Aug. 21, 1945. J. J. KITTEL 2,383,257

TYPEWRITING MACHINE

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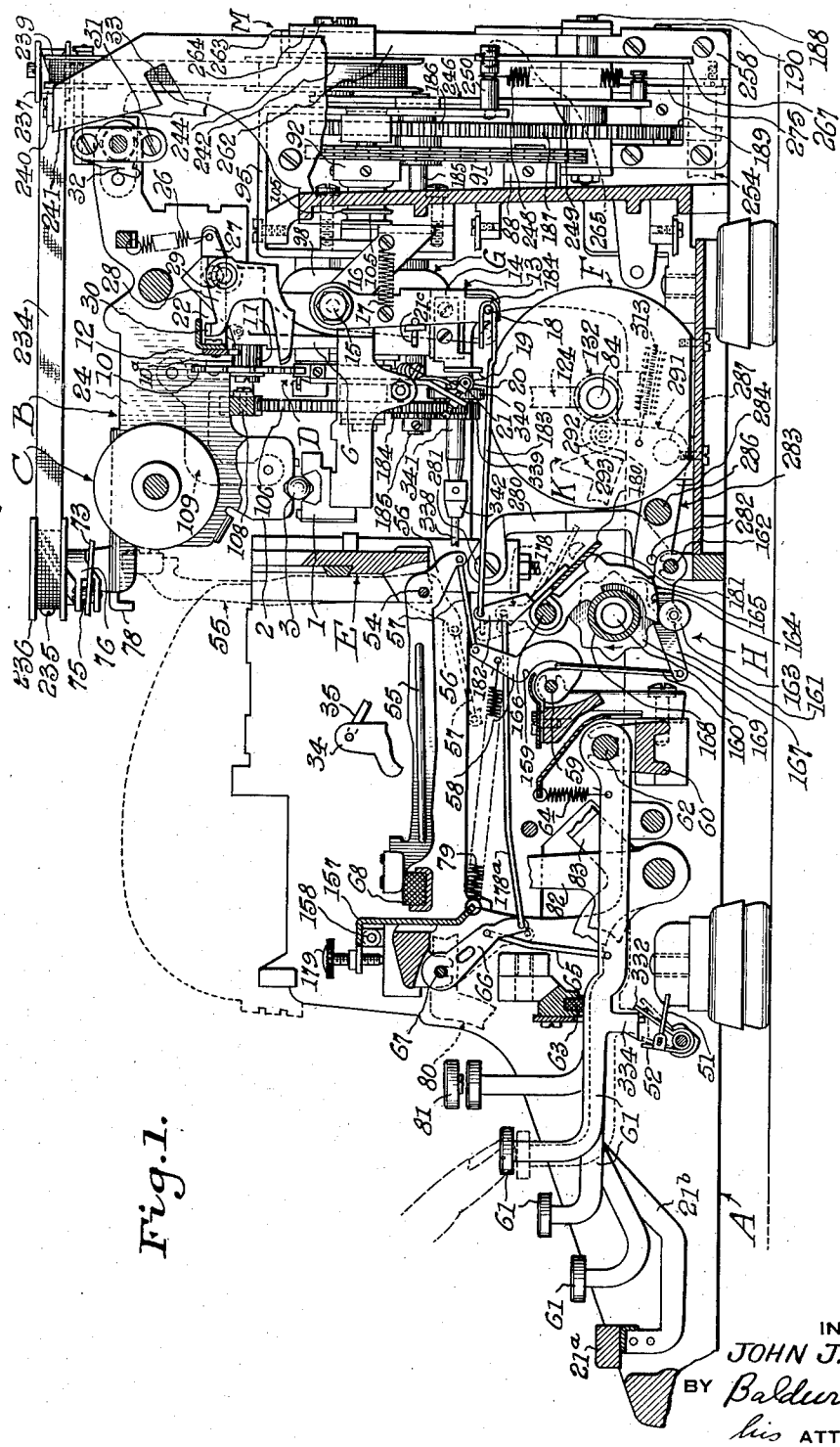


Fig. 1.

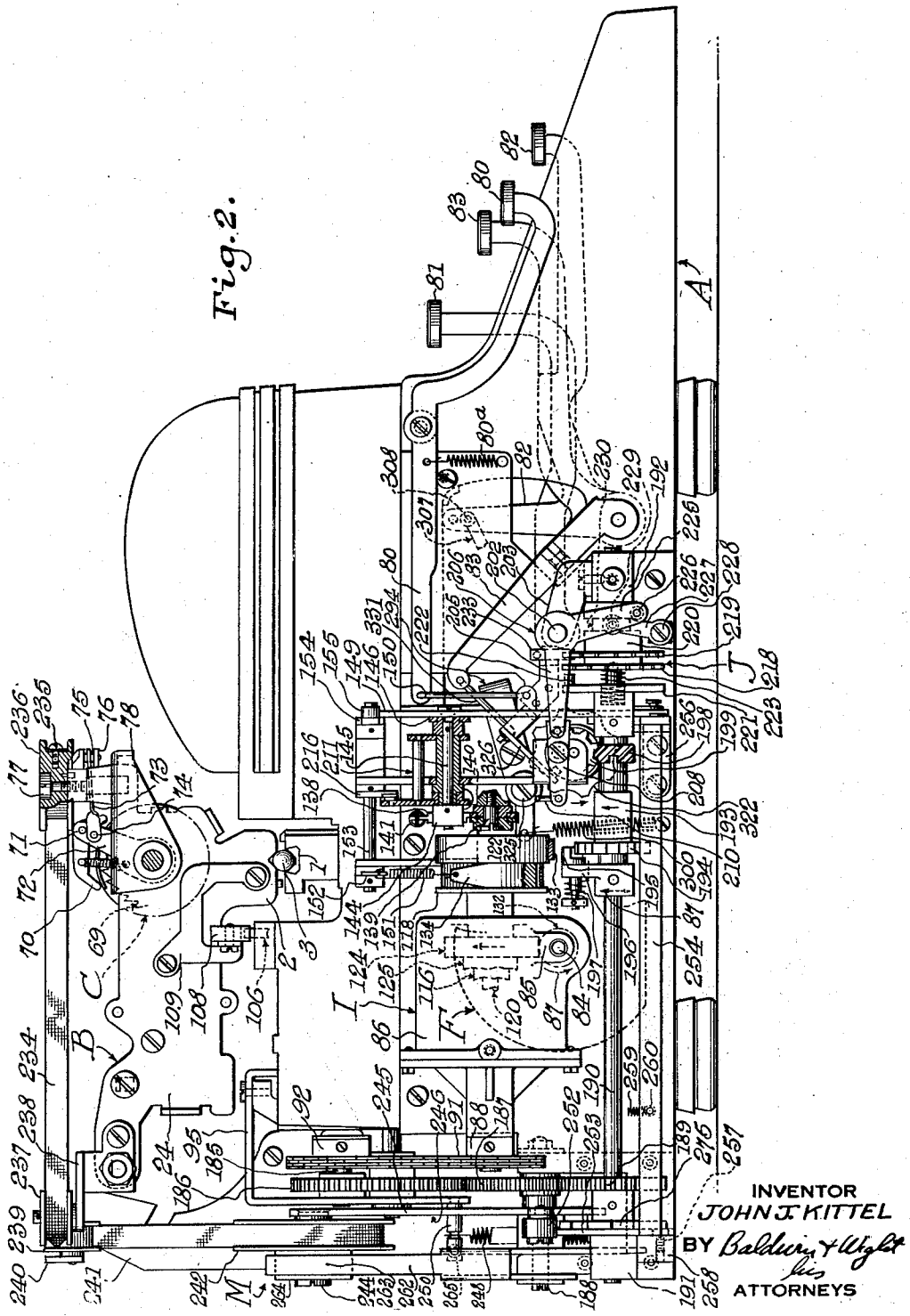
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Fig. 2.

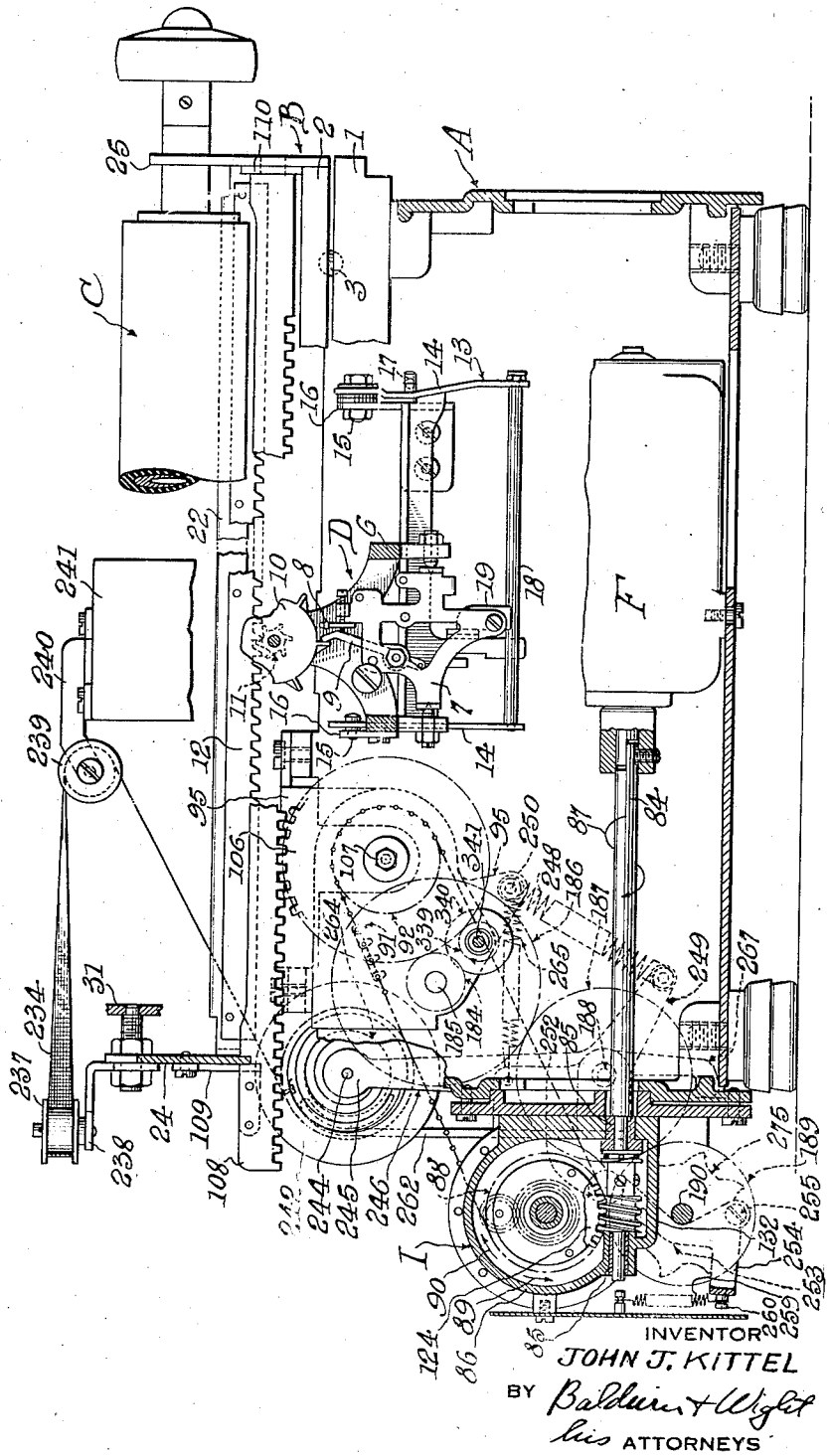


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Fig. 3.



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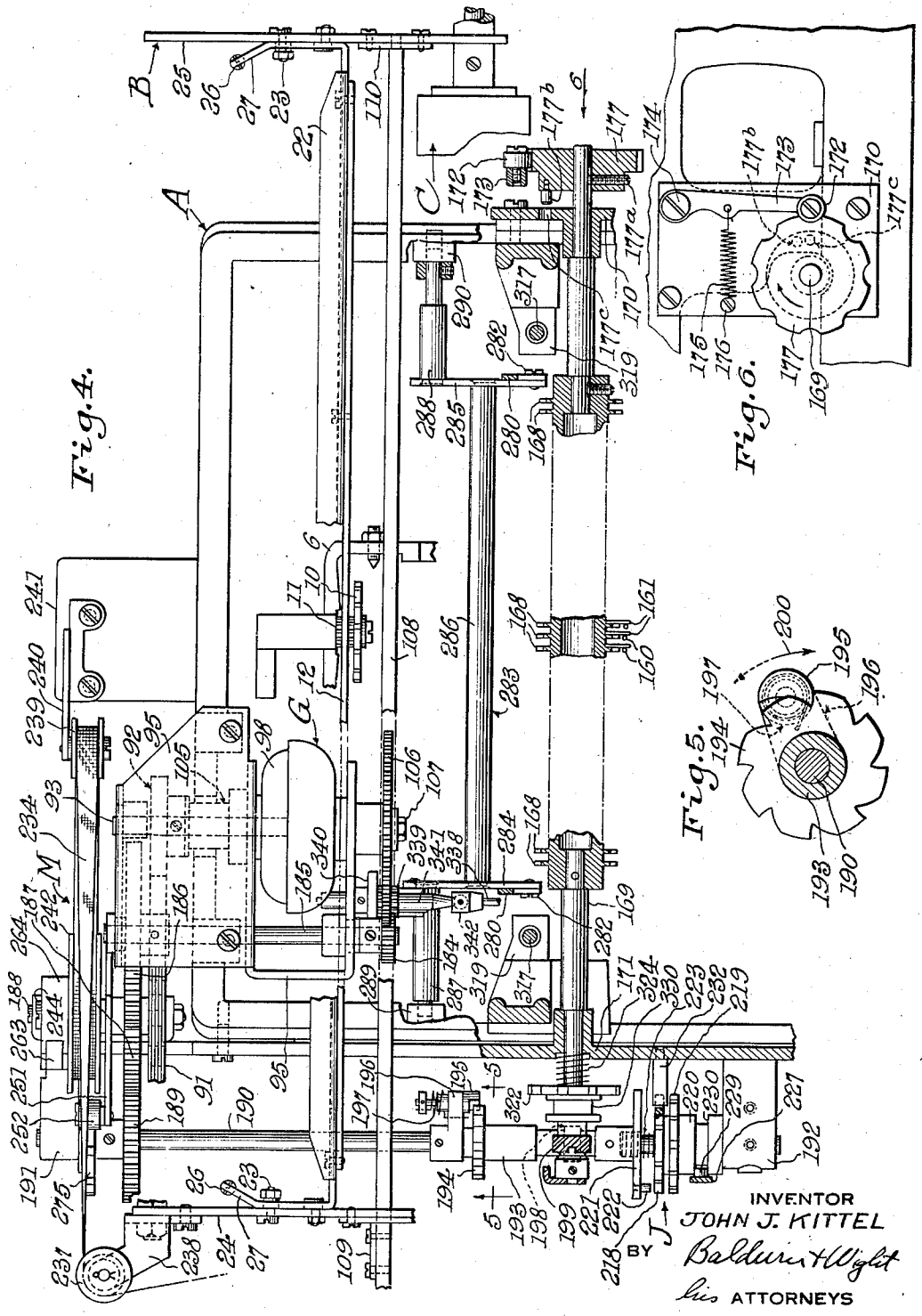


Fig. 4.

Fig. 6.

Fig. 5.

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TYPEWRITING MACHINE

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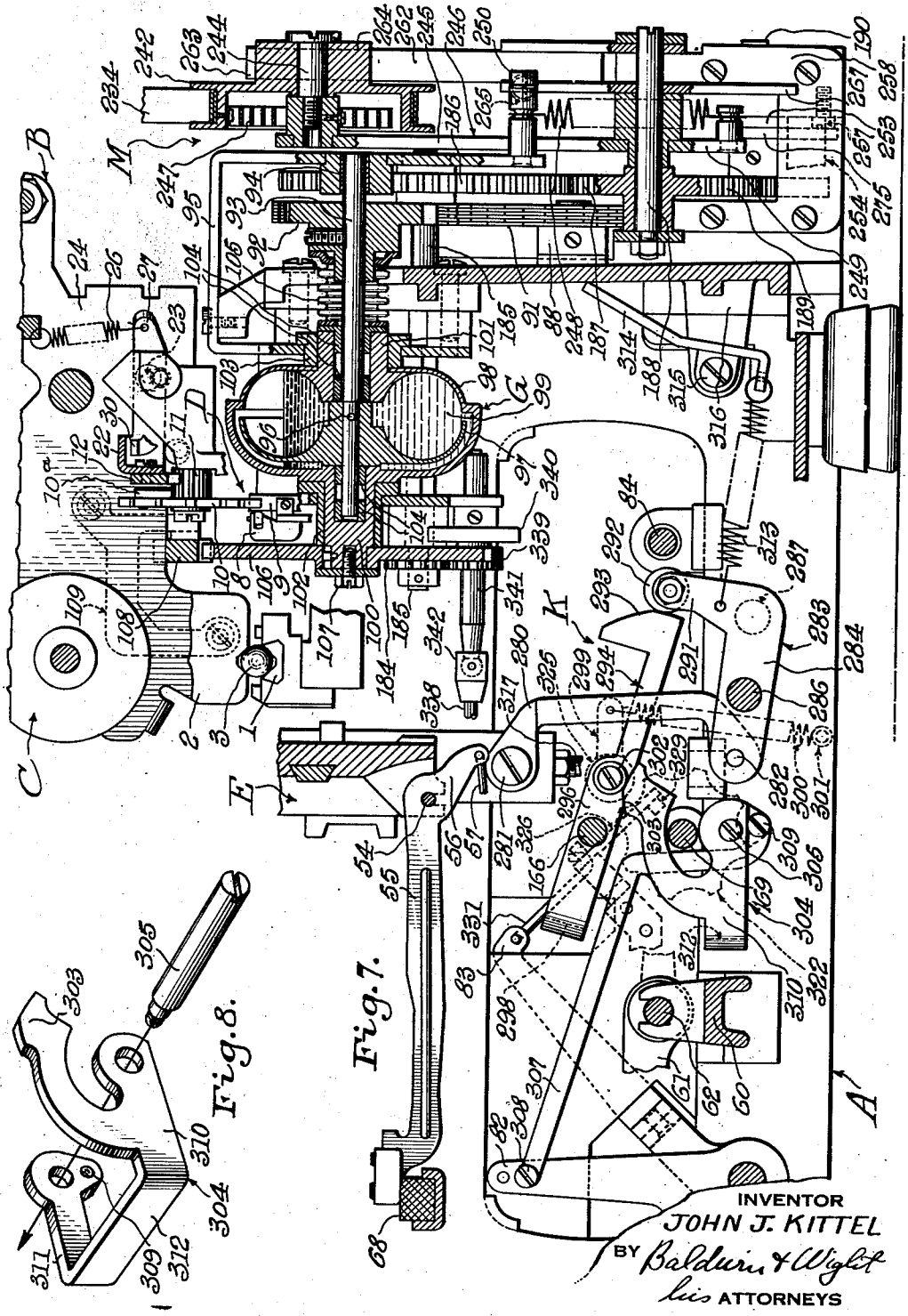


Fig. 7.

Fig. 8.

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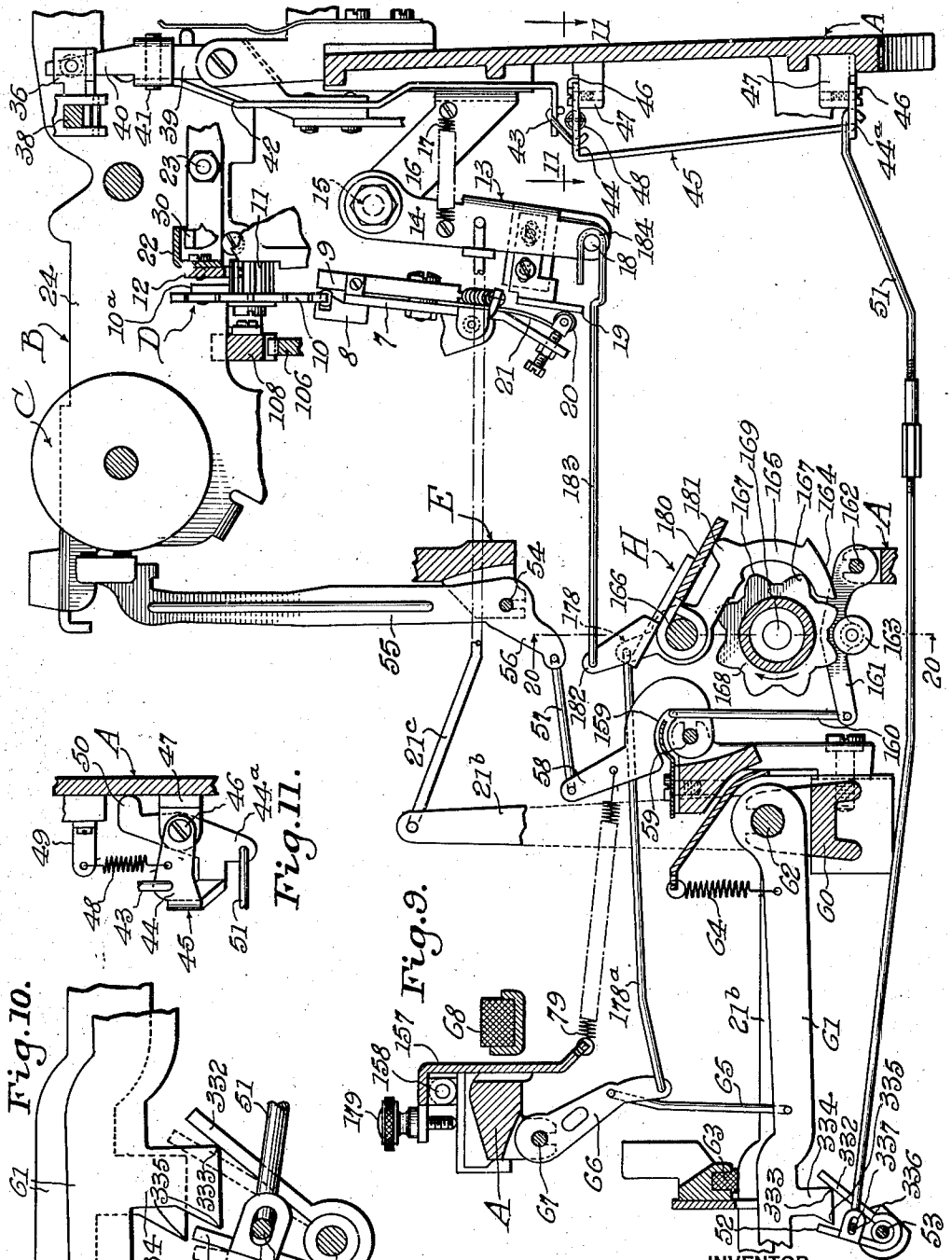


Fig. 9.

Fig. 11.

Fig. 10.

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TYPEWRITING MACHINE

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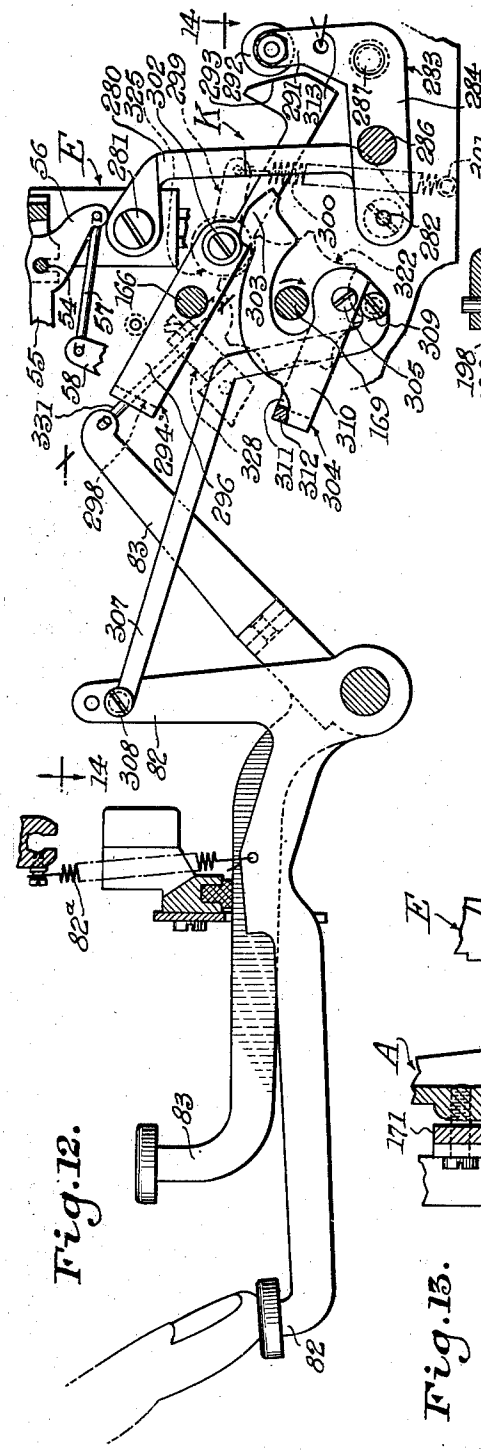


Fig. 12.

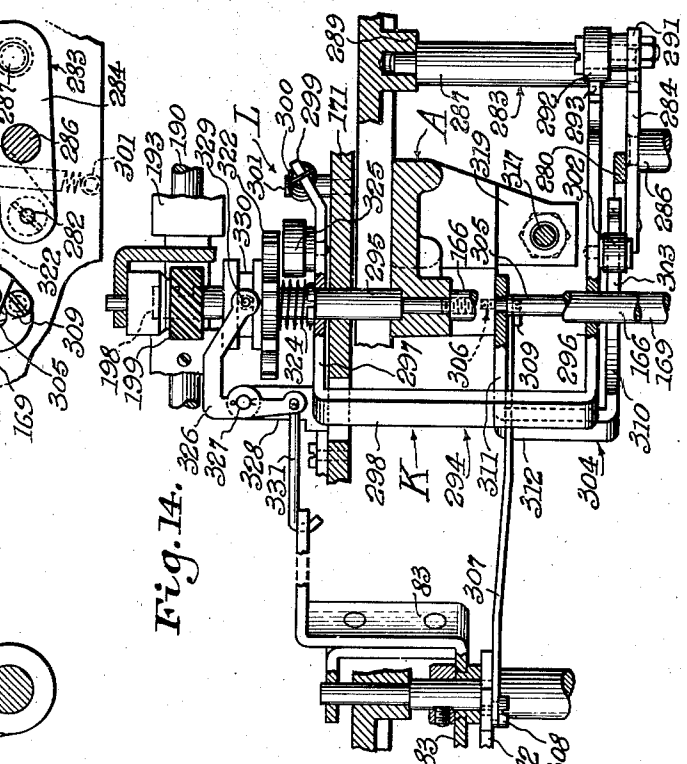


Fig. 14.

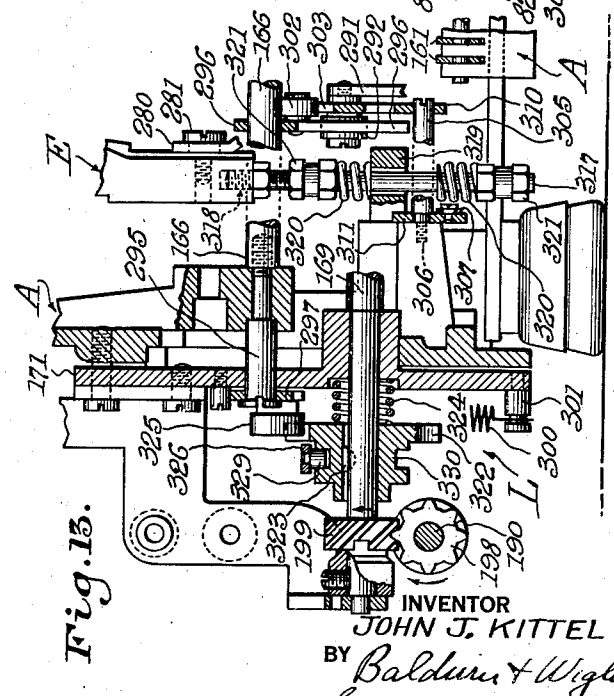


Fig. 13.

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TYPEWRITING MACHINE

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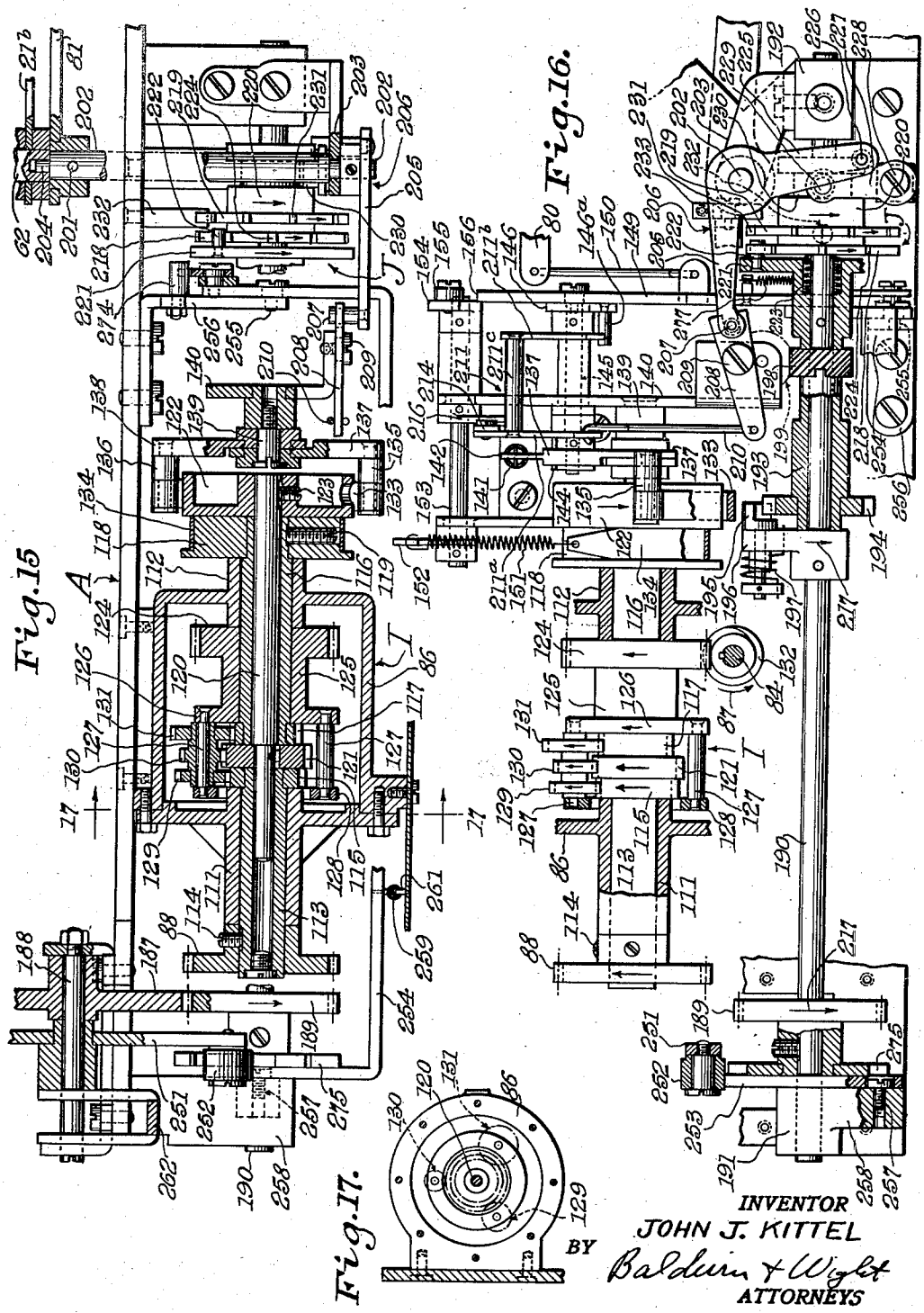


Fig. 15

Fig. 16.

Fig. 17.

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Fig. 19.

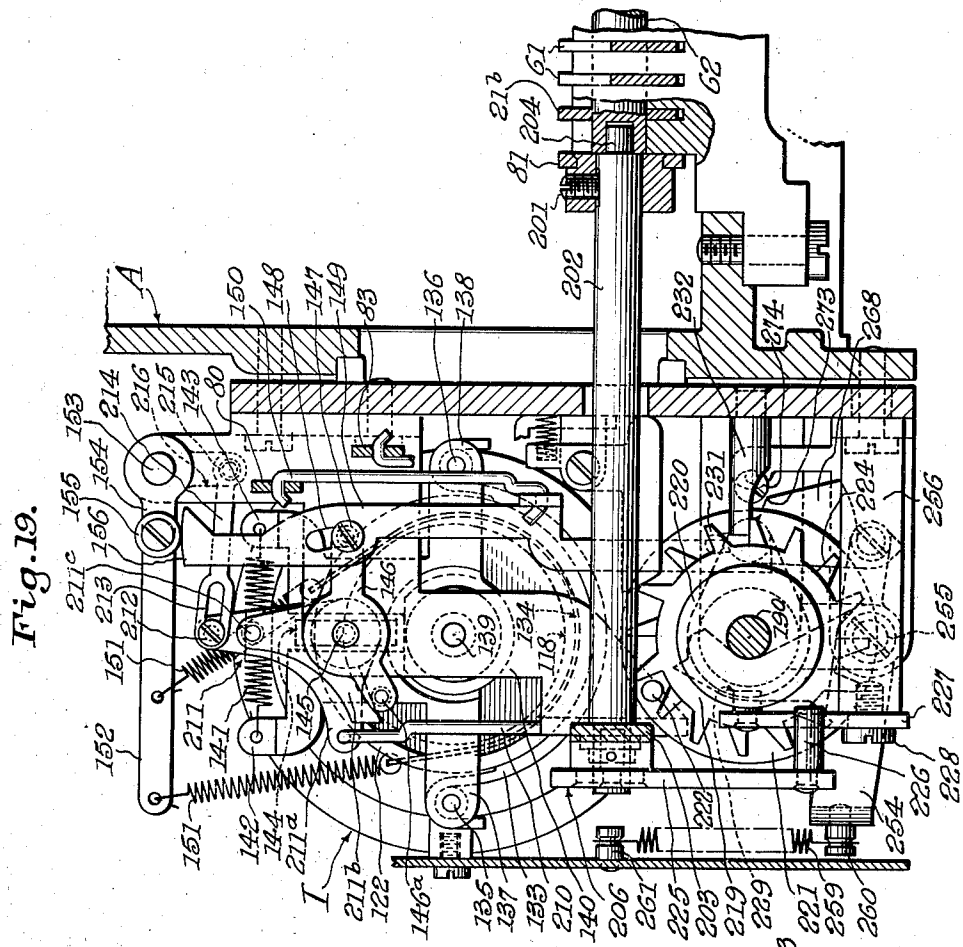
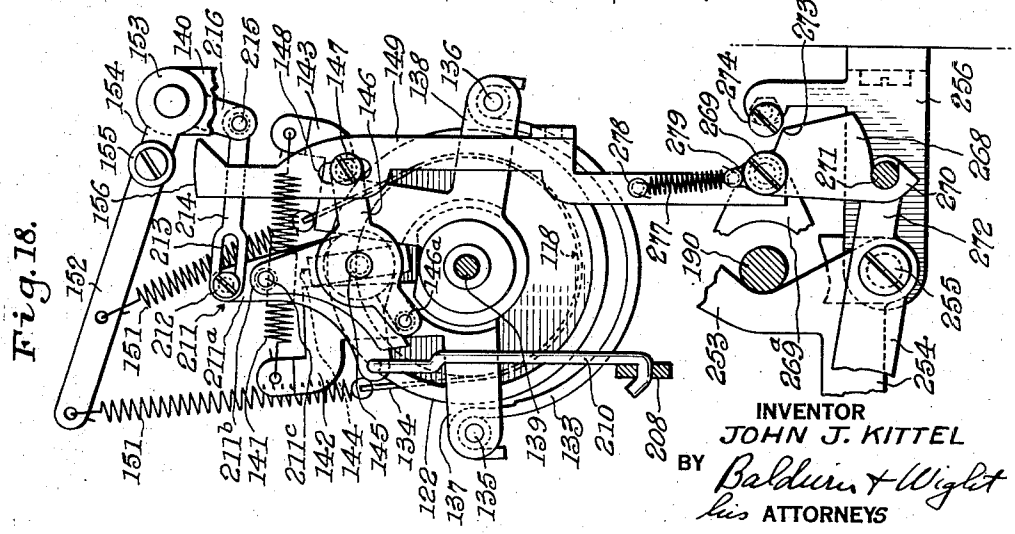


Fig. 18.



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Fig. 21.

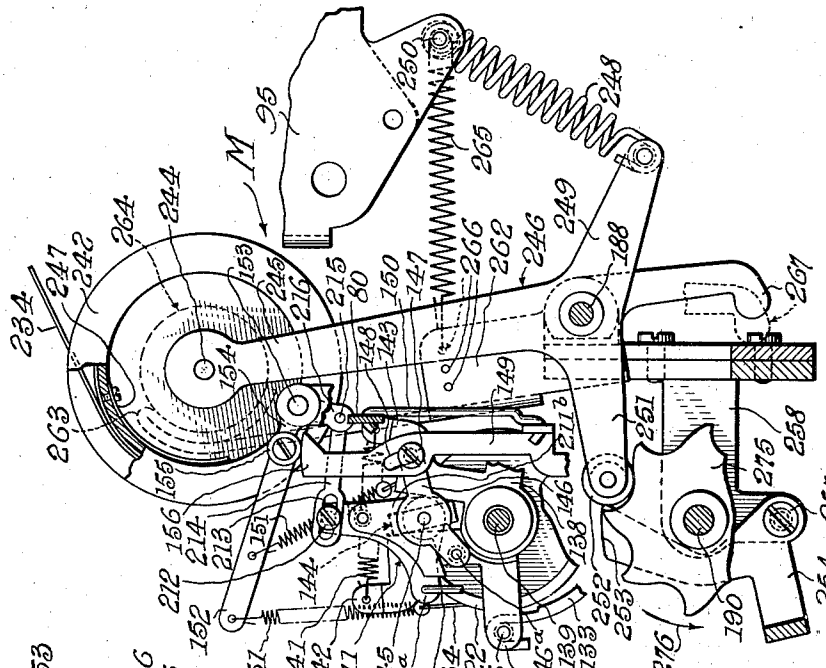


Fig. 22.

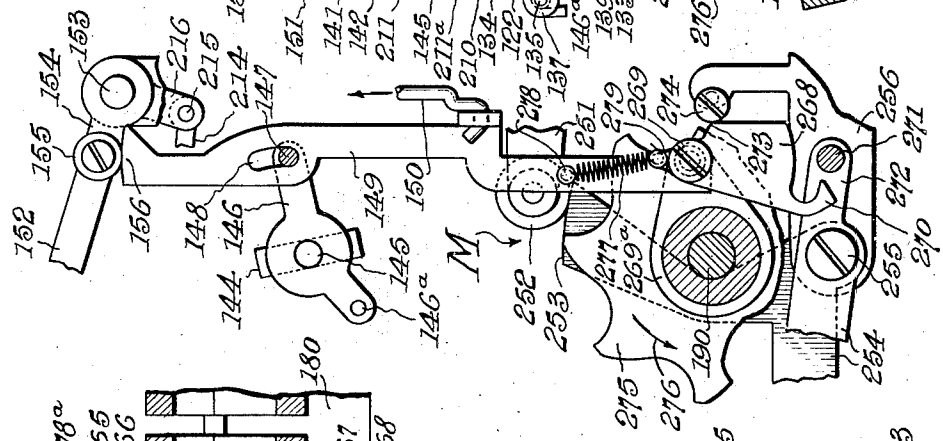
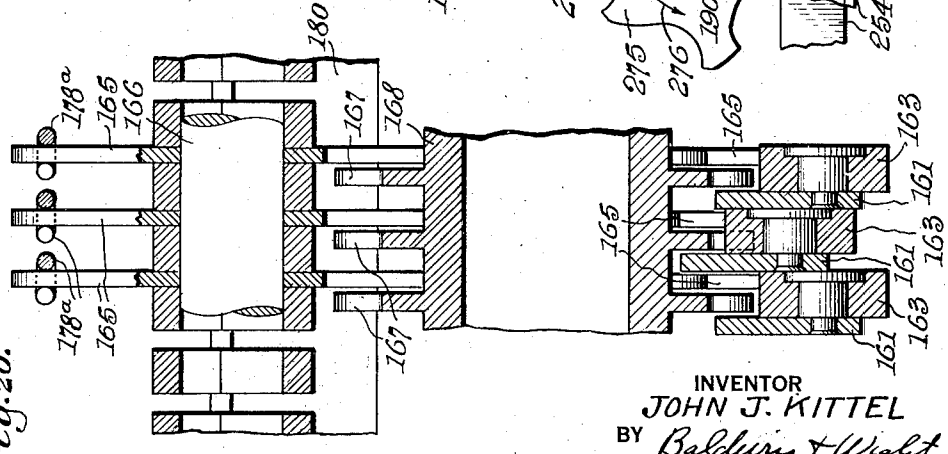


Fig. 20.



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TYPEWRITING MACHINE

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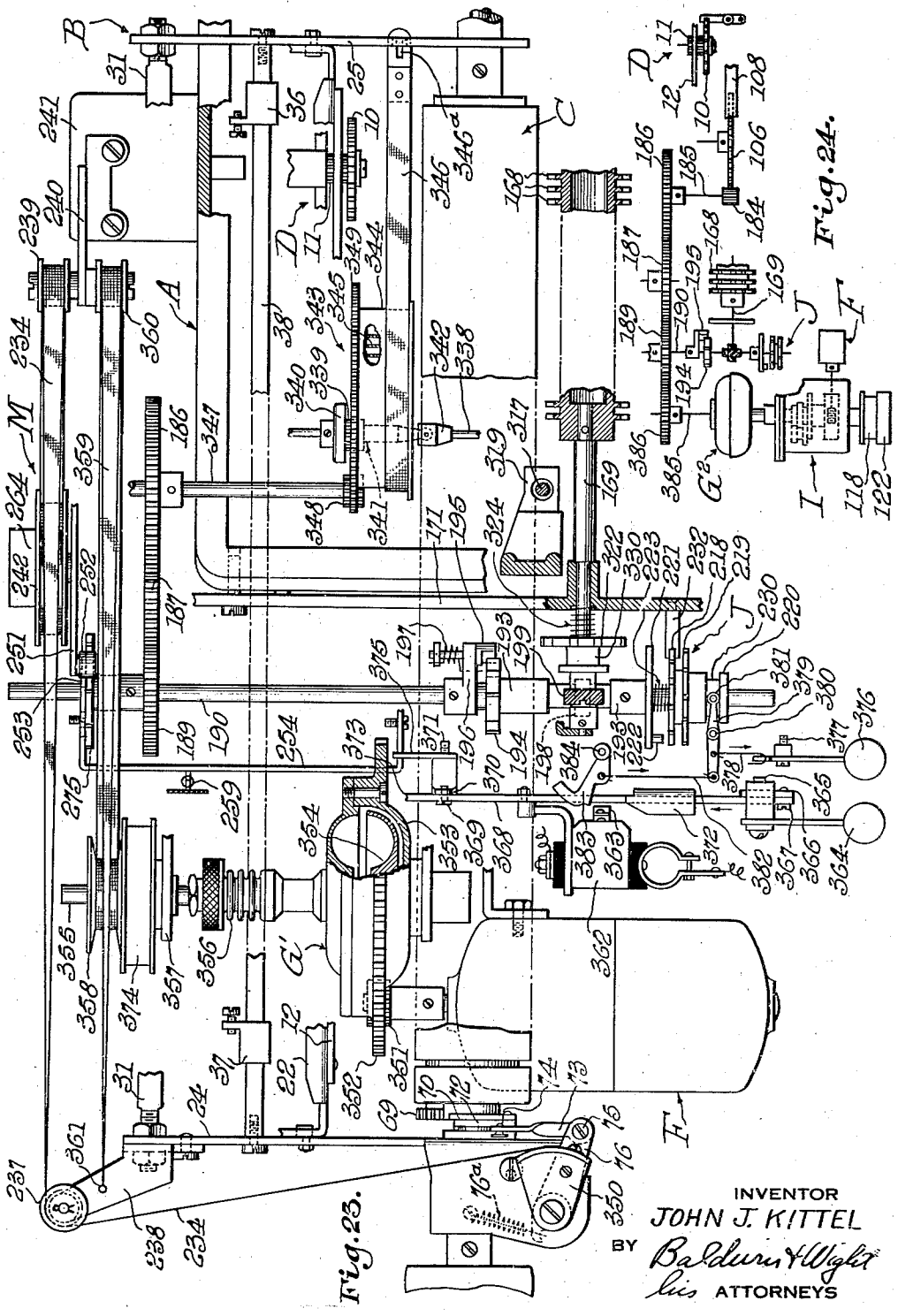


Fig. 24.

Fig. 23.

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Patented Aug. 21, 1945 2,383,257

UNITED STATES PATENT OFFICE

2,383,257

TYPEWRITING MACHINE

John Joseph Kittel, St. Albans, N. Y., assignor to Royal Typewriter Company, Inc., New York, N. Y., a corporation of New York

Application July 3, 1943, Serial No. 493,450

27 Claims. (Cl. 197—17)

This invention relates to typewriting or like machines, and more particularly to machines of this class in which mechanism usually operated by manual effort is operated by power supplied by a motor or motors, under manual control.

An object of the invention is to provide a power operated typewriter or like machine in which the power supplying and manual control mechanism is so arranged and so interconnected with other parts of a standard or more nearly standard kind customarily embodied in manually operated typewriters that the power and control mechanism may be operatively associated with such other parts with a minimum of modification of the basic machine construction.

Another object is to provide a machine of the class referred to with improved power drive mechanism for actuating, under manual control, parts performing usual typewriter functions such as type bar or other type member operation, line spacing, carriage drive in both directions, back spacing, and case shifting.

Another object is to provide a typewriter or like machine of the character referred to in which the power for actuating or controlling the actuation of the parts performing some of these operating functions is transmitted through a fluid coupling having the property of cushioning the operating effort and reducing shock.

Another object is to provide a typewriter or like machine in which the type members are movable to typing position by power means such as springs and are piloted or controlled during at least part of their typing strokes by means operable independently of the power means.

Another object is to provide a construction of this kind in which the type member piloting means is driven through an impositive drive device, preferably a fluid coupling.

Another object is to provide a typewriting or like machine in which the type members are moved to typing position by power means and are returned to normal position by other power means arranged to transmit drive through a fluid coupling.

Another object is to provide improved fluid drive mechanism for causing a typewriter carriage to perform letter spacing and return or back spacing movements.

Another object is to provide mechanism for effecting step-by-step back spacing of a typewriter carriage by power transmitted through an impositive drive cushioning device, preferably a fluid coupling.

Another object is to provide a typewriter or like machine in which the escapement mechanism for controlling the travelling carriage movements comprises two separate units operable selectively for effecting letter spacing and back spacing carriage movement respectively.

Another object is to provide a typewriter or like machine equipped with improved line spacing mechanism operable by power means such as a spring motor.

Another object is to provide line spacing mechanism of the kind referred to including resetting means operable by power transmitted through an impositive drive device, for example a fluid coupling.

Another object is to provide a typewriter or like machine having case shifting mechanism including means for impositively transmitting shifting force or effort to a case shifting element for moving it to one of its positions.

Another object is to provide case shifting mechanism of the character stated in which the effort for moving the shifting element to one of its positions is transmitted through a fluid coupling.

Another object is to provide an improved arrangement of drive connections for transmitting variable slip torque from the driving to the driven elements.

A further object is to provide an improved safety lock device for mechanism having one or more of the characteristics referred to above.

Other objects will become apparent from a reading of the following description, the appended claims, and the accompanying drawings, in which:

Figure 1 is a vertical cross sectional view of a typewriter embodying the invention, the section being taken fore and aft of the machine;

Figure 2 is a view mainly in elevation from the left side of the typewriter shown in Figure 1 with some parts being shown in section and showing especially line spacing mechanism, carriage returning mechanism, and back spacing mechanism with the parts being shown in their normal or at rest positions; some other parts including those for actuating the typing mechanism not being shown;

Figure 3 is a vertical section taken from end to end of the typewriter shown in Figures 1 and 2 with some parts broken away, others omitted, and others shown in elevation;

Figure 4 is a fragmentary horizontal section with some parts being shown in elevation and others being omitted;

Figure 5 is a detail vertical section on the line 5—5 of Figure 4 showing a pawl and ratchet one

way drive construction, drawn on an enlarged scale;

Figure 6 is a detail view in elevation showing a cam roller detent mechanism as viewed when looking in the direction of the arrow 6 in Figure 4;

Figure 7 is a fragmentary enlarged vertical sectional view fore and aft of the machine and showing particularly the relationship between a carriage and fluid coupling for transmitting drive to the carriage. This view also illustrates line spacing mechanism, case shifting mechanism, and ribbon feeding connections shown in their normal or at rest positions;

Figure 8 is a perspective view of a rockable latch member forming part of the case shifting mechanism, and its pivotal mounting;

Figure 9 is an enlarged view partly in elevation and partly in vertical section, fore and aft of the machine, showing type bar actuating mechanism and a safety lock device associated with line locking mechanism;

Figure 10 is a fragmentary detail elevation on an enlarged scale showing the safety lock device;

Figure 11 is a fragmentary horizontal section on the line 11—11 of Figure 9;

Figure 12 is a fragmentary view partly in elevation and partly in vertical section, fore and aft of the machine, showing case shift mechanism including a shiftable segment in lower case position;

Figure 13 is a fragmentary vertical sectional view taken end-to-end of the machine and showing parts of the case shift mechanism in lower case position;

Figure 14 is a fragmentary horizontal sectional view substantially on the irregular lines 14—14 of Figure 12 and showing the parts in the same positions as are shown in Figure 12;

Figure 15 is a longitudinal horizontal section through planetary reversing gearing and a supplemental escapement mechanism conditioned for back spacing the typewriter carriage in step-by-step movements;

Figure 16 is a fragmentary side elevation of the mechanism shown in Figure 15 but with some parts being shown in section;

Figure 17 is a detail section on the line 17—17 of Figure 15;

Figure 18 is an enlarged front elevation of drive reversing and back spacing mechanism, showing the parts in the positions occupied when the carriage is to be back spaced in step-by-step increments;

Figure 19 is a view of the mechanism shown in Figure 18 but with other cooperating parts also being illustrated, the parts all being shown in the normal positions they occupy when the machine is conditioned for driving the carriage in the letter spacing direction;

Figure 20 is a detail vertical section on the line 20—20 of Figure 9 drawn on an enlarged scale and showing a cam mechanism for piloting type bars to typing position and for resetting them in inactive position;

Figure 21 is a front elevational view of line spacing mechanism with some parts being shown in section and all of the parts being shown in their active positions occupied during a line spacing operation;

Figure 22 is a front elevational view showing some of the parts illustrated in Figure 21, the parts being shown in the positions occupied just after a line spacing operation has been effected;

Figure 23 is a diagrammatic plan view of a modified construction in which a spring motor is provided for driving the carriage in the letter spacing direction and for supplying power for operating other typewriter parts, such as the typing mechanism; and

Figure 24 is a diagrammatic illustration of a modified construction in which a fluid coupling is interposed between the reversing gearing and the carriage driving gears.

Embodiment Shown in Figures 1 to 22 Inclusive

Introduction

The invention is capable of being embodied in typewriting machines of various kinds. For the purposes of illustration it is shown in connection with a typewriter the general construction and arrangement of many of the parts of which conform to the well known Royal Standard typewriter construction.

The typewriter illustrated comprises a main frame A mounted on which is a bottom rail 1 cooperable with a top rail 2 and interposed balls 3 for supporting a carriage B for letter spacing and return movements. A cylindrical platen member C is mounted on the carriage for travel therewith and for rotation thereon for line spacing purposes in the usual manner.

When the machine is conditioned for operation, the carriage B is urged to move in the letter spacing direction under the control of an escapement mechanism unit generally designated D. The escapement mechanism comprises a fixed frame 6 which pivotally mounts a rocker 7 carrying a fixed dog 8 and a pivoted dog 9 cooperable in the usual manner with an escapement wheel 10. The wheel 10 is connected through a pawl 10^a (Figures 1, 7 and 9) to a pinion 11 normally in mesh with an escapement rack 12 mounted on the carriage. A universal frame 13 includes arms 14 pivoted at 15—15 on a frame mounted bracket 16. The universal frame is urged rearwardly by a spring 17 and includes a universal bar 18 adapted to be pulled forwardly upon the depression of one of the usual key levers or the space bar. Adjustably mounted on the frame 13 is a pressure plate 19 adapted to push against a roller 20 journaled at the lower end of a spring arm 21 carried by the rocker 7 (see Figure 9). When the frame 13 is rocked clockwise as viewed in Figure 9, the plate 19 pushes the roller 20 so as to rock the rocker 7 and operate the escapement mechanism D to effect a single letter spacing movement of the carriage in the usual manner. The usual space par 21^a (Figure 1) having the arms 21^b (Figures 1 and 9) is connected by a link 21^c to the universal frame 13.

The escapement rack 12 is mounted on a bail 22 which is pivoted as at 23 on the carriage end plates 24 and 25. Springs 26 respectively interposed between the carriage end plates and rearwardly extending arms 27 integral with the bail 22 normally hold the rack 12 down in engagement with the escapement pinion 11. For permitting tabulating movements of the carriage B, the bail 22 and the rack 12 are rocked clockwise as viewed in Figure 1 by a tabulating rack lift lever 28 pivoted on the main frame as at 29 and being formed with an ear 30 engageable with the bail 22 in the usual manner. The carriage is equipped with a tabular stop frame 31 mounting a plurality of key-settable stops, one of which is shown at 32 in Figure 1, the stops 32 being adapted to cooperate with a frame mounted stop finger 33. Operating connections between the

stop finger 33 and the tabulating key lever, a portion of which is shown at 34 in Figure 1, include a link 35, the remainder of such connections being of known construction as shown for example in the patent to Lewis C. Myers, No. 2,209,279, granted July 23, 1940.

The travel of the carriage in letter spacing and return directions is limited respectively by margin stops 36 and 37 mounted on a margin stop bar 38 and being cooperable with a center stop 39 (see Figures 9 and 23). When the carriage approaches the end of its travel to the left in the letter spacing direction, the margin stop 36 operates a line lock lever 40 so that when the carriage is brought to rest by the center stop 39 the key levers cannot be operated. The line lock lever 40 is pivoted as at 41 on the center stop 39 and is formed with a downwardly extending arm 42, the lower end of which is connected by a link 43 to one arm 44 of a lever 45 pivoted as at 46 on frame brackets 47 (see Figures 9 and 11). A spring 48 interposed between the lever arm 44 and a frame mounted ear 49 urges the lever 45 and line lock lever 40 to non-line locking position, movement of the parts under the urge of the spring 48 being limited by engagement of a stop projection 50 on the lever 45 with the frame A. Another arm 44a of the lever 45 is connected by a link 51 to a key lever blocking device, which in the form shown comprises a line lock plate 52 pivoted as at 53.

The usual case shift member, in the form shown a type bar segment E, is mounted for vertical shifting on the frame A and is equipped with a pivot wire 54 which mounts the usual complement of type bar members, one of which is shown at 55. Each type member 55 is formed with a short arm 56 connected by a link 57 to an intermediate lever 58 pivoted as at 59 on the key lever bracket 60 carried by the frame A. The bracket 60 also mounts the key levers 61 which are pivoted on a fulcrum shaft 62 and are urged upwardly against a stop 63 by returning springs 64. Each key device 61 is connected by a link 65 to a front lever 66 pivoted as at 67 on the frame A. The type bars 55 normally and when in inactive position are supported at their free ends by a head rest 68.

In the conventional Royal Standard construction, as for example the construction shown in the patent to Henry J. Hart, No. 2,202,451 granted May 28, 1940, each of the front levers 66 is connected by a link to an associated intermediate lever 58 so that upon depression of a key lever, manually applied force is transmitted to the type bar for moving it to printing position. As is pointed out hereinafter, a feature of the present invention consists in utilizing depression of a key lever for disabling a restraining device so as to permit power operable means to apply the effort for moving the type bar to printing position.

It will be understood that a key lever 61, the type bar 55 and associated parts shown in the drawings are representative of each of the plurality of type bar actions and associated key mechanism although only one complete type bar action is shown. The description of one complete type bar action is intended to serve as a description of the other type bar actions.

For rotating the platen C to effect line spacing, a ratchet wheel 69 fast with the platen is adapted to be moved by a spring urged pawl 70 pivoted as at 71 on a rock arm 72 journaled on the platen shaft (see Figure 2). A thrust link 73 is pivotally connected at 74 to the rock arm 72 and is pivotally connected at 75 to a crank arm 76 pivoted as at 77 on a carriage mounted bracket 78. Rocking of the crank arm 76 moves the thrust link 73, rock arm 72, pawl 70, and ratchet wheel 69 to rotate the platen in the well known manner. The crank arm 76 may be returned by a spring 76a as shown in Figure 23.

The similarity of the construction thus far described to the construction of the known Royal Standard typewriting machine will be apparent to those familiar with the art. Some other parts to be referred to hereinafter also will be recognized as being of known construction.

General description

In accordance with the present invention, power operated mechanism controlled by manually operable keys supplies the effort for the performance of the usual typewriting machine operations, i. e. letter spacing and return travel driving of the carriage, actuation of the type bars, case shifting, back spacing and tabulating movement of the carriage, and line spacing movement of the platen. In the embodiment shown in Figures 1 to 22 inclusive, a prime mover F, preferably an electric driving motor, transmits cushioned power through a fluid coupling slip or impositive drive device G for normally urging the carriage B in the letter spacing direction under the control of the escapement mechanism D.

Each type bar action is loaded by power means comprising a spring 79 which urges the associated type bar to move to printing position but which normally is prevented from acting by restraining mechanism H. Means are provided for individually releasing the restraining mechanism H associated with each key lever and type bar in response to operation of that key lever and movement of the carriage in the letter spacing direction.

Returning of the carriage B to line starting position is effected by transmitting drive from the motor F through reversing gearing generally designated I controlled by a carriage return lever 80.

Back spacing of the carriage through distances corresponding to a predetermined small number of letter spacing increments is effected by driving the carriage through the reversing gearing I under control of a separate back spacing escapement mechanism unit J which in turn is controlled by a back space key lever 81.

Normally the type bar segment E is held in its upper position by mechanism generally designated K which is adapted to be released in response to depression of a shift key lever 82 for permitting the segment to be moved downwardly by gravity. The segment E is restored to its upper position by lifting mechanism generally designated L operated from the motor F under control of a shift release or reset key lever 83.

The line spacing crank arm 76 is adapted to be rocked by spring powered mechanism M (see Figure 21) under the control of the carriage return lever 80.

Carriage driving mechanism

As shown in Figure 3 the motor F is equipped with a shaft 84 journaled as at 85—85 in the housing 86 of the reversing gear I. The shaft 84 turns in the direction of the arrows 87 (Figures 2, 3, and 16) and transmits drive through the reversing gear I to a chain gear 88 which is driven in the direction of the arrow 89 for effecting car-

riage letter spacing travel and in the direction of the arrow 90 for returning or back spacing the carriage (see Figure 3).

The chain gear 88 drives a chain 91 which in turn drives a chain gear 92 fast on a shaft 93 journaled at one end as at 94 in a frame bracket 95. Adjacent its other end the shaft is connected at 96 to the propeller element 97 of the kinetic type fluid coupling G which may be of the kind disclosed in the patent to John J. Kittel No. 2,279,141 granted April 7, 1942. The coupling runner element 98 houses the propeller 97 and the fluid 99 (see Figure 7), and is formed with hubs 100 and 101 journaled respectively in bearings 102 and 103 carried by the bracket 95. The end of the shaft 93 adjacent the coupling G is journaled by bearings 104 interposed between the shaft 93 and the hubs 100 and 101. A bellows seal 105 prevents escape of fluid past the hub 101. A gear 106 secured as at 107 to the runner hub 100 meshes with a rack 108 mounted on the carriage end plates by brackets 109 and 110 (Figures 1, 2, and 3).

In operation, when the machine is conditioned for the typing of a line, the motor F drives the coupling propeller 97 through the reversing gearing I in a direction tending to transmit drive through the fluid 99 to rotate the runner 98 and gear 106 and move the rack 108 and carriage B in the letter spacing direction. The carriage can be held at rest by the escapement mechanism D because of the impositive drive characteristics of the fluid coupling G. Whenever the escapement mechanism is operated so as to release the carriage for letter spacing travel, the fluid-transmitted effort becomes effective for advancing the carriage. When the carriage is brought to rest by the escapement mechanism, the cushioning effect provided by the fluid coupling G prevents the occurrence of any undesirable shock or strain. During letter spacing operation the chain gear 88 is driven in the direction of the arrow 89 (Figure 3).

For returning or back spacing the carriage, the gearing I is set to cause the chain gear 88 to rotate in the direction of the arrow 90 (Figure 3). This will drive the propeller 97 of the coupling G in the opposite direction, thereby reversing the direction of rotation of the gear 106 and driving the rack 108 and carriage in the reverse or return direction.

The reversing gearing I comprises a planetary transmission enclosed within the housing 86 which is formed with aligned bearings 111 and 112 (Figure 15). A hollow output shaft 113 journaled in the bearing 111 has the chain gear 88 secured to it by a set screw 114. A sun gear 115 having twenty-two teeth is secured to the inner end of the shaft 113. A hollow shaft 116 journaled in the bearing 112 is fitted at its inner end with a sun gear 117 having twenty teeth, and at its outer end is equipped with a brake drum 118 secured to the shaft by a set screw 119. Journaled within the hollow shafts 113 and 116 is a shaft 120 equipped with a sun gear 121 disposed between the sun gears 115 and 117 and having twenty-four teeth. A brake drum 122 is secured to the shaft 120 by a set screw 123.

A worm wheel 124 is formed with a hub 125 journaled on the hollow shaft 116. Integral with the hub 125 is a carrier flange 126 on which are mounted planetary gear shafts 127, supported also by a ring or arbor 128. Mounted on each shaft 127 is a set of planetary gears 129, 130 and 131 secured together to rotate in unison. The planetary gears 129 have fourteen teeth and mesh with the sun gear 115 having twenty-two teeth, the planetary gears 130 have twelve teeth and mesh with the sun gear 121 having twenty-four teeth, and the planetary gears 131 have sixteen teeth and mesh with the sun gear 117 having twenty teeth. The relation of the pitch diameters of the gears 115, 117, 121, 129, 130, and 131 is the same as the relation of the numbers of teeth in the gears. The worm wheel 124 is in mesh with a worm 132 fast on the motor driven shaft 84, which is the input shaft of the reversing gearing I.

In operation, the worm wheel 124 and carrier flange 126 are rotated constantly to move the sets of planet gears 129, 130, and 131 around the sun gears 115, 121, and 117 with which they mesh constantly. The direction of rotation of the sun gear 115 and hence the direction of rotation of the chain gear 88 depends upon which of the sun gears 117 and 121 is held stationary. The brake drum 122 which is connected to the sun gear 121 by the shaft 120 is normally held stationary by a releasable brake bank 133 whereas the brake drum 118 connected to the sun gear 117 by the shaft 116 is normally free to turn. Thus when the machine is conditioned for the typing of a line, the sun gear 121 is held stationary and the planetary gears 129, 130, and 131 revolve with the carrier flange 126 and rotate about their own axes. The relative ratios of the planetary gears to their associated sun gears are such that under this condition the sun gear 115 and the chain drive gear 88 will be driven in the direction of the arrow 89 (Figure 3), that is counterclockwise as viewed from the front of the machine, thus tending to drive the carriage in the letter spacing direction.

In order to back space or return the carriage to line starting position, the brake band 133 is released from the drum 122 and a brake band 134 is applied to the drum 118 to hold it and the sun gear 117 against rotation. With the planetary gearing conditioned in this manner, the gears will be driven in the direction indicated by the arrows in Figure 16 and the chain drive gear 88 will be driven in the direction of the arrow 90 (Figure 3) so as to drive the propeller 97 of the fluid coupling G in the reverse direction and transmit drive to the carriage rack 108 for returning it to line starting position or for back spacing it under the control of the separate escapement mechanism J to be described later.

The mechanism for operating the brake bands 133 and 134 is shown in Figures 2, 15, 16, 18, 19, 21, and 22. The ends of the brake band 133 are connected respectively to pins 135 and 136 carried by levers 137 and 138 both pivoted as at 139 on a bracket 140. A spring 141 connected between arms 142 and 143 respectively on the levers 137 and 138 urges the levers to rock in opposite directions for yieldably holding the brake band 133 in contact with the drum 122 so as normally to condition the gearing I to transmit letter spacing drive to the carriage. Mechanism for releasing the brake band 133 from the drum 122 includes a double acting cam plate 144 secured to a rock shaft 145 journaled on the bracket 140 and being disposed between the levers 137 and 138. A rock lever 146 fixed to the shaft 145 is equipped with a shouldered screw 147 which is received in a slot 148 in a vertically movable member 149. The member 149 is connected to the carriage return lever 80 by means of a link 150.

In operation, when the carriage return lever

80 is depressed the link 150 and member 149 are raised, the bottom wall of the slot 148 thereby being pressed upwardly against the screw 147 to rock the lever 146 counterclockwise as viewed in Figure 19. This will rock the cam plate 144 to the position shown in Figure 22 so as to rock the levers 137 and 138 against the urge of the spring 141, thereby moving the brake band 133 out of engagement with the drum 122.

Depressing of the carriage return lever 80 also serves to apply the brake band 134 to the brake drum 118. The ends of the brake band 134 are connected by springs 151 to an arm 152 fixed to a shaft 153 pivoted on the bracket 140. The shaft 153 also carries a short arm 154 equipped with a roller 155 which normally is engaged by a shoe 156 at the top of the vertically movable member 149.

In operation, when the carriage return lever 80 is depressed and the vertically reciprocable member 149 is raised to release the brake band 133 in the manner previously described, the shoe 156 will push upwardly on the roller 155 so as to rock the arm 152 clockwise from the position shown in Figure 19 to the position shown in Figure 18, thereby tensioning the springs 151 and applying the brake band 134 to the drum 118. As previously stated, the releasing of the band 133 from the drum 122 and the application of the band 134 to the drum 118 causes the chain gear 88 to revolve in the direction indicated by the arrow 90 (Figure 3) for driving the carriage in the return direction. When the lever 80 is released, it will be returned to its inactive position by a spring 80a.

The brake operating mechanism includes other parts for operating the brake bands 133 and 134 during step-by-step back spacing of the carriage. The arrangement and operation of these other parts will be described hereinafter.

Typing mechanism

The mechanism for operating and for controlling the operation of the type bars 55 is similar in some respects to mechanism disclosed in the copending application of John J. Kittel, Serial No. 493,449, filed July 3, 1943. In accordance with the present invention the depressing of a key lever 61 is not made effective for applying manually exerted force for moving the type bar 55 on its printing stroke, but is utilized for releasing the restraint on a spring 79 connected between the intermediate lever 58 and an adjusting plate 157 pivoted as at 158 on the frame A. When released, the spring 79 contracts and rocks the lever 58 counterclockwise, thereby swinging the type bar 55 to printing position.

Depending from a curved slot 159 in the lever 58 is a link 160 pivoted at its lower end to a cam follower lever 161 in turn pivoted as at 162 on the frame A. The lever 161 is equipped with an anti-friction roller 163 which normally is held against upward movement by the restraining face 164 of a releasable bar lock keeper 165 pivoted as at 166. The roller 163 also is releasably restrained against upward movement by the crest of one of the eight lobes 167 on a combined type-bar-piloting and resetting member comprising cam 168 secured to a shaft 169 journaled on the typewriter frame A by suitable bearings on supporting plates 170 and 171. A detent roller 172 mounted on a lever 173 pivoted as at 174 on the supporting plate 170 is urged by a spring 175 anchored on a stud 176 into contact with a detent wheel 177 secured to the cam shaft 169 by a set screw 177a for yieldably maintaining the cam 168 with the crest of a lobe 167 directly above the roller 163. Thus, both the bar lock keeper 165 and the cam 168 normally prevent rising of the roller 163 and therefore normally restrain the lever 58 from being rocked by the spring 79. In order to discontinue the restraint of both the keeper 165 and the piloting and resetting member 168 and permit the spring 79 to contract and drive the type bar to printing position it is necessary to displace the restraining face 164 of the keeper 165 from above the roller 163 and also to rotate the cam 168 so as to allow the roller to move into the depression between two cam lobes 167.

The bar lock keeper 165 is adapted to be rocked upon depression of the associated key 61 for displacing the restraining face 164 from above the roller 163. For this purpose an arm 178 on the keeper 165 is connected by a link 178a to the key operated lever 66. Thus, upon depression of the key 61, the link 65 will rock the lever 66 clockwise to pull on the link 178a and rock the keeper 165 counterclockwise thereby moving the keeper face 164 away from the roller 163.

Thereafter, to enable the spring 79 to actuate the lever 58, link 57 and type bar 55, the cam 168 is rotated one-eighth of a revolution. While the depression between the lobe 167 last positioned above the roller 163 and the next adjacent lobe is presented above the roller the lever 161 is free to rock clockwise. Hence the spring 79 contracts and rocks the intermediate lever 58 counterclockwise unrestrained by the link 160 and lever 161, and the link 57 is pulled forwardly to swing the type bar 55 to printing position, as shown in Figure 9.

The force of the type bar printing impact may be varied by turning an adjusting screw 179 carried by the adjusting plate 157 and having its end engaging a fixed part of the frame A. If the screw 179 is turned to rock the adjusting plate 157 clockwise as viewed in Figures 1 and 9, the springs 79 associated with the respective type bars will be subjected to additional tension so as to be capable of swinging the type bars 55 into printing position with more force. Adjustment of the tension of the springs 79 is accompanied by a variation in the force required to depress the key levers 61, thus requiring a heavier "touch" to effect operation of a type bar. This is because additional tensioning of the springs 79 causes the rollers 163 to be held against the keepers 165 with greater force, thereby requiring additional manually applied effort for moving the keepers 165 from engagement with the rollers 163.

For operating the escapement mechanism D in response to the depression of a key lever 61, a supplemental universal bar 180 is pivoted at 166 and is engaged by projections 181 formed respectively on the bar keepers 165. An arm 182 on the supplemental universal bar 180 is connected to the escapement frame 13 by a pull rod 183 having its rear end hooked at 184 to embrace the rod 18 on the universal frame 13. Thus, when a key lever 61 is depressed, the associated keeper 165 is swung counterclockwise from the position shown in Figure 1 to the position shown in Figure 9, thereby rocking the supplemental universal bar 180 counterclockwise and swinging the universal frame 13 clockwise to actuate the escapement mechanism. When the key lever is released, the springs 17 and 64 will contract to

restore the parts to the positions shown in Figure 1.

The cam shaft 169 is rotated step-by-step in response to carriage letter spacing travel and moves through one-eighth of a revolution in response to each letter spacing increment of carriage travel. Connections between the carriage driving mechanism and the cam shaft 169 include a gear 184 secured to the front end of a shaft 185 and meshing with the carriage driving gear 106. A gear 186 secured to the rear end of the shaft 185 meshes with a gear 187 rotatable on a shaft 188 and meshing with a gear 189 fast on a shaft 190 journaled as at 191 and 192 (Figures 2, 4, and 16). A sleeve 193 freely rotatable on the shaft 190 is fast with a ratchet wheel 194 engageable by a pawl 195 carried on an arm 196 fast with the shaft 190. A spring 197 urges the pawl 195 into operative engagement with the ratchet wheel 194. A spiral gear 198 fast with the sleeve 193 meshes with a spiral gear 199 secured to the cam shaft 169. When the carriage moves in the letter spacing direction, the gears 106, 184, 186, 187, and 189 rotate the ratchet shaft 190 in the direction of the arrow 200 (Figure 5) and move the one way drive device 194—195 and sleeve 193 through one-eighth of a complete revolution for each single letter spacing movement of the carriage. Drive is transmitted from the sleeve 193 through the spiral gears 198 and 199 to rotate the cam shaft 169 also through one-eighth of a revolution for each letter spacing increment of the carriage movement.

In operation, and with the parts positioned as shown in Figure 1, each type bar actuating spring 79 is restrained by engagement of the associated roller 163 with a lobe 167 and with the associated keeper restraining face 164. When a key lever 61 is depressed, the associated keeper 165 is swung to the position shown in Figure 9, thereby rocking the supplemental universal bar 180 and operating the escapement mechanism D in the manner previously described. When the carriage moves in response to operation of the escapement mechanism the cam shaft 169 is rotated as explained above. As the cam lobe 167 which was in contact with the roller 163 prior to operation of the key lever 61 moves from above the roller 163, a cam depression will be presented above the roller 163 and the roller will be enabled to rise so as to permit the spring 79 to move the type bar 55 to printing position, the retreating cam lobe piloting the type bar to typing position. The type bar will reach printing position when the cam shaft has moved through one-sixteenth of a revolution, the parts then being positioned as shown in Figure 9. During the next one-sixteenth of a revolution of the cam shaft 169, the next or following cam lobe 167 will engage the roller 163 so as to move the arm 161 downwardly, thereby restoring the type bar 55 to its position of rest, reloading the spring 79, and enabling the restraining face 164 of the keeper 165 to move over the roller 163. The parts then will have been returned to the positions shown in Figure 1 and the escapement mechanism D will have arrested the carriage and the cam shaft 169.

As shown in Figure 9, the shape and size of the cam 168, the mounting of the type member 55, and the connections between the roller 163 and the type member 55 are so interrelated that the roller 163 is out of contact with the cam 168 when the type member 55 reaches typing position. Thus the cam 168 is effective for restraining or piloting the type member during part of the typing stroke but not during the last part of the stroke. Consequently the adjusment of the spring 79 can be effective for varying the force of the type impact.

In the event it is necessary for a service man to perform a type bar aligning operation, requiring the manual raising and holding of individual type bars in or near printing position, the cam shaft 169 is set to position depressions between cam lobes 167 of each cam 168 directly above the rollers 163 associated with the respective type bars 55. For setting the cam shaft 169 in this position, the set screw 177a is loosened and the detent wheel 177 is slid to the left, as viewed in Figure 4, and is turned together with the cam shaft 169 until a pin 177b on the detent wheel enters a hole 177c in the supporting plate 170. The settable means 177b—177c will position the cams 168 with cam depressions immediately below the rollers 163 as shown in Figure 9, that is with the cams displaced angularly one-sixteenth of a revolution from the normal position shown in Figure 1. Any type bar 55 may then be manipulated by hand after releasing the associated bar lock keeper 165 by depressing the key lever 61.

Back spacing mechanism

Back spacing of the carriage through increments corresponding to letter spaces is effected in response to depressing of the back spacing lever 81 which reverses the drive through the planetary gearing I and operates the separate back spacing escapement unit J for causing the back spacing movement to take place step-by-step, one step for each depressing of the lever 81. The lever 81 is secured as at 201 to a shaft 202 rockable in a bracket bearing 203 and a pilot bearing 204 in the key lever fulcrum shaft 62 (Figures 15 and 19). An arm 205 f a two-armed lever 206 secured to the shaft 202 has pin and slot connection at 207 to a lever 208 pivoted as at 209 to the bracket 140. A link 210 is pivoted at its lower end to the lever 208 and at its upper end is pivoted to a frame 211 rockable on the cam shaft 145 and comprising plates 211a and 211b connected by a stake 211c. A shouldered screw 212 mounted on the plate 211a extends through a slot 213 in a link 214 pivoted as at 215 to an arm 216 fast on the shaft 153. A pin 146a secured to the lever 146 extends under the rock frame plate 211b, so that when the frame 211 is rocked counterclockwise the lever 146 also will be rocked.

In operation, depressing of the back spacing lever 81 rocks the shaft 202 clockwise as viewed in Figure 16 so as to rock the levers 206 and 208 and pull down on the link 210, thereby rocking the frame 211 counterclockwise as viewed in Figure 19. This pulls on the link 214 to rock the shaft 153 and the arm 152 from the position shown in Figure 19 to the position shown in Figure 18, thereby applying the brake band 134 to the brake drum 118. The rocking of the frame 211 also rocks the lever 146, the shaft 145, and the cam 144 to the positions shown in Figure 18 so as to release the brake band 133 from the brake drum 122. As previously explained, releasing of the brake band 133 and applying of the brake band 134 conditions the planetary transmission I to drive the carriage in the reverse or back spacing direction at which time the shaft 190 will be rotated in the direction of the arrows 217 in Figure 16.

The escapement mechanism J for causing the back spacing movement to be carried out in step-by-step increments includes two escapement

wheels 218 and 219 both fixed to a sleeve 220 which is slidable on and normally rotatable relatively to the shaft 190. A disc member 221 fixed to the shaft 190 is equipped with a pin 222 projecting toward but normally being out of engagement with the adjacent escapement wheel 218, as shown in Figures 2 and 4. A spring 223 interposed between the root of a counter bore in the hub of the disc 221 and the sleeve 220 urges the wheels 218 and 219 away from the disc 221 so as to maintain the mechanism J normally disabled; but is yieldable to permit the sleeve 220 to be moved to the position shown in Figures 15 and 16 wherein the pin 222 extends between two adjacent teeth 224 on the wheel 218. In this position the pin 222 couples the disc 221 and shaft 190 to the escapement wheels 218 and 219.

Mechanism is provided for moving the escapement wheels 218 and 219 to the position shown in Figures 15 and 16 in response to the depressing of the back spacing lever 81. A depending arm 225 of the two-armed lever 206 is equipped with a pin 226 which bears against an arm 227 pivoted as at 228. The free end of the arm 227 is provided with a pin 229 disposed in a groove 230 in the sleeve 220. When the back spacing lever 81 is depressed, the arm 227 will be rocked counterclockwise from the position shown in Figure 2 to the position shown in Figure 16 so as to shift the escapement wheels 218 and 219 to the left and couple them to the pin 222, disc 221, and shaft 190.

As shown in Figure 19 the teeth 224 on the wheel 218 are staggered with respect to the teeth 231 on the escapement wheel 219. The staggered teeth are cooperable with a fixed pin stop 232 and a limbered dog 233 in a manner to permit step rotational movement of the escapement wheels 218 and 219 each time the escapement wheels move axially from the normal positions shown in Figures 2 and 4 to the operating positions shown in Figures 15 and 16 and then back to the normal positions.

In operation, depressing of the back spacing lever 81 first couples the escapement wheel 218 to the disc 221 and shaft 190 and reverses the drive through the gearing I so as to urge the carriage to travel in the reverse direction. However, the escapement wheels are held stationary, the shaft 190 cannot rotate, and the carriage is held stationary until the escapement wheels 218 and 219 have been moved completely to the positions shown in Figures 15 and 16 and then returned to the positions shown in Figures 2 and 4. During this to-and-from movement of the escapement wheels 218 and 219 the teeth 224 and 231 will cooperate with the fixed stop 232 and limbered dog 233 to permit enough rotation of the shaft 190 to enable the carriage to be back spaced through a distance corresponding to one letter spacing increment. It will be apparent that the carriage may be back spaced through a distance corresponding to a plurality of letter space increments by depressing the back space lever 81 repeatedly, each depressing operation bringing about the same sequence of operations of the reversing gear mechanism I and the escapement mechanism J.

Line spacing mechanism

Rotation of the platen C for line spacing is effected by operation of a normally restrained spring which is adapted to be rendered active by depressing the carriage return lever 80. A flexible pull band 234 has one of its ends wound partially around and connected at 235 to a drum 236 fast with the line spacing crank arm 76. The band extends rearwardly from the drum 236 and is trained around a pulley 237 journaled on a bracket 238 and thence to and around a pulley 239 mounted on a bracket 240 carried by the usual tabulating finger cover 241. The other end portion of the band 234 is wound upon and secured to an actuating drum 242. The drum 242 is journaled as at 244 on one arm 245 of a three-armed lever element 246 pivoted on the shaft 188. A spring 247 housed within the drum 242 constantly urges the drum to rotate in a direction to take up slack in the band 234 but is not strong enough to actuate the line spacing mechanism against the urge of its returning spring 76a (Figure 23).

The three-armed lever 246 is urged counterclockwise as viewed in Figures 3 and 21 by a power device comprising a strong motor spring 248 connected between an arm 249 of the lever 246 and a post 250 on the bracket 95. Normally the three-armed lever 246 is in the position shown in Figure 3 which shows it displaced clockwise from the position shown in Figure 21. For releasably restraining the lever 246 in this position an arm 251 on the lever is equipped with a cam follower roller 252 adapted to be held up by a retainer 253 fast with a bail 254 pivoted as at 255 on a bracket 256 and as at 257 on a bracket 258 (see Figure 15). A spring 259 (see Figure 19) interposed between a stud 260 on the bail and a stud 261 on the frame yieldably holds the bail with the retainer 253 under the roller 252, thereby preventing the spring 248 from rocking the three-armed lever 246 to the position shown in Figure 21.

An arm 262 pivoted on the shaft 188 is provided at its upper end with a brake shoe 263 normally disengaged from but being adapted to engage a brake drum 264 integral with the take-up drum 242. A spring 265, which is relatively weak as compared to the spring 248, has one end anchored in a selected one of three holes 266 in the arm 262 and has its other end connected to the post 250. The spring 265 urges the arm 262 clockwise as viewed in Figures 3 and 21, the movement of the arm 262 by the spring 265 being limited by engagement of a stop projection 267 on the arm with the bracket 258.

In operation, the three-armed lever 246 and brake arm 262 normally will be in the positions shown in Figure 3, the brake shoe member 263 being out of engagement with the brake drum 264. The drum 242 can rotate freely to pay out or take up the band 234 while the carriage travels, and the operating connections between the platen member C and the spring motor movable element 246 are therefore disabled.

Mechanism is provided for withdrawing the retainer 253 in response to depressing of the carriage return lever 80 so as to remove the restraint on the spring 248 and enable it to rock the three-armed lever 246 to the position shown in Figure 21. During the first part of such rocking movement, the brake drum 264 engages the brake shoe 263 so that the drum 242 is locked against rotation. The lever 246 is then rocked further by the spring 248 as is permitted by yielding of the spring 265 and corresponding rocking of the brake arm 262. The drum 242 is thus held against rotation while being moved bodily, and the band 234 is pulled so as to rotate the drum 236 and actuate the line spacing crank arm 76.

The mechanism for displacing the retainer 253 from under the roller 252 includes a latch dog 268 pivoted as at 269 on the vertically movable

member 149. The pivot 269 also serves to connect the lower end of the member 149 to an arm 269a which is free to rotate on the shaft 190, thus guiding the member 149 and preventing it from being displaced laterally. The latch dog 268 is provided with a hook element 270 detachably engaged with a pin element 271 on an arm 272 integral with the bail 254. The dog 268 is formed with a cam face 273 adapted to engage a pin 274 adjustably mounted on the bracket 256. The arrangement is such that when the member 149 and dog 268 are raised the cam face 273 will be displaced by the pin 274 to rock the dog 268 and disengage the hook element 270 from the pin element 271.

In operation, when the carriage return key 80 is depressed and the member 149 is raised in the manner previously described, the first part of the upward movement of the dog 268 will lift the pin 271 to rock the bail 254 and displace the retainer 253 from underneath the roller 252. This will enable the spring 248 to rock the three-armed lever 246, engage the brake drum 264 with the brake shoe 263, and pull on the band 234 to rock the line spacing crank arm 76. In response to further depression of the key 80, the dog 268 continues to rise, causing it to be unhooked from the pin 271 by the action of the pin 274 on the dog cam face 273. At this time the bail spring 259 is urging the bail to move and return the retainer 253 to its normal position but the retainer is disposed alongside the roller 252 as shown in Figure 21, and rocking of the bail back to normal position is blocked.

Mechanism driven by the motor F and operable in response to carriage return travel is provided for resetting the three-armed lever 246 in its normal position to enable the line spacing returning spring 76a to return the crank arm 76 and to enable the bail spring 259 to move the retainer 253 back under the roller 252. A resetting cam 275 fast with the shaft 190 is positioned under the roller 252. When the carriage return key 80 is depressed it not only rocks the bail 254 but also starts reverse rotation of the shaft 190 for driving the carriage in the return direction. At this time the cam 275 will revolve in the direction indicated by the arrows 276 in Figures 21 and 22. When the roller 252 was released by displacement of the retainer 253, the roller descended into a depression on the resetting cam 275. When the next cam rise passes under the roller 252 the roller will be picked up and moved substantially to the position shown in Figure 22. The roller will then have been positioned at a level high enough to enable the bail spring 259 to move the retainer 253 in under the roller by imparting to the roller a slight further upward movement. This will move the roller clear of the resetting cam 275 so that during continued rotation of the cam throughout the carriage returning operation the cam will not engage the roller 252.

When the carriage return movement has been completed the key 80 will be released and the member 149 will descend, permitting the dog cam face 273 to pass below the pin 274. A spring 277 interposed between a pin 278 on the member 149 and a short arm 279 on the dog 268 will then return the hook 270 into detachable engagement with the bail pin 271.

Figure 21 shows the positions of the parts just after the spring 248 has rocked the three-armed lever 246 to pull the band 234 and actuate the line spacing crank arm 76. Figure 22 shows the positions of the parts just after the resetting cam 275 and retainer 253 have acted in succession to return the roller 252 and arm 246 to their normal positions, thereby enabling the returning spring 76a to restore the line spacing crank arm 76 to its normal position.

It should be noted that travel of the carriage in the return direction effected by depressing the back spacing lever 81 will not cause operation of the line spacing mechanism. This is because operation of the back spacing lever 81 rocks the brake cam shaft 145 and the lever 146 through connections independent of the vertically movable member 149. The screw 147 on the lever 146 merely moves idly in the slot 148 of the member 149 so that the latter is not raised and the line spacing mechanism is not affected. Operation of the carriage return lever 80 will rock the lever 146 as previously explained but this will not affect the back spacing escapement mechanism J because the pin 146a on the lever 146 can move idly away from the rock frame plate 211b.

It will be seen that the connections between the power spring 248 and the line spacing pull band 234 include a manually disengaged friction coupling constituted by the brake drum 264 and brake shoe 263. Therefore, when the carriage travels and the coupling 263—264 is disengaged, there will be no strain on the parts other than the small loading imposed by the spring 247 which merely keeps the band 234 taut or free from slack. When the coupling 263—264 is engaged by pressing of the shoe 263 on the drum 264, the spring motor 248—246 will be operatively connected to the line spacing band 234.

Case shifting mechanism

The case shifting segment member E is biased to a lower position by its own weight but normally is held in its upper position for the typing of small letters by the releasable means K including two links 280 pivoted to the segment as at 281 and pivoted as at 282 to a shift frame generally designated 283. The shift frame 283 comprises arms 284 and 285 connected by a tie rod 286 and respectively being fitted with pintles 287 and 288 journaled in frame bearings 289 and 290. The shift frame arm 284 is formed with a vertical extension 291 equipped with a cam follower roller 292 normally engaged by the cam end 293 of a secondary release latch or interponent 294 pivoted on the tie rod 166 and on a shouldered screw 295 (see Figures 13 and 14) extending through the mounting plate 171 and into the tie rod 166.

The interponent latch 294 comprises spaced arms 296 and 297 connected by a cross bar 298, and an extension 299 on the arm 297. A spring 300 interposed between the extension 299 and a post 301 on the mounting plate 171 urges the latch 294 to rock clockwise from the normal position shown in Figure 7. However the latch 294 normally is held in its Figure 7 position by engagement of a roller 302 on the arm 296 with a retainer 303 on a segment release latch or retainer device 304 which is pivoted on a headless screw 305 threaded at 306 in the frame A. A link 307 is pivoted as at 308 to the shift key 82 and is pivoted at 309 to the segment release latch 304. As shown clearly in Figure 8, the release latch 304 comprises spaced arms 310 and 311 connected by a cross bar 312, the retainer 303 extending upwardly from the arm 310.

In operation, when the shift lever 82 is depressed and rocked counterclockwise as viewed in Figure 7, the link 307 will be retracted to rock the segment release latch 304 clockwise to the posi-

tion shown in Figure 12. With the retainer 303 in this displaced position, the roller 302 can move downwardly, thereby enabling the spring 300 to rock the secondary release latch 294 to the position shown in Figure 12. This will displace the cam end 293 from its holding position in contact with the roller 292 so as to permit the shift frame 283 to rock counterclockwise from its Figure 7 position to its Figure 12 position. The segment E will then descend by gravity, its weight being partially counter-balanced by a spring 313 connected between the shift frame vertical extension 291 and an adjustable anchor 314 pivoted as at 315 on a bracket 316. When the shift lever 82 is released it will be returned to its normal position by a spring 82^a.

The shifting of the segment E is cushioned by shock absorbers provided at each end of the segment and each comprising a pin 317 having threaded connection with the segment as at 318 and passing through a frame lug 319. Cushioning springs 320 are mounted on each pin 317 both above and below the associated lug 319, the positions of the springs being variable by adjusting nuts 321.

Means actuated by power supplied from the motor F through the fluid coupling G are provided for returning the segment to its upper position. A resetting cam 322 is keyed as at 323 to the cam shaft 169 so as to rotate therewith and to be slidable axially thereon. A spring 324 interposed between the mounting plate 171 and the resetting cam 322 yieldably urges the cam to a normal position shown in Figure 14 wherein the cam is displaced axially out of the plane of a cam follower roller 325 mounted on the arm 297 on the secondary release latch 294. During normal typing operation the cam 322 rotates with the cam shaft 169 but has no effect upon the roller 325.

For shifting the cam 322 into position for cooperation with the roller 325, a lever 326 pivoted as at 327 on a bracket 328 is equipped with a pin 329 extending into a groove 330 in the hub of the cam 322. The lever 326 is connected by a link 331 to the shift release lever 83.

In operation, when it is desired that the segment E be returned to its upper position, the shift reset lever 83 is rocked counterclockwise as viewed in Figure 12, causing it to pull on the link 331 and to rock the lever 326 clockwise as viewed in Figure 14. The pin 329 will then shift the cam 322 into the plane of the interponent roller 325 and when the cam shaft and cam 322 are rotated a lobe on the cam will raise the roller 325, thereby rocking the interponent 294 counterclockwise from its Figure 12 position to its Figure 7 position. The cam end 293 will force the roller 292 to the right as viewed in Figure 12 to rock the shift frame 283 back to its normal position as shown in Figure 7. The spring 82^a will then return the shift key 82 and the segment release latch 304 to their normal positions with the retainer 303 again disposed under the roller 302 on the secondary latch 294, the parts then all being set for the typing of small letters with the segment E supported in its upper position. The cam-urging spring 324 acts through the cam 322, lever 326, and link 331 to return the shift release lever 83 to its normal position.

Safety lock mechanism

Means are provided for preventing operative depressing of more than one key lever 61 at the same time, thereby making it impossible for two or more type bars to collide and/or jam. In the form shown, the usual Royal line lock plate 52 is modified by having formed integrally therewith an extension blade 332 which serves as an operating part adapted to be engaged by the heel 333 of an abutment 334 on any key lever 61 when it is depressed. The device comprising the parts 52 and 332 is generally of V shape with the leg 332 normally extending diagonally across the paths of the abutment heels 333. When the key lever is shifted from the position shown in full lines in Figure 1 to the position shown in full lines in Figures 9 and 10, the abutment heel 333 engages the operating part 332 and rocks the blocking part 52 rearwardly from its normal forwardly offset position to the position shown in full lines in Figures 9 and 10. The line lock plate 52 will then be disposed directly under the toes 335 of the aligned key lever abutments 334 so as to prevent operative downward movement of the other key levers. This operation of the safety lock does not disturb the line lock lever 40 because the link 51 interposed between the line lock plate 52 and the line lock lever 40 has its front end connected to the line lock plate 52 by a one way drive connection including a part 336 of the link 51 and a slot 337 in the line lock plate. Thus rearward movement of the link 51 in response to operation of the line lock lever 40 will move the line lock plate 52 to its locking position but rearward movement of the line locking plate caused by depression of a key lever 61 will not move the link 51.

The safety lock device prevents the operation of more than one key lever when the motor F is running and also prevents the depressing of more than one key lever when the motor is shut off. Thus damaging of the type bar mechanism is avoided.

Tabulating mechanism

As previously explained, tabulating movement of the carriage may be effected by operating the usual tabulating key, a portion of which is shown at 34 (see Figure 1), to lift the rack 12 out of mesh with the escapement pinion 11. When the carriage is no longer restrained by the escapement mechanism, the motor F will drive the carriage through the cushioning fluid coupling G and gearing I. When the carriage is arrested by engagement of the set stop 32 with the tabulating finger 33, the cushioning effect provided by the fluid coupling G will prevent harming the driving mechanism.

Ribbon spool drive

The usual ribbon spool driving shaft 338 is driven from the motor F through the fluid coupling G and gearing I. As shown in Figures 1, 3, 4, and 7 a pinion 339 meshes with the gear 106 and transmits drive in one direction only through an enclosed ratchet device 340 to a shaft 341 which is connected through a universal coupling 342 to the ribbon spool driving shaft 338.

Modification shown in Figure 23

Figure 23 shows somewhat diagrammatically a modified arrangement in which the prime mover or motor F drives the carriage B in the return direction through a fluid coupling G', the motor being operated only during carriage return or back spacing operations, and the carriage being driven in the letter spacing direction by a spring barrel motor 343. The spring motor 343 may be of conventional construction including a

barrel 344 powered by a spring 345. A draw band 346 wound around the barrel and connected thereto has its free end connected as at 346a to the carriage B. The known or conventional typewriter parts and some other parts which correspond to similarly functioning parts included in the embodiment shown in Figures 1 to 22 inclusive are designated in Figure 23 by the same reference characters as designate the corresponding parts included in the embodiment shown in Figures 1 to 22 inclusive. The construction shown in Figure 23 includes back spacing escapement mechanism J of the kind previously described and spring powered equipment M for operating the line spacing mechanism which also is of the type previously referred to. The ratchet shaft 190 is provided with a gear 189 driven by the gear 187 which in turn is driven by the gear 186. The gear 186 is secured to a shaft 347 equipped with a pinion 348 which meshes with a gear 349 secured to the barrel 344 of the spring motor 343.

In operation, and during the typing of a line, the motor F does not run and there is no force tending to move the carriage in the return direction. The carriage is urged in the letter spacing direction by the spring motor 343 and draw band 346, and letter spacing movement is controlled by the escapement mechanism D in the usual manner. When the carriage moves in the letter spacing direction the barrel gear 349 turns, thus driving the ratchet shaft 190 through the pinion 348, the shaft 347, and the gears 186, 187, and 189. Operation of the shaft 190 step-by-step in correspondence to the step-by-step letter space movements of the carriage drives the cam shaft 169 through the ratchet device 194—195 and the spiral gears 198 and 199.

The case shifting mechanism may be similar to that shown in Figures 1 to 22; and Figure 23 shows the resetting cam 322 of this mechanism carried by the shaft 169. The line spacing mechanism and spring powered equipment M for operating it is similar to the corresponding mechanism shown in Figures 1 to 22 with the exception that the pull band 234 is connected to a segment 350 instead of a drum such as the drum 236 shown in Figure 1.

The mechanism for moving the carriage in the return direction, either for placing the carriage in line starting position or for back spacing it step-by-step, may be similar in some respects to carriage driving mechanism disclosed in the patent to John J. Kittel No. 2,279,142 granted April 7, 1942. The mechanism shown includes the motor F equipped with a pinion 351 meshing with a gear 352 on the impeller section 353 of the kinetic type fluid coupling G' generally similar to the coupling G shown in Figure 7. The runner or driven element 354 of the coupling G' is fast with a shaft 355 which extends through a packing gland 356 and is journaled in a stationary bracket 357. Secured to the extended end of the shaft 355 is a barrel or drum 358. A pull band 359 has one end portion wound around and secured to the drum 358 and extends from the drum around a pulley 360 mounted on the bracket 240 and thence extends to the left for connection as at 361 to the bracket 238 secured to the carriage end plate 24.

As previously stated, the motor F does not run except during movement of the carriage B in the return direction. The starting and stopping of the motor is controlled by a switch 362 in circuit with the motor and including a contact making member 363. A carriage return key 364 pivoted as at 365 has an arm 366 pivoted as at 367 to a reciprocable link 368. The link 368 is pivoted as at 369 to a rock arm 370 fulcrumed as at 371. Carried by the link 368 is a cam 372 adapted upon rearward movement of the link 368 to move the switch member 363 to its contact making position.

When the carriage return key 364 is depressed, the link 368 is moved rearwardly causing the cam 372 to engage the switch member 363 and move it to the left, closing the motor circuit. The motor F will then drive the propeller 353 of the coupling G' which will transmit drive through the fluid medium to the driven or runner element 354, thus rotating the shaft 355 and drum 358. The band 359 will be wound on the drum 358 thereby moving the carriage to the right, the movement continuing as long as the carriage return key 364 is held depressed, or until the carriage reaches its end position determined by engagement of the margin stop 37 with the center stop 39.

In order that the speed of the carriage return movement be controlled, the link 368 may be extended rearwardly as indicated at 373 for connection to mechanism (not shown) for operating a brake band cooperable with a brake drum 374 fast on the shaft 355. Mechanism of this kind is disclosed in the aforementioned patent to Kittel No. 2,279,142.

For activating the spring powered equipment M for operating the line spacing mechanism when the carriage return key 364 is depressed, an arm 375 is made fast with the rock arm 370 so that when the latter is rocked upon depressing of the key 364 the arm 375 will rock the bail 254 to remove the retainer 253 from underneath the roller 252 (see Figures 23, 21, and 22).

A back spacing key 376 pivoted as at 377 is provided for starting the motor F and operating the separate back spacing escapement mechanism J. The key 376 is connected by a link 378 to a lever 379 pivoted as at 380 and equipped at one end with a pin or roller 381 extending into the groove 230 in the sleeve 220. The other end of the lever 379 is connected by a link 382 to a cam lever 383 pivoted as at 384. In operation, each time the back spacing key 376 is depressed and released, the motor F will operate to urge the carriage in the return direction in the manner previously described and the escapement mechanism J will operate to permit a limited movement of the carriage in the return direction equivalent to one letter spacing movement.

Modification shown in Figure 24

Figure 24 shows diagrammatically a modification of the form shown in Figures 1 to 22 and in which the motor F transmits drive to the coupling G^2 in opposite directions according to the setting of the reversing gearing I. A shaft 385 which transmits power from the coupling G^2 is thus adapted to be operated in two directions selectively. The shaft 385 is equipped with a gear 386 which meshes with the gear 189 on the ratchet shaft 190. As in the form shown in Figures 1 to 22 inclusive, the gear 189 meshes with the gear 187 which in turn meshes with the gear 186.

With this modified arrangement in which the gear 386 meshes with the gear 189, it is not necessary to use a separate drive such as the drive comprising the gears 88 and 99 and the chain 91 embodied in the construction shown in Figures 1 to 22 inclusive.

Summary

It is apparent that mechanism embodying the invention disclosed herein provides for the smooth performance with minimum manual effort of all of the usual typewriter functions or operations previously requiring the exertion of substantial manual effort in the operation of most standard or conventional typewriters. The mechanism for supplying the power and controlling its application may be installed conveniently in typewriters of basically standard and approved design, and is adapted to be interconnected with standard typewriter parts the design and arrangement of many of which need not be changed at all.

The fluid drive connection between the prime mover F and the type bar spring resetting mechanism, the travelling carriage, the line spacing motor resetting mechanism, the back spacing mechanism, and the case shifting mechanism provides for both rapid and smooth operation free from undesirable shocks and noise. The flexible, cushioning drive transmitting characteristics of the fluid coupling are especially advantageous in a construction in which the power for performing all of the typewriting functions is supplied by a single motor or prime mover. There always is available an adequate source of smooth, cushioned power for the performance of any one or the simultaneous performance of more than one operation.

The mechanism described with reference to the drawings embodies the invention in the form now preferred, but it is evident that changes may be made without departing from the invention as defined in the claims.

I claim:

1. In a typewriter or like machine, a movable type member; power means urging said member to typing position; a keeper normally restraining said power means to permit said type member to remain in normal position; a resetting member normally positioned to also restrain said power means; and key controlled mechanism for actuating said keeper and said resetting member to discontinue the restraint of both on said power means.

2. In a typewriter or like machine, a movable type member; power means urging said member to typing position; a keeper normally restraining said power means to permit said type member to remain in normal position; a resetting cam normally positioned to also restrain said power means; and key controlled mechanism for first actuating said keeper and then actuating said cam to successively discontinue their restraints on said power means.

3. In a typewriter or like machine, a movable type member; power means urging said member to typing position; a keeper normally restraining said power means to permit said type member to remain in normal position; a combined type-member-piloting and type-member-resetting device; and key controlled mechanism for actuating said keeper to discontinue its restraint on said power means, and for actuating said device to pilot said member to typing position and to then reset said member in normal position.

4. In a typewriter or like machine, a movable type member; power means urging said member to typing position; a keeper normally restraining said power means to permit said type member to remain in normal position; a device for piloting said member during its typing stroke; and key controlled mechanism for actuating said keeper to discontinue its restraint on said power means and for actuating said piloting device to control the speed of movement of said member during at least a part of its typing stroke.

5. In a typewriter or like machine, a movable type member; power means urging said member to typing position; a keeper normally restraining said power means to permit said type member to remain in normal position; a device for piloting said member during only a part of and not during the last portion of its typing stroke; and key controlled mechanism for actuating said keeper to discontinue its restraint on said power means and for actuating said piloting device to control the speed of movement of said member during said part of its typing stroke.

6. In a typewriter or like machine, a movable type member; power means urging said member to typing position; a keeper normally restraining said power means to permit said type member to remain in normal position; a rotatable cam for piloting said member during its typing stroke; and key controlled mechanism for actuating said keeper to discontinue its restraint on said power means and for actuating said piloting rotatable cam to control the speed of movement of said member during at least a part of its typing stroke.

7. In a typewriter or like machine, a movable type member; power means urging said member to typing position; releasable means for normally restraining said power means to permit said type member to remain in normal position and for controlling the speed of travel of said member to typing position, said releasable means including a pilot device adapted to retard said member during at least a part of its printing stroke; and key controlled mechanism for operating said releasable means to release the restraint on said power means and for actuating said pilot device.

8. In a typewriter or like machine, a movable type member; power means urging said member to typing position; releasable means for normally restraining said power means to permit said type member to remain in normal position and for controlling the speed of travel of said member to typing position, said releasable means including a rotatable lobed cam, a cam follower; means connecting said follower to said member; and means normally positioning said cam substantially with the crest of a lobe in engagement with said follower; and key controlled mechanism for rotating said cam to enable said follower and said member to be moved by said power means with the follower in contact with the retreating lobe whereby the cam pilots said member to typing position.

9. In a typewriter or like machine, a movable type member; power means urging said member to typing position; releasable means for normally restraining said power means to permit said type member to remain in normal position, for controlling the speed of travel of said member to typing position, and for resetting said member in normal position, and again imposing the restraint on said power means, said releasable means including a rotatable lobed cam, a cam followers; means connecting said follower to said type member, and means normally positioning said cam substantially with the crest of a lobe in engagement with said follower; and key controlled mechanism for rotating said cam to enable said follower and said member to be moved by said power means with the follower in contact with the retreating cam lobe whereby the cam pilots said member to typing position, and for then rotating the cam further to move a lobe thereof into resetting engagement with said fol-

lower for returning said follower and said member to their normal positions.

10. In a typewriter or like machine, a movable type member; power means urging said member to typing position; releasable means for normally restraining said power means to permit said type member to remain in normal position, for controlling the speed of travel of said member to typing position, and for resetting said member in normal position, and again imposing the restraint on said power means, said releasable means including a rotatable multilobed cam, a cam follower; means connecting said follower to said type member, and means normally positioning said cam substantially with the crest of a lobe in engagement with said follower; and key controlled mechanism for rotating said cam to enable said follower and asid member to be moved by said power means with the follower in contact with the retreating cam lobe whereby the cam pilots said member to typing position, and for then rotating the cam further to move an adjacent lobe thereof into resetting engagement with said follower for returning said follower and said member to their normal positions, the shape and size of the cam, the mounting of the type member, and the connections between said cam follower and said type member being so interrelated that when the type member arrives at typing position the cam follower is positioned between two adjacent cam lobes and out of contact with the cam.

11. In a typewriter or like machine, a frame; a carriage mounted to travel thereon; means for driving said carriage; a platen on said carriage; escapement mechanism cooperable with said carriage driving means for effecting step-by-step letter spacing movements of said carriage; a type member movably mounted on said frame; power means urging said member to typing position; a keeper normally restraining said power means to permit said type member to remain in normal position; means including a key device for moving said keeper to discontinue its restraint on said power means; and means connecting said keeper to said escapement mechanism for operating the latter in response to actuation of said key device.

12. In a typewriter or like machine, a frame; a carriage mounted to travel thereon; means for driving said carriage; a platen on said carriage; escapement mechanism cooperable with said carriage driving means for effecting step-by-step letter spacing movements of said carriage; a plurality of type members movably mounted on said frame; power means urging said type members respectively to typing positions; a plurality of keepers associated respectively with the type members and normally restraining said power means; a plurality of key devices respectively connected to said keepers and adapted individually upon actuation to disable the respectively associated keepers; a universal member movable by any actuated keeper when said keeper is disabled by actuation of its associated key device; and means operatively connecting said universal member to said escapement mechanism.

13. In a typewriter or like machine, a frame; a carriage mounted to travel thereon; means for driving said carriage; a platen on said carriage; escapement mechanism cooperable with said carriage driving means for effecting step-by-step letter spacing movements of said carriage; a plurality of type members movably mounted on said frame; power means urging said type members respectively to typing positions; a plurality of keepers associated respectively with the type members and normally restraining said power means; a plurality of key devices respectively connected to said keepers and adapted individually upon actuation to disable the respectively associated keepers; a universal member movable by any actuated keeper when said keeper is disabled by actuation of its associated key device; means operatively connecting said universal member to said escapement mechanism; a space bar, and connections between said space bar and said escapement mechanism for operating the latter without disabling any of said keepers.

14. In a typewriter or like machine, a frame; a carriage mounted to travel thereon; means for driving said carriage; a platen on said carriage; escapement mechanism cooperable with said carriage driving means for effecting step-by-step letter spacing movements of said carriage; a plurality of type members movably mounted on said frame; power means urging said type members respectively to typing positions; a plurality of keepers associated respectively with the type members and normally restraining said power means; a plurality of key devices respectively connected to said keepers and adapted individually upon actuation to disable the respectively associated keepers; a universal member movable by any actuated keeper when said keeper is disabled by actuation of its associated key device; means operatively connecting said universal member to said escapement mechanism; resetting means for returning any type member from typing to normal position; and means for actuating said resetting means in response to actuation of said escapement mechanism.

15. In a typewriter or like machine, a frame; a carriage mounted to travel thereon; means for driving said carriage; a platen on said carriage; escapement mechanism cooperable with said carriage driving means for effecting step-by-step letter spacing movements of said carriage; a plurality of type members movably mounted on said frame; power means urging said type members respectively to typing positions; a plurality of keepers associated respectively with the type members and normally restraining said power means; a plurality of key devices respectively connected to said keepers and adapted individually upon actuation to disable the respectively associated keepers; a universal member movable by any actuated keeper when said keeper is disabled by actuation of its associated key device; means operatively connecting said universal member to said escapement mechanism; resetting means normally also restraining said power means to maintain said type members in inactive positions; and means responsive to operation of said escapement mechanism for operating said resetting means to first release its restraint on said power means and to then reset an actuated type member in normal inactive position.

16. In a typewriter or like machine, a frame; a carriage mounted to travel thereon; means for driving said carriage; a platen on said carriage; escapement mechanism cooperable with said carriage driving means for effecting step-by-step letter spacing movements of said carriages; a plurality of type members movably mounted on said frame; power means urging said type members respectively to typing positions; a plurality of cam follower levers mounted to rock about a common axis and being respectively connected to said type members; mutually aligned cam fol-

lowers on said levers respectively; a plurality of keepers mounted to rock about a common axis and respectively being engageable with said cam followers for restraining said power means and normally maintaining said type members in inactive positions; key devices connected respectively to said keepers and operable for moving the keepers out of engagement with the cam followers; a cam shaft extending parallel to the line of said cam followers; lobes on said shaft adapted respectively upon rotation of said shaft to engage the follower associated with any actuated type member to reset it in normal position; and means responsive to operation of said escapement mechanism for rotating said shaft.

17. In a typewriter or like machine, a frame; a carriage mounted to travel thereon; carriage driving means including a motor and fluid cushion coupled driving connections between said motor and said carriage; a platen on said carriage; escapement mechanism cooperable with said carriage driving means for effecting step-by-step letter spacing movements of said carriage; a type member movably mounted on said frame; power means urging said member to typing position; a keeper normally restraining said power means to permit said type member to remain in normal position; means including a key device for moving said keeper to discontinue its restraint on said power means; and means connecting said keeper to said escapement mechanism for operating the latter in response to actuation of said key device.

18. In a typewriter or like machine, a frame; a carriage mounted to travel thereon; carriage driving means including a motor and fluid cushion coupled driving connections between said motor and said carriage; a platen on said carriage; escapement mechanism cooperable with said carriage driving means for effecting step-by-step letter spacing movements of said carriage; a type member movably mounted on said frame; power means urging said member to typing position; a keeper normally restraining said power means to permit said type member to remain in normal position; means including a key device for moving said keeper to discontinue its restraint on said power means; means connecting said keeper to said escapement mechanism for operating the latter in response to actuation of said key device; resetting means for returning said type member to normal position; and means operable by said motor through said fluid cushion coupled driving connections under control of said escapement mechanism for actuating said resetting means.

19. In a typewriter or like machine, a movable type member; a loaded spring urging said member to typing position; a keeper normally restraining said loaded spring to permit said type member to remain in normal position; a resetting member normally positioned to also restrain said loaded spring; and key controlled mechanism for actuating said keeper and said resetting member to discontinue the restraint of both on said loaded spring.

20. In a typewriter or like machine, a frame; a carriage mounted thereon for letter spacing and return travel; escapement mechanism for controlling letter spacing carriage travel; type members; power means urging said type members to typing positions; releasable means for restraining said power means and for moving any type member from typing position back to normal position including a rotatable resetting cam shaft; key devices each operable for actuating said releasable means to discontinue the restraint on said power means with respect to one of said type members and for operating said escapement mechanism; and connections between said carriage and said cam shaft including a one-way drive device for rotating said cam shaft only during carriage letter spacing travel.

21. In a typewriter or like machine, a frame; a carriage mounted thereon for letter spacing and return travel; escapement mechanism for controlling letter spacing carriage travel; type members; power means urging said type members to typing positions; releasable means for restraining said power means and for moving any type member from typing position back to normal position including a rotatable resetting cam shaft; key devices each operable for actuating said releasable means to discontinue the restraint on said power means with respect to one of said type members and for operating said escapement mechanism; another shaft; connections between said other shaft and said carriage for driving said other shaft in opposite directions respectively during carriage letter-spacing and return travel; and a one-way drive connection between said other shaft and said cam shaft for operating the cam shaft only in response to carriage letter-spacing travel.

22. In a type writer or like machine, a frame; a carriage mounted thereon for letter spacing and return travel; escapement mechanism for controlling letter spacing carriage travel; a motor; driving connections between said motor and said carriage including fluid cushioned coupling means and reversing gearing for driving the carriage selectively in letter-spacing and return directions; type members; power means urging said type members to typing positions; releasable means for restraining said power means and for moving any type member from typing position back to normal position including a rotatable resetting cam shaft; key devices each operable for actuating said releasable means to discontinue the restraint on said power means with respect to one of said type members and for operating said escapement mechanism; and connections between said carriage and said cam shaft including a one-way drive device for rotating said cam shaft only during carriage letter spacing travel.

23. In a typewriter or like machine, a movable type member; power means urging said member to typing position; means including a cam and follower for normally restraining said type member to hold it in inactive position against the urge of said power means; key controlled mechanism for effecting step movement of said cam for first discontinuing the restraint of said means on said type member to enable said power means to move said type member to typing position and for then returning said type member to inactive position and again imposing restraint on said member; and settable means for locking said cam in an intermediate position in which the cam and follower impose no restraint on said type member.

24. In a typewriter or like machine, a movable type member; power means urging said member to typing position; means for normally restraining said type member to hold it in inactive position against the urge of said power means and including an element movable in steps to first enable said power means to move said type member to typing position and for then returning said type member to inactive position and again im-

posing the restraint upon said typing member; key controlled mechanism for operating said element in steps; and means for releasably holding said element in a position in which it does not restrain said type member to thereby enable the type member to be moved manually back and forth between its inactive position and typing position.

25. In a typewriter or like machine, a movable type member; power means urging said member to typing position; means for normally restraining said type member to hold it in inactive position against the urge of said power means and including an element movable in steps to first enable said power means to move said type member to typing position and for then returning said type member to inactive position and again imposing the restraint upon said typing member; key controlled mechanism for operating said element in steps; detent means for yieldably holding said element in positions in which it restrains said type member; and means for releasably holding said element in a position in which it does not restrain said type member to thereby enable the type member to be moved manually back and forth between its inactive position and typing position.

26. In a typewriter or like machine, a movable type member; power means urging said member to typing position; a follower connected to said type member; a rotatable multilobed cam cooperable with said follower; key controlled means for normally maintaining said cam positioned with a lobe thereof so engaging said follower as to restrain said type member from moving to typing position but being operable for effecting a step rotary movement of tne cam to remove said lobe from engagement with said follower to permit the type member to be moved to typing position and to then bring an adjacent lobe into engagement with said follower for returning said type member to inactive position and again restraining it; and means for locking said cam in a position in which said follower is disposed between two adjacent cam lobes.

27. In a typewriter or like machine, a movable type member; power means urging said member to typing position; a follower connected to said type member; a rotatable multilobed cam cooperable with said follower; key controlled means for normally maintaining said cam positioned with a lobe thereof so engaging said follower as to restrain said type member from moving to typing position but being operable for effecting a step rotary movement of the cam to remove said lobe from engagement with said follower to permit the type member to be moved to typing position and to then bring an adjacent lobe into engagement with said follower for returning said type member to inactive position and again restraining it; a fixed part with respect to which the cam is rotatable; a hole in said part offset radially from the axis of said cam; a locating member rotatable in unison with but being movable axially with respect to said cam; and a pin on said locating member adapted to enter said hole and being so positioned with respect to the cam lobes that said follower will be disposed substantially midway between two adjacent lobes when said locating member and same cam are turned to enable said pin to enter said hole.

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