April 23, 1940. E. S. SVENSSON 2,198,139

RECORDING APPARATUS

Filed June 6, 1936 5 Sheets-Sheet 1

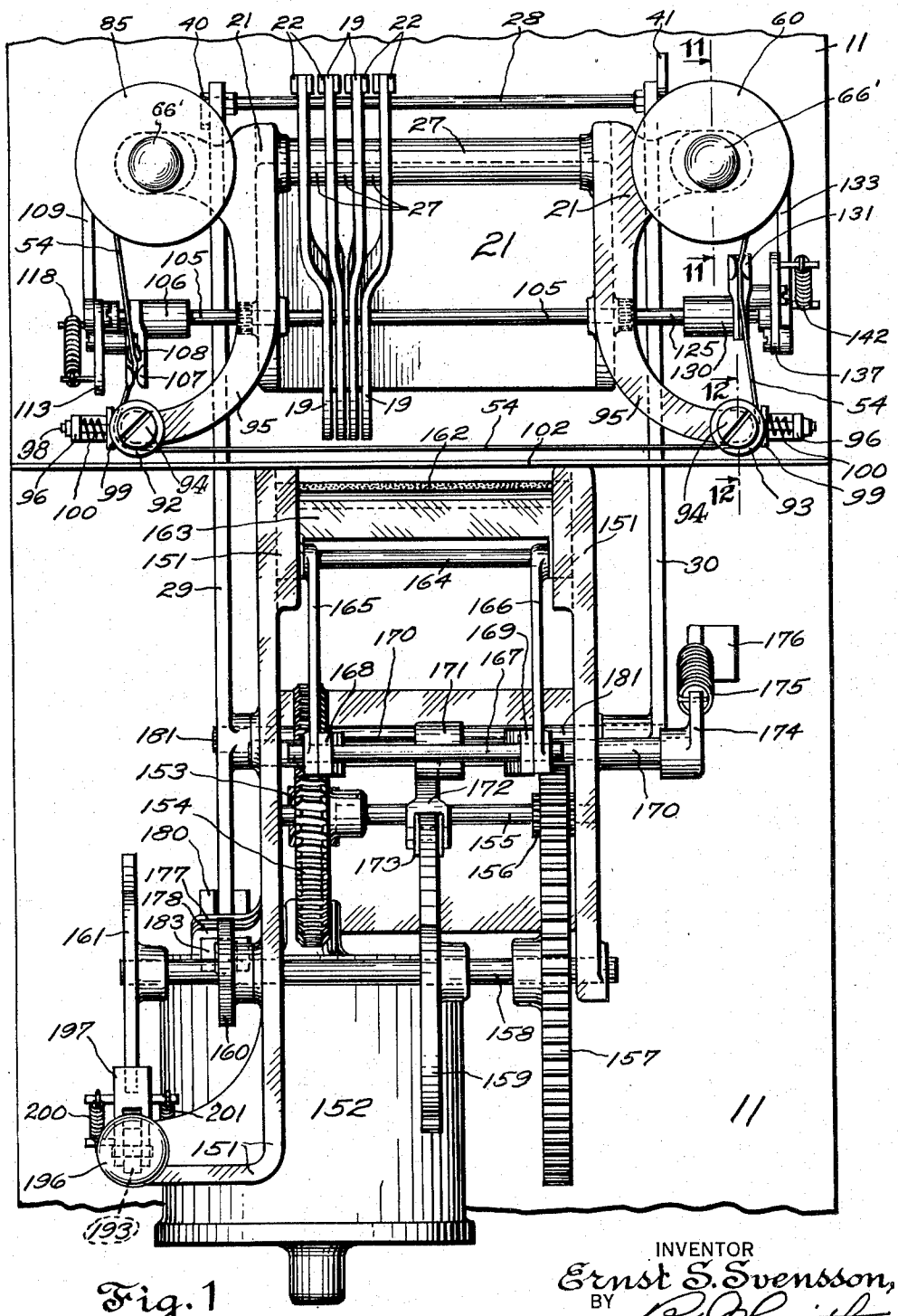



Fig. 1

INVENTOR
Ernst S. Svensson,
BY
ATTORNEY

April 23, 1940. E. S. SVENSSON 2,198,139

RECORDING APPARATUS

Filed June 6, 1936 5 Sheets-Sheet 2

Fig. 2

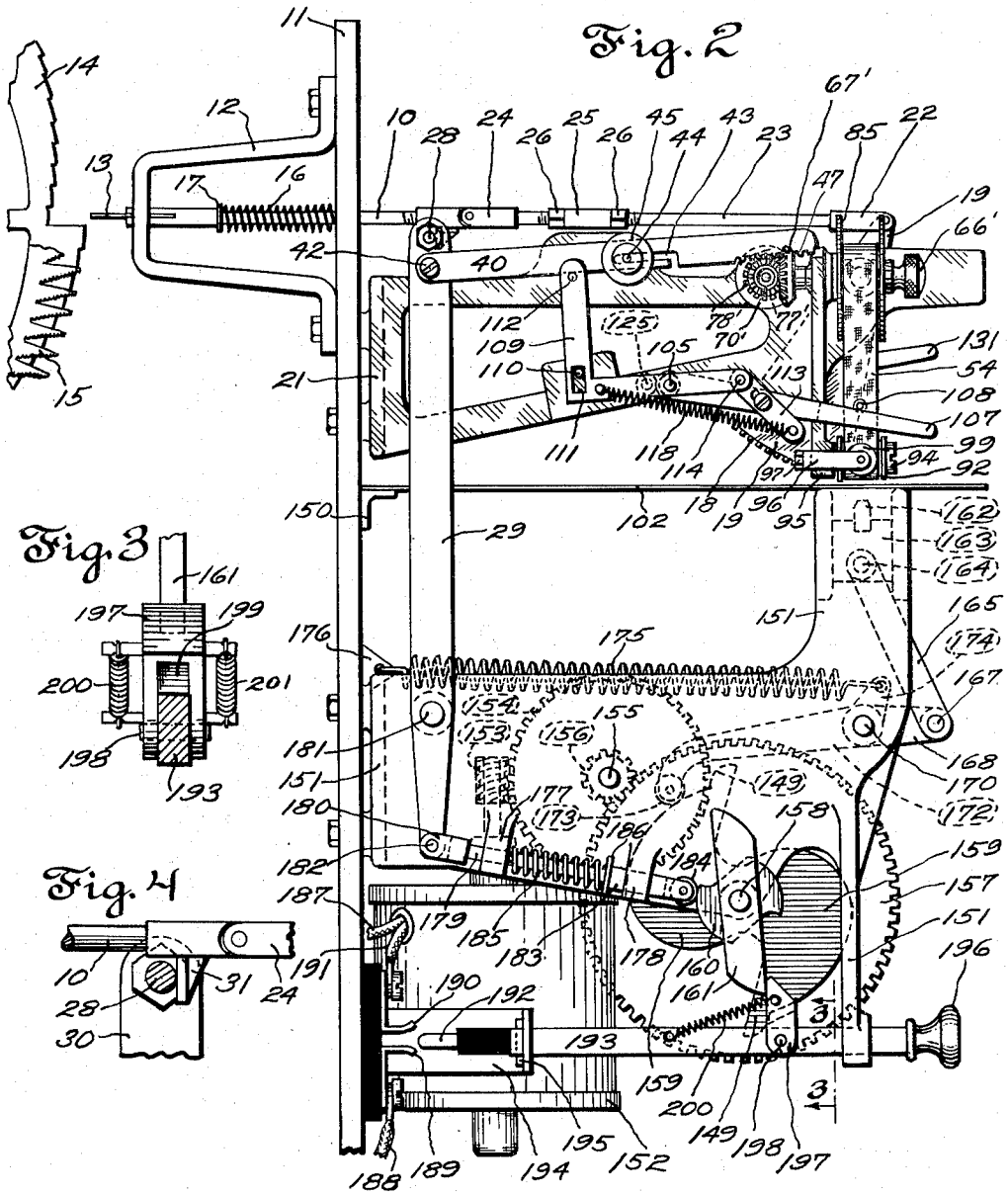


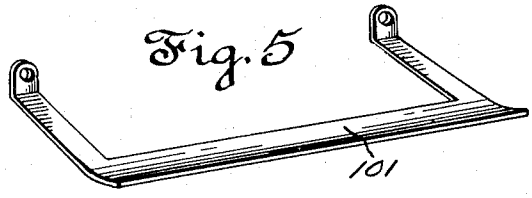

Fig. 3




Fig. 4




Fig. 5




INVENTOR
Ernst S. Svensson,
BY
ATTORNEY

April 23, 1940. E. S. SVENSSON 2,198,139

RECORDING APPARATUS

Filed June 6, 1936 5 Sheets-Sheet 3

Fig. 8

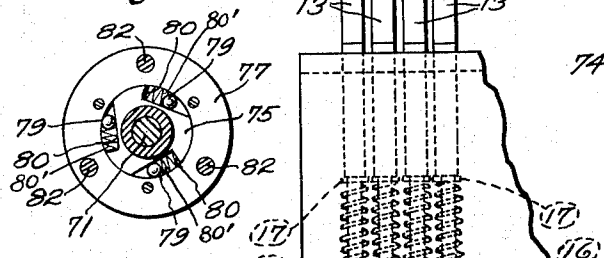


Fig. 7

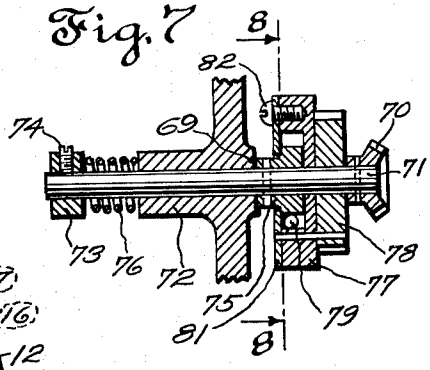




Fig. 6

INVENTOR
Ernst S. Svensson,
BY
ATTORNEY

April 23, 1940. E. S. SVENSSON 2,198,139

RECORDING APPARATUS

Filed June 6, 1936 5 Sheets-Sheet 4

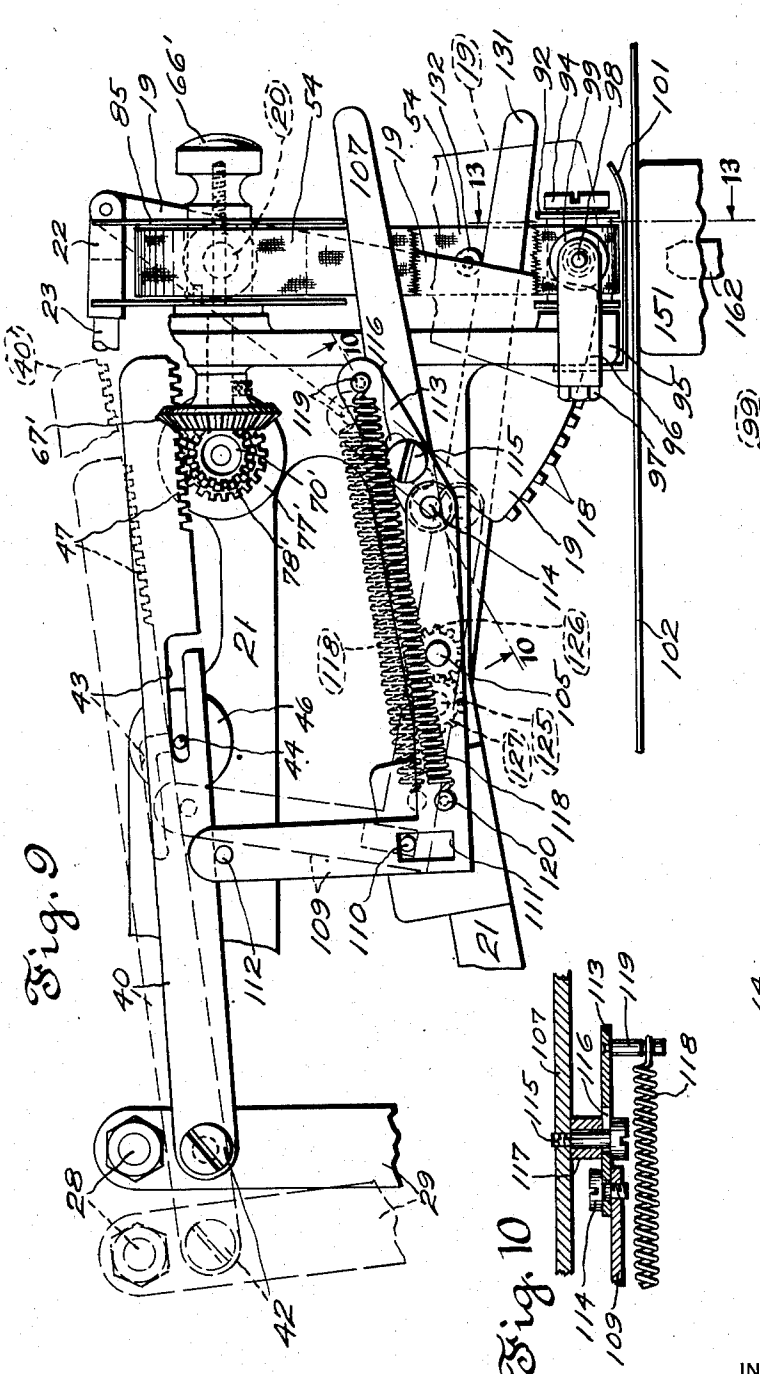


Fig. 9



Fig. 10

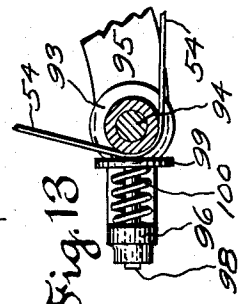


Fig. 13

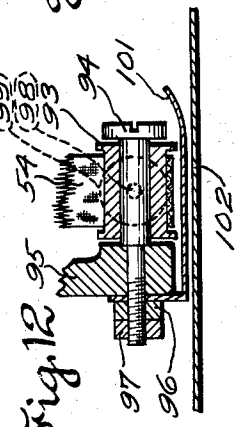


Fig. 12

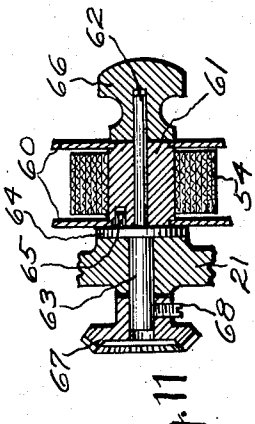


Fig. 11

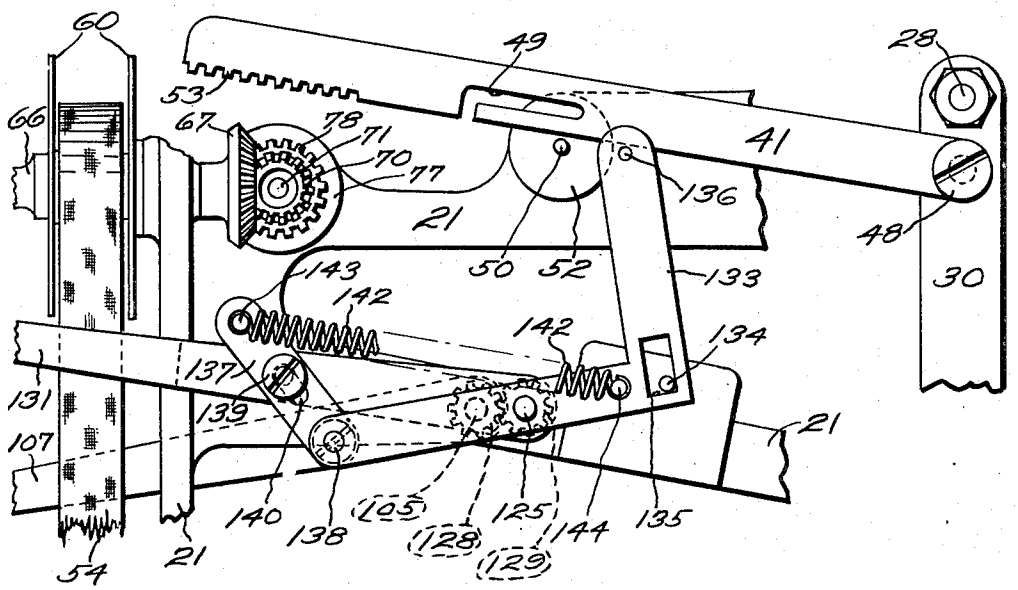
INVENTOR
Ernst S. Svensson
BY
Peter Smith
ATTORNEY

April 23, 1940. E. S. SVENSSON 2,198,139

RECORDING APPARATUS

Filed June 6, 1936 5 Sheets-Sheet 5

Fig. 14




INVENTOR
Ernst S. Svensson
BY
ATTORNEY

Patented Apr. 23, 1940

2,198,139

# UNITED STATES PATENT OFFICE

2,198,139

## RECORDING APPARATUS

Ernst S. Svensson, Bridgeport, Conn., assignor to The Kron Company, Bridgeport, Conn., a corporation of Connecticut

Application June 6, 1936, Serial No. 83,870

15 Claims. (Cl. 101—336)

This invention relates to recording apparatus of rugged nature suited to severe conditions of service such as the recording of weights measured by heavy industrial scales, and particularly to parts of such apparatus comprising or closely associated with a self-reversing ribbon feed mechanism. Other portions of the recording apparatus are claimed in my co-pending application, Serial No. 259,787, filed March 4, 1939.

An important object of the improvements is to construct a ribbon feeding apparatus for this purpose whose operating parts are strong and perform substantial extents of movement thereby to eliminate requirements for extreme accuracy and fine dimensioning of the parts.

A further object is to provide a self-reversing ribbon feed mechanism which shall be more rugged and dependable in operation than are such mechanisms as commonly constructed and which shall be comprised of two distinct sets of parts for pulling the ribbon at different times in respectively opposite directions so that these separate parts may be widely spaced at opposite sides of a common frame and so that there may be interposed between the separated sets of parts a printing station of any desirable width and equipped with any desirable number of side-by-side type set-up and registering devices.

A still further object is to employ novelly arranged ribbon feeding drive parts to be operated by a common oscillator and a flexible type of overcentering toggle mechanism automatically operative to reverse the direction of ribbon feed without possibility of bind or obstruction under any operating condition that can be assumed by the ribbon feeding parts. Other objects will appear from the description hereinafter. With reference to the accompanying drawings:

Fig. 1 is a front view of the entire recording mechanism.

Fig. 2 is a side elevation looking from the left at Fig. 1 and further shows the portions of stepped members which may be employed to determine the value registering positions of the type segments, Fig. 2 being drawn on a smaller scale than Fig. 1.

Fig. 3 is an enlarged fragmentary view taken in section on the plane 3—3 in Fig. 2 looking in the direction of the arrows.

Fig. 4 is a correspondingly enlarged fragmentary view taken in section on the plane 4—4 in Fig. 6 looking in the direction of the arrows.

Fig. 5 is a perspective view of the guard for the inking ribbon, the showing of which is omitted in Figs. 1 and 2.

Fig. 6 is a plan view of the upper portion of the mechanism in Fig. 1 and is drawn on a corresponding scale.

Fig. 7 is an enlarged sectional view taken on the plane 7—7 in Fig. 6 looking in the direction of the arrows.

Fig. 8 is a sectional view taken on the plane 8—8 in Fig. 7 looking in the direction of the arrows.

Fig. 9 is an elevation similar to the upper portion of Fig. 2 drawn on an enlarged scale and showing the control parts for the ribbon reversing drive mechanism differently positioned, a portion of the length of the inking ribbon being shown as broken away, and the outer guide disc for the rack bar omitted.

Fig. 10 is a fragmentary sectional view taken on the plane 10—10 in Fig. 9 looking in the direction of the arrows.

Fig. 11 is an enlarged fragmentary view taken in section on the plane 11—11 in Fig. 1 looking in the direction of the arrows.

Fig. 12 is an enlarged fragmentary view taken in section on the plane 12—12 in Fig. 1 looking in the direction of the arrows.

Fig. 13 is a fragmentary view taken in section on the vertical plane 13—13 in Fig. 9 looking in the direction of the arrows.

Fig. 14 is an elevation drawn on the same scale as Fig. 9 looking from the right at Fig. 1 and showing the parts positioned to accord with the position of parts in Fig. 1.

The recording mechanism as a whole may be viewed as comprised of three main systems of parts which may respectively be termed the type registering mechanism, the self-reversing ribbon feed mechanism, and the power and printing hammer mechanism.

### *Type registering mechanism*

This mechanism is best shown in Figs. 1, 2, 4, and 6. One or more horizontal feeler rods 10 are mounted for longitudinal sliding movement in apertures through the main vertical frame plate 11 and in respectively aligned rectangular apertures through the offset bracket 12 shown mounted on the exterior surface of frame plate 11 in Figs. 2 and 6. Feeler rods 10 are equipped with any suitably thin edged feeler terminals 13 which are constantly urged toward steps on peripherally notched wheels 14, 15, etc., by individual light springs 16, each of which springs surrounds a rod 10 and is compressed between a collar 17 carried thereby and the bracket 12. The stepped wheels 14 and 15 are representative of

any adjustably positionable stops which may be located respectively in the paths of the different feeler terminals 13. For an example of one possible purpose and function of such stepped wheels reference may be had to U. S. Patent No. 2,173,746 granted September 19, 1939, on an application of Glenn E. Weist, Serial No. 753,842, wherein similar discs are designed to be rotatively positioned in accordance with the weights of a load and by the automatic action of a weighing scale in order that the weights measured thereby may be recorded.

The stepped wheel peripheries preferably act to limit sliding of rods 10 to selected portions of their total permissible travel, which portions of travel accord respectively with the spacing of type characters 18 that project from the peripheral edge of a type segment 19 of which segment four are shown pivotally mounted upon a common shaft 20 in Figs. 1 and 6. Shaft 20 is supported by and spans the space between the left and right sides of an upper frame casting 21 which is shown in Fig. 2 to be mounted at its rear end upon the main vertical frame plate 11.

The upper end of each type segment 19 is pivotally connected to a clevis 22 from which a connector 23 extends rearwardly and terminates in a similar clevis 24 pivotally connected to the forward end of a corresponding feeler rod 10. The effective length of any connector 23 may be adjusted finely by a threaded coupling 25 interposed between separate rod parts of the connector and having threaded engagement therewith and lockable in adjusted position by the end nuts 26 which also have threaded engagement with the rod parts.

In Figs. 1 and 6 the type segments 19 are seen to be axially spaced by suitable collars 27 which surround the support shaft 20 and it will be plain that a considerably greater number of type segments than the four shown, together with additional manually settable type segments carrying any desired data, can be accommodated within the space between the sides of the frame casting 21. Provision of this ample space is made possible by certain features of the self-reversing ribbon feed mechanism hereinafter to be described. The normal, or non-printing position of the type segments is as pictured in full lines in Figs. 2, 6 and 9 and this position is brought about through the action upon all of the rods 10 of an actuating bail comprised of the transversely disposed rod 28 connecting and carried by the upper ends of two vertical bail arms. One segment is indicated by broken lines in Fig. 9 as shifted to a printing position. The bail arm 29 swings at the left of the frame casting 21 and the bail arm 30 swings at the opposite or right side of the frame. Both as these bail arms swing in unison about a lower pivot point as will later be described, and they carry the bail rod 28 in a path of travel corresponding with the travel of depending projections 31 respectively carried by the rods 10 (see Fig. 4). Thus the bail rod 28 may act to force all of the rods 10 simultaneously toward the front against the opposition of their compression springs 16 or by movement toward the rear may release all of rods 10 to the individual action of such springs as individually and respectively limited by the notched wheels 14, 15, etc.

*Self-reversing ribbon feed mechanism*

This mechanism is automatically motivated in an intermittent manner by swinging strokes of one or the other of the bail arms 29 and 30, which have been described, and through the longitudinal movements of two rack bars, 40 at the left side of the frame casting 21, and 41 at the right side of the frame casting. Rack bar 40 is pivoted at 42 to the left bail arm 29 and has a cut-out forming the bayonet slot 43, through which passes a fixed guide pin 44 which rigidly projects from the frame 21 and is threaded to receive two axially adjustable guide discs 45 and 46 on respectively opposite sides of rack bar 40 and suitably spaced to permit free sliding movement of the latter between them. Near its free end and on its bottom edge, rack bar 40 carries gear teeth 47. In similar manner rack bar 41 is pivoted at 48 to the right bail arm 30 and has a cut-out forming a bayonet slot 49, through which passes a fixed guide pin 50 which rigidly projects from the right side of frame 21 and is threaded to receive two axially adjustable guide discs 51 and 52 on respectively opposite sides of rack bar 41 and suitably spaced to permit free sliding movement of the latter between them. Near its free end and on its bottom edge, rack bar 41 carries the gear teeth 53.

As in the case of the rack bars 40 and 41 and their associated parts above described, the entire working mechanism for feeding the ribbon in one direction, as shown at the left of the upper frame casting 21 in Figs. 1 and 6, is substantially duplicated, part for part, by the working mechanism for feeding the ribbon in the opposite direction, which is shown at the right side of frame casting 21 in said figures. The minor exceptions to this will become plain as the description proceeds. The inking ribbon is designated as 54 in Figs. 1, 2, 6, 9, 11, 12 and 13 of the drawings.

One end of ribbon 54 is wound upon a spool 60 whose manner of mounting is most clearly shown in Fig. 11. The hub 61 of spool 60 contains an axial hole which permits it to be mounted upon the spindle portion 62 of a feed shaft 63 which is equipped with the thrust flange 64 carrying a forwardly projecting pin 65 adapted to engage a recess in the spool hub 61 for rotatively impelling the spool while permitting its ready withdrawal from spindle 62 for changing the ribbon. The thumb nut 66 has threaded engagement with the spindle 62 as a readily removable means for securely holding the spool upon the spindle. The shaft 63 has a free bearing in a laterally extending portion of frame 21 and projects therethrough to carry fixedly the bevel gear 67 secured by the set screw 68, at the rear.

Bevel gear 67 meshes with a bevel pinion 70 whose associated parts are most clearly shown in Fig. 7 and include a one-way drive clutch for transmitting longitudinal movement of rack bar 40 to bevel pinion 70 and hence to bevel gear 67 and to the ribbon spool 60. Bevel pinion 70 is pinned to the outer end of a stub shaft 71 which has bearing lengthwise of the boss 72 projecting from the frame casting 21, and shaft 71 also projects inwardly of the same and carries at its innermost end the thrust collar 73 fixed thereto in axially adjustable relationship by the set screw 74. The peripherally notched core 75 of the one-way drive clutch is also pinned to shaft 71 in fixed spacing from the bevel pinion 70 and adjacent the outer surface 69 of boss 72 and is yieldingly forced against this boss surface by the axially acting tension in the coiled spring 76 compressed between the thrust collar 73 and the inner end of boss 72 thereby to produce a frictional resistance to the turning of stub shaft 71 and the parts

fixed thereto. This frictional effect will be seen, therefore, to be transmitted from the bevel pinion 70 to the ribbon spool 60 through the bevel gear 67.

The stub shaft 71 also carries between the bevel pinion 70 and the clutch core 75 the clutch casing 77 to which is fixedly pinned the gear 78 which is in mesh, upon suitable occasions, with the gear teeth 53 on rack bar 40. Except for the one-way acting clutch balls 79 which wedge between core 75 and casing 77 in the notches 80 of core 75 as shown in Fig. 8, the clutch casing 77 together with the gear 78 is freely rotatable in relation to the stub shaft 71 and to the clutch core 75 and bevel pinion 70 fixed thereon. In a well known manner, clockwise rotation of the clutch casing in Fig. 8 will wedge the balls 79 and drive the clutch core clockwise, whereas counterclockwise rotation of the clutch case will free the balls from wedging effect and permit the clutch core 75 together with the stub shaft 71 to remain stationary as is its tendency due to the friction occasioned by the spring 76 as described. The clutch balls 79 and springs 80' if desired are retained in their respective cavities by the annular plate 81 secured to the clutch case by screws 82.

The parts above described for transmitting the lengthwise reciprocative movements of rack bar 41 to the ribbon spool 60 for intermittently rotating the latter in a ribbon winding direction, or counterclockwise in Fig. 1, are substantially duplicated in construction and function by a corresponding set of parts on the left side of the frame casting 21 for transmitting the movement of rack bar 40 to the ribbon spool 85 upon which is wound the other end of ribbon 54. It will therefore be necessary to mention only briefly the parts which transmit to spool 85 an intermittent rotative movement in clockwise direction for winding the ribbon in the opposite direction of feed. Such of these parts as are shown at the left side of the frame in Fig. 6 and elsewhere, are given primed reference characters like their respective duplicate parts located at the right side of the frame and their construction and operation will correspondingly be understood.

Rack bar 40, when in mesh with gear 78' turns the clutch casing 77' in both directions of its travel but only clockwise rotation of the clutch casing is imparted to the bevel pinion 70', and hence, through bevel gear 67' and its stub shaft 71' only clockwise rotation is imparted to ribbon spool 85 in Fig. 1.

Between the ribbon spools 60 and 85 the ribbon extends around a left guide pulley 92 and a right guide pulley 93, each of which pulleys is similarly mounted by a construction most clearly shown in Fig. 12. The shoulder stud 94 retains and gives bearing to the guide pulley and penetrates the extremity of a horn-like projection 95 of the frame casting. The rearwardly projecting end of stud 94 serves to mount a pressor bracket 96 which is rigidly retained thereon by the fastening nut 97. In Fig. 13 the pressor bracket 96 is most clearly shown to afford sliding support for the stem 98 of a pressor disc 99 which is constantly urged toward the right in Fig. 13 by the compression spring 100 so that pressor disc 99 yieldingly bears upon the inking ribbon 54 while the latter is in contact with its guide pulley 93. As a similar pressor disc or plunger is provided to co-act with both guide pulleys 92 and 93 as shown in Fig. 1, the foregoing description of one will suffice for both.

Figs. 6, 9 and 12 show secured between the pressor bracket 96 and the frame casting the rear end of a skeletonized guard 101 of which a perspective view is shown in Fig. 5. Such guard may be employed to protect the unsupported horizontal stretch of ribbon 54 between its guide pulleys 92 and 93 to insure that a piece of paper or cardboard, thrust rearwardly and edgewise under the ribbon for printing a record thereon, shall not be permitted to disturb or damage the ribbon, and to facilitate the edgewise entrance of such card or sheet of paper between the guard 101 and the horizontal floor plate 102, the guard is lipped upwardly at its forward edge.

*Automatic reversing control*

Associated at each side of the frame casting 21, with each of the duplicate mechanisms which transmit intermittent drive from the rack bars to the ribbon spools respectively, is a system of over centering, spring biased levers which serve to determine whether the right ribbon spool 60 shall be rotatively advanced counterclockwise or whether the left ribbon spool 85 shall be rotatively advanced clockwise by the simultaneous reciprocative movements of the rack bars 41 and 40, respectively, in Fig. 1.

This system of levers which coacts with the left rack bar 40 is most clearly shown in Figs. 2 and 9 and derives its sole support from a long shaft 105 which extends transversely through both sides of the frame casting 21 and is free to turn therein. Nearest the frame, shaft 105 carries the hub 106 of a shift arm 107 which is forked at its forward extremity to permit the ribbon 54 to pass through the narrow space thereby provided and the ribbon carries a protruding eyelet 108 which is too thick to pass between the arms of the fork whereby downward feed of the ribbon when it is nearly unwound from spool 85 impels the shift arm 107 toward position shown in Fig. 2. A stop 104 fast on shaft 105 engages frame pin 104' to prevent further downward swing of arm 107.

At its left extremity, the shaft 105 affords free pivotal support for a bell crank 109 whose turning movement relative to shaft 105 is limited by the engagement of a frame-carried pin 110 which protrudes through an elongated hole 111 in the bell crank. Near the top end of its vertical portion, bell crank 109 rigidly carries a long pin 112 which extends toward the frame and is positioned to engage with the lower edge of rack bar 40.

Connection between the shift arm 107 and the bell crank 109 comprises a toggle link 113 which is pivotally connected to the forward extremity of bell crank 109 at 114 and which is slidably and pivotally connected to shift arm 107 by the construction most clearly shown in Fig. 10 wherein the shoulder screw 115 is seen to pass through the elongated slot 116 in toggle lever 113 and to be rigid with the shift arm 107, and to carry between the toggle lever and the shift arm, the spacer collar 117. This construction permits the toggle lever both to pivot about and slide lengthwise in relation to the shoulder screw 115 as the space between the head of the screw and the spacer collar 117 is sufficient to prevent bind. The long coiled spring 118 constantly tends to pull toward each other the spring stud 119 carried by the toggle lever 113 and the spring stud 120 carried by the bell crank 109 so that the parts tend to retain the position in which they are shown in Fig. 2 as determined by the combined action of stop means 110 and 104'.

The system of levers which coacts with the right

rack bar 41 is most clearly shown in Fig. 14 and derives its sole support from a long shaft 125 which extends transversely through both sides of the frame casting 21 and is free to turn therein. Fig. 6 most clearly shows that shafts 125 and 105 are adjacent and parallel. At the left side of frame casting 21 shaft 105 carries a small gear 126 which is in mesh with a corresponding gear 127 on shaft 125, both of these gears being fixed to their respective shafts whereby the shafts always turn simultaneously and in opposite directions through preferably the same angle of rotation. Similar gears accomplishing the same purpose are shown at the right of the frame comprising the intermeshed gears 128 and 129 respectively fixed to shafts 105 and 125 to relieve the shafts of torsional strain.

Nearest the frame, shaft 125 carries the hub 130 of a shift arm 131 which is forked at its forward extremity to permit the ribbon 54 to pass through the narrow space thereby provided and near its end which is wound upon spool 60 the ribbon carries another protruding eyelet 132 which is too thick to pass between the arms of this fork whereby downward feed of the ribbon when it is nearly unwound from spool 60 will impel the shift arm 131 from its position shown in Fig. 14 downward. A stop 145 fast on shaft 125 engages frame boss 145' to limit downward swing of arm 131 in its position shown in Fig. 9.

At its right extremity, the shaft 125 affords free pivotal support for a bell crank 133 whose turning movement relative to shaft 125 is limited by the engagement of a frame-carried pin 134 which protrudes through an elongated hole 135 in the bell crank. Near the top end of its vertical portion, bell crank 133 rigidly carries a long pin 136 which extends toward the frame and is positioned to engage with the lower edge of rack bar 41.

Connection between the shift arm 131 and the bell crank 133 comprises a toggle link 137 which is pivotally connected to the forward extremity of bell crank 133 at 138 and which is slidably and pivotally connected to shift arm 131 by a construction analogous to that shown in Fig. 10 wherein the shoulder screw 139 passes through elongated slot 140 in toggle link 137 and is rigid with the shift arm 131 and carries the spacer collar 141. The long coiled spring 142 is under tension between the spring stud 143 carried by the toggle link 137 and the spring stud 144 carried by bell crank 133 so that the parts tend to retain their position as shown in Fig. 14 by the combined action of parts including stops 134 and 145'.

*Power and printing hammer mechanism*

This mechanism is located completely below the floor plate 102 which at its rear end is supported upon the bracket 150 and at its forward end is supported upon the upstanding portion of the lower frame casting 151. Most of the power and printing hammer mechanism is supported between the two sides of frame casting 151 which itself derives support from the main frame plate 11 to which it is bolted at the rear end.

Any suitable electric motor 152 may be separately mounted upon the main frame plate 11, and the motor shown has its shaft equipped with a drive worm 153. The worm wheel 154 is in mesh with worm 153 and rotates the shaft 155 to which it is fixed. Shaft 155 has bearing at each of its ends in the frame casting 151 and also carries fixed thereto the pinion 156. Pinion 156 is in mesh with the large gear 157 which is fixedly carried by the cam shaft 158. Cam shaft 158 also spans and has bearings in the two sides of frame casting 151 and fixedly carries between the frame sides a cam 159 for controlling the printing hammer. Outside the left bearing in the frame casting shaft 158 carries a cam 160 for controlling the bail arm 29 and thereby the type registering and ribbon feed mechanisms. At its left extremity in Fig. 1 cam shaft 158 also rotates an electric switch operating cam 161 thereby to interrupt automatically the circuit to the electric motor 152 when a cycle of recording action has been completed.

Th printing hammer comprises a strip of suitable platen material 162 securely mounted on the top surface of a hammer block 163 which at both ends is guided for vertical sliding movement in the frame casting 151. Block 163 carries the horizontal rod 164 which pivotally supports two depending links 165 and 166. The lower ends of these links are pivotally engaged by a similar horizontal rod 167 which is swingingly supported by and connects the free ends of two forwardly projecting arms 168 and 169 which arms are fixedly mounted upon shaft 170 in spaced relation. The ends of shaft 170 have bearings in the frame casting 151. At a central portion, shaft 170 fixedly carries the hub 171 of the cam follower arm 172 whose rearwardly extending end is equipped with a roller 173 riding in contact with the periphery of cam 159. At the right side of the frame casting, shaft 170 fixedly carries the stub arm 174 with which is connected the hammer actuating spring 175 whose rear end is anchored to a bracket 176 mounted on the main frame plate 11.

The outer left surface of the frame casting 151 is equipped with two bearing lugs 177 and 178 which guide a longitudinally sliding plunger device consisting of a rod 179 rigidly carrying the clevis 180 at its rear end and thereby pivotally connected to the lower extremity of the bail arm 29. Both this bail arm and the corresponding bail arm 30 at the right side of the frame casting are rigidly mounted on the opposite extremities respectively of a pivot shaft 181 which extends through and has bearings in both sides of the frame casting.

The rod 179 of the plunger device may have a sufficiently loose fit in the bearing lug 177 to permit the pivot pin 182 in clevis 180 to follow the arc of swing of the lower extremity of bail arm 29 but rod 179 is made rigid with a sliding bar 183 at its forward end which is preferably of rectangular cross section and a good sliding fit within a corresponding aperture through the bearing lug 178. A roller 184 is pivotally carried at the forked extremity of bar 183 and is constantly pressed against the periphery of cam 160 by the compression spring 185 loosely surrounding rod 179 and bearing against the lug 177 at its rear end while its forward end bears against a thrust washer 186, fast to bore 183.

187 represents a current supply wire running directly to the windings of the electric motor 152. Another supply wire 188 electrically connects one switch contact 189 to the source of current supply. The other switch contact 190 is connected to the motor by a wire 191 so that making and breaking electrical contact between parts 189 and 190 will respectively start and stop the motor. A conductive switch plug 192 is adapted electrically to bridge contacts 189 and 190 when moved to the left in Fig. 2 and is carried in in-

sulated relation at the rear extremity of a horizontal bar 193 which has sliding bearing in a stationary bracket 194 and is limited in its movement toward the front by the engagement with said bracket of a cross pin 195. The forward end of bar 193 is slidingly supported in a downwardly and laterally extending portion of the frame casting and is equipped with a manual operating handle 196. A dog 197 is pivoted at 198 to the bar 193 and straddles this bar in a bifurcated lower portion 199 as shown in Fig. 3 and projects upwardly for engagement by the cam 161.

Dog 197 is constantly urged counter clockwise in Fig. 2 by springs 200 and 201, being normally disposed in upstanding position as shown in Fig. 2 by the engagement of the rear edge of its bifurcation with the top edge of bar 193 whereas the higher disposition of its front bifurcated edge permits at times relative swinging of the top of dog 197 toward the right in Fig. 2 by overpowering of the tension in springs 200 and 201. This tension, however, is sufficiently strong to enable counter clockwise rotation of cam 161 in Fig. 2 to pick up and impel the bar 193 to its position shown in Fig. 2 by engagement with dog 197 for the purpose of opening the switch.

*Operation of type registering and printing mechanism*

Omitting reference to the self-reversing ribbon feed mechanism, the power operated type registering and printing mechanism is shown in Figs. 1 and 2 as its parts are positioned when the electric motor 152 has been cut out of circuit automatically at the end of a cycle of recording action. During a single cycle of such action, the cam shaft 158 performs a half turn counter clockwise in Fig. 2. The cycle is initiated by manually pushing the switch knob 196 as far as it will go toward the left in Fig. 2. In this movement the dog 197 will tip toward the right as permitted by the yielding of spring 200 and will slip under the lower end of cam 161 (at that time stationary) and spring erect into its perpendicular relation to bar 193 after it has passed the end of cam 161. The switch plug 192 then completes circuit between the switch contacts 189 and 190 causing motor 152 to start running thus rotating worm 153, worm wheel 154, shaft 155, pinion 156, gear 157, and thereby the cam shaft 158 together with the three cams 159, 160 and 161 fixed thereto, in a counter clockwise direction in Fig. 2.

A very small amount of rotation of cam 160 will permit roller 184 which rides in contact therewith, to move suddenly toward the right under the power of the spring 185 and the consequent pulling of the lower end of bail arm 29 toward the right about its pivot 181 will throw the upper portions of bail arms 29 and 30 toward the left in unison together with their carried bail rod 28. By thus moving away from the projections 31 on all of the feeler rods 10 simultaneously, each of these rods is released or delivered to the thrust of its individual spring 16 which will carry each feeler terminal 13 toward the left in Fig. 2 until it is intercepted or blocked in its movement.

While many devices are known in the art of registering mechanisms for blocking the spring urged advance movement of type positioning feeler elements for conditioning the type to print some recordable value, any of which devices may be used for that purpose with my improved recording mechanism, there is herein illustrated for that purpose the differently notched peripheries of respectively separate wheels 14 and 15 of which there may be one for each different feeler terminal 13 and which may be rotatively positioned by the automatic action of a weighing scale.

As each of rods 10 moves toward the left in Fig. 2 a distance determined by the notched wheels 14 and 15, it will, through its connection to a corresponding type segment 19, swing that segment counter clockwise in Figs. 2 and 9 a corresponding degree of travel about the pivot shaft 20 so that the proper one of type characters 18 will be positioned in printing position vertically beneath the segment pivot. Fig. 9 represents one of the type segments 19 by broken lines as having been swung to a suitable printing position.

When the proper positioning of all type segments 19 has been thus accomplished cam 159 will have rotated far enough in Fig. 2 to discharge the roller 173 from its highest peripheral point to its lowest peripheral point whereupon under the power in spring 175, the follower arm 172 will abruptly swing downwardly in Fig. 2 causing counter clockwise rotation of shaft 170 and by means of arms 168 and 169 causing the connecting rod pivots 167 to be abruptly elevated. By this action the hammer block 163 is caused to deliver a smart blow upwardly through the action of the connecting links 165 and 166 so that the platen 162 momentarily presses upwardly against the type characters which are in its path on all of the segments 19, a rectangular aperture 103 in the floor plate 102 accommodating this action.

Thus by means of the inked ribbon 54 which is stretched laterally slightly above the floor plate 102 in alignment with the platen 162, a record will be printed from all of the type segments which have been moved to printing position, upon any piece of paper or cardboard which may be interposed between the ribbon and the top surface of the floor plate 102. The ribbon guard 101 shown in Figs. 5, 6, 9 and 12 facilitates the insertion of the paper on which a record is to be printed and protects the ribbon from damage thereby.

The cam shaft 158 continues to travel after the record has been struck and in doing so proceeds to restore both the bail arm 29 and hammer block 163 to their starting positions shown in Fig. 2 whereby all of the type segments 19 and feeler rods 10 are correspondingly restored. When the follower rollers 173 and 184 have thus arrived at the diametrically opposite high points on the peripheries of their respective cams, the top end of cam 161 will have rotated to a position before completing its half turn in which it will engage and force to the right the top end of dog 197 in Fig. 2. Springs 200 and 201 are sufficiently strong to pull the switch block 192 out from between contacts 189 and 190 without permitting the dog 197 to swing upon its pivot 198 so that all of the parts become restored to their positions in Fig. 2 except that the three cams 159, 160, and 161 are diametrically reversed. These cams, however, are symmetrical with respect to any diameter through their axis so that a subsequently repeated half turn of cam shaft 158 will precisely repeat the cycle of recording operation which has been described. After current has been cut off from motor 152, there may be slight variation in the amount of overrun of the parts which are rotated thereby due to inertia, but

a check on this inertia effect will be exerted by dog 197 after bar 193 has been positively stopped by the pin 195 engaging bracket 194 owing to the tension in spring 200.

For additional assurance against too much overrun travel of cam shaft 158 after the motor is de-energized, the bump 149 may be formed on the periphery of cam 159 which, upon engaging with roller 173 will augment the yielding resistance to continued rotation of the cam shaft 158 before the cam 160 shall have coasted far enough counterclockwise to recede from the path of roller 184.

*Operation of self-reversing ribbon drive mechanism*

Each back-and-forth movement of the upper ends of bail arms 29 and 30 causes a lengthwise reciprocation of some pushing and/or pulling members or devices herein illustrated as rack bars 40 and 41 respectively and simultaneously, but the movement of only one of these devices or rack bars is, at a given time, transmitted to cause feeding movement of the ribbon. Whenever so transmitted, the action of one device or rack bar is to feed the ribbon in a direction opposite to that in which it is fed by movement of the other device or rack bar.

Each backward stroke of rack bar 40 results only in an idle counterclockwise rotation of gear 78' in Fig. 9 if the rack teeth 47 be in mesh with that gear because of the free slippage in that direction of rotation permitted by the one way clutch within the clutch casing 77'. Bevel pinion 70' is held stationary by the friction between the hub of its clutch core 75' and the frame boss 72' occasioned by the spring 76'. Each forward stroke of rack bar 40 rotates the pinion 70' clockwise in Fig. 9 through the one way drive clutch inside of casing 77' and overcomes this friction, thereby turning bevel gear 67' an increment of movement which advances the ribbon spool 85 clockwise in Fig. 1 to feed ribbon 54 a short distance from right to left in Figs. 1 and 6. During this action of rack bar 40 for feeding the ribbon it will be clear from reference to Fig. 14 that rack bar 41 reciprocates idly, being held out of mesh with gear 77 by pin 136.

Also during this feeding movement of the ribbon, the ribbon is held taut in all portions of its length through the friction applied by the pressure of presser disc 99 against it at the guide pulley 92 and through the friction applied by the pressure of presser disc 99 against it at guide pulley 93 and through the resistance offered to the take off rotation of spool 60 by the friction between clutch core 75 and the frame boss 72 in Fig. 7.

Upon the meshing of rack bar 41 with gear 78 accompanied by the disengagement of rack bar 40 from gear 78', similar back-and-forth movements of rack bar 41 will operate intermittently to feed ribbon 54 from left to right in Figs. 1, and 6 against the slack preventing resistances of the two plunger discs 99 and of the clutch core 75' against the frame boss 72' in the following manner.

Each backward stroke of rack bar 41 results only in an idle clockwise rotation of gear 78 in Fig. 14 because of the free slippage in that direction of rotation permitted by the one way clutch within the clutch casing 77. Bevel pinion 70 is held stationary by the friction between the hub of its clutch core 75 and the frame boss 72 occasioned by the spring 76. Each forward stroke of rack bar 41 rotates the pinion 70 counterclockwise in Fig. 14 through the one way drive clutch inside of casing 77 and overcomes this friction thereby turning bevel gear 67 an increment of movement which advances the ribbon spool 60 counterclockwise in Fig. 1 to feed ribbon 54 a short distance from left to right in Figs. 1 and 6. During this action of rack bar 41 for feeding the ribbon it will be clear from the description to follow that rack bar 40 or whatever other form of pushing or pulling device may perform a corresponding function reciprocates idly, being held in its broken line position in Fig. 9 and out of mesh with gear 78'.

There remains to be described the working of the parts which insure that only one of the rack bars 40 and 41 shall be effective at any given time to cause feeding of the ribbon and that the function of feeding shall be shifted at the proper time from one rack bar to the other and vice versa to control the direction of feed. The feed shifting levers are thrown simultaneously in opposite directions by a force applied to either one of them because the shaft 105 on which lever 107 is fixed is geared to the shaft 125 on which lever 131 is fixed. The downward throw of shift lever 107 is limited by stops 104 and 104' and the downward thrown of shift lever 131 is limited by stops 145 and 145'. The frame carried stop pin 110 limits the ability of bell crank 109 to swing counterclockwise about its pivot 105 in Fig. 2 and the frame carried stop pin 50 limits the ability of bell crank 133 to swing counter clockwise about its pivot 125 in Fig. 14.

The taggle acting links 113 and 137 of the shift levers 107 and 131 respectively, coupled with the movement limiting action of stop pins 110 and 134 resiliently establishes the equilibrium of the parts in their positions shown in Figs. 2 and 14 while leaving either shift lever movable in a direction to reverse its relationship with respect to the other shift lever.

Since little force is required to reverse the shift levers, the necessary force can be applied by an obstruction such as the eyelet 108 carried by the ribbon and shown in Figs. 1 and 2 to have engaged the shift lever 107 and carried it downwardly to the position shown in those figures. This action of the ribbon carried eyelet 108 thus brought about a reversal in the direction of the feeding of the ribbon in a manner which will become clear from Fig. 9 wherein it is assumed that the subsequent feeding of the ribbon from right to left in Figs. 1 and 6 has finally caused another eyelet 132 carried by the ribbon near its opposite end to bear down upon shift lever 131 during the progress of the feeding movement of the ribbon. To illustrate the flexibility of the mechanism, let it be assumed that a single full forward stroke of rack bar 40 advances the eyelet 132 downwardly a sufficient distance to depress shift lever 131 from its position shown in Fig. 2 to its position in Fig. 9. Because of gears 126 and 127 shift lever 107 becomes simultaneously elevated from its position shown in Fig. 2 to its position in Fig. 9, but during this elevation of shift lever 107 no movement of bell crank 109 clockwise about its pivot 105 has been possible owing to the constraining engagement of guide pin 44 in the bayonet slot 43 of rack bar 40, the lower edge of which bar maintains the bell crank pin 112 in its lowest position. However, the pivot stud 115 which is fixed in shift lever 107 has been swung upwardly to a position which causes the spring 118 to overcenter with relation to the pivotal con-

nection 114 of the toggle lever 113 to the bell crank 109 so that the action of spring 118 in tending to pull together the spring studs 119 and 120 has been converted into a force which tends to keep shift lever 107 in its elevated position and which stands ready to swing the bell crank carried pin 112 upwardly when this may become possible.

It is obvious from Fig. 9 that the bell crank carried pin 112 will be enabled to move upwardly, as the bell crank 109 swings about its pivot 105, when a subsequent stroke of the bail arm 29 to the left for registering the type segments in a printing position, has drawn the rack bar 40 so far back that the edge opening into bayonet slot 43 registers with the guide pin 44. At this moment the bell crank 109, toggle lever 113, and their connecting spring 118 abruptly shift from their full line positions in Fig. 9 to their broken line positions in that figure with the consequent elevation of rack bar 40 to its broken line position where it will be maintained so that its subsequent forward stroke comprises an advance of its forward toothed end to the position 40'. Until the shift arms 107 and 131 are again reversed by the eyelet 108 due to repeated feeding of the ribbon from left to right in Figs. 1 and 6, rack bar 40 will continue to reciprocate with each cycle of recording movement of cam shaft 158 as an idling motion with its teeth 47 out of mesh with the gear 78' and with its lower edge riding above the guide pin 44. When relieved of the uplift of the bell crank pin 112, the next movement of rack bar 40 to its broken line position 40 in Fig. 9 will permit re-engagement of guide pin 44 by the bayonet slot 43 and restore the rack bar to its ribbon feeding mesh with gear 78'.

As the before described performance of the self-reversing ribbon feed mechanism is the same in the case of the parts at the right of the machine shown in Fig. 14 it will not be necessary to repeat a detailed description of the operation of the latter.

If desired, the increment of feeding movement imparted to ribbon 54 at each stroke of the rack bar 40 or 41 may be such that two, three or more strokes are necessary to advance either the eyelet 108 or the eyelet 132 a distance equal to the full permissible throw of shifter arms 107 or 131. It is not necessary that shifter arms 107, 131, be carried the full distance to their respective lowest positions by the ribbon eyelets because when these arms have been carried downwardly far enough to cause overcentering of the link 113 or 137, the spring 118 or 142 will automatically complete the throw of either shifter arm to its lowermost position.

For brevity in the appended claims, the two bail arms 29 and 30 and their connecting structure are termed an impeller or an oscillator it being clear that all power for motivating the parts of the type registering and ribbon feeding mechanism is transmitted therethrough and requires only to be disconnected from the parts 28 or 40 to operatively disassociate the lower power mechanism from the upper printing mechanism. In fact, only disengagement of rack bars 40 and 41 from their guide pins 44 and 50 is necessary to permit removal and replacement of the type registering and ribbon feeding mechanism as a unit without disconnecting the bail 29, 30 from any of its associated parts.

The advantages of these improvements may be obtained by the use of parts differing widely from the exact shape and arrangements herein disclosed to illustrate the invention, and the following claims will be understood to include by their terms all equivalents for the particular construction shown which would be suggested to one skilled in the art by the disclosure hereof.

I claim:

1. Control apparatus for shifting the direction of feeding movement imparted to an inking ribbon, embodying in combination with the ribbon, drive members reciprocating in unison for feeding said ribbon in opposite directions at respectively different times, separate pulling devices impellable by said drive members and acting respectively on opposite ends of said ribbon, and separate sets of rigid toggle jointed elements constructed and arranged by overcentering in opposite directions of relative movement to effect respectively the operative engagement and disengagement of each of said drive members with respectively different ones of said ribbon pulling devices.

2. Control apparatus for shifting the direction of feeding movement imparted to an inking ribbon, embodying in combination with the ribbon, drive members reciprocating in unison for feeding said ribbon in opposite directions at respectively different times, separate pulling devices acting respectively on opposite ends of said ribbon, and feed reversing mechanism including two levers intergeared to swing simultaneously in respectively opposite directions and connected in a manner to govern thereby the operative engagement of each of said drive members with respectively different ones of said pulling devices, together with spring means constantly biasing said levers toward one or the other of their extreme limits of relative swinging movement.

3. In combination with control apparatus as described in claim 2, an element projecting from the said ribbon and carried thereby in a path operatively to engage with and move one of said levers against the resistance of the said spring means.

4. Ribbon reversing mechanism embodying in combination, ribbon feeding gears, two rack bars carrying gear teeth and arranged to reciprocate longitudinally while said teeth are in either meshed or unmeshed relationship to said gears respectively, a stationary guide for each of said rack bars positively constraining the bar to reciprocate in a path in which its teeth are in meshed relation to its corresponding gear, and means for at different times removing each of said rack bars from said constraint by its stationary guide, thereby to permit either rack bar to reciprocate longitudinally in unmeshed relation to its corresponding gear.

5. Ribbon reversing mechanism embodying in combination, ribbon feeding gears, two rack bars carrying gear teeth and arranged to reciprocate longitudinally in unison, a stationary guide for each of said rack bars normally constraining the bar to reciprocate in a path in which its teeth are in meshed relation to its corresponding gear, and two interconnected and simultaneously shiftable feed reversing devices cooperatively related respectively to said rack bars in a manner to release only one of said bars at a time from the constraint of its stationary guide and constructed and arranged constantly to hold the released bar in unmeshed relationship to its corresponding gear while both of said bars reciprocate longitudinally in unison.

6. Ribbon reversing mechanism as described in claim 5 in which the said feed reversing devices

are intergeared in a manner to shift simultaneously in respectively opposite directions.

7. Ribbon controlled devices for effecting the delayed automatic disconnecting of a ribbon feeding drive, including in combination with an inking ribbon, a ribbon feeding reciprocator, a one way clutch arranged to transmit at times feeding movement to said ribbon from an advance stroke of said reciprocator and to transmit no movement to said ribbon from a reverse stroke of said reciprocator, resilient mechanism constructed and arranged to be actuated by feeding movement of said ribbon in a manner to store up power in said mechanism tending to shift said reciprocator out of operative association with said clutch, and detent means constructed and arranged to resist said stored up power in a manner to defeat automatic shifting of the reciprocator by said resilient mechanism until said reciprocator performs its reverse stroke and then to release said power for shifting said reciprocator.

8. In spring biased mechanism for reversing the direction of feed of an inking ribbon, in combination, a ribbon feeding drive member mounted to reciprocate in a feeding path of travel and in a non-feeding path of travel at respectively different times, a shifter device operative to displace said drive member from its feeding path of travel and to constrain said member to reciprocate in its non-feeding path of travel, a swingable arm for actuating the shifter lever, a toggle link connected in swingable relation both to said shifter device and to said actuator arm, and a toggle action spring connecting said shifter device to said link in a manner to oppose over-centering relative movement therebetween.

9. In ribbon feeding mechanism for recording apparatus, a ribbon feeding rack, a ribbon feeding gear, a lengthwise reciprocative bar adapted to operate said rack and having a lengthwise bayonet slot opening through one edge thereof, a frame pin engageable with said bayonet slot to permit lengthwise reciprocation of the rack and to hold the rack in mesh with said gear, and means to displace said bar from engagement with the frame carried pin when the edgewise opening of the bayonet slot registers with the latter, thereby to unmesh said rack from said gear.

10. In ribbon feeding mechanism for recording apparatus, in combination, two ribbon spools supporting opposite ends of the ribbon respectively, two guide pulleys engaging with said ribbon at spaced points along its length separated from said spools, a presser foot constantly and resiliently urged against said ribbon at each of its points of engagement with said guide pulleys thereby to prevent slack from occurring in the stretch of the ribbon between said guide pulleys in both directions of feeding travel of the ribbon.

11. In apparatus including an inking ribbon supported to traverse a printing station between spools located at opposite sides of said station and upon which spools respectively opposite ends of said ribbon are wound, reversibly acting ribbon feeding mechanism including in combination a stationary pivot supporting each of said spools for rotary movement, toothed wheels mounted to rotate on stationary axes and connected to turn respectively with said spools, reciprocative bars each having a toothed edge and arranged to be reciprocated in unison and lengthwise with their said edges controllably positioned either in or out of driving engagement respectively with said wheels, and means constructed and arranged to be moved while the said pivots and the said wheel axes remain stationary in a manner to shift either of said bars edgewise toward and into driving engagement with one of said wheels and simultaneously to shift the other of said bars edgewise away from and out of driving engagement with the other of said wheels.

12. In apparatus as defined in claim 11, the combination with ribbon feeding mechanism as defined in said claim, of one-way drive clutches constructed and arranged to transmit movement from each of the said toothed wheels respectively to each of the said spools.

13. In apparatus as defined in claim 11, the combination with ribbon feeding mechanism as defined in said claim, of one-way drive clutches constructed and arranged to transmit movement from each of the said toothed wheels respectively to each of the said spools and means to hold each of the said bars away from and out of engagement with its associated toothed wheel while the other of said bars is in driving engagement with the other of said toothed wheels and while the said spool pivots remain in unchanged positional relation to each other.

14. In apparatus as defined in claim 11, ribbon feeding mechanism as defined in said claim in which the said means to shift the said bars includes separate sets of toggle jointed members constructed and arranged by overcentering in one direction of relative movement to shift one of the said bars for driving engagement with one of the said toothed wheels and by overcentering in the other direction of relative movement to shift the other of said bars for driving engagement with the other of said toothed wheels.

15. In apparatus as defined in claim 11, in combination with ribbon feeding mechanism as defined in said claim, an element projecting from said ribbon and carried thereby in a path of travel to engage with the said shifter means and actuate the latter in a manner to reverse the operative disposition of said bars with respect to driving engagement with their respective toothed wheels.

ERNST S. SVENSSON.