

Aug. 28, 1928.

H. A. FOOTHORAP
TYPEWRITING MACHINE

1,681,978

Filed May 14, 1925

14 Sheets-Sheet 1

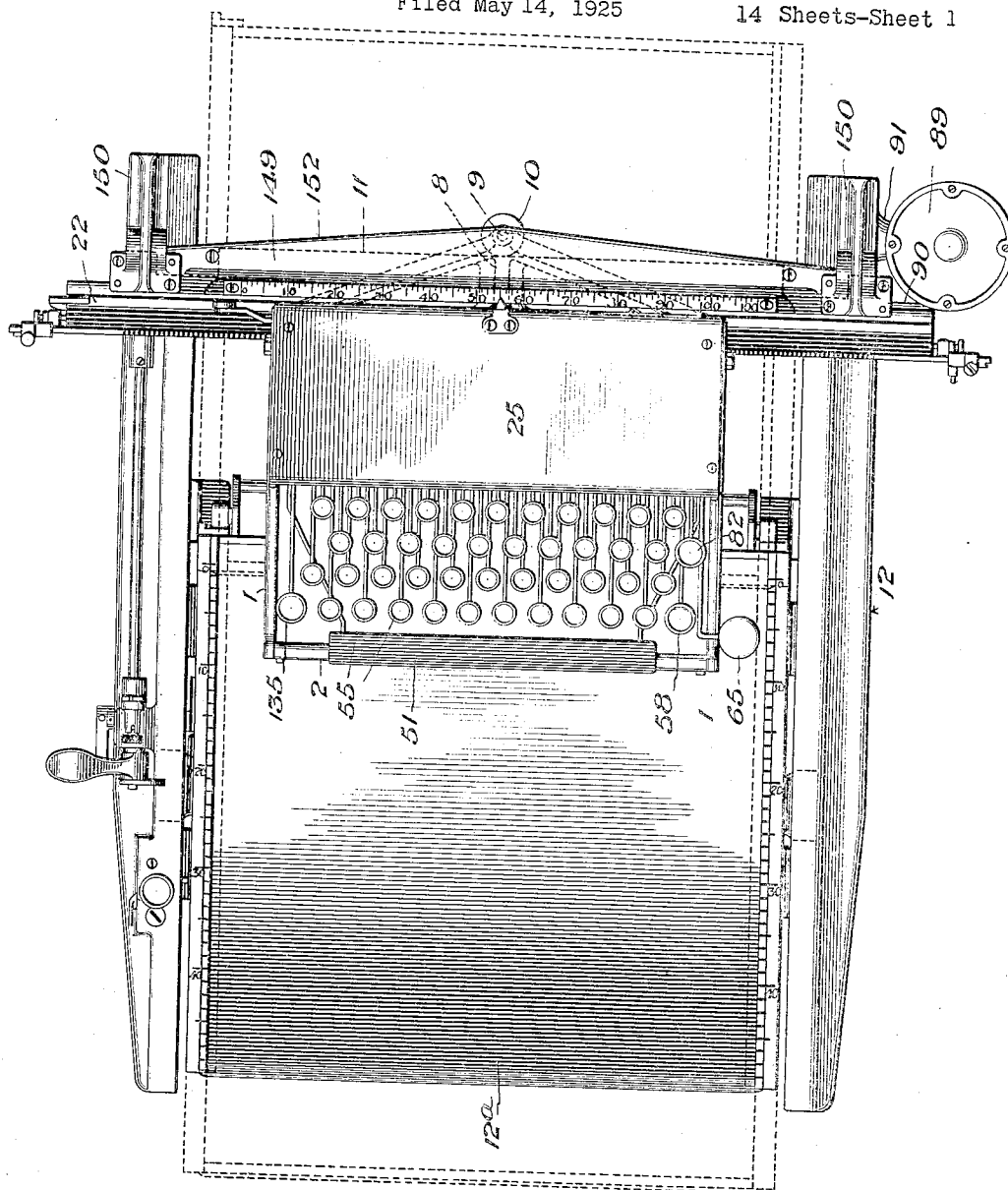


Fig. 1.

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By

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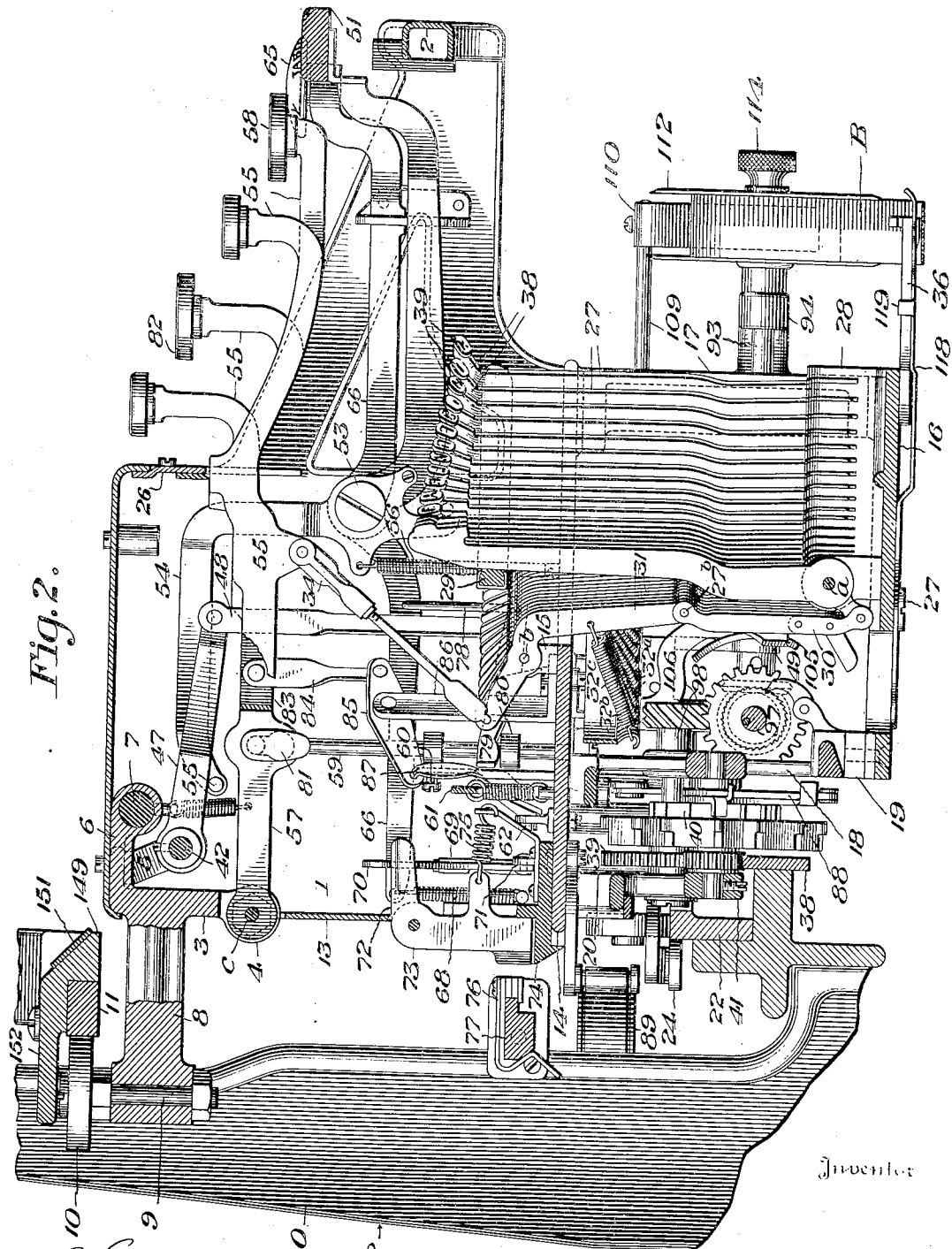
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TYPEWRITING MACHINE

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14 Sheets-Sheet 2



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TYPEWRITING MACHINE

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14 Sheets-Sheet 3

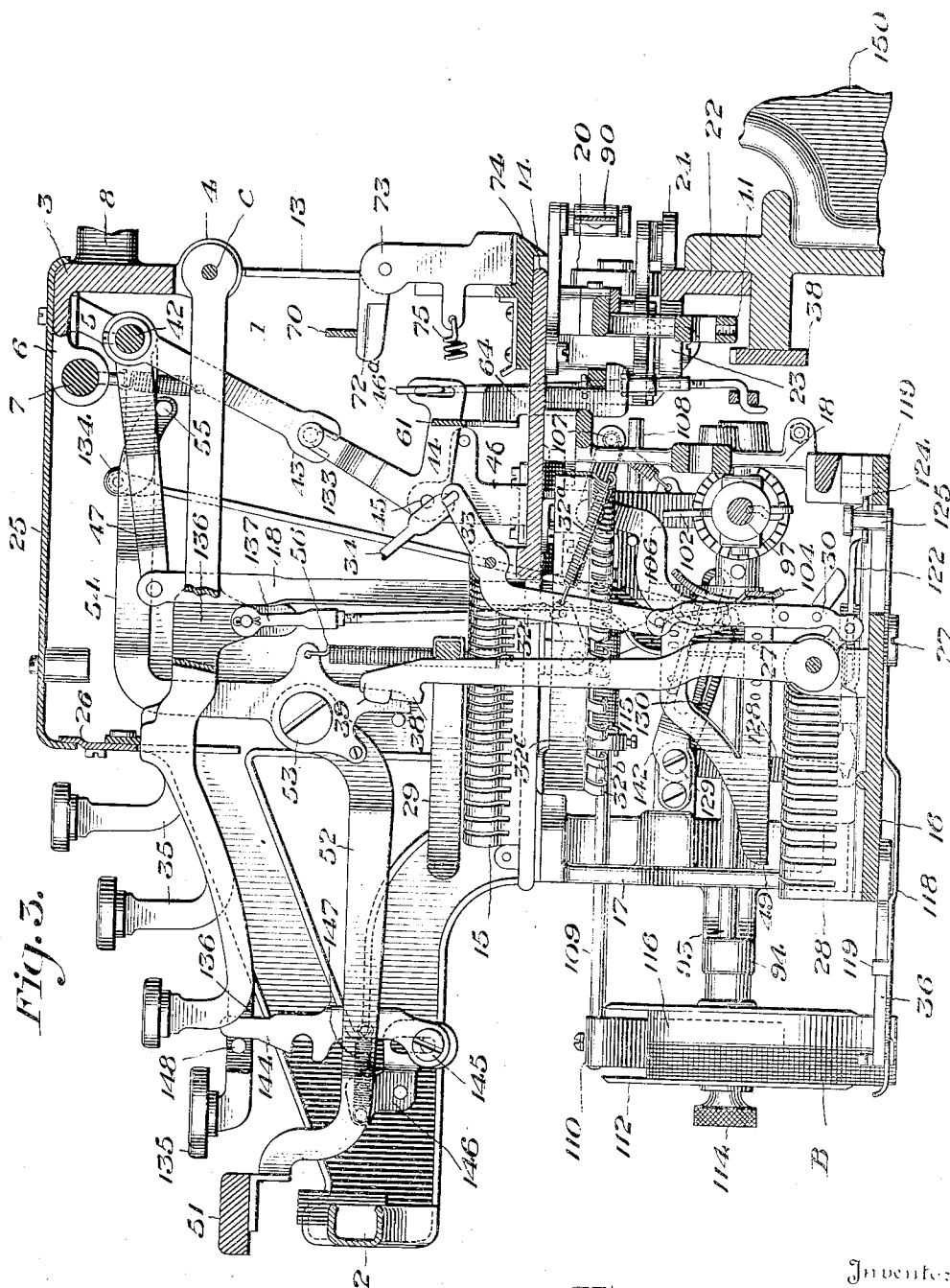


Fig. 3.

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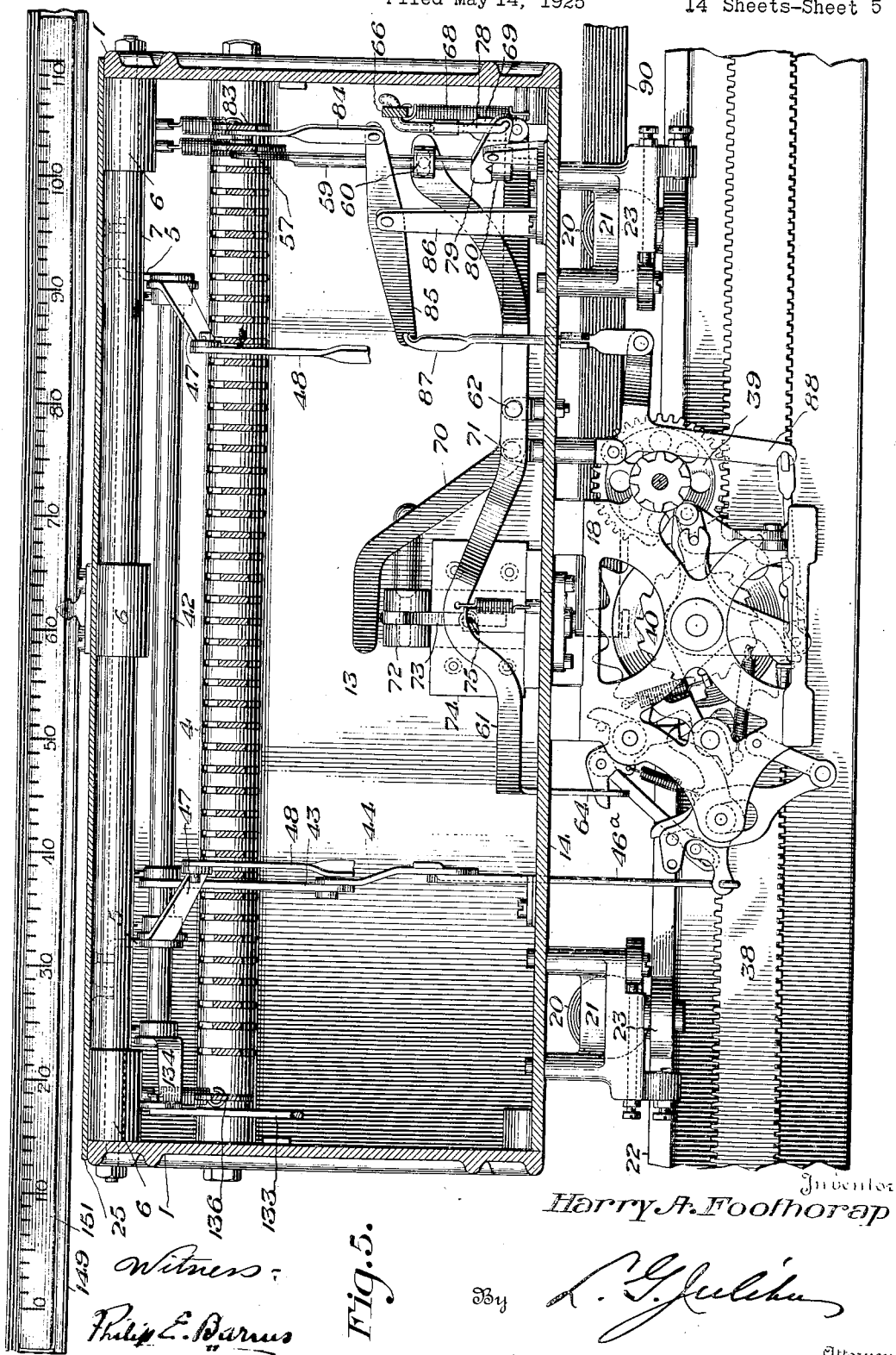
H. A. FOOTHORAP

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TYPEWRITING MACHINE

Filed May 14, 1925

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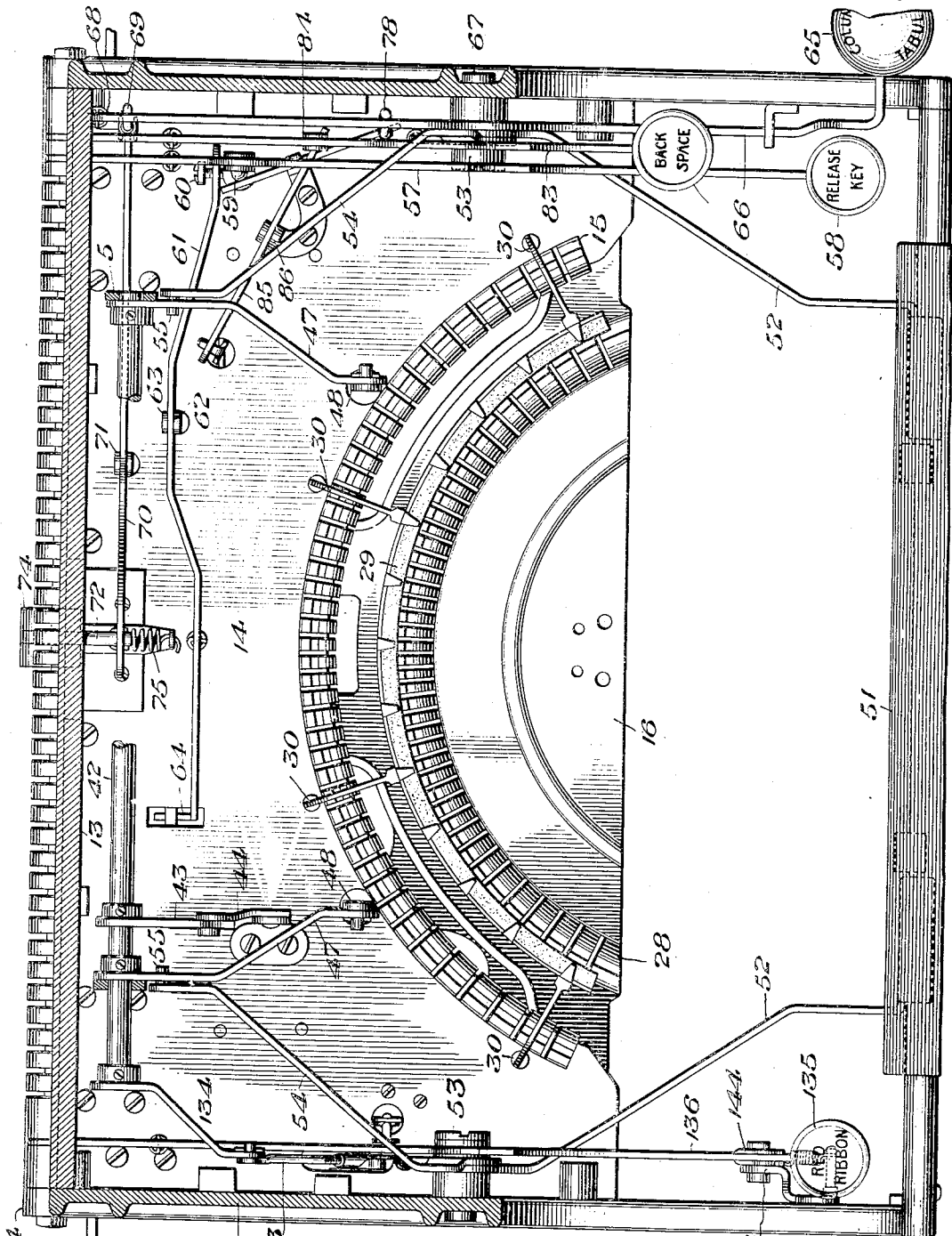
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TYPEWRITING MACHINE

Filed May 14, 1925

14 Sheets-Sheet 6



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Fig. 6.

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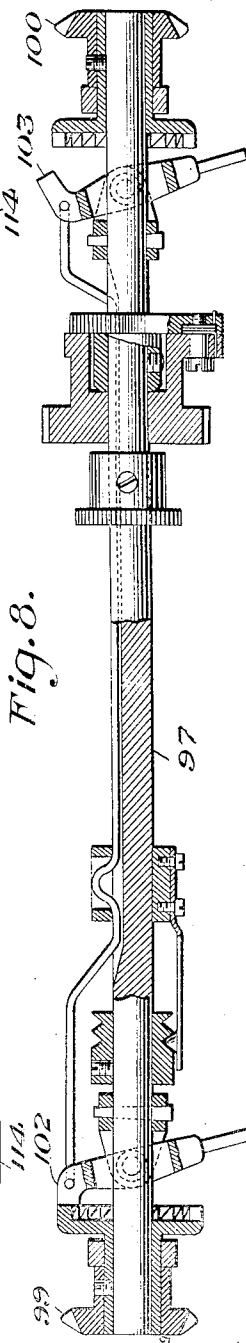
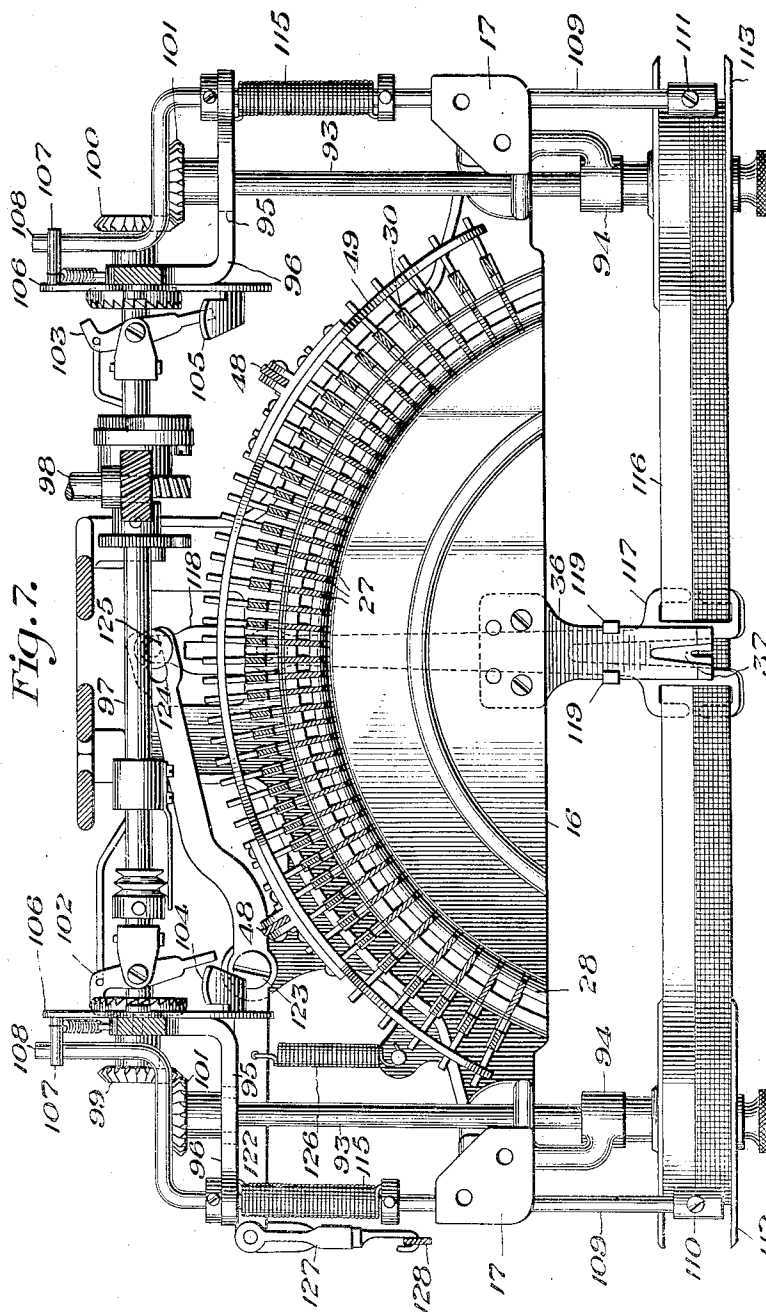
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TYPEWRITING MACHINE

Filed May 14, 1925

14 Sheets-Sheet 7



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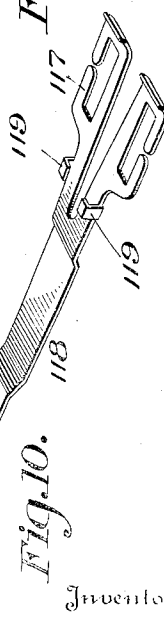
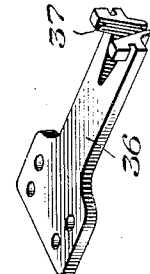
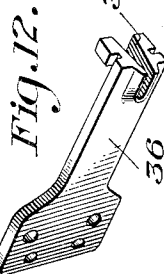
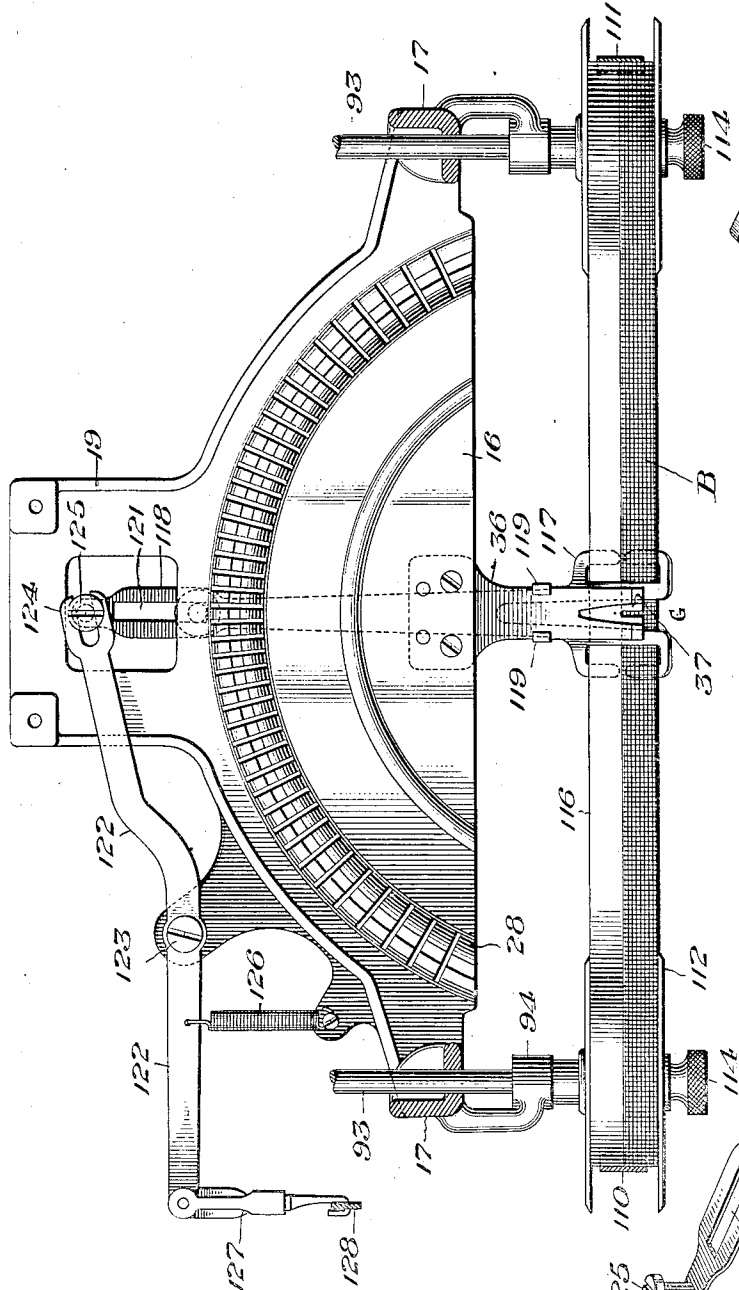
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TYPEWRITING MACHINE

Filed May 14, 1925

14 Sheets-Sheet 8

Fig. 9.



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H. A. FOOTHORAP
TYPEWRITING MACHINE

1,681,978

Filed May 14, 1925

14 Sheets-Sheet 9

Fig.13.

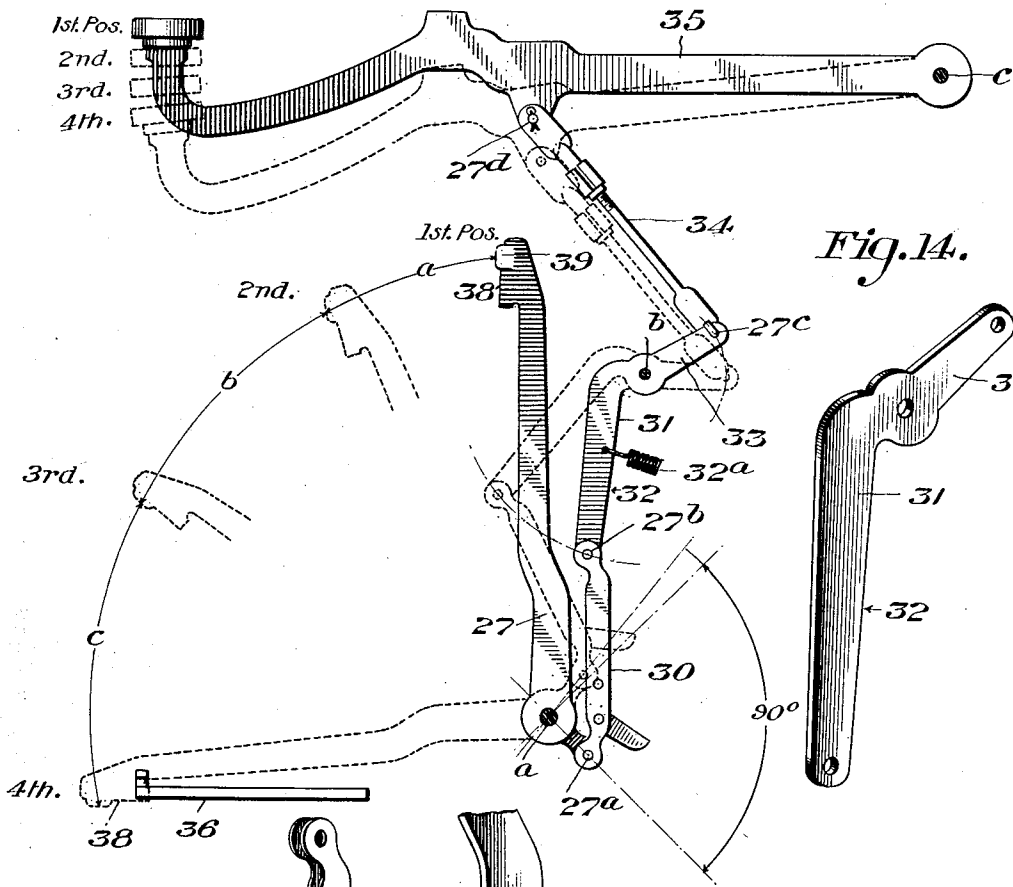


Fig.14.

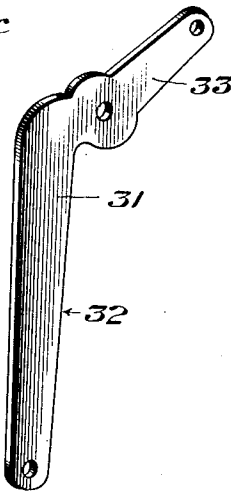


Fig.15.

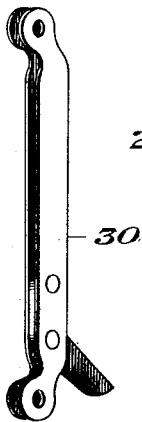
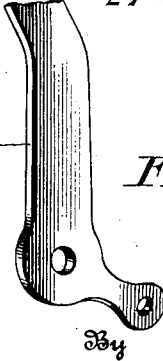


Fig.16.



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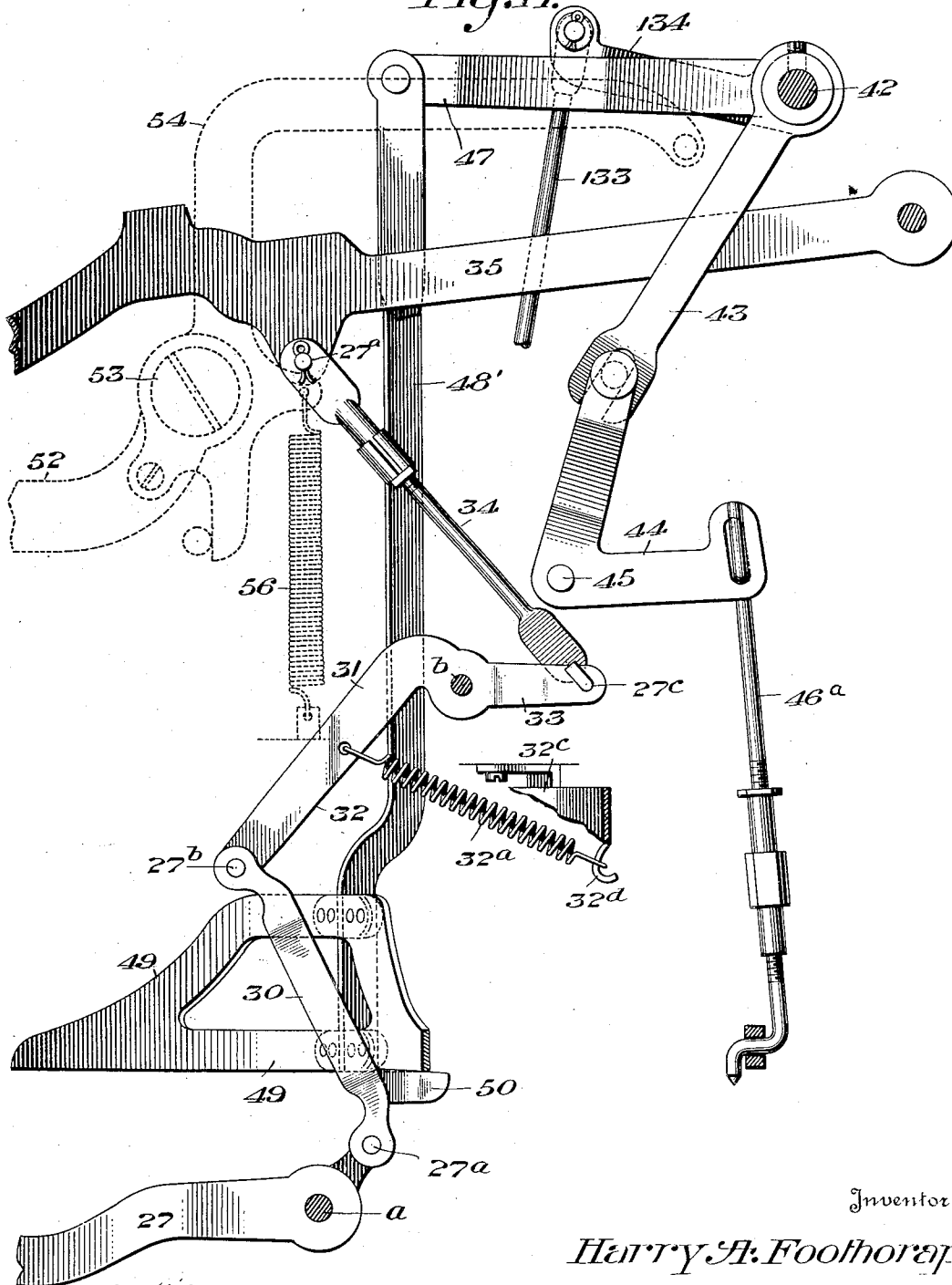
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TYPEWRITING MACHINE

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14 Sheets-Sheet 10

Fig. 17.



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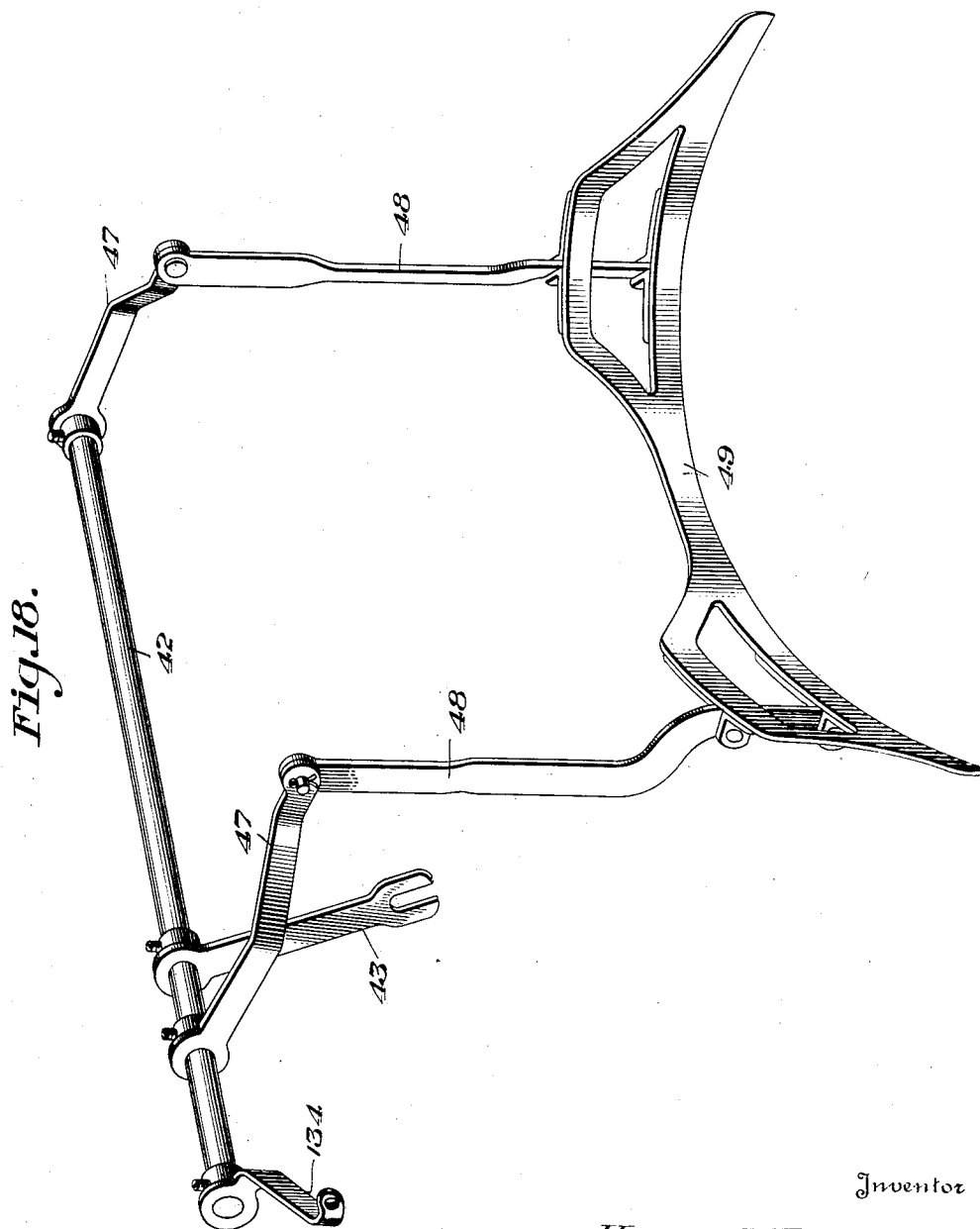
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TYPEWRITING MACHINE

Filed May 14, 1925

14 Sheets-Sheet 11



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TYPEWRITING MACHINE

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14 Sheets-Sheet 12

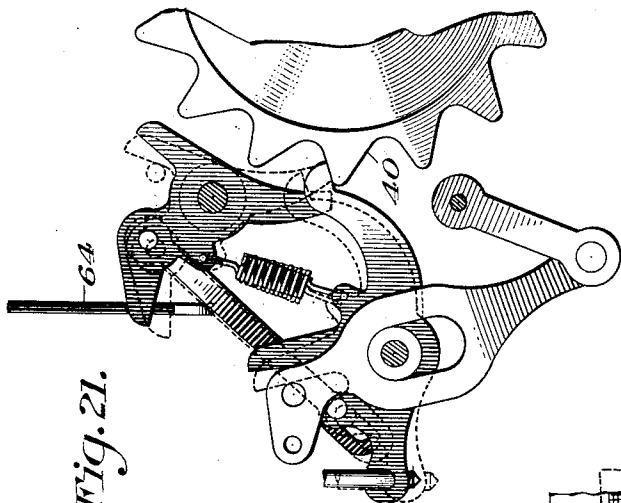


Fig. 21.

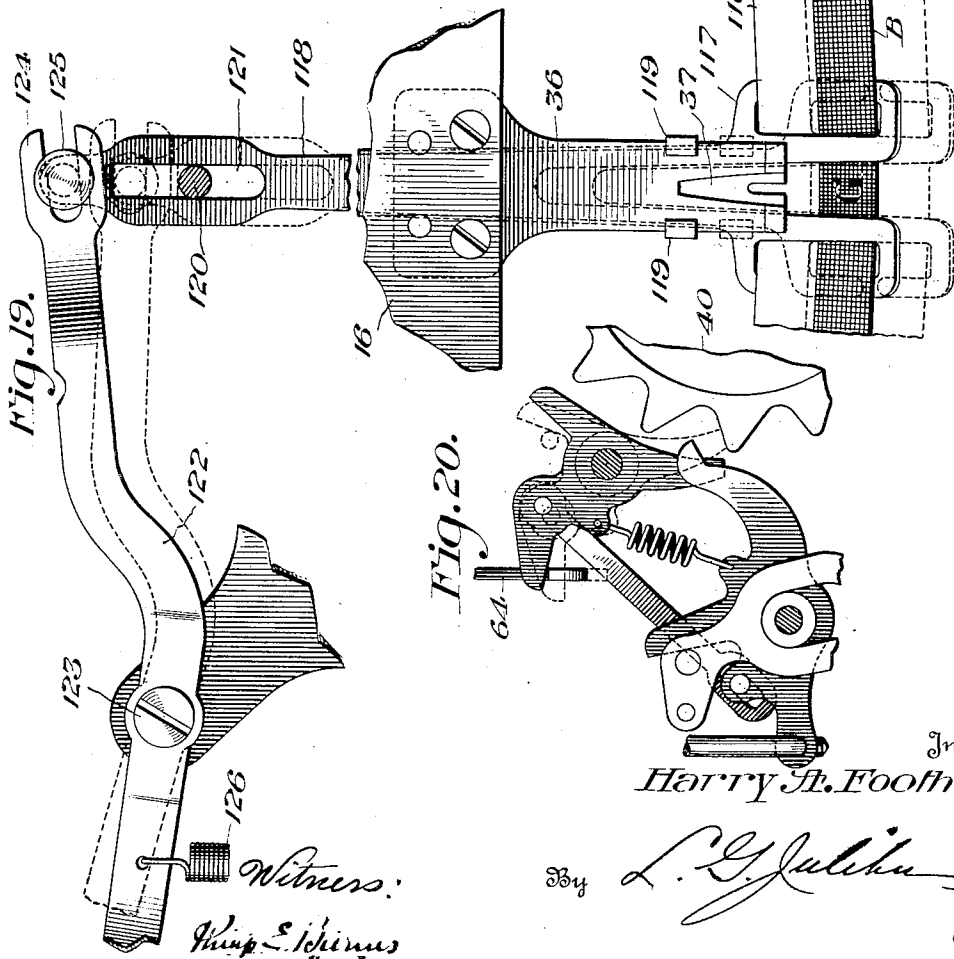
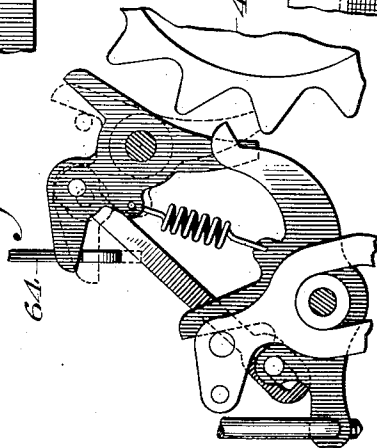


Fig. 19.

Fig. 20.



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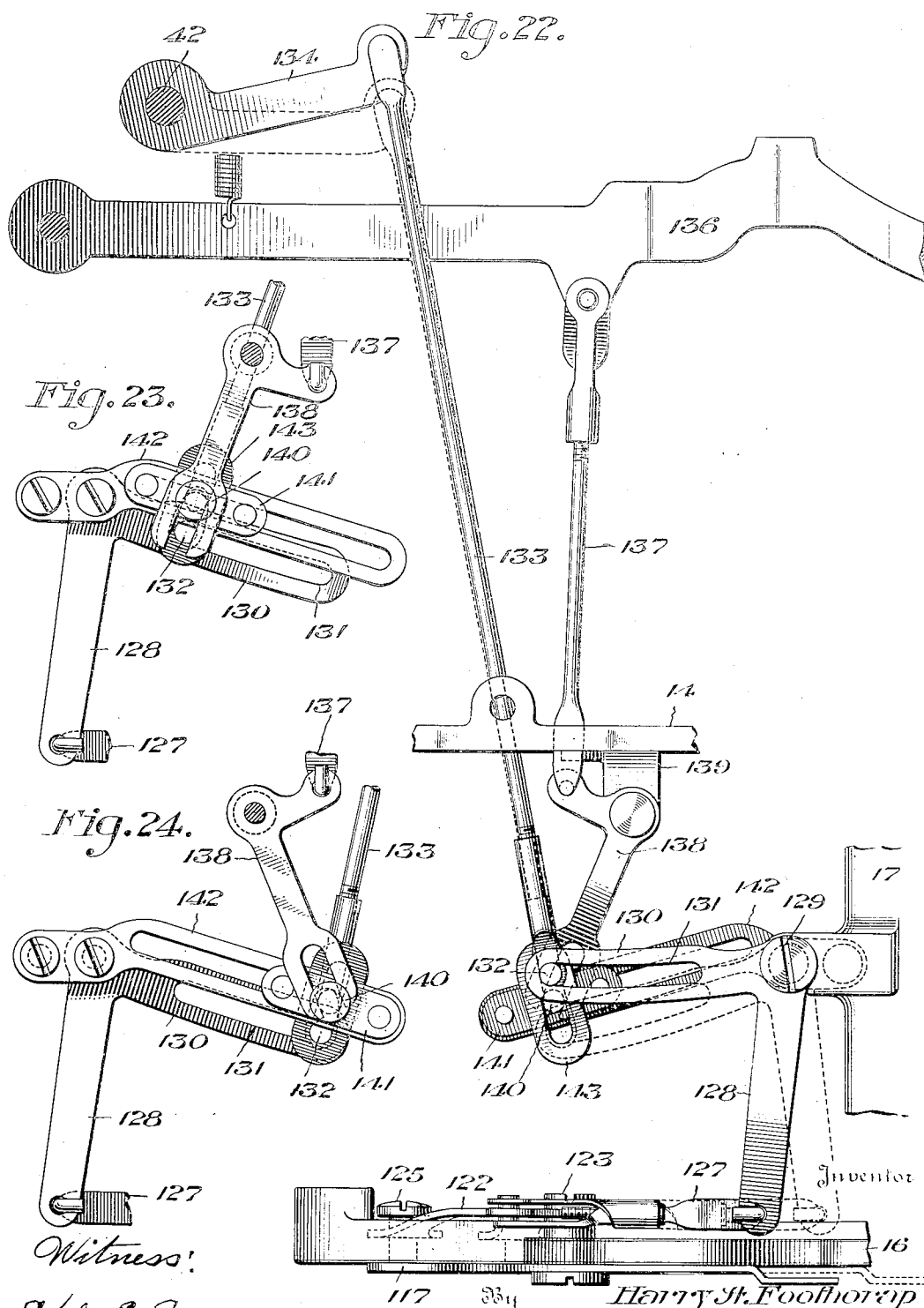
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TYPEWRITING MACHINE

Filed May 14, 1925

14 Sheets-Sheet 13



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H. A. FOOTHORAP

TYPEWRITING MACHINE

Filed May 14, 1925

14 Sheets-Sheet 14

Fig. 26.

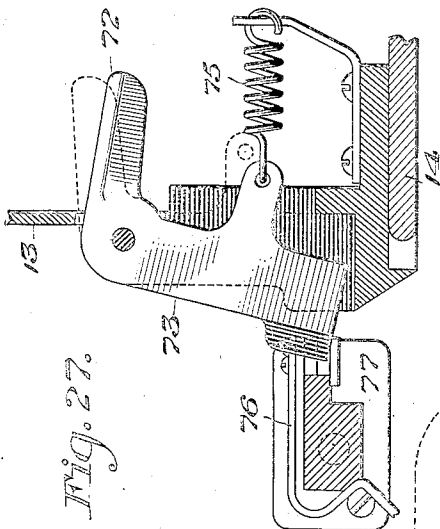
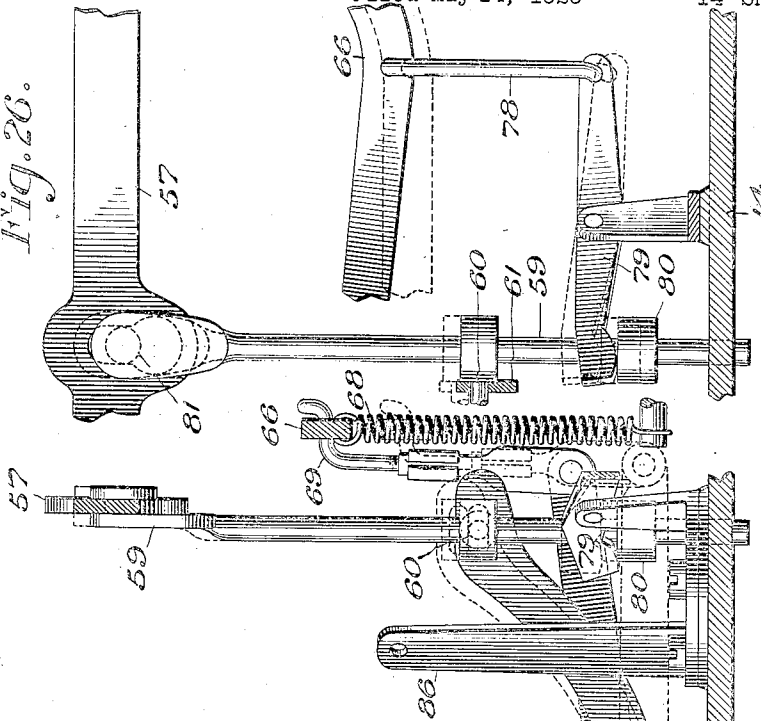
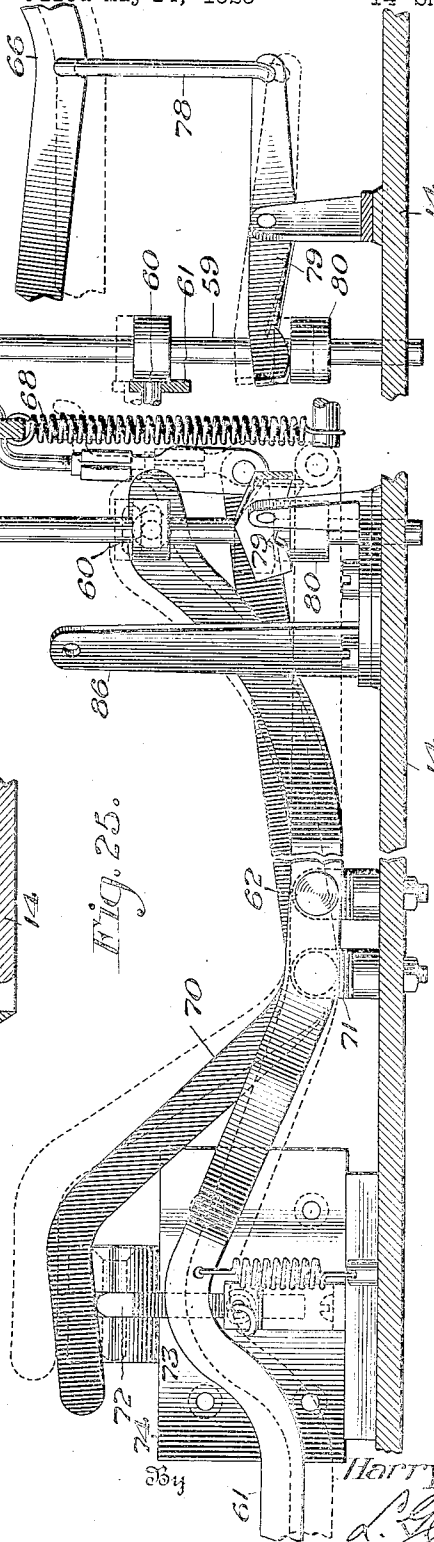


Fig. 25.



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UNITED STATES PATENT OFFICE.

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TYPEWRITING MACHINE.

Application filed May 14, 1925. Serial No. 30,265.

This invention relates to typewriting machines, and more particularly to what is known as a flat platen typewriter, characterized by a flat platen, a frame, and a carriage so relatively arranged and moved that matter printed on a work sheet, supported by the platen, would be properly line and letter spaced.

The object of the invention is to produce a novel organization of the machine which will simplify the construction, reduce to a minimum the burden of operation, and secure complete visibility of the entire line being written and the adjacent portion of the work.

Many subordinate objects of the invention will appear as the succeeding description is developed, one of these being to secure the light running of a carriage capable of being easily and quickly removed from the frame by providing a three point suspension for the carriage, located entirely at the rear thereof, and another being the entire elimination of such elements as the carriage supporting frame as have heretofore been located at the front of the carriage and have interfered somewhat with complete visibility of the writing, and with the smooth retention of the work sheet on the platen. Also, the elimination of the more or less complicated and indirect ribbon guides and inaccessible mounting of the ribbon spools, usual in this class of machines, by mounting the ribbon spools accessibly at the front of the machine and in a position to permit the ribbon to pass directly from spool to spool without the necessity for any guiding means other than the ribbon vibrator.

Figure 1 is a plan view of a typewriting machine constructed in accordance with my invention.

Figure 2 is a vertical sectional view through the center of the machine, with a portion of the carriage supporting frame broken away and the platen omitted.

Figure 3 is a similar view, with a section taken in a different plane.

Figure 4 is a similar section, with a key depressed and the type arm swung down to the printing position.

Figure 5 is a vertical transverse section.

Figure 6 is a sectional plan view, line of section being just over the cover plan.

Figure 7 is another sectional plan, the plane of the section being below the sub-lever deck.

Figure 8 is a detailed section of the ribbon reversing shaft in its associated parts.

Figure 9 is a plan view of the type deck showing the relation thereto of the ribbon supporting means, the type guide and ribbon vibrator.

Figure 10 is a detailed perspective view of the ribbon vibrator.

Figures 11 and 12 are detailed views of the type guide.

Figure 13 is a diagrammatic view of the type action.

Figures 14, 15, and 16, are respectively detailed views of a sublever, link, and type bar.

Figure 17 is a view of a type arm, its action, the universal bar, and the connections between the universal bar and the escapement.

Figure 18 is a detailed perspective view of the universal bar and its mounting.

Figure 19 is a detailed view of the ribbon vibrator, its mounting and a portion of its operating means.

Figures 20 and 21 are detailed views of a portion of the carriage feeding mechanism.

Figure 22 is a detailed view of a portion of the ribbon mechanism.

Figures 23 and 24 are detailed views of the color selecting mechanism.

Figure 25 is a detailed view showing portions of the carriage release and tabulating mechanism.

Figure 26 is a detail of a portion of the mechanism shown in Figure 25, and

Figure 27 is a detailed view of the tabulating mechanism.

The general organization of the carriage includes a frame having two side plates 1 extended forwardly of the keyboard, connected by a front bar 2 of channel construction for rigidity. At their upper rear corners, the side plates 2 are spaced and connected by a comparatively heavy corner bar 3, formed with a key lever comb bearing 4, downwardly extending bearing brackets 5 for the universal rock shaft and for the extending arm 6 which accommodates the tie rod 7, which rigidly unites the corner bar 3 and the side plates 1. The bar 3 is also

formed with a rearwardly extending arm 8, through which extends a vertical shaft 9, carrying at its upper end a central carriage guide roller 10, which bears against a transverse bar 11 of the carriage supporting frame 12. Below the comb bearing 4, and extending between the plates 1, is the back plate 13 of the carriage frame, the bottom of which is closed by a sublever deck 14, the front edge of which is located well in rear of the vertical plane of the bar 2, and is of arcuate form with an arcuate comb bearing 15 rising from the plane of the plate for the mounting of the sublevers of the type action, to be described presently.

Below the opening in the segment formed by the arcuate front edge of the sublever deck 15 is the type lever deck 16, connected to the sublever deck by posts or hangers 17 of angular cross section, located at the opposite sides or ends of the type lever deck at its front edge. At a third point the deck or bottom plate 16 is supported from deck 14 by the main escapement bracket 18, screwed to a rearward extension 19 of the type lever deck.

It has been mentioned that the carriage roller 10, behind the upper center of the carriage, constitutes a central bearing on the frame 12. The three point suspension of the carriage is completed by two side rollers 20, mounted on bearing blocks 21, at the rear corners of the carriage below the sublever deck 14, to which they are secured (see Figure 4). These rollers 20 roll on a track 22, constituting a part of the carriage supporting frame 12, and front and rear guide rollers 23 and 24 bear against the rear and front faces of the rack and are likewise carried by the blocks 21, the rear rollers being adjustable as usual.

The carriage frame and carrying structure is completed by a cover plate 25 and a front comb plate 26, which serves the double purpose of closing the upper front portion of the casing and guiding the various key levers at a point well in advance of the fulcrums thereof. It will be seen from what has been said thus far, that the carriage of this machine is of a light rigid structure, supported entirely at the rear of the carriage by three point suspension from the carriage supporting frame 12, and that the carriage includes in its organization a keyboard, a sublever deck located below the rear of the keyboard, and a type bar deck located below the sublever deck and opposite the opening segment thereof.

The type action.

The type bars 27 are journaled at their lower ends in the arcuate bearing comb 28, carried by the type bar deck 16 concentric with the bearing comb 15 of the sublever. This disposes the type arms in a forwardly

opening arcuate assemblage and they normally occupy the substantially upright position shown in Figure 3, with their upper ends against the arcuate buffer ring 29, carried by arms 30, extended from the deck 14. The hub of each type arm is connected by the usual lug to the lower end of a link or draw bar 30, preferable of U-shaped or channeled cross section, and disposed vertically behind the bar. The upper end of the link 30 is pivotally connected to the lower end of the angular arm 31 of a bell crank sublever 32, the other or shorter arm 33 of which is, in turn, pivotally connected to an adjustable push rod 34, connected at its upper end to a key lever 35 substantially midway between the fulcrum and key of said key lever.

The design of this type action is intended to attain the three primary objectives of accelerated action, locking of the bar against rebound and smooth operation. It will be seen from the diagrammatic showing in Figure 13 that the relation of the fulcrums *a*, *b*, and *c* of the type arm sublever 31 and key lever 35, and the connections 27^a and 27^b, between the type arm and the sublever, and the connections 27^c and 27^d, between the push rod 34 and the sublever and key lever, is such that these several objectives are attained. The tendency of the type arm to rebound from the buffer is opposed by the substantially locking relation of the connections 27^a, 27^b, and the fulcrum *b*, which are merely in alignment and therefore oppose more than sufficient resistance to the tendency of the bar to rebound. Next, it will be observed that as the arcs of movement of the connections 27^a and 27^b are in substantially right angular relation during the first part of the key depression, a considerable portion of the movement of the sublever will be absorbed by the lateral swinging of the link 30, but as the type bar descends the paths of movement of the connections 27^a and 27^b would become more nearly aligned so that the movement of the bar, as it approaches the work and after the inertia has been overcome, will be accelerated. Also, it will be noted that normally the short end 33 of the sublever is disposed almost at right angles to the push rod 34, which latter is disposed at such an angle that the most advantageous application of the force imposed upon the key will be applied for the operation of the sublever and bar against the resistance of the retracting spring 32^a, connected to the arm 31 of the sublever 32, and to one of the hooks 32^b of an arcuate spring bar 32^c, secured to the underside of the deck 14. It will be noted, particularly by referring to Figures 2 and 4, that this arrangement of the type bar retracting springs disposes them in rear of the type actions and radial to the printing point,

in a position of easy accessibility for renewal when the carriage is inverted.

The type bar guide.

- 5 Forced alignment of the connections printed is secured by extending a type guide 36 from the front edge of the type deck 16, formed with a converging throat 37, for the reception of the guide lug 38 formed on
10 the type bar immediately adjacent the type 39.

The carriage feeding mechanism.

- Generally, the carriage feeding mechanism is not novel, so far as the escapement or the
15 immediately associated parts are concerned (see my Patent #1,203,519).

- A carriage feed rack 38 is carried by the carriage supporting frame below the rear of the sublever deck 14, and meshes with feed
20 gears 39, the movements of which are controlled by an escapement mechanism indicated as a whole by 40. The escapement is mounted between the main escapement bracket 18 and the rear escapement bracket 41, both
25 of which, as in the patented construction, drop from the sublever deck.

- The normal operation of the escapement is effected by the universal rocker or rock shaft 42, mounted in bearings 5, extending
30 inwardly from the corner plate 3 of the carriage. From the rocker 42 extends downwardly, an arm 43, having a slot and pin connection with a bell crank 44 fulcrumed at 45, on a bracket 46 on the deck
35 14. If the rocker 42 is rocked in a direction to swing the arm 43 upward and forward, the bell crank 44 will be rocked to operate the escapement through the draw wire 46^a. The shaft 42 is rocked as usual upon the
40 depression of any type key, so that upon the printing of a character the carriage will feed forward to the next position. This is accomplished by extending from the shaft 42 a pair of arms 47, from which
45 depend hangers 48, carrying at their lower ends an arcuate universal bar or frame 49. This frame normally occupies the position shown in Figure 3, behind the links 30, and above and in the path of projection 50,
50 extended rearwardly from the links 30, adjacent the lower ends thereof. At the proper time in the operation of the type action, the projection 50, on the operative type bar, will engage and lift the universal
55 bar 49 and thus, through the intermediate characters rocking the shaft 42, cause the shifting of the escapement dogs in the usual manner. When the key is released, the type arm and other parts will return to normal
60 position and the reshifting of the escapement dogs will permit the feeding of the carriage as usual. While the escapement proper is not new, a part of the novel organization of the machine embraces the
65 arrangement of the universal bar 49 and the

arrangement of the connections between the bar and the escapement.

At the front of the keyboard is mounted, as usual, the spacing bar and a space key 51, carried by yoke 52, mounted to swing 70 from the stud shafts 53, extended inwardly from the side plates of the carriage (see Figures 3 and 6).

Movable with the yoke and space key are swinging arms 54, the rear ends of which 75 are converged and provided with pins 55 which underlie the arms 47, which, as we have seen, are fixed to the universal rocker 42. Obviously, if the space key 51 is depressed, the arms 54 will elevate the arms 80 47 to operate the escapement, the retraction being effected by retractive springs 56.

The carriage release.

Adjacent one end of the comb bearing 4 85 is mounted the carriage release lever 57, having the usual release key 58. From the lever 57 depends a rod 59, having a slot and pin connection at 60, with a lever 61 fulcrumed at 62, on the bar 63, secured to the 90 deck 14. At the end of the lever 61, opposite its connection with the release key, is a hook 64 which co-acts with the holding dog of the escapement to move said dog to an in-
95 operative position when the release key is depressed. Except for the mounting of the parts, this carriage release operation is substantially the same as that shown in Patent #1,203,519, and therefore need not be further discussed. 100

The tabulator.

The tabulator key 65 is mounted at the right hand end of the carriage on a tabulator key lever 66, mounted on a stud 67, 105 and held in elevated position by a spring 68 (see Figures 5 and 6). Adjacent to its rear end the lever 66 is connected through an intermediate link 69 at one end of a lever 70, fulcrumed on a bearing 71 above the 110 deck 14. The rear end of the lever 70 overlies the angular end 72, of pivoted tabulator stop 73, carried by a tabulator block 74 and retained in an active position by a spring 75. Upon the depression of the 115 tabulator key 65, the rear end of the lever 66 will be elevated, thus elevating one end of the lever 70 and depressing the opposite end of said lever to swing the stop 73 and to project the same into a path obstructed 120 by one of a series of tabulator stops 76, mounted on a tabulator bar 77, carried by the carriage supporting frame 12 in rear of the carriage.

It is customary to effect the release of the carriage when the tabulator key is operated and this is accomplished by connecting the tabulating key lever 66 through the medium of a link 78, on the lever 79, the opposite end of which overlies the collar 80 on the 125 130

bar 59 of the carriage release mechanism, it being observed that the slot and pin connection 81, between the release lever and the bar 59 (see Figure 2), will permit downward movement of the bar and cause the tabulating mechanism to release the escape key. Obviously, when the tabulating key is depressed, the rear end of its lever will be elevated to project the tabulator stop 73 in the manner described, and to cause the lever 79 to draw down the bar 59 and thus operate the lever 61 to release the carriage and to permit its advance until arrested by the tabulator stops.

The back space mechanism.

The back space key 82 is connected by a lever 83, mounted at the end of the bearing comb 4, and connected by a link 84 with a sublever 85, mounted on a post 86, upstanding from the deck 14. The other end of the lever 85 is connected by a link 87 to the usual bell crank 88 of the carriage release mechanism, constructed and operated substantially as described in my Patent #1,203,520.

The carriage is propelled as usual in the direction of the letter spacing by a spring drum 89, connected to the carriage by a tape 90 and mounted on a bracket 91 at one end of the carriage supporting frame 12.

The ribbon mechanism.

The ribbon mechanism, as to general operation, is much the same as the mechanism shown in my Patents #1,286,573 and #1,459,199, but in the matter of arrangement it possesses material novelty and contributes largely to the accomplishment of the purposes underlying this particular design of machine.

We have seen that the carriage is mounted with a three point suspension at its rear end without front supports or guides which usually obstruct the front of the machine, and tend to obstruct the work. We have also seen that the printing point is located in an unobstructed position below a keyboard sufficiently elevated to remove it from the line of vision. It will now be seen that the ribbon is so mounted entirely at the front of the machine that a portion of it will necessarily cover the printing point at the moment of printing. It will be entirely withdrawn from the line of writing to fully expose the latter when the key is released. It will also be seen that the usual ribbon guides are entirely eliminated and the ribbon fed directly from spool to spool, with less obstructing of the work than has heretofore been possible, in spite of the mounting of the ribbon spools at the rear of the machine and a provision of complicated ribbon guides. At the opposite ends of the carriage

are journaled parallel ribbon spool shafts 93, in front bearings 94, extending from the members 17 and in rear bearings 95, in bearing brackets 96, which also afford bearings for the ribbon driving shaft 97 which extends across the machine in the back in substantially the position occupied in the patents before mentioned. The shaft 97 is driven, as usual, upon the gear 39 through the medium of a shaft 98, and is designed to drive one or the other of a pair of gears 99 and 100 which mesh with similar gears 101 at the rear ends of the spool shaft 93.

To connect the appropriate gear, 99 or 100, to the ribbon driving shaft 97, the usual clutches, including the connecting clutch levers 102 and 103, are provided with these levers or operated by two cam controlling devices 104 and 105. These controlling devices 104 and 105 are in the form of cams carried by bell crank levers 106, pivoted on the brackets 95, at a point between the cams and pins 107, which project outwardly from the other ends of the levers and overlie cranks 108 at the rear ends of ribbon control shafts 109, parallel with the spool shafts 93 and carrying at their front ends ribbon followers 110 and 111. These ribbon followers contact with the ribbon on the spools 112 and 113, mounted at the front ends of the spool shafts 93 by knurled screws 114. The control shafts 109 are afforded bars in the brackets 95 and the hangers 17, and each is under torsional tension from a spring 115, which tends to rotate the shaft as the ribbon on the adjacent spool diminishes and the ribbon follower is permitted to swing in toward the axis of the ribbon spool under the action of the spring 115. The leading characteristics of this ribbon mechanism are like that in the patent before identified, with the distinction: That in the patented construction the spools were mounted at the rear of the machine, adjacent to the shaft 97 with their axes parallel to said shaft so that the controlling cams 105 and the ribbon followers were directly connected. In the present machine, since the ribbon spools are at the front of the machine, with their axes parallel to each other and at right angles to the shaft 97, it is necessary to introduce the spool shafts 93, extending from front to rear of the machine to connect the spools with the ribbon drive shaft, and to mount the controlling devices 104 and 105 on the bell cranks 106, which instead of being directly associated with the followers 111, are cooperatively related thereto through the medium of the control shafts 109 extending from the front of the machine to the rear thereof, and having the cranks 108 co-acting with the pins 107 on the bell cranks 106.

The ribbon 116 is wound on and extends between the spools and as the carriage ad-

vances and the shaft 97 rotates, one of the spools 112 is driven to wind the ribbon thereon and to withdraw it from the other spool whose follower moves gradually towards the axis of the spool until, when the spool has been sufficiently depleted, a crank 108 at the rear end of the adjacent control bar, swings the bell crank 106 to cause the control cam 104 or 105 to be placed in position to co-act with the adjacent clutch lever 102 or 103. Then, as movement of the carriage continues, the connected clutch levers will be swung to disconnect the engaged clutch and engage the disconnected clutch so that the driven spool shaft will be released and the other control shaft driven to reverse the direction or feeding of the ribbon.

The ribbon vibrator.

Midway between the spools 112 and 113, the ribbon is threaded through a bifurcated ribbon guide 117, formed at the front end of a ribbon vibrator 118 in the form of a narrow plate located immediately below the type deck 16, and having front and rear guiding means. The front guiding means is in the form of angular lugs 119, extending from the opposite sides of the vibrator and bent around the opposite edges of the type guide 36. The rear guiding means is in the form of a head screw 120 passed through a longitudinal slot 121 in the vibrator and screwed into the deck from its underside. Normally the vibrator 118 occupies the fully retracted position shown in Figure 7, which presents it in rear of the writing line which is fully exposed, as well as most of the adjacent writing, because, as will be apparent, the ribbon descends to the ribbon guide 117 from the upper sides of the comparatively elevated ribbon spools. Therefore, the only portion of the ribbon which is held in obstructing relation to the work is that very small area which passes under the ribbon guide at the center of the machine.

When the printing mechanism is operated, however, the ribbon must be vibrated forwardly so as to come opposite the printing point, the location of which, relative to the machine, is indicated at G, in Figure 9. This movement of the ribbon vibrator is accomplished by a vibrator lever 122 fulcrumed on a projection of the deck 16 at 123, and having its inner bifurcated end 124 engaged with a headed stud 125 in the rear end of the vibrator 118. A vibrator retracting spring 126, attached to the lever 122, retains the vibrator in its normal or retracted position. At its outer end the lever 122 is connected by a link 127 to the lower end of a bell crank 128, fulcrumed at 129, and having its horizontal arm 130 formed with a longitudinal slot 131. The slot 131, in the bell crank 128, is engaged by a stud 132 fixed to the lower end of a draw rod 133,

the upper end of which is attached to an arm 134 extended from one end of the shaft 142. Normally, the stud 132 is disposed at the extreme end of the slot 131 to secure a minimum movement of the vibrator when the arm 134 is elevated. This movement of the arm takes place, as will be understood, when the shaft 42 is rocked, as heretofore described, upon the elevation of the universal bar 49 by the lugs 50 of the type action. Therefore, before the operated type reaches the work the shaft 42 will be rocked, the arm 134 will be raised, the draw wire 133 will be moved upward to swing the bell crank 128, and the lever 122 to advance the vibrator from the full line position to the distant line position in Figure 22, or from the fixed normal position to the fixed printing position, which will present the front or black color stripe *a* of the ribbon under the type. As soon as the operated type moves back sufficiently to drop the universal bar, the connected parts, including the vibrator, will return to normal position and the printing point of the work will be fully exposed.

Color selection.

As usual in this class of machines, the ribbon is divided into stripes of different colors, the one illustrated being what is known as a bichrome, the rear half of which is a red stripe *b*. Obviously, since it is desired to print in red the ribbon must be shifted laterally a greater distance from its normal position than before, because the rear red stripe, instead of the front black stripe, must be advanced to the printing point. To secure this exaggerated throw of the ribbon it is merely necessary to move the stud 132 on the draw bar 133 along the slot 131 in the bell crank 128, for the purpose of moving the connection between the bell crank and the draw rod closer to the fulcrum of the lever, as the throw of the arm 134 is constant. This location of the connection closer to the fulcrum will obviously result in a greater throw of the bell crank and a longer throw of the vibrator. The color selection mechanism, therefore, embraces means for moving the stud 131 toward the fulcrum 129 by the depression of a red ribbon key 135. This key is located at the front end of a red ribbon lever 136, fulcrumed in the comb 4 and connected by a push rod 137 to the short arm of a bell crank 138, fulcrumed on a bracket 139 dropped from the deck 14. The lower end of the bell crank 138 is bifurcated to engage a headed stud 140 on a shifter 141, movable in a fixed guide 142 and provided at the opposite side of the guide 142 with a movable guide 143 which engages the stud 132 on the draw rod 133. Thus, by depressing the red ribbon key lever 136, it is depressed to swing

the bell crank 138 and shift the shifter 141 and the guide 143 along the fixed guide 142, if the movable guide 142 is not engaged with the stud 132 at the lower end of the push rod.

5 This movement of the shifter will move the stud closer to the fulcrum of the bell crank 128 so that the next operation of a key to print will cause the maximum throw of the ribbon vibrator and present the red stripe

10 of the ribbon in the printing point. The red ribbon lever is held in its depressed or operative position by latch 144, pivoted at 145 on a bracket 146 and urged in one direction by a spring 147. The latch engages a

15 pin 148 on the lever and its upper end, when the red ribbon key is depressed, is disposed adjacent to be above the key for convenient release.

General.

20 In the general class of machines to which the present invention relates, the movable printing carriage is some times mounted on a movable line space frame which moves

25 longitudinally of a platen or work support, relative to which the carriage and printing mechanism moves in a lateral direction.

In Figure 1, however, I have shown the carriage movable transversely of a fixed supporting frame 12, for both the carriage and

30 the platen 12^a, which is laterally movable in the frame 12 in the line spacing direction. The manner of supporting and feeding the platen is neither specifically described nor

35 claimed in this application, but one of the novel features with which I am concerned is the method of mounting the carriage on the frame 12. This will be clear, more particularly, from Figures 1 and 2. The

40 weight of the carriage is sustained by the rail 22, as heretofore described, and it is held from tilting forward by the roller 10, which, as has been seen, bears against a head

45 rail 11 set into an elevated transverse bar 149 extending between vertical frame members 150 of the carriage and platen supporting frame 12. The transverse bar 149 carries a

50 square plate 151 and, also, has a rearwardly extending horizontal flange 152 disposed over the horizontal roller 10. Flange 152 diminishes in width from the center toward

its outer ends, as shown in Figure 1. By moving the carriage from its center position it may be slightly raised and then entirely

55 withdrawn from its supporting frame in a manner which closely facilitates adjustment and repair.

It is thought that from the foregoing the construction and operation of the machine will be clearly understood, but I reserve the right to effect such modifications as may come within the scope of the protection prayed.

What I claim is:

35 1. In a down strike typewriter, the com-

bination with a supporting frame having upper and lower rails disposed horizontally one above another, of a carriage having movable connection with said rails at its rear side and supported exclusively by such connections, and down strike printing mechanism mounted on the carriage in advance of the carriage support.

2. In a down strike typewriter, a supporting frame having upper and lower rails, 75 a carriage having supporting rollers traveling on the lower rail, and a roller engaging the rear side of the upper rail to prevent forward tilting of the carriage, said rollers constituting the sole supporting means for 80 the carriage, and down strike printing mechanism mounted on the carriage.

3. In a down strike typewriter, a stationary supporting frame having two transverse rails disposed one above another, a platen 85 movable in the frame in one direction, a carriage supported exclusively by said rails, and down strike printing mechanism mounted on the carriage in advance of its exclusive support.

4. In a down strike typewriter, a stationary supporting frame having horizontal platen guides and carriage guides in right angular relation, the carriage guides being 90 disposed one above another, a platen mounted in the platen guides, a carriage supported at its rear side exclusively by the carriage guides, and down strike printing mechanism mounted on the carriage.

5. In a down strike typewriter, the combination with a frame, a flat platen and a traveling carriage supported by the frame, of a down strike printing mechanism including type bars, sub-levers and a key board, upper and lower decks for the sub- 105 levers and type bars, the key board extending well in advance of both decks and the printing point of the type bars also being located well in advance of the decks but below the front portion of the key board.

6. In a down strike typewriter, the combination with a frame, platen and movable carriage, of supporting means for the carriage located exclusively at its rear side, a horizontal type arm segment in the carriage, down strike type arms mounted in the segment and movable to a printing point materially in advance of the entire segment, and a key board extending in advance of the vertical plane of the printing point and 120 located in an elevated position, the described relations of parts and the character of the carriage mounting resulting in maximum visibility of the printing point of the machine.

7. In a down strike typewriter, a series of normally upstanding type bars downwardly movable to the printing point, of elevated keys, connections between the keys and type arms including links having pro- 125

jections located adjacent to the type arm mountings, a rock shaft having operative connection with the escapement, arms extending therefrom, links suspended from the arms, and an arcuate universal bar suspended by the links over the projections and the links of the type bar connections.

8. In a down strike typewriter, the combination with a frame, a flat platen and a traveling carriage supported by the frame, of a down strike printing mechanism including type bars, sub-levers and a key board, upper and lower decks for the sub-levers and type bars, the key board extending well in advance of both decks and the printing point of the type bars also being located well in advance of the decks but below the front portion of the key board, and ribbon spools located at opposite sides of the printing point and having parallel axes located in a horizontal plane intermediate of the decks.

9. In a down strike typewriter, the combination with a frame, a flat platen and a traveling carriage supported by the frame, of a down strike printing mechanism including type bars, sub-levers and a key board, upper and lower decks for the sub-levers and type bars, the key board extending well in advance of both decks and the printing point of the type bars also being located well in advance of the decks but below the front portion of the key board, ribbon spools at opposite sides of the printing point, parallel spool shafts extended rearwardly between the decks from the spools and a ribbon feed shaft for the spool shafts.

10. In a down strike typewriter, the combination with a frame, a flat platen and a traveling carriage supported by the frame, of a down strike printing mechanism including type bars, sub-levers and a key board, upper and lower decks for the sub-levers and type bars, the key board extending well in advance of both decks and the printing point of the type bars also being located well in advance of the decks but below the front portion of the key board, ribbon spools at opposite sides of the printing point, parallel spool shafts extended rearwardly between the decks from the spools, a ribbon feed shaft for the spool shafts, means for driving the feed shaft, and means for connecting either spool shaft to the feed shaft.

11. In a down strike typewriter, the combination with a frame, a flat platen and a traveling carriage supported by the frame, of a down strike printing mechanism including type bars, sub-levers and a key board, upper and lower decks for the sub-levers and type bars, the key board extending well in advance of both decks and the printing point of the type bars also being located well in advance of the decks but below the

front portion of the key board, and a ribbon vibrator extending in advance of the lower deck to vibrate the ribbon.

12. In a down strike typewriter, the combination with a frame, a flat platen and a traveling carriage supported by the frame, of a down strike printing mechanism including type bars, sub-levers and a key board, upper and lower decks for the sub-levers and type bars, the key board extending well in advance of both decks and the printing point of the type bars also being located well in advance of the decks but below the front portion of the key board, a type guide extended in advance of the lower deck and a ribbon vibrator connected to said guide.

13. In a down strike typewriter, the combination with a frame, a flat platen and a traveling carriage supported by the frame, of a down strike printing mechanism including type bars, sub-levers and a key board, upper and lower decks for the sub-levers and type bars, the key board extending well in advance of both decks and the printing point of the type bars also being located well in advance of the decks but below the front portion of the key board, a type guide extended in advance of the lower deck, a ribbon vibrator connected to said guide, and a key operated universal bar connected to the vibrator.

14. In a down strike typewriter, the combination with a frame, a flat platen and a traveling carriage supported by the frame, of a down strike printing mechanism including type bars, sub-levers and a key board, upper and lower decks for the sub-levers and type bars, the key board extending well in advance of both decks and the printing point of the type bars also being located well in advance of the decks but below the front portion of the key board, a type guide extended in advance of the lower deck, a ribbon vibrator connected to said guide, a key operated universal bar connected to the vibrator, and means for varying the throw of the vibrator.

15. The combination with an arcuate series of type bars having a common printing point, a pair of ribbon spools opposite the printing point, parallel spool shafts extending rearwardly from the spools, a ribbon feed shaft located in rear of the type bars, means for reversing the direction of ribbon feed, said means including clutches, controlling devices therefor, and parallel rock shafts having means at their rear ends for operating the controlling devices and provided at their front ends with ribbon followers adjacent to the spools.

16. The combination with a pair of ribbon spools, parallel spool shafts and a feed shaft, of gearing between the spool shafts and opposite ends of the feed shaft, clutches controlling the connection of said gearing

with the feed shaft, levers provided with cams to control the operation of the clutches, parallel rock shafts having cranks at their rear ends co-acting with the levers to move the cams into and out of operative position, and ribbon followers mounted on the front ends of the rock shafts.

17. The combination with a movable supporting frame of a carriage having a movable supporting connection exclusively at its rear side, with the frame and down-strike printing mechanism mounted on the carriage in advance of said supporting connection.

18. The combination with a movable supporting frame, including upper and lower rails, of a carriage supported exclusively at its rear side from said rails, the lower rail serving as a track and the upper rail serving to prevent forward tilting of the car-

riage, and a printing mechanism mounted on the carriage and including type bars mounted in advance of the carriage support and downwardly movable to a printing point in advance of their mounting.

19. In a typewriter, the combination with upper and lower supporting rails, down-strike printing mechanism, a carriage supporting the printing mechanism and movable along the rails and engaging the upper side only of the lower rail and the rear side only of the upper rail, whereby the carriage will be supported exclusively at its rear side and may be readily removed from its support by a rearward tilting and an upward lifting movement of the carriage.

In testimony whereof I affix my signature.

HARRY A. FOOTHORAP.