universal bar, independent rib-
bon-vibrator arms upon opposite sides of the
machine, and independent connections be-
85 tween each of said vibrator-arms and the uni-
versal bar.

70. In a type-writing machine, the combi-
nation of a universal bar, independent rib-
bon-vibrator arms upon opposite sides of the
90 machine, independent link connections be-
tween each of said vibrator-arms and the uni-
versal bar, and means for adjusting each of
said links to vary the positions of impact of
the types on the ribbon.

71. In a type-writing machine, the combi-
nation of two independent vibrator-arms,
independent ball-bearing supports for said
arms, and means for moving the arms.

72. In a type-writing machine, the combi-
100 nation of a spindle, a roller-bearing raceway,
supported by said spindle, a ribbon-vibrator
having a roller-bearing raceway therein, and
a series of antifriction-rollers received in said
raceways.

73. In a type-writing machine, the combi-
nation of an outwardly-projecting spindle
secured to each side of the machine, ribbon-
vibrator arms that are supported upon said
spindles, and antifriction roller-bearings for
110 each of said arms.

74. In a type-writing machine, the combi-
nation of an outwardly-projecting spindle
removably secured to each side of the ma-
chine, adjustable ball-bearing washers sup-
115 ported upon said spindle, ribbon-vibrator
arms that are each provided with a ball-bear-
ing portion, and antifriction-balls that con-
nect the arms to ball-bearing washers.

75. In a type-writing machine, the combi-
120 nation of a pair of spindles secured to the
machine-frame, a ribbon-vibrator arm sup-
ported upon each spindle, and a ribbon-guide
roller supported on each spindle.

76. In a type-writing machine, the combi-
125 nation of an outwardly-projecting spindle
secured to each side of the machine-frame, a
ribbon-vibrator arm supported upon ball-
bearings on said spindle, and a ribbon-guide
roller supported on each spindle.

77. In a type-writing machine, the combination of a ribbon-vibrator, ball-bearing supports for said vibrator, means for actuating the vibrator, and ribbon-feed pawls connected to and actuated through said vibrator.

78. In a type-writing machine, the combination of a ribbon-vibrator supported upon ball-bearings, means for moving said vibrator, ribbon-spools, and feed-pawls for rotating said spools, said pawls being connected directly to and moved by the ribbon-vibrator.

79. In a type-writing machine, the combination of ribbon-spools, ribbon-vibrator arms located at opposite sides of the machine, a ratchet-wheel for each ribbon-spool, and a cooperating feed-pawl connected to and actuated by each vibrator-arm.

80. In a type-writing machine, the combination of ribbon-spools, ribbon-vibrator arms located at opposite sides of the machine, a universal bar to which each vibrator-arm is connected, ball-bearings upon which the vibrator-arms are supported, a ratchet-wheel for each ribbon-spool, and a cooperating feed-pawl connected to and actuated by each vibrator-arm.

81. In a type-writing machine, the combination of ribbon-spools located upon opposite sides of the machine and which project outwardly therefrom, and each of which has a ratchet formed on one of the flanges thereof, ribbon-vibrator arms located upon opposite sides of the machine, and a feed-pawl actuated by each of said vibrator-arms and cooperating with a ratchet formed on a ribbon-spool flange.

82. In a type-writing machine, the combination of ribbon-spools, each of which has a ratchet formed on one of the flanges thereof, ribbon-vibrator arms, and feed-pawls which are connected to and are actuated by said vibrator-arms and cooperate with the said ratchets formed on the ribbon-spool flanges.

83. A ribbon-spool that has a hollow core of resilient metal to which the flanges of the spool are secured and the edges of which constitute clamping means to secure an end of the ribbon to the spool.

84. A ribbon-spool comprising heads or flanges that are secured to a hollow core which has a free edge that clamps an end of the ribbon to the core, and means for effecting a movement of said free edge to and from the clamping position.

85. A ribbon-spool comprising heads or flanges, and a strip of metal that is riveted at its ends to said flanges so as to form a core for the spool and so as to provide a free resilient edge which secures the ribbon to the core of the spool.

86. A ribbon-spool comprising heads or flanges, a strip of metal that is riveted at its ends to said flanges so as to form a core for the spool and so as to provide a free resilient

edge which secures the ribbon to the core of the spool, and a spindle that is supported in place by the spool-flanges and is provided with means for deflecting the free edge of the core against its tension.

87. A ribbon-spool comprising heads or flanges, a strip of metal that is riveted at its ends to said flanges so as to form a core for the spool and so as to provide a free resilient edge which secures the ribbon to the core of the spool, a spindle that is supported in place by the spool-flanges and is provided with means for deflecting the free edge of the core against its tension, and a handle at one end of the spindle that constitutes means for turning the spindle in its bearings and means for rotating the spool.

88. A ribbon-spool comprising heads or flanges, a strip of metal that is riveted at its ends to said flanges so as to form a core for the spool and so as to provide a free resilient edge which secures the ribbon to the core of the spool, a finger-piece that extends outwardly of the flange of the spool and is adapted to move said free resilient edge and which likewise constitutes a handle for turning the spool.

89. In a type-writing machine, the combination with a movable part of the machine, of ribbon-spools, reversing devices, and a pressing device adapted to bear upon the ribbon on each of said spools and to move toward and away from the center of the spool as the ribbon is unwound and is wound up on the spool, and which determines when each of the reversing devices and the movable part may be brought into cooperation and the direction of the feed of the ribbon reversed.

90. In a type-writing machine, the combination of a movable part that is actuated at each printing operation of the machine, a reversing device adapted to be brought into cooperation with said movable part, to be actuated thereby and reverse the direction of the feed of the ribbon, a ribbon-spool, and a contact device that bears against the ribbon and automatically moves away from or toward the center of the spool as the ribbon is wound on or unwound from the spool and which controls the reversing device and determines the reversal in the direction of the feed of the ribbon.

91. In a type-writing machine, the combination of a ribbon-spool, a rack, a member that engages the rack, a movement of one of said last-mentioned elements being transmitted to the other to effect a reversal in the direction of the feed of the ribbon, and means for automatically bringing said member and rack into cooperation when an end of the ribbon is approached.

92. In a type-writing machine, the combination of a ribbon-spool, a rack, a member that engages the rack, a movement of one of

said last-mentioned elements being transmitted to the other to effect a reversal in the direction of the feed of the ribbon, and a controlling device for automatically bringing
 5 said member and rack into coöperation when an end of the ribbon is approached, said controlling device comprising a pressing device that bears on the ribbon and automatically moves away from or toward the center of the
 10 spool as the ribbon is wound on or unwound from the spool.

93. In a type-writing machine, the combination of ribbon-spools, driving means for turning said ribbon-spools, shiftable means
 15 for operatively connecting one spool with and disconnecting the other from the turning means, and means that are actuated directly by said driving means to effect a shifting of said shiftable means.

20 94. In a type-writing machine, the combination of a pair of ribbon-spools; driving means therefor including two driving parts that are actuated at each printing operation, one of said driving parts being employed for
 25 each spool; and automatically-actuated reversing means comprising a reversing device for each spool, each of said reversing devices being adapted to be brought into coöperation with the associated driving part; and a contact-controlling device for each ribbon-spool
 30 and each of which bears on the ribbon of the associated spool and determines when the associated driving part and reversing device

may be brought into coöperation and the direction of the feed of the ribbon reversed. 35

95. In a type-writing machine, the combination of a pair of ribbon-spools; a pair of ratchet-wheels one for each spool; a driving-pawl for each ratchet-wheel; and automatically-actuated means which afford an engage-
 40 ment between one pawl and its associated ratchet-wheel and which simultaneously effects a disengagement between the other pawl and its associated ratchet-wheel when an end of the ribbon is approached, said au-
 45 tomatically-actuated means comprising a reversing device for each spool that is adapted to be brought into coöperation with and to be actuated by the associated driving-pawl, a contact-controlling device for each ribbon-
 50 spool and each of which bears on the ribbon of the associated spool and moves away from or toward the center of the spool as the ribbon is wound on or unwound from the spool and determines when an associated
 55 reversing device and driving-pawl may be brought into coöperation and the direction of the feed reversed.

Signed at Syracuse, in the county of Onondaga and State of New York, this 2d day of
 October, A. D. 1902. 6c

ALEXANDER T. BROWN.

Witnesses:

CHARLES J. TONER,
 F. G. BODELL.