Feb. 16, 1926. 1,573,205

F. L. TAYLOR ET AL

WRITING MACHINE

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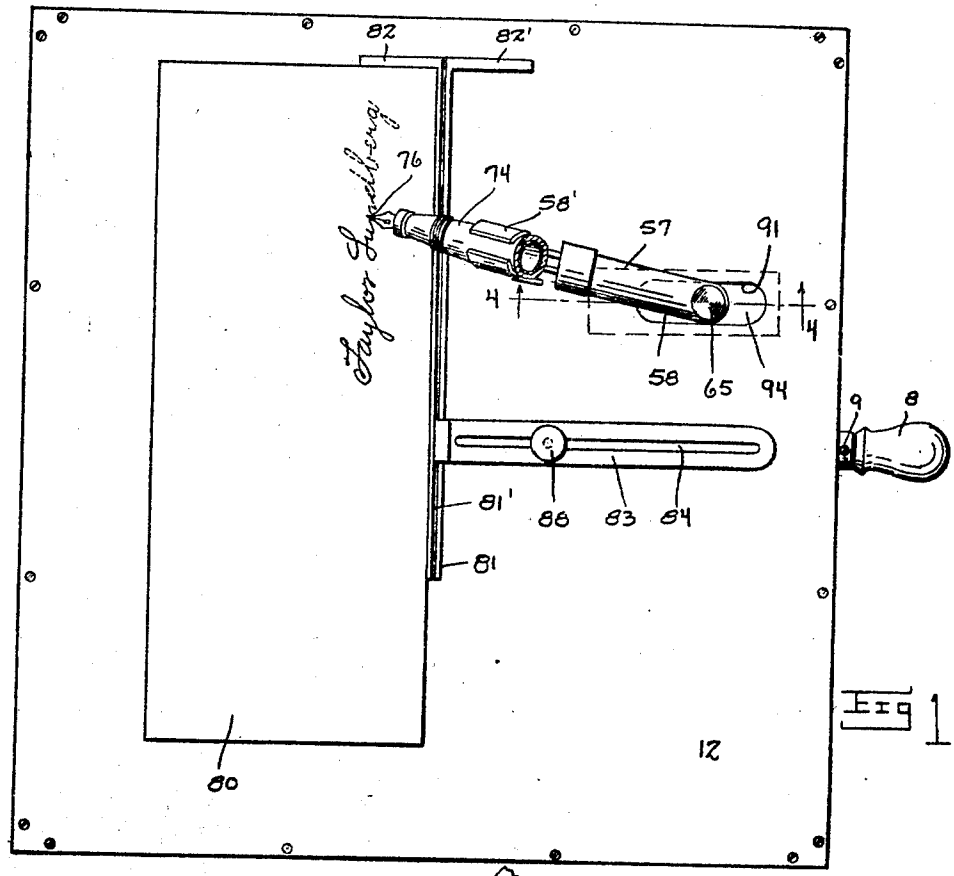


Fig 1

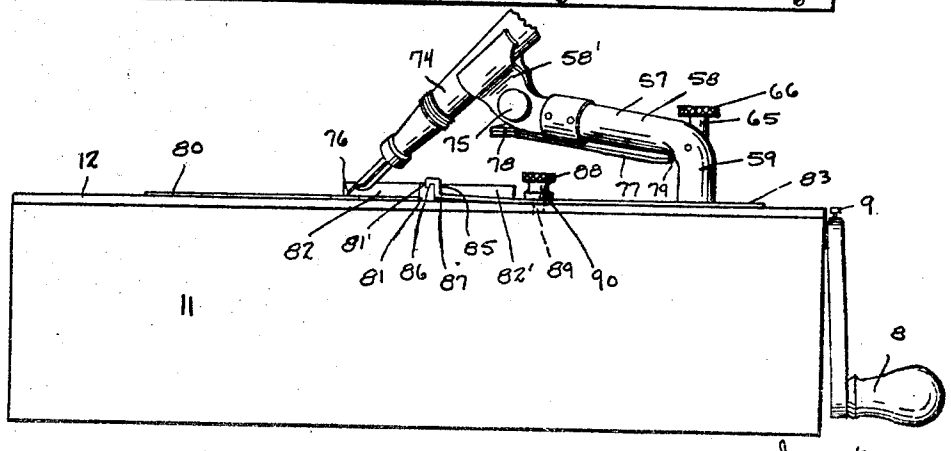


Fig 2

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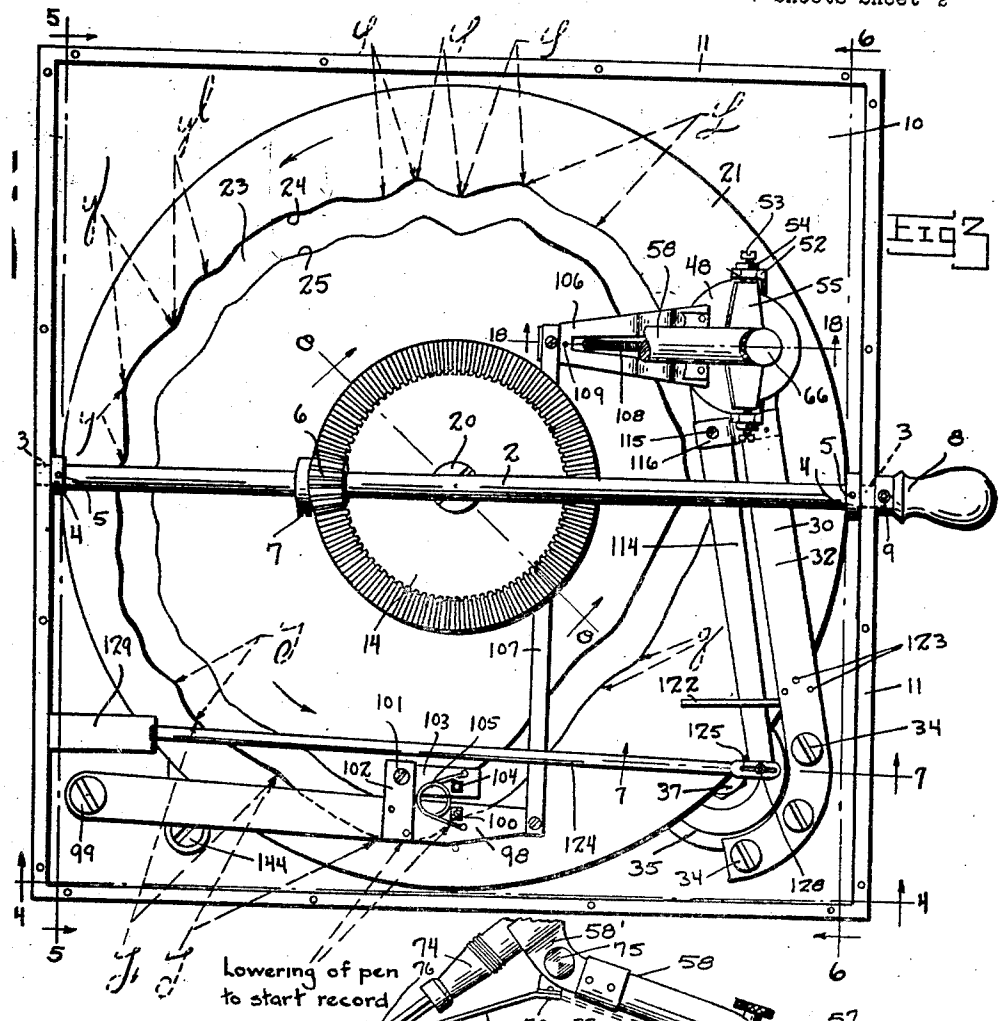
By H. E. Scantlebury Attorney

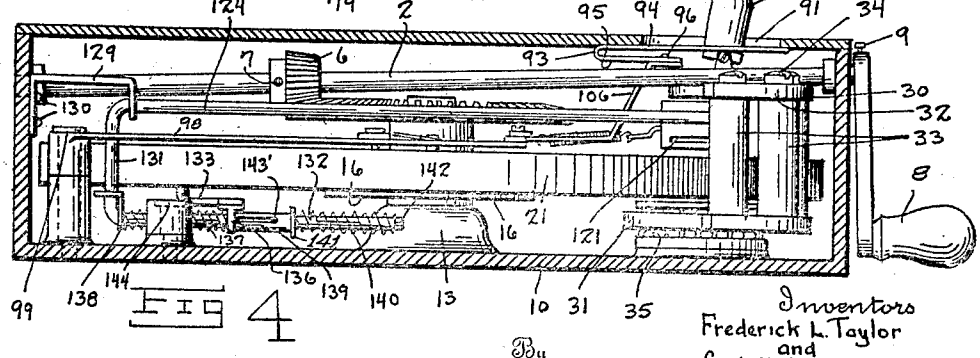
Feb. 16, 1926. 1,573,205

F. L. TAYLOR ET AL

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Filed Feb. 6, 1922 7 Sheets-Sheet 2





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Feb. 16, 1926.

1,573,205

F. L. TAYLOR ET AL

WRITING MACHINE

Filed Feb. 6, 1922

7 Sheets-Sheet 3

Fig 5

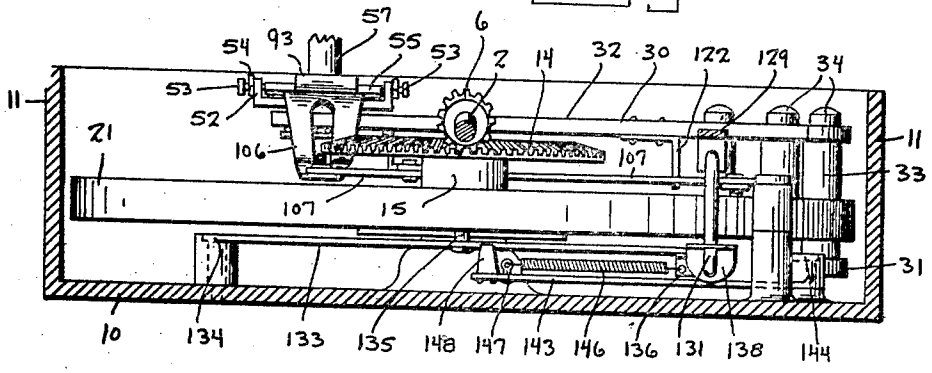
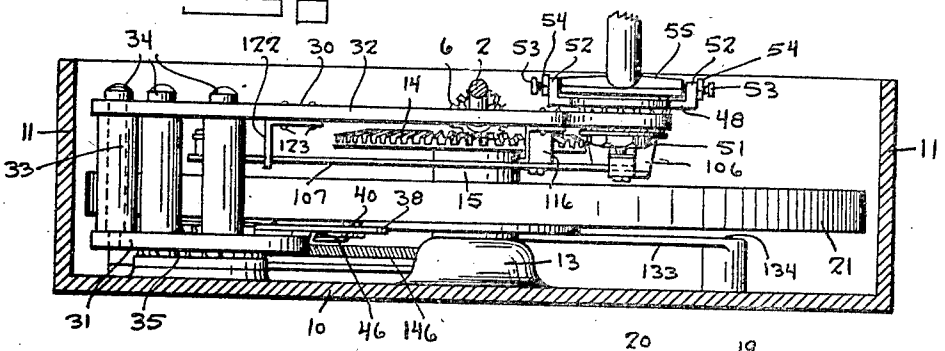


Fig 6



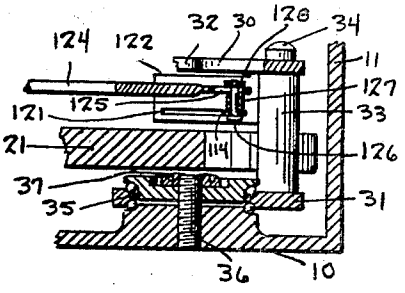
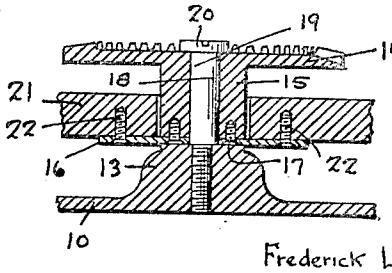


Fig 7



Fig

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Feb. 16, 1926. 1,573,205

F. L. TAYLOR ET AL

WRITING MACHINE

Filed Feb. 6, 1922 7 Sheets-Sheet 4

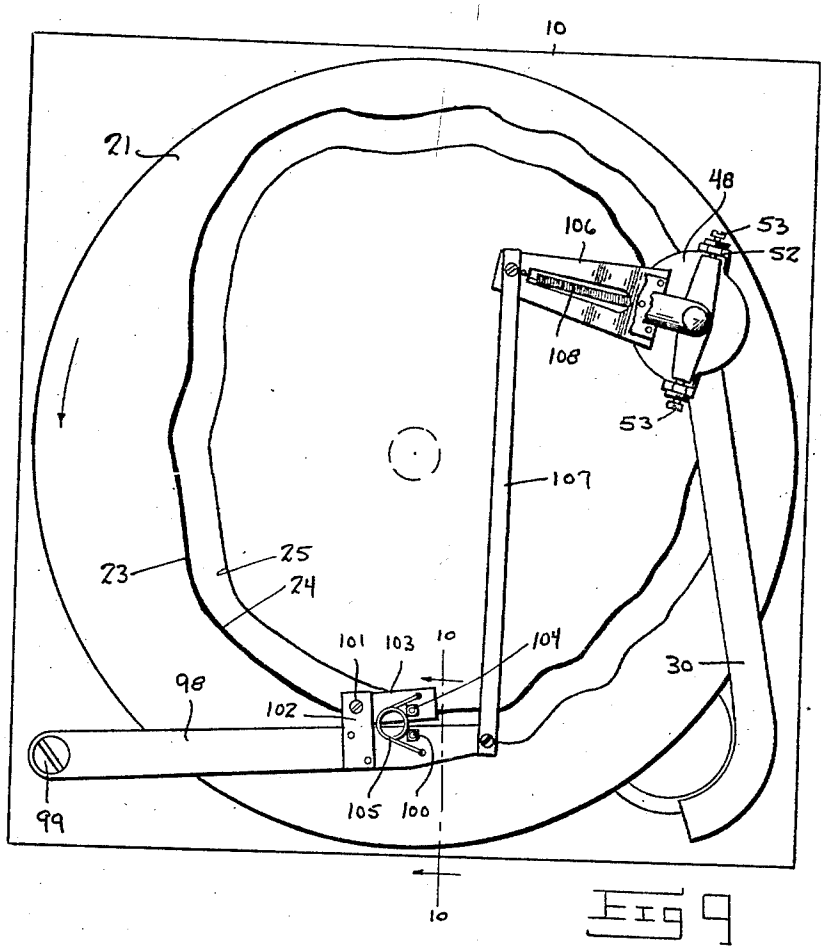


Fig 9

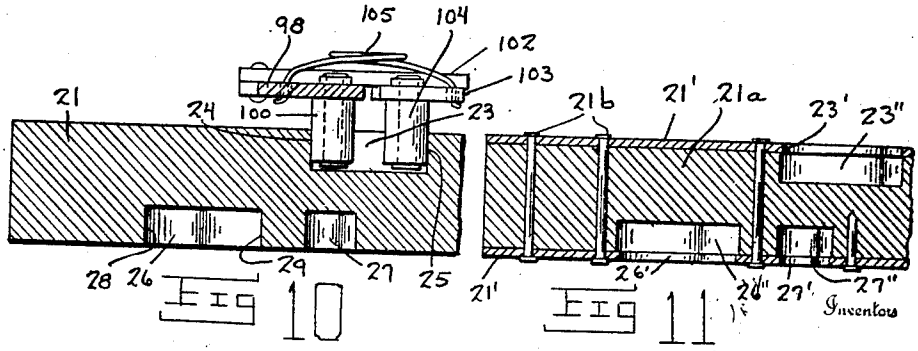


Fig 10 Fig 11

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Feb. 16, 1926. 1,573,205

F. L. TAYLOR ET AL

WRITING MACHINE

Filed Feb. 6, 1922 7 Sheets-Sheet 5

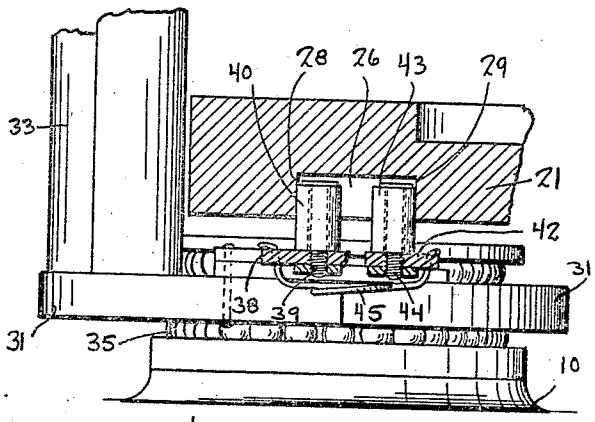


Fig 13

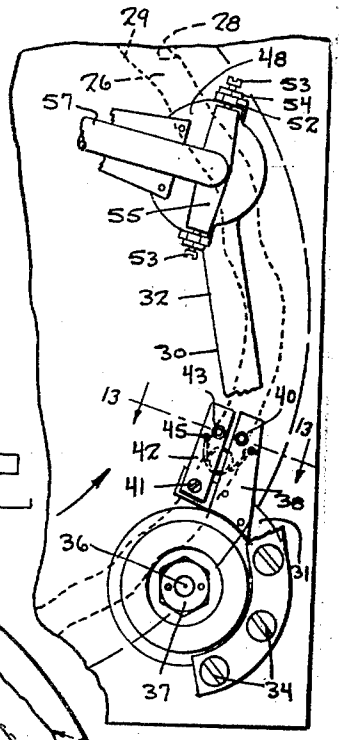


Fig 12

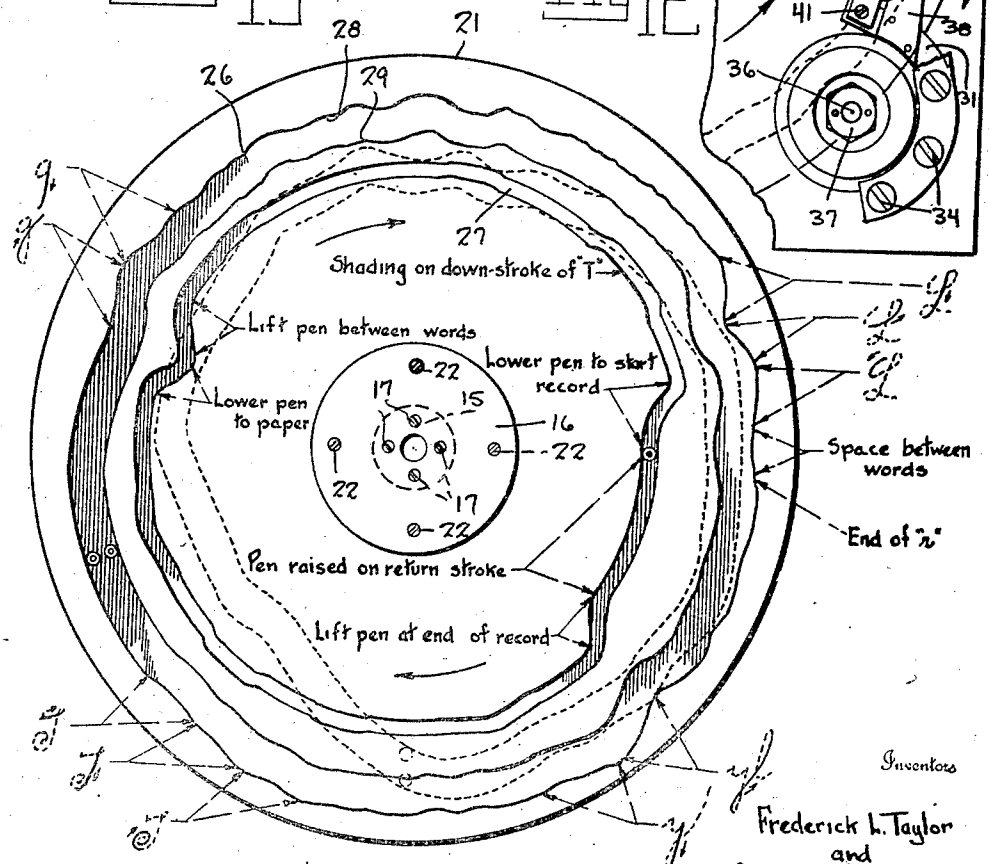


Fig 14

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1,573,205

F. L. TAYLOR ET AL

WRITING MACHINE

Filed Feb. 6, 1922

7 Sheets-Sheet 6

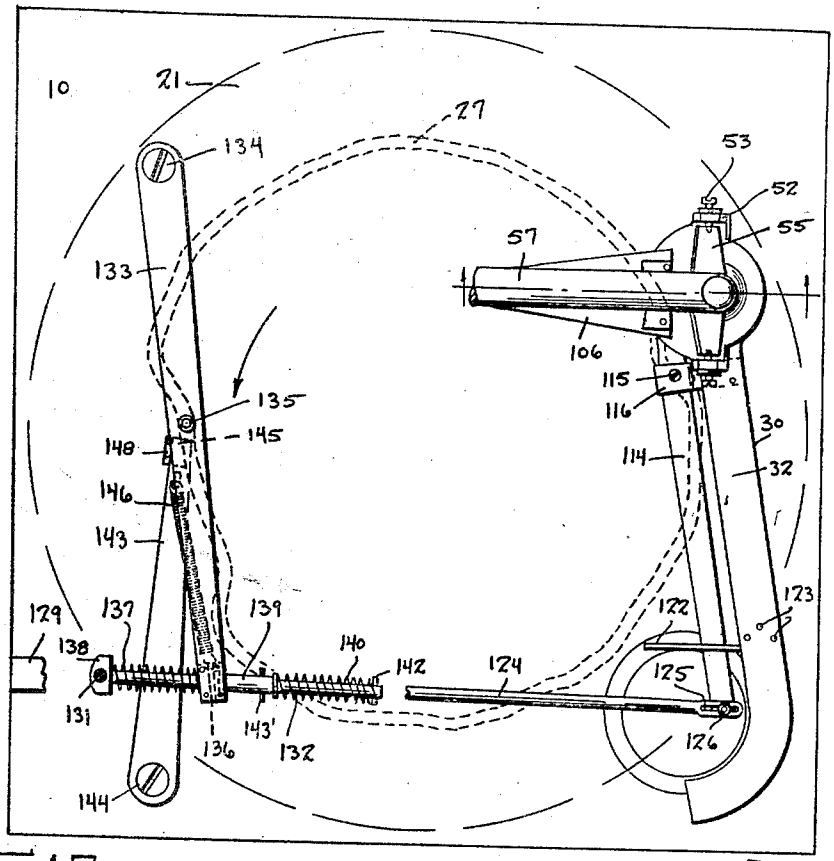


Fig 15

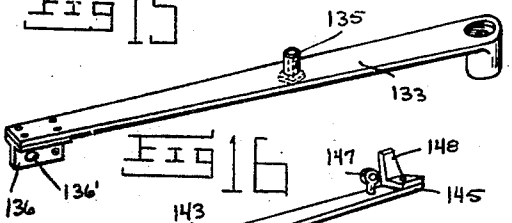


Fig 16

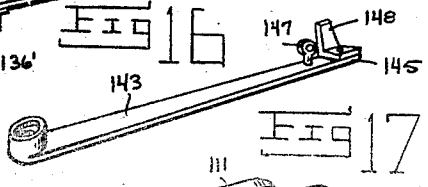


Fig 17

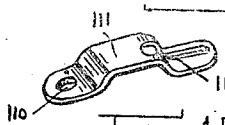


Fig 19

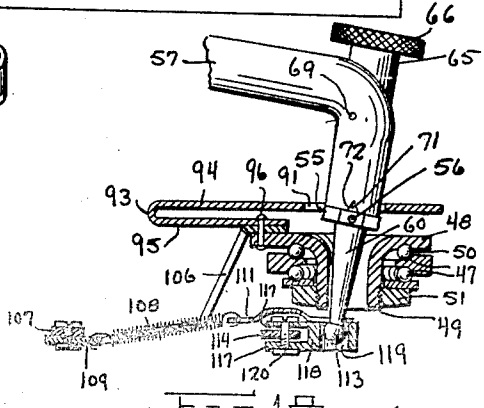


Fig 18

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1,573,205

F. L. TAYLOR ET AL

WRITING MACHINE

Filed Feb. 6, 1922

7 Sheets-Sheet 7

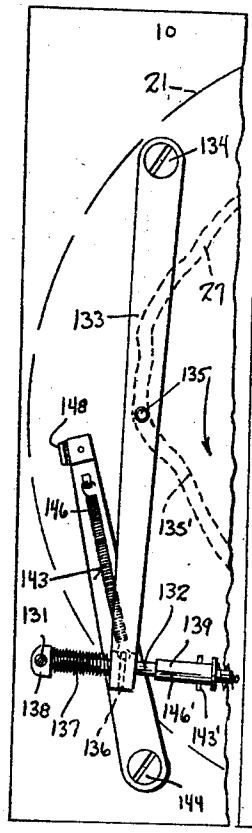


Fig 21

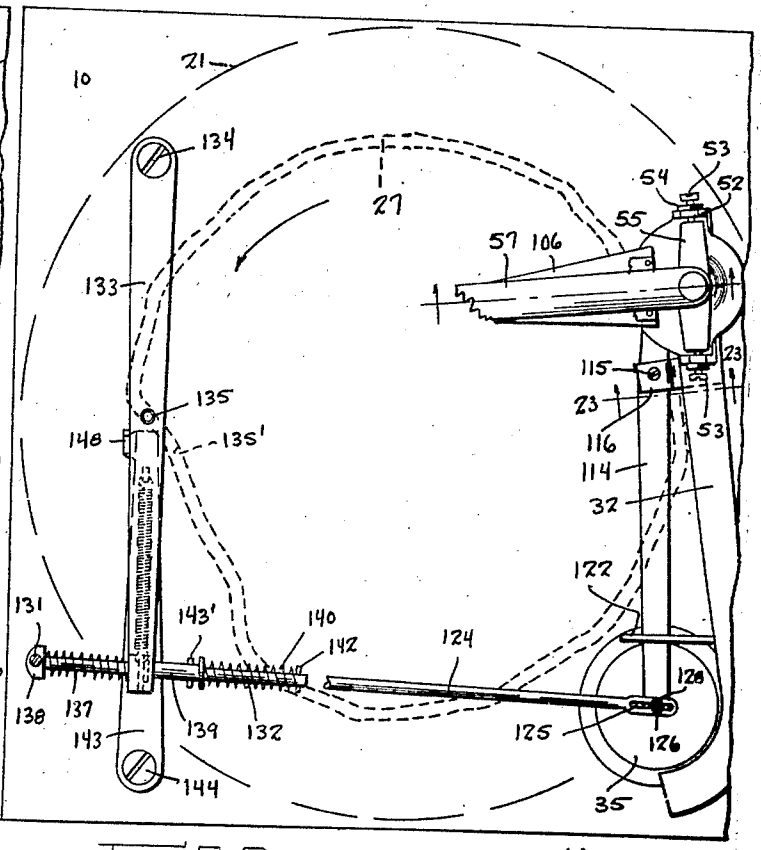


Fig 20

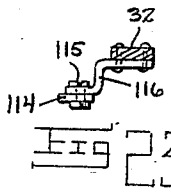


Fig 23

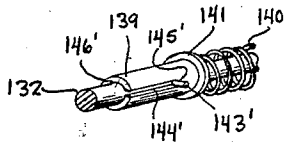


Fig 24

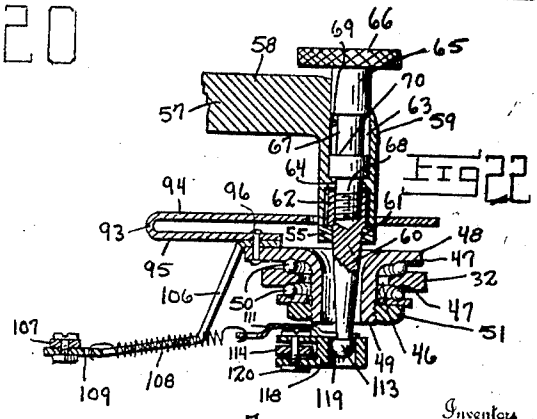


Fig 22

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Patented Feb. 16, 1926. 1,573,205

UNITED STATES PATENT OFFICE.

FREDERICK L. TAYLOR AND CARL E. LUNDBERG, OF SPOKANE, WASHINGTON.

WRITING MACHINE.

Application filed February 6, 1922. Serial No. 534,626.

To all whom it may concern:

Be it known that FREDERICK L. TAYLOR and CARL E. LUNDBERG, joint inventors, and citizens of the United States of America, residing at Spokane, in the county of Spokane and State of Washington, have invented new and useful Improvements in Writing Machines, of which the following is a specification.

This invention relates to automatic writing machines whereby signatures or other written matter may be mechanically reproduced.

The principal object of the invention is to provide an automatic writing machine by means of which faithful copies of written matter may be reproduced with all the individual characteristics as to outline, shading, etc., of the original written matter.

Another object of the invention is to provide a device of the character described, which shall be so constructed and so arranged that it will occupy a minimum of space without detracting from its efficiency.

Another object is to provide a device of the character described employing a novel type of record cam and cam follower means operatively connected to the writing member, whereby the action of the device is rendered smooth and whereby a small amount of power is required for its operation.

Another object is to provide a device of the character described which shall be extremely sensitive with respect to the variations of the writing produced and yet be sturdy and durable of construction.

Our invention also resides in the cam, as an article of manufacture.

Still further objects will be more fully described in connection with the accompanying drawings and more particularly pointed out in and by the appended claims.

In the drawings, wherein like numerals designate the same parts throughout the various figures of the drawings:

Figure 1 is a top plan view of our device.

Figure 2 is a front elevation of the device.

Figure 3 is a plan view of the machine as it appears with the top or cover removed.

Figure 4 is a section on line 4—4 of Figure 3, the section through the top member or cover being taken on line 4—4 of Figure 1.

Figure 5 is a section on line 5—5 of Figure 3.

Figure 6 is a section on line 6—6 of Figure 3.

Figure 7 is a section on line 7—7 of Figure 3.

Figure 8 is a section on line 8—8 of Figure 3.

Figure 9 is a plan view of the record carrying member, showing the cam and connecting mechanism utilized for imparting horizontal strokes to the writing member.

Figure 10 is an enlarged section on line 10—10 of Figure 9.

Figure 11 is a section showing a modified form of cam construction.

Figure 12 is a broken away top plan view of the mechanism utilized for imparting vertical strokes to the writing member, the cam groove for actuating this mechanism being shown in dotted lines.

Figure 13 is an enlarged section on line 13—13 of Figure 12.

Figure 14 is a plan view of the lower face of the record carrying member, showing the cam grooves conforming to the vertical strokes and to the variations in intensity of the different strokes in the writing to be reproduced.

Figure 15 is a broken away top plan view of the mechanism utilized for shifting the writing member into and out of operative relation to the paper being written on, and also utilized for imparting the variations in intensity to the different strokes in the writing being reproduced. In this view the marking member is out of operative position with respect to the paper being written on.

Figure 16 is a perspective view of a cam follower carrying lever.

Figure 17 is a perspective view of a compensating lever.

Figure 18 is a section on line 18—18 of Figure 3.

Figure 19 is a perspective view of a link used in securing a counter-balancing spring to the marker arm.

Figure 20 is a view similar to Figure 15 but showing the mechanism in the position it will assume as the marking member is lowered into operative position.

Figure 21 shows a portion of the mechanism shown in Figures 15 and 20, but in

the position the mechanism assumes during the actual writing period of the marking member.

Figure 22 is a view similar to Figure 18, but showing the mechanism in more complete section and in the position it assumes when the marking member is in operative position.

Figure 23 is a section on line 23—23 of Figure 20.

Figure 24 is a broken away perspective view of the takeup spring as mounted on the tension transmitting rod of the device.

We have provided a container comprising base 10, sides 11 and top 12, the latter comprising in itself, or being adapted to carry, a paper supporting table. A shaft 2 (see Fig. 3) extends between and has bearing at 3 in two opposite sides 11 of container 10 and is held from lateral movement by means of collars 4 which are secured to shaft 2 by pins 5. A bevel pinion 6 is fixed on shaft 2 by such means as set-screw 7. Shaft 2 comprises the operating or power transmission shaft, and while suitable mechanical means such as a motor may be suitably coupled to said shaft for driving same, we have shown, for the purpose of illustration, a handle 8 secured to shaft 2 by such means as set screw 9 whereby shaft 2 may be manually revolved or driven.

Located substantially in the center of base 10 and extending upwardly therefrom is a boss 13. (Fig. 8.) Bevel gear 14 is adapted to mesh with bevel pinion 6 and has a depending hub 15, to the lower face of which is secured a plate 16 by means of screws 17. Bevel gear 14 is revolubly mounted on the bearing face 19 of a screw 18 which has threaded engagement with boss 13. Screw head 20 serves as a retainer for gear 14, and plate 16 is adapted to revolve over the upper face of boss 13.

We have shown the record carrying member in the form of a disk 21 secured to and arranged in concentric relation with plate 16 and gear 14 by means of screws 22 (Fig. 8). In the upper face of member 21 is cut the groove 23 forming shoulders 24 and 25 (Fig. 3.) The undulations of the face of shoulder 24 are cut to correspond with the horizontal strokes of the writing to be reproduced and such shoulder forms the actuating cam face.

The contour of shoulder 25 substantially parallels that of shoulder 24 and the face of such shoulder 25 may be termed as a secondary cam face.

On the reverse side of disk 21 are the cam grooves 26 and 27 (Fig. 14). Groove 26 forms the shoulders 28 and 29, the undulations in the face of shoulder 28 corresponding to the vertical strokes of the writing to be reproduced, such shoulder 28 serving as a cam actuating face. The contour of shoulder 29 substantially parallels that of shoulder 28 and the face of such shoulder 29 may be termed as a secondary cam face.

The undulations of the groove 27 are cut to correspond with the varying pressure applied to the marking member used in forming the original writing from which the copies are to be made and are adapted to control the marking member of the present invention to vary the intensity of the strokes being formed thereby to correspond with the intensity and shading of the original writing. Certain portions of groove 27 are cut in a manner to shift the marking member of the present invention into and out of operative relation to table 12, as will be later described.

Pivotally arranged on base 10 is a supporting arm 30. Arm 30 comprises a lower plate 31 and a main supporting arm 32 superposed with respect thereto and connected therewith by means of spacers 33 and screws 34 (Figs. 4 and 7). Plate 31 has a ball-bearig connection 35 with base 10, screw 36 and nut 37 serving to hold the various members of the ball-bearing connection in operative relation to each other.

Extending from plate 31 is a lever 38 (Figs. 6, 12 and 13), upon which is mounted by means of screw 39, a cam follower or roller 40. Roller 40 is adapted to project into groove 26 and co-act with cam actuating face 28. Pivotally mounted at 41 to plate 31 is roller supporting member 42 which carries the roller 43 by means of screw 44, roller 43 projecting into groove 26 and being adapted to co-act with secondary cam face 29. A coil spring 45, having its opposite extremities secured to lever 38 and lever 42, serves to urge member 42 upon its pivotal connection 41 and thus tend to spread rollers 40 and 43 apart to cause and maintain constant contact between roller 40 and face 28. Thus, even though secondary cam face 29 does not exactly parallel cam face 28, roller 40 will continue in contact with face 28, spring 45 taking up all inequalities in the width of groove 26.

The free end of arm 32 is apertured as at 46 (Fig. 22) and ball races 47 are formed on either side thereof.

A plate 48, having a centrally apertured hub 49, which extends downwardly through aperture 46, is pivotally mounted on arm 32 by means of ball bearings 50, such bearings being held in operative relation to ball races 47 by means of nut 51 which is threaded on the end of hub 49.

Plate 48 is provided with upstanding ears or lugs 52, (Figs. 6 and 15) through which are threaded pivot screws 53, adjustably retained in position by lock nuts 54. A crossbar 55 extends over plate 48 and its ends have bearing engagement with

pivot screws 53 at 56 (Fig. 18), so that bar 55 is held in pivotal or tilting relation to plate 48 and arm 32.

A marker arm 57 of substantially L shape has a relatively long arm 58 and a relatively short arm 59 (Fig. 4). A pin 60 is frictionally secured to bar 55 by being forced through a central aperture 61, therein, the upper extremity 62 of pin 60 being internally threaded and adapted to extend into bore 63 provided in the lower extremity of short arm 59. Bore 63 is reduced in diameter as at 64. A connecting screw 65 is provided with a knurled or otherwise multilated head 66 to provide a finger grip and is reduced in diameter at 67 and 68, portion 68 being threaded for engagement with the internally threaded upper extremity 62 of pin 60. A pin 69 projecting through bore 63 is adapted to prevent the entire withdrawal of screw 65 from bore 63 as it lies in the upward path of shoulder 70. In order to establish the correct positioning of arm 57 on crossbar 55, we have provided a lug 71 on bar 55 adapted to register with a corresponding notch 72 provided in the lower edge of arm 59 (Fig. 18).

In order to remove marker arm 57 from operative relation with the interior mechanism of the container 10 and thus render the device less liable to breakage in transit or for the purpose of rendering the machine inoperative as a precautionary measure, screw 65 is revolved to bring threaded portion 68 out of engagement with internally threaded portion 62, whereupon the entire arm 57 may be freely lifted away.

While any type of marking member may be attached to the marker arm 57 in any suitable manner, we have shown, for the purpose of illustration, a fountain pen 74 removably attached to arm 57 by means of spring clips 58′ carried on arm 57.

Nut 75 serves to draw clips 58′ together to tightly embrace the marking member or pen 74. In order that the operator may initially set the member 74 so that the marking point 76 will be in correct relation to the arm 57 and the paper supporting table 12, we have provided a leaf 77 having pivotal engagement with the arm 57 at 78, and having upward extension 79 (Figs. 2 and 4).

When arm 57 is raised as in Figure 4, leaf 77 may be swung into the position shown, member 74 shifted with respect to clips 58′ until point 76 contacts with the leaf 77 as shown in Fig. 4, and clips 58′ tightened about member 74 by means of nut 75. Leaf 77 may then be swung into inoperative position as shown in Figure 2, where it may remain until it is desired to check up the adjustment of the member 74, or until member 74 has been removed and re-inserted.

We have designated the paper or other material upon which the reproduction is to be made, at 80. It is desirable to positively position paper 80 on paper supporting table 12 so as to be in operative relation to marking member 74 and, since this position will vary with various written matter and sizes of paper, we have shown an adjustable positioning means.

Our positioning means comprises positioning bar 81 which is freely slidable over the surface of table 12 and which is provided with the longitudinally extending groove 81′ on its upper edge. Bar 81 is also provided with cross bars 82 and 82′ extending at substantially 90° on either side of bar 81.

A clamping bar 83 is longitudinally slotted as at 84 and one extremity is bent upwardly as at 85 and downwardly at 86, the latter bend providing a depending extension adapted to register with and extend into groove 81′. The length of bend 85 is such that when extension 86 engages groove 82, the bottom side of bar 83 will slightly clear the top of table 12 adjacent the bar 81, as at 87. A clamping or thumb nut 88 has a threaded extremity 89 adapted to extend through slot 84 and into threaded engagement with table 12. It will be seen that clamping bar 83 is not only mounted so as to be longitudinally slidable with respect to nut 88, but that it may be swung radially about nut 88. Consequently, due to the above method of mounting bar 83 on table 12 and the sliding engagement between bar 81 and clamping bar 83, we have provided a paper positioning means which gives an almost unlimited range of adjustment to the bar 81 over the table 12. Having positioned bar 81 in correct relation to marking member 74, clamping nut 88 is turned down until shoulder 90 presses bar 83 tightly against top 12 causing extension 86 to press bar 81 against top 12 and thereby frictionally retain the said bar 81 in fixed relation to top or paper supporting table 12.

Crossbars 82 and 82′ are adapted to engage the end of paper 80 to establish the relative position thereof on supporting table or top 12 to determine the relative position of the signature to be written with respect to the side edge of the paper 80, the bar 82 being adapted to engage the right hand edge of the paper 80. By turning bar 81 end for end, the cross bar 82′ will be in a position to engage the left hand edge of the paper to be written on, and by thus making a provision for turning bar 81 end for end it will be seen that the effective range of the positioning member is greatly increased.

It will be noted that paper supporting table or top 12 is apertured as at 91 to allow for the passage therethrough of marking arm 57 and that aperture 91 is sufficiently large to allow the required movement of arm 57. In order to close the major portion of

aperture 91 without interfering with the proper functioning of arm 57, we have provided a shutter 92 bent upon itself as at 93 to provide a shutter plate 94 and fastening plate 95. Plate 95 is fastened to plate 48 by such means as rivets 96 and plate 94 is apertured as at 97 to allow for the passage therethrough of arm 59. Shutter 92 is preferably constructed of a slightly resilient material so that the bend 93 will tend to hold plate 94 in sliding contact with the lower face of supporting table 12.

We will now describe the means for shifting marker arm 57 and consequently marking member 74 in relation to paper 80 to impart horizontal strokes to paper 80.

A lever 98 is pivoted to base 10 by means of screw 99 (Fig. 9) and carries a cam follower or roller 100 adapted to project into groove 23 and co-act with cam actuating face or shoulder 24. Pivotally mounted at 101 to arm 102, which is rigidly secured to lever 98, is a roller supporting member 103 carrying roller 104, roller 104 being adapted to project into groove 23 and to co-act with secondary cam face or shoulder 25. A coil spring 105, having its opposite extremities secured to lever 98 and member 103, serves to radially swing member 103 upon its pivotal connection 101 and thus spread rollers 100 and 104 apart to cause and maintain constant contact between roller 100 and face 24; thus, even though secondary cam face 25 does not exactly parallel cam face 24, roller 100 will continue in contact with face 24, spring 105 taking up all irregularities in the width of groove 23.

A crank arm 106 (Figs. 9 and 18) is secured to plate 48 and a link 107 connects lever 98 and crank 106, so that radial movement of lever 98 caused by the roller 100 following the undulations of face 24 will impart a radial movement to plate 48 about its ball-bearing connection with supporting arm 32 and hence cause a radial movement of marker arm 57 with respect to supporting arm 32.

As previously noted, cross bar 55 and hence marker arm 57 are tiltably arranged with respect to plate 48 and arm 32. In order to counter-balance the weight of long arm 58 and the marking member 74 carried thereby, we have provided a spring 108 (Figs. 3 and 18) secured to crank 106 at one end as at 109, and connected at the other end through an aperture 110 (Fig. 19) provided in the spring holding link 111. Link 111 is provided with a bayonet slot 112 adapted to slip over the knob 113 provided on the lower extremity of pin 60. It will be seen that the tendency of spring 108 to swing or tilt marker arm 57 in a clockwise direction offsets the tendency of the weight of long arm 58 and member 74 to swing arm 57 in a counter-clockwise direction.

A lever 114 is fulcrumed at 115 to a bracket 116 depending from arm 32 (Figs. 15, 20 and 23), one extremity of lever 114 extending between the forks 117 of a link 118 which is apertured or recessed at 119 to receive the knob 113. Screw 120 serves to pivotally connect lever 114 and link 118. The opposite end of lever 114 extends through a guide slot 121 in bracket 122 (Fig. 7) which is secured to lever 32 at 123. A connecting rod 124 is slotted as at 125 to receive a connecting screw 126 loosely mounted in the extremity of lever 114, spacer 127 separating lever 114 and rod 124. Slot 125 allows for adjustment between lever 114 and rod 124 while nut 128 on pin 126 serves to set such adjustment.

Rod 124 is slidably supported by means of bracket 129 secured to one of the side walls 11 at 130, and is bent downwardly at 131 (Fig. 4) and then forwardly to form tension transmitting rod 132. A cam follower lever 133 is pivotally mounted on base 10 by means of screw 134 and carries an upwardly projecting cam follower or roller 135 adapted to project into groove 27 and co-act with the shoulders formed in member 21 by said groove. The free extremity of lever 133 carries a flange 136 (Fig. 4) which is apertured at 136′ (Fig. 16) to allow for the free passage therethrough of tension transmitting rod 132, thereby forming a sliding connection between lever 133 and rod 132. A compression spring 137 encircles rod 132 and is interposed between flange 136 and a spring stop 138 (Figs. 4 and 5) which is positioned on said rod 132.

Spring 137 serves to yieldably connect lever 133 and rod 132 and, as will be later described, to impart a varying pressure of contact between marking member 74 and paper 80.

A sleeve 139 (Figs. 4 and 24) is slidably mounted on rod 132 and is urged to the left in Figure 4 by means of a spring 140 encircling rod 132 and interposed between end 141 of sleeve 139 and pin 142 on rod 132. A pin 143′ carried by rod 132 is adapted to project through slots 144′ provided in sleeve 139, and the engagement of the ends 145′ of slots 144 and pin 143′ limits the movement of sleeve 139 to the left in Figs. 4 and 24.

Spring 140 is of such a strength that it normally holds sleeve 139 to the left in Figure 4 as a nonyielding stop on rod 132, so that when flange 136 contacts with the end 146′ of sleeve 139, a further movement of flange 136 to the right in Figure 4 will carry the rod 132 bodily to the right, in other words, sleeve 139 and spring 140 form a normally positive stop on rod 132. However, should external force be accidentally exerted downwardly on marker arm 57, thus swinging lever 114 in a clockwise di-

rection around screw 115, and sliding rod 124 and hence rod 132 to the left in Figure 4, it will be seen that spring 140 will yield and be compressed between end 141 and pin 142 thus enabling rod 132 to slide to the left without moving lever 133. In this manner, such external force on arm 57 is taken up by spring 140 instead of being imparted to the cam carrying lever 133. Otherwise this external force would be imparted to lever 133 which would result in a great strain on cam follower 135 due to its being confined within groove 27.

Referring to Figures 15, 20 and 21, it will be observed that a compensating lever 143 is pivoted to base 10 as by screw 144, its free end 145 being adapted to underlie cam follower lever 133. A compensating spring 146 is connected at one end to lever 143 by such means as eye 147 and at the other end to the free extremity of cam follower lever 133 through the medium of flange 136. A stop 148 on lever 143 is adapted to co-act with the edge of lever 133 to limit the clockwise movement of lever 143.

In Figure 11 we have shown a modified form of record carrying member, wherein such member consists of two surface plates 21′ preferably constructed of a wear-resisting material separated by a core 21^a which may be of wood or other light, easily cut material, said plates 21′ and core 21^a being fastened together by such means as rivets 21^b. Grooves 23′, 26′ and 27′ correspond to grooves 23, 26 and 27 in member 21, the core 21^a being also grooved as at 23″, 26″ and 27″ to allow for the projection of cam follower rollers thereinto but being cut wider than the grooves 23′, 26′ and 27′ in order that the shoulders formed by grooves 23′, 26′ and 27′ may form the only faces against which the cam follower rollers contact, thus eliminating the necessity of cutting grooves 23″, 26″ and 27″ with great accuracy as is true of the grooves in plates 21′. By this construction the weight of the record carrying member may be considerably reduced.

We will now describe the operation of our device. For the purpose of illustration we have shown the record carrying member 21 as carrying grooves 23, 26 and 27 cut to conform to the characters comprising our surnames so as to shift marking member 74 in relation to paper 80 to impart to said paper a composite signature as illustrated in Figure 1. In Figs. 3 and 14 we have indicated the specific undulations which cause several of the distinguishing characteristics of the written matter to be reproduced. The contour of the grooves lying between the arrow heads on the ends of the dash lines indicate the cam faces which, when they co-act with their respective followers, generate the solid portion of the letters indicated at the extremities of the dash lines, the dotted portions of the letters being generated by preceding and succeeding cam faces.

Assuming now that the marking member is raised out of operative relation to the paper supporting table 12 and paper 80 and the device is in readiness to initiate the writing of a signature the various parts will be in the positions shown in Figures 3, 4, 5, 6, 7, 14, 15 and 18. Upon revolving handle 8 and hence shaft 2 and bevel pinion 6 in a clockwise direction, gears 14 and hence record carrying member 21 will be revolved in a counter-clockwise direction. (Since, in Figure 14, the member 21 is shown as being inverted, the direction of rotation is indicated as being clockwise. It will also be noted that in Figures 12, 15, 20 and 21 the member 21 and the cam grooves 26 and 27 are shown in dotted lines since they superpose certain parts of the mechanism and would necessarily have to be removed to disclose such mechanism, as shown).

Referring now to Figures 14, 15 and 20, the cam groove 27 is provided with an undulation which, initially, carries follower 135 and hence lever 133 in a clockwise direction, and this movement is imparted to rod 132 through the co-action of flange 136, spring 137 and spring stop 138. In this manner connecting rod 124 is thrust to the left in Figure 15 with a consequent clockwise movement on the part of lever 114 and a downward tilting movement on the part of marker arm 57 and marking member 74 until point 76 contacts with paper 80. At the time of the initial contact of point 76 with paper 80, the various elements will be in the positions of Figures 20 and 22, the co-action between the lever 133 and the stop 148 on lever 143 causing lever 143 to swing in a clockwise direction until levers 133 and 143 are substantially in line, it also being noted that in this position cam follower 135 is substantially in the line of centers of screws 134 and 144. It will also be noted that pin 126 at the extremity of rod 124 substantially superposes the center of the pivotal mounting of supporting arm 32, whereby subsequent radial movement of arm 32 does not affect rod 124.

Upon continued rotation of member 21 the groove 27 forces follower 135 still further outwardly towards the periphery of member 21 with a consequent further clockwise movement of lever 133, and a consequent compression of spring 137 thus placing a tension or longitudinal pressure on rods 132 and 124, which tension or pressure is imparted to marking member 74 as a downward pressure against paper 80, groove 27 being cut to correspond with the intensity of the characters to be formed so that the pressure of contact be-

tween point 76 and paper 80 conforms with the pressure exerted in writing the original matter.

Were there no compensating means provided in connection with lever 133 it will be seen that the load of compressing spring 137 would occur entirely between the cam follower 135 and the shoulders 135′ of groove 27 which would result in such friction between said follower and shoulder that a varying amount of power would have to be exerted in revolving member 21 depending upon the relative degree of compression of spring 137, thus tending to prevent smooth action and to cause an uneven motion in the rotation of member 21 and consequent unevenness in the writing being formed by the marking member 74.

However, by reference to Figures 20 and 21 it will be seen that the instant cam follower 135 carries lever 133 sufficiently in a clockwise direction to throw levers 133 and 143 out of line, the spring 146 throws lever 143 into the position of Figure 21, whereupon the contractive effect of spring 146 exerts a clockwise pull on lever 133 and thus compensates the counter-clockwise thrust exerted against lever 133 by spring 137. In other words, in Figure 21, lever 133 is practically hung in balance by the opposed effect thereon of the springs 137 and 146, and therefore the expansive force of spring 137 is kept from causing a binding action between follower 135 and shoulder 135′ without detracting from the proper functioning of spring 137 in imparting the desired longitudinal pressure on rods 132 and 124. In actual practice it has been found that the compensating lever and spring 143 and 146, function in such a manner that there is no appreciable retarding effect against the rotation of record carrying member 21 even when the initial pressure of contact is being placed upon the marking member 74.

Now assuming that the rotation of the member 21 is continued, whenever the cam follower 135 is forced further outwardly towards the periphery of such member 21 by the contour of groove 27, spring 137 is further compressed to impart a greater pressure of contact between paper 80 and point 76, while this pressure is relieved whenever the contour of groove 27 carries follower 135 inwardly towards the center of member 21 by reason of a consequent expansion of spring 137.

When marking member 74 is to be raised out of operative relation to paper 80 to provide spaces between words or for returning the marking member to its starting position, cam follower 135 is forced inwardly towards the center of member 21 by a suitable undulation in groove 27 which results in first allowing spring 137 to expand, thus relieving the pressure of contact between paper 80 and point 76. Lever 133 will then contact with end 146′ of sleeve 139 and, spring 140 being normally non-yieldable, rods 132 and 124 will be thrust to the right in Figure 4. This movement results in tiltably raising marker arm 57 or swinging it in a counter-clockwise direction through the medium of lever 114 and link 113.

The rotation of member 21 causes a radial movement on the part of marker arm 57 with respect to arm 32 through the co-action of cam follower 100 with the undulation in cam groove 23, and the connections between said follower and the marker arm, namely, lever 98, link 107, crank arm 106, and plate 48. Such radial movement of marker arm 57 imparts a consequent movement to marking member 74 to reproduce on paper 80 a line conforming to the horizontal strokes of the original writing.

Simultaneously with the above radial movement of marker arm 57, the rotation of member 21 causes a radial movement of supporting arm 30 about its pivotal mounting 35 on base 10, through the co-action of cam follower 40 with the undulations in cam groove 26, and the lever 38. Such radial movement of supporting arm 30 causes a consequent movement to marking member 74 to reproduce on paper 80 a line conforming to the vertical strokes of the original writing. Groove 26 is so cut that it causes supporting arm 30 to be gradually swung in a counter-clockwise direction, over and above its movement for reproducing vertical strokes on the part of member 74, as the writing progresses towards the finishing point in order to compensate a portion of the radial movement of the marker arm 57 with respect to the supporting arm, so that the writing being formed has a substantially straight baseline as differentiated from the arcuate baseline which would otherwise be formed.

While we have herein shown and described a specific embodiment of our invention, we do not wish to be limited thereto except for such limitations as the claims may impart.

We claim:—

1. In a reproducing machine, a record carrying member having a cam groove, a supporting arm, a marking member operatively connected to said supporting arm, cam following means carried by said supporting arm and projecting into said groove and engaging one side thereof, and means carried by said supporting arm and co-acting with the other side of said groove and adapted to hold said cam following means in contact with said first mentioned side.

2. In a reproducing machine, a record carrying member having a cam groove, a supporting arm, a marking member operatively connected to said arm, a cam follow-

ing roller carried by said supporting arm and projecting into said groove for engaging one side thereof, a roller supporting member pivoted to said supporting arm, a roller carried by said last mentioned member and projecting into said groove to contact with the other side thereof, and spring means adapted to swing said roller supporting member in a manner to spread said first and second mentioned rollers apart, whereby said cam following means is held in contact with said first mentioned side of said groove.

3. A reproducing machine comprising a paper supporting table, a pivotally mounted supporting arm capable of radial movement about its pivotal mounting, a marker arm pivotally supported on said supporting arm, a marking member carried by said marker arm in super-posed relation to said table, cam actuated means operatively connected to said marker arm for radially swinging said marker arm with respect to said supporting arm for moving said marking member over said paper to form the horizontal strokes of the writing being formed, and cam actuated means for simultaneously swinging said supporting arm radially about its pivotal mounting to compensate a portion of the radial movement of said marker arm, whereby the writing being formed has a substantially straight base line as differentiated from the arcuate base line which would otherwise be formed.

4. A reproducing machine comprising a container, a paper supporting table forming the top of said container, record cams within said container and corresponding to the writing to be formed, means adapted to actuate said cams, a marker arm operatively connected to said cams within said container and extending upwardly through the top of said container, said top being apertured to allow for the passage therethrough and the lateral movement thereof, a marking member carried by said marker arm and super-posing said table, and means apertured for the passage of and movable with said marker arm and adapted to close the major portion of said aperture in said top.

5. In a reproducing machine including a base and a paper supporting table, a record carrying member revolubly mounted on said base and having cam grooves in the upper and lower surfaces of said member corresponding to the characters to be formed, a supporting arm pivotally mounted on said base, a marker arm pivotally and tiltably supported on said supporting arm and carrying a marking member in super-posed relation to said table, means operatively connecting certain of said cam grooves to said marker arm and another of said cam grooves to said supporting arm, and means for revolving said record carrying member whereby said cam grooves are caused to shift said marking member in relation to the paper supporting table to impart to said paper a line conforming with the characters represented by said cam grooves.

6. In a reproducing machine including a marking member and a record carrying member having actuating cam faces formed by grooving said record carrying member in a manner whereby said actuating cam faces conform to the writing to be formed, levers operatively connected to said marking member, actuating cam following members on certain of said levers and adapted to project into said grooving, said member having secondary cam faces formed in said grooving and opposing said actuating cam faces, secondary cam following members projecting into said grooving in opposed relation to said actuating cam following members and mounted on said levers in a manner to be movable towards and away from said actuating cam following members, and means adapted to spread said actuating cam following and said secondary cam following members apart from one another to retain said cam following members in contact with said actuating and secondary cam faces, respectively.

7. In a reproducing machine including a base, a paper supporting table, a record carrying member, and a marking member in super-posed relation to said table, means adapted to relatively shift said marking member with respect to said table to impart to said paper the horizontal strokes of a line conforming to written characters, said means comprising a cam face on said record carrying member corresponding to the horizontal strokes of the characters being formed, a supporting arm, a marker arm pivotally mounted on said supporting arm and carrying said marking member, an actuating lever fulcrumed on said base, cam following means carried by said actuating lever, co-acting means on said record carrying member and said actuating lever adapted to retain said cam following means in contact with said cam face, and an operative connection between said actuating lever and said marker arm.

8. In a reproducing machine including a base, a paper supporting table, a record carrying member, and a marking member in super-posed relation to and adapted to contact with said paper, means adapted to actuate said record carrying member and means adapted to vertically shift said marking member with respect to said table to vary the pressure of contact exerted on said paper by said marking member, said means comprising a cam groove on said record carrying member, said cam groove corresponding to the comparative intensity of the different strokes of the writing to be formed, a tilt-

ably mounted marker arm connected to said marking member, a cam follower lever fulcrumed to said base, a cam following member on said lever adapted to co-act with said cam groove, a slidably mounted tension transmitting rod operatively connected to said marker arm and having slidable connection with said cam follower lever, a spring stop on said rod, and a compression resisting spring interposed between said spring stop and said cam follower lever whereby movement of said cam and said cam follower imparts a variably yielding slidable movement to said tension rod through said spring.

9. In a reproducing machine including a base, a paper supporting table, a record carrying member and a marking member in super-posed relation to and adapted to contact with said paper, means adapted to actuate said record carrying member and means adapted to vertically shift said marking member with respect to said table to vary the pressure of contact exerted on said paper by said marking member, said means comprising a cam groove on said record carrying member, said cam groove corresponding to the comparative intensity of the different strokes of the writing to be formed, a tiltably mounted marker arm connected to said marking member, a cam follower lever fulcrumed to said base, a cam following member on said lever adapted to co-act with said cam groove, a slidably mounted tension transmitting rod operatively connected to said marker arm and having slidable connection with said cam follower lever, a spring stop on said rod, a compression resisting spring interposed between said spring stop and said cam follower lever whereby movement of said cam and said cam follower imparts a variably yielding slidable movement to said tension rod through said spring, and compensating means connected to said cam follower lever whereby when said spring is compressed by movement of said cam follower lever, the major portion of the thrusting effort of said spring against said cam follower lever is transmitted to said compensating means to relieve said cam following means and said cam from the load of such compression.

10. In a reproducing machine including a base, a paper supporting table, a record carrying member and a marking member in super-posed relation to and adapted to contact with said paper, means adapted to actuate said record carrying member and means adapted to vertically shift said marking member with respect to said table to vary the pressure of contact exerted on said paper by said marking member, said means comprising a cam on said record carrying member, said cam corresponding to the comparative intensity of the different strokes of the writing to be formed, a tiltably mounted marker arm connected to said marking member, a cam follower lever, a cam follower on said follower lever adapted to co-act with said cam, and yieldable connecting means between said cam follower lever and said marker arm.

11. In a reproducing machine including a base, a paper supporting table, a record carrying member and a marking member in super-posed relation to and adapted to contact with said paper, means adapted to actuate said record carrying member and means adapted to vertically shift said marking member with respect to said table to vary the pressure of contact exerted on said paper by said marking member, said means comprising a cam on said record carrying member, said cam corresponding to the comparative intensity of the different strokes of the writing to be formed, a tiltably mounted marker arm connected to said marking member, a cam follower lever, a cam follower on said follower lever adapted to co-act with said cam, a slidably mounted tension transmitting rod, spring means co-acting with said cam follower lever and said transmitting rod, whereby movement of said cam follower lever caused through the co-action between said cam and said cam follower imparts a variably yielding slidable movement to said transmitting rod through said spring.

12. In a reproducing machine including a base, a paper supporting table, a record carrying member and a marking member in super-posed relation to and adapted to contact with said paper, means adapted to actuate said record carrying member, and means adapted to vertically shift said marking member with respect to said table to vary the pressure of contact exerted on said paper by said marking member, said means comprising a cam on said record carrying member, said cam corresponding to the comparative intensity of the different strokes of the writing table to be formed, a tiltably mounted marker arm connected to said marking member, a cam follower lever, a cam follower on said follower lever adapted to co-act with said cam, a slidably mounted tension transmitting rod, spring means co-acting with said cam follower lever and said transmitting rod, whereby movement of said cam follower lever caused through the co-action between said cam and said cam follower imparts a variably yielding slidable movement to said transmitting rod through said spring, and compensating means connected to said cam follower lever adapted to substantially neutralize the thrusting effect of said spring means exerted against said cam follower lever without affecting the

thrusting effort of said spring against said transmitting rod.

13. In a reproducing machine including a record carrying member having a cam, a supporting arm, a marker arm fulcrumed on said supporting arm, a marking member secured to said marker arm on one side of its fulcrum, a lever operatively connected to said marker arm on the other side of said fulcrum, said lever being fulcrumed to said supporting arm, a cam follower lever, a cam follower on said last mentioned lever and co-acting with said cam, a slidably mounted tension transmitting rod having slidable connection with said cam follower lever, a spring stop on said rod, a spring on said rod interposed between said stop and said cam follower lever, and connecting means between said rod and said first mentioned lever.

14. In a reproducing machine including a record carrying member having a cam, a supporting arm, a marker arm fulcrumed on said supporting arm, a marking member secured to said marker arm on one side of its fulcrum, means adapted to counterbalance said marker arm and said marking member and means actuated by said cam and connected to said marker arm adapted to tilt said marker arm with respect to said supporting arm where fulcrumed thereto.

15. In a reproducing machine including a base and a record carrying member having a cam, a supporting arm, a marker arm fulcrumed on said supporting arm, a lever operatively connected to said marker arm, a cam follower lever fulcrumed on said base, a cam follower on said follower lever co-acting with said cam, a slidably mounted tension transmitting rod, connecting means between said rod and said first mentioned lever, a yieldable connection between said rod and said cam follower lever, a compensating lever fulcrumed on said base and operatively connected to said cam follower lever, and a stop adapted to limit the radial movement of said compensating lever about its fulcrum point in one direction.

16. In a reproducing machine including a paper supporting table, a record carrying member having a cam, a marking member in super-posed relation to and adapted to contact with said table, a cam follower adapted to contact with said cam, spring means operatively connected to said marking member and said cam follower and controllable by the co-action between said cam follower and said cam and adapted to vertically shift said marking member with respect to said table, and compensating means operatively connected to said spring means whereby the pressure of contact between said cam and said cam follower is maintained substantially uniform irrespective of the variance in pressure of contact between said table and said marking member.

17. In a reproducing machine including a paper supporting table, a record carrying member having a cam, a marking member in super-posed relation to said table, and means adapted to vertically shift said marking member into and out of operative relation to said paper, said means comprising a tiltably mounted marker arm connected to said marking member, a lever operatively connected to said marking member, a tension transmitting rod operatively connected to said lever, stops on said transmitting rod, a cam follower carrying member, a cam follower on said last mentioned member and co-acting with said cam, said cam follower carrying member having a sliding connection with said transmitting rod between said stops, and a spring on said transmitting rod interposed between said cam follower carrying member and one of said stops.

18. In a reproducing machine including a paper supporting table, a record carrying member having a cam, a marking member in super-posed relation to said table, and means adapted to vertically shift said marking member into and out of operative relation to said paper, said means comprising a tiltably mounted marker arm connected to said marking member, a lever operatively connected to said marking member, a tension transmitting rod, operatively connected to said lever, a spring stop on said transmitting rod, a yieldable stop on said transmitting rod normally held in non-yieldable relation thereto, a cam follower carrying member, a cam follower on said last mentioned member and co-acting with said cam, said cam follower carrying member having a sliding connection with said transmitting rod between said stops, and a spring on said transmitting rod interposed between said cam follower carrying member and said spring stop.

19. In a reproducing machine including a paper supporting table, a marking member super-posing said table, and a record carrying member having cam actuating shoulders formed by grooving said record carrying member, said shoulders conforming to the writing to be formed, cam following means projecting into said grooves, means co-acting with the other shoulder formed by said grooving and adapted to hold said cam following means in contact with said cam actuating shoulders.

20. A reproducing machine comprising paper holding means, a pen, mechanism for actuating the pen to reproduce a signature, and means imposing flexible variation of pressure on the pen to reproduce the shading of the original signature irrespective of the extent of flexibility of the pen points.

21. A reproducing machine comprising paper holding means, a pen, and mechanism adapted to actuate said pen to reproduce a signature including a cam having a cam groove provided with primary and secondary undulated walls, a portion of said mechanism having non-yielding and yielding members engaging said walls respectively to operate said mechanism.

22. A reproducing machine comprising paper holding means, a pen, and mechanism adapted to actuate said pen to reproduce a signature, said mechanism including a cam having a cam groove provided with parallel and correspondingly undulated walls, a portion of said mechanism having a pair of rollers engaging said walls, and a spring for spreading said rollers against said walls to operate said mechanism as said cam is advanced.

23. A reproducing machine comprising paper holding means, a pen, mechanism for actuating said pen to reproduce a signature including spring means for varying pressure of said pen to reproduce shading of the signature, and a compensating device automatically preventing variable drag on said machine resulting from variable action of said spring means.

24. A signature writing machine having pen actuating means including a cam, pen tension means actuated by said cam for varying pen pressure, and compensating means preventing drag on said cam irrespective of the amount of pen tension induced by said cam.

25. A signature reproducing machine having pen actuating mechanism including a rotating cam, said cam having a pen tension initiating groove, a pen tensioning device including a spring pressed pivoted lever having a follower engaging said groove, a pivoted compensating lever, and compensating spring means acting on said levers to prevent said follower from imposing drag on said cam irrespective of the amount of tension imparted to said first named lever.

26. A signature reproducing machine having pen actuating mechanism including a rotary cam, a pen tensioning means including a spring pressed lever actuated by said cam to increase or decrease the tension on said lever to vary the shading pressure on said pen, and compensating means reducing drag of said lever on said cam as the latter increases tension on said spring pressed lever.

27. A signature reproducing machine including a pen adapted to be advanced into and out of writing contact, pen actuating mechanism, and automatically acting means included in said mechanism for flexibly advancing said pen into writing contact and positively retracting said pen from writing contact.

28. A signature writing machine including a pen adapted to be advanced into a writing contact position, actuating mechanism for operating said pen to reproduce a signature, and automatically acting means yieldingly advancing and holding said pen into a writing contact position.

29. A signature reproducing machine comprising a supporting arm having one of its ends rotatively swivelled to swing about a fixed axis and having a free end, a pen holding arm having a pen at one end thereof and having its remaining end rotatively swivelled on said free end of said supporting arm and also tiltable on said supporting arm, a rotatable cam, means actuated by said cam for oscillating said supporting arm, means actuated by said cam for oscillating said pen holding arm, and means actuated by said cam for tilting said pen holding arm to respectively impart vertical, horizontal and shading strokes to said pen.

30. A signature reproducing machine comprising a pen holding arm, a pen adjustably mounted in said arm, and means carried by said arm for coaction with the pen point to indicate correct positioning of said pen, and said means being adjustable out of range of said pen after the latter has been positioned.

31. A reproducing machine comprising an actuated arm, a pen holding arm mounted to turn and rock on said actuated arm and having a portion extending through and below said actuated arm, and means connected with said projecting portion below said actuated arm for rocking said pen holding arm.

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