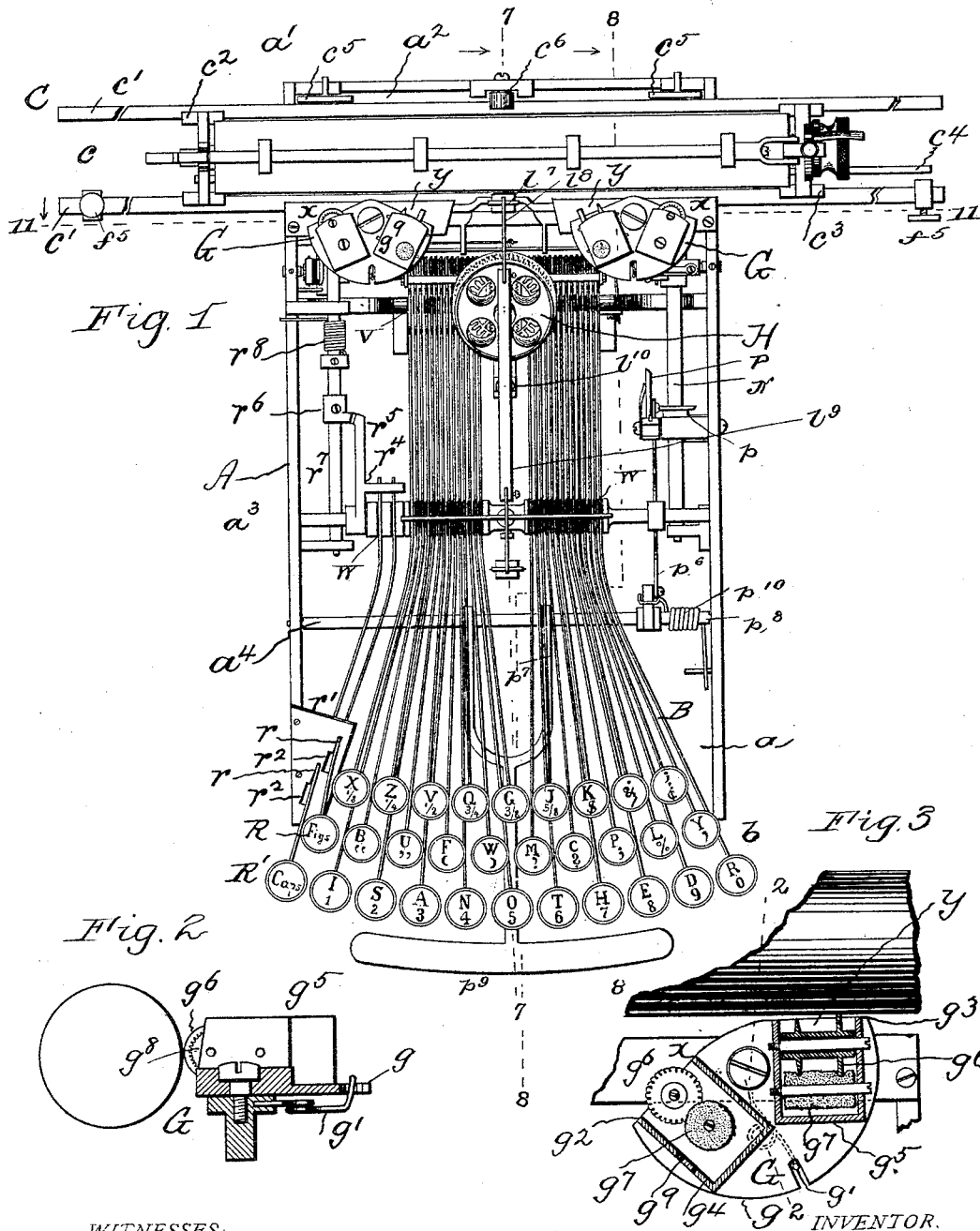


7 Sheets—Sheet 1.

No. 459,093.

Patented Sept. 8, 1891.



WITNESSES:

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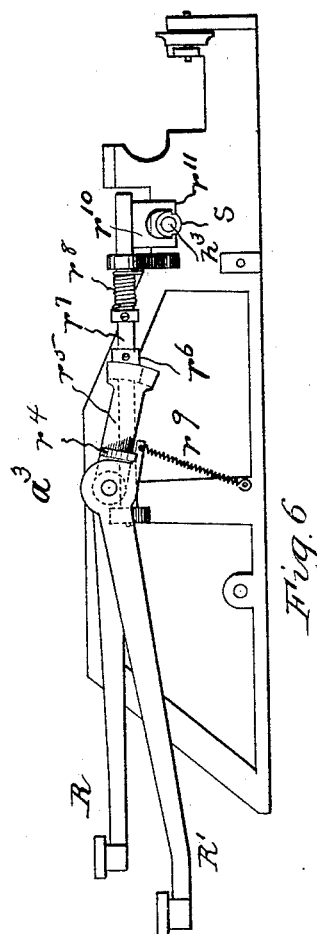
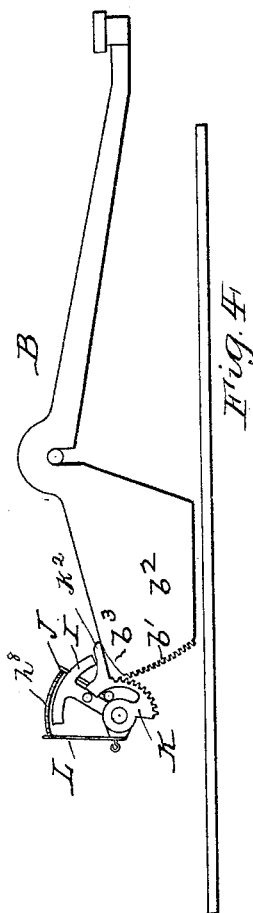
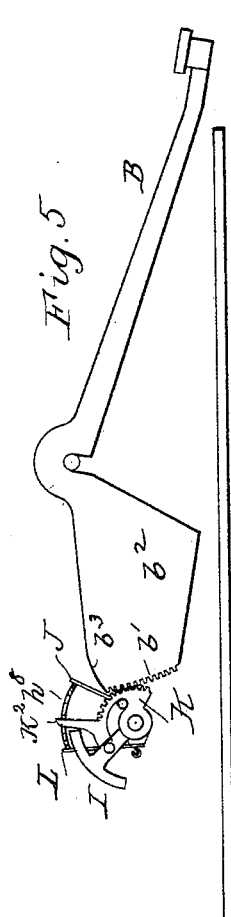
(No Model.)

7 Sheets—Sheet 2.

G. C. BLICKENSDEKFER.  
TYPE WRITING MACHINE.

No. 459,093.

Patented Sept. 8, 1891.



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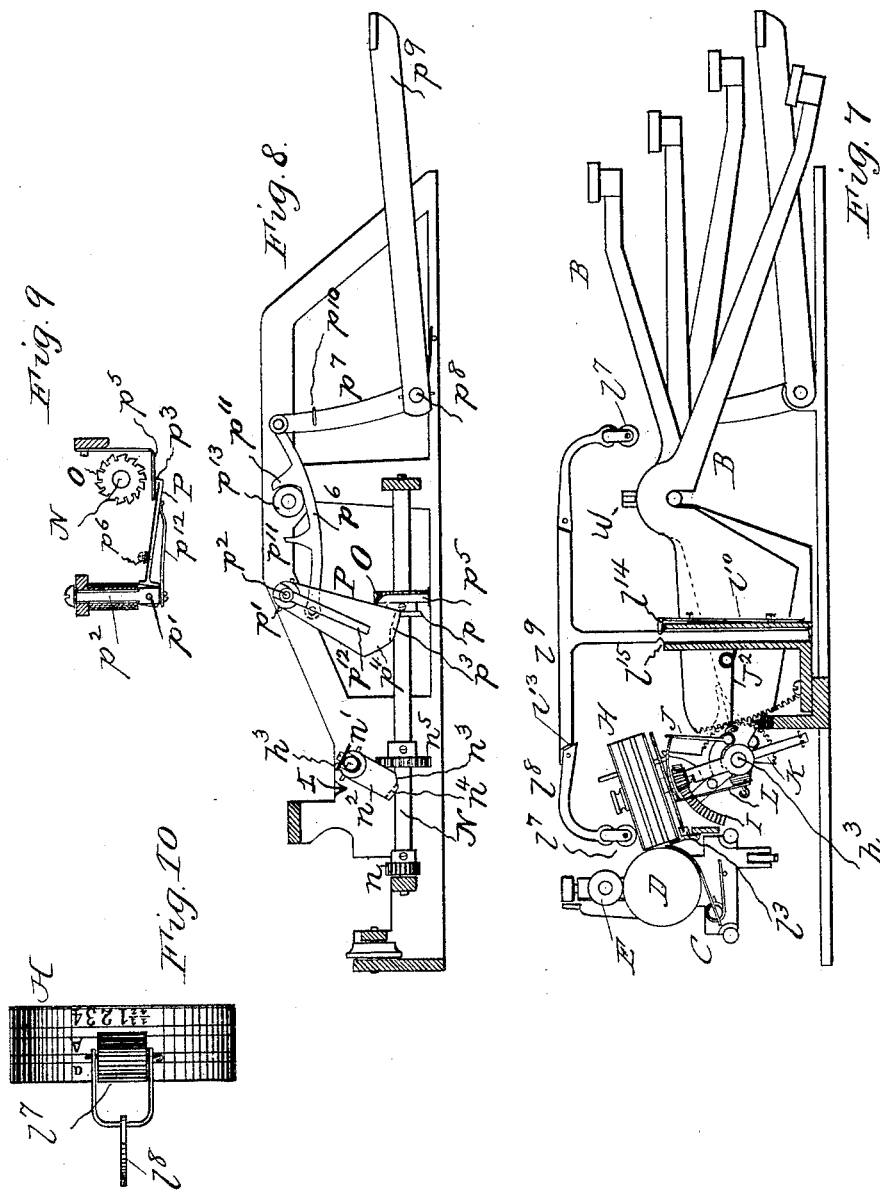
(No Model.)

7 Sheets—Sheet 3.

G. C. BLICKENS DERFER.  
TYPE WRITING MACHINE.

No. 459,093.

Patented Sept. 8, 1891.



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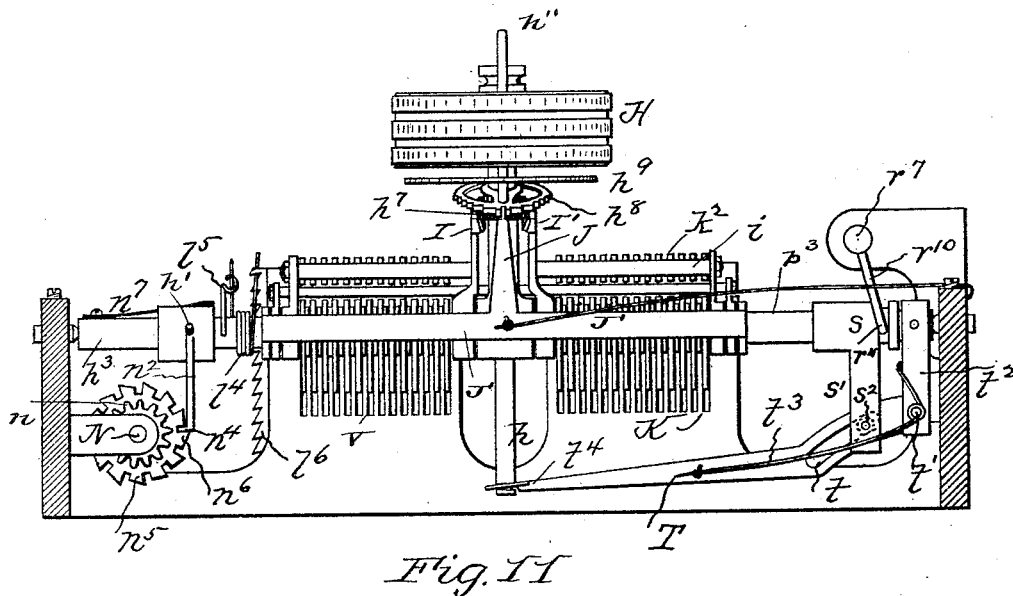
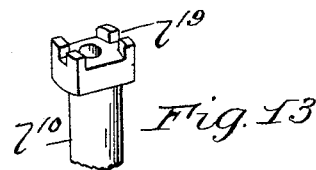
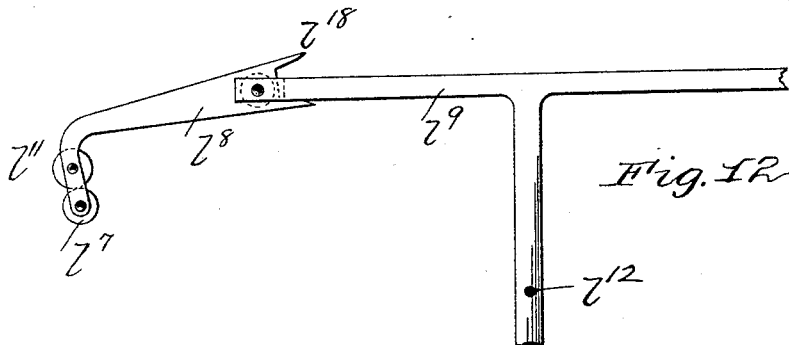
(No Model.)

7 Sheets—Sheet 4.

G. C. BLICKENSDEFFER.  
TYPE WRITING MACHINE.

No. 459,093.

Patented Sept. 8, 1891.

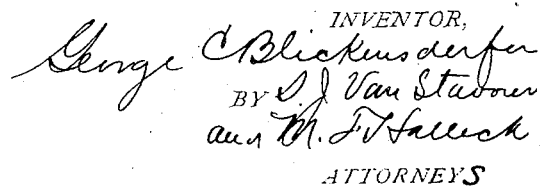


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7 Sheets—Sheet 5.

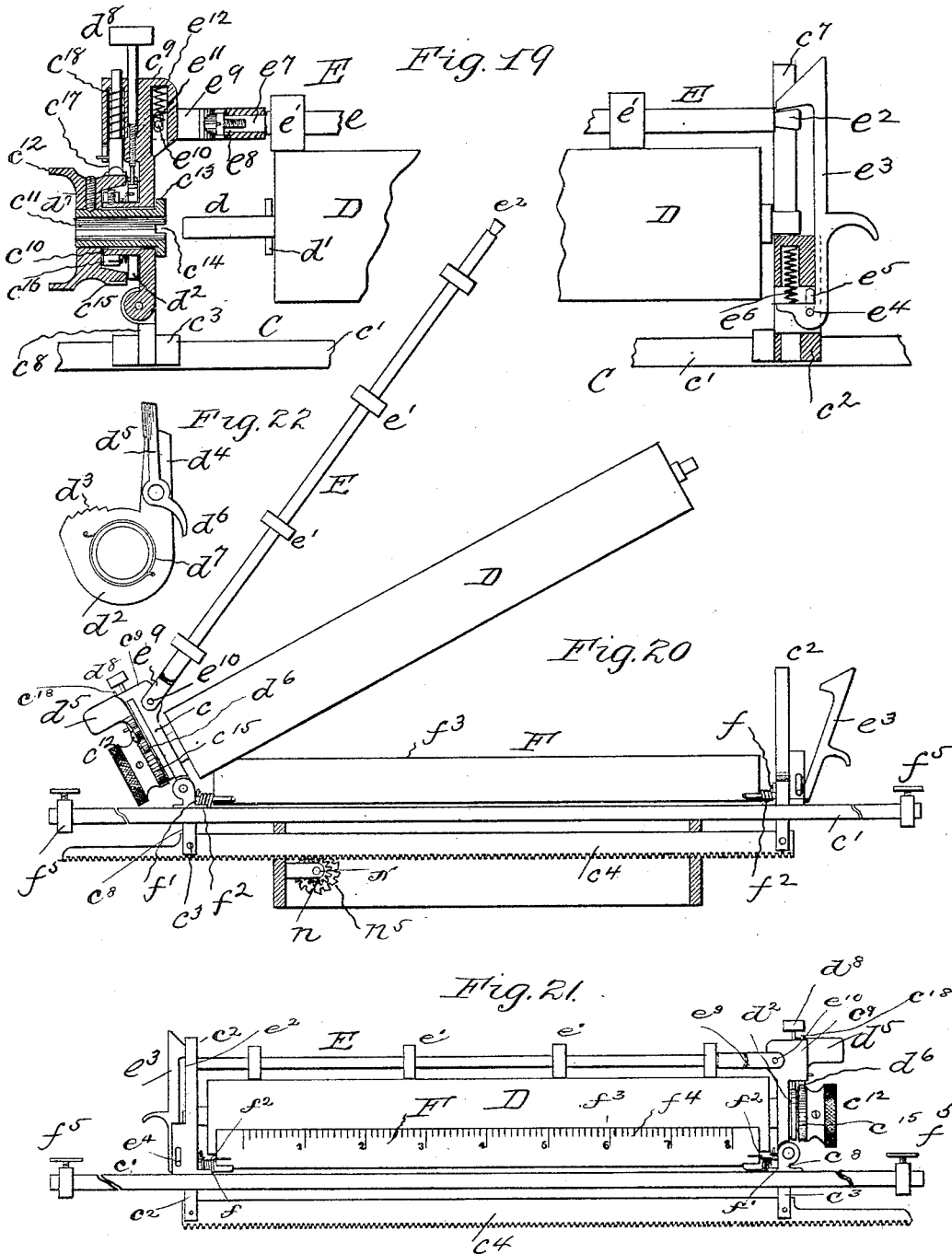
Patented Sept. 8, 1891.



G. C. BLICKENSDEKFER.  
TYPE WRITING MACHINE.

No. 459,093.

Patented Sept. 8, 1891.



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7 Sheets—Sheet 7.

No. 459,093.

*Fig. 23.*

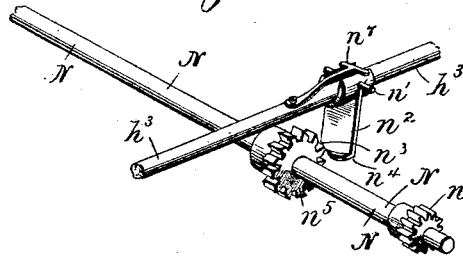


Fig. 24.

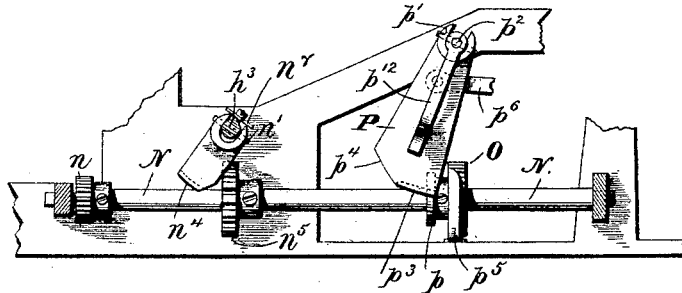
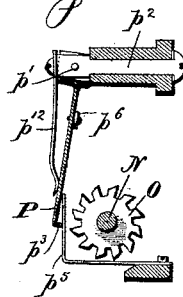
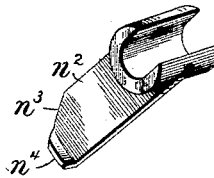


Fig. 25.



*Fig. 26.*



Witnesses:  
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# UNITED STATES PATENT OFFICE.

GEORGE C. BLICKENSDERFER, OF STAMFORD, CONNECTICUT, ASSIGNOR TO  
THE BLICKENSDERFER MANUFACTURING COMPANY, OF NEW YORK, N. Y.

## TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 459,093, dated September 8, 1891.

Application filed April 25, 1891. Serial No. 390,488. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE C. BLICKENS-  
DERFER, a citizen of the United States, resid-  
ing at Stamford, in the county of Fairfield and  
5 State of Connecticut, have invented certain  
new and useful Improvements in Type-Writ-  
ing Machines; and I do hereby declare the fol-  
lowing to be a full, clear, and exact descrip-  
tion of the invention, such as will enable oth-  
10 ers skilled in the art to which it appertains to  
make and use the same.

My invention relates to type-writers, and  
particularly to that class or type of such ma-  
chines as have an axially-moving type-wheel  
15 which is propelled against the platen to im-  
press the type; and it consists in certain im-  
provements in the construction and operation  
thereof, as will be hereinafter fully set forth,  
and pointed out in the following claims.

20 Reference is had to the accompanying draw-  
ings, wherein Figure 1 is a plan view of a type-  
writing machine embodying my invention. Fig. 2 is a sectional elevation showing paper-  
carriage roller and underscoring, canceling,  
25 or like devices, taken on the line 22 in Fig. 3.  
Fig. 3 is a sectional plan of the same, said  
parts in both said figures being drawn to an  
enlarged scale. Fig. 4 is a diagrammatic side  
elevation showing key-lever eccentric, ratchet-  
30 wheel for the type-wheel, stop-pawls for  
said ratchet-wheel, and tumbler-actuating  
mechanism between the key-lever, rack, and  
actuating bar or bail for one of said pawls,  
said parts being shown in their normal posi-  
35 tion. Fig. 5 is a like view showing said parts  
in the position assumed by them when the  
type-wheel is making an impression. Fig. 6  
is a side elevation of key-levers and actuat-  
ing mechanism for variously raising the type-  
40 wheel on its shaft to bring different fields or  
rows of letters or characters into action. Fig.  
7 is an elevation, partly sectional, on the line  
7 in Fig. 1, of the machine. Fig. 8 is a like  
view on the line 8 in Fig. 1, and shows the  
45 feeding mechanism for the paper-carriage in  
elevation. Fig. 9 is an elevation, partly in  
section, of the feeding mechanism for said car-  
riage under control of the spacer-bar for spac-  
ing between words. Fig. 10 is a plan of type-  
50 wheel and part of inking device or roller

therefor. Fig. 11 is a cross-section, partly in  
elevation, of the machine on the line 11 11 in  
Fig. 1. Fig. 12 is a sectional side elevation  
of a preferred form of inking device for the  
type-wheel. Fig. 13 is a perspective view of 55  
the standard for supporting said inking de-  
vice. Fig. 14 is an elevation, looking from  
the right of Fig. 1, drawn to an enlarged scale,  
of type-wheel, its shaft, concentric and eccen-  
tric ratchet-wheels therefor, limiting-pawls 60  
for the eccentric ratchet-wheels, and actuat-  
ing mechanism for said parts. Fig. 15 is a  
plan of said concentric ratchet-wheel. Figs.  
16 and 17 are like views of the eccentric ratch-  
et-wheel with pawls, type-wheel shaft with pin- 65  
ion, and segmental racks, showing the same  
in two different positions. Fig. 18 is a per-  
spective, looking from the front left corner of  
Fig. 1, showing more plainly the relative posi-  
tion of the segmental racks, eccentric ratchet- 70  
wheel, stop-pawls for the latter, and tumblers  
for the actuating mechanism for the racks,  
one of said pawls, and for propelling the type-  
wheel to the roller or platen. Fig. 19 is a  
vertically sectional elevation, looking from 75  
the rear of Fig. 1, partly broken away, of an  
improved form of paper-carriage. Fig. 20 is  
a like elevation showing the carriage in con-  
nection with its feeding mechanism and the  
paper-holding rollers in a raised position. 80  
Fig. 21 is an elevation, looking from the front  
of Fig. 1, of the paper-carriage detached from  
the machine and showing its parts in their  
normal position; and Fig. 22 is a side eleva-  
tion of part of the feeding mechanism for the 85  
paper-carriage roll detached from the car-  
riage. Fig. 23 is a perspective view of the  
carriage-actuating ratchet mechanism; Fig.  
24, a side elevation, on a larger scale than  
that shown in Fig. 8, of the paper-carriage- 90  
actuating shaft, and the pawls for actuating  
said shaft, and part of the actuating mechan-  
ism for said pawls; Fig. 25, a section on line  
25 25, Fig. 24, and on an enlarged scale, of  
part of the mechanism under control of the 95  
spacer-bar for actuating the shaft that moves  
the paper-carriage; and Fig. 26, a perspective  
of the pawl which is under the control of the  
type key-levers to actuate the shaft that  
moves the paper-carriage.



A represents the frame or housing of the machine, which may be of an oblong or other desired configuration required, having preferably an open front  $a$  for the key-board end  $b$  of the key-levers B, and at or near its rear end  $a'$  a transverse open way or bed  $a^2$ , through which slides the paper-carriage C, said frame or housing being suitably connected by transverse bars  $a^3$   $a^4$ , adjacent to its front end.

The paper-carriage C may be of any desired construction; but for purposes of my invention I prefer the form shown, which consists of a base  $c$ , composed of two parallel bars  $c'$   $c''$ , united by cross-bars or upright brackets  $c^2$   $c^3$ , and from which depends a rack  $c^4$ . The bars  $c'$   $c''$  are preferably round in cross-section and are preferably supported on grooved rollers  $c^5$   $c^6$ , suitably mounted in the bed or way  $a^2$  on each side of the same, so that the carriage C can be moved with as little frictional resistance as possible. If desired to prevent any tendency of the carriage C raising from its roller-supports  $c^5$   $c^6$ , an additional roller or rollers  $c^6$  may be mounted on one or both of the sides of the way  $a^2$  to contact with the upper side of one of the carriage rods or bars  $c'$ , as shown more plainly in Fig. 1.

The bracket or standard  $c^2$  consists of one piece or a single upright having a vertical slot  $c^7$ , with open upper end, as more plainly shown in Fig. 19. The bracket or standard  $c^3$  consists of a lower fixed part or section  $c^8$ , to which is hinged an upper part or section  $c^9$ , as more plainly shown in Fig. 19. The hinged section  $c^9$  has an outside tubular hub or projection  $c^{10}$ , in which is mounted a tubular sleeve  $c^{11}$ , having on its outside end, which projects beyond the outer end of the hub  $c^{10}$ , a thumb-wheel  $c^{12}$  and on its inner end a collar  $c^{13}$ , which abuts against the inner side of bracket-section  $c^9$ , so as to maintain said sleeve  $c^{11}$  loosely within the tubular hub or projection  $c^{10}$ . The collar end  $c^{13}$  of sleeve  $c^{11}$  is provided with a transverse slot  $c^{14}$ , or more than one of these transverse slots  $c^{14}$  may be provided, if desired.

Mounted in sleeve  $c^{11}$  and in the bottom of the vertical slot  $c^7$  of the standard  $c^2$  is the main roller D for the carriage C, its journal end  $d$ , entering the sleeve  $c^{11}$ , being provided with a transverse pin  $d'$  for engagement with the transverse slot  $c^{14}$  on the collar end  $c^{13}$  of sleeve  $c^{11}$ , so as to connect said collar  $c^{13}$  and sleeve  $c^{11}$  with said roller D, in order that they may turn or rotate together and for purposes of removing said roller from the carriage, as hereinafter more fully described.

The thumb-wheel  $c^{12}$  is provided, either integrally or otherwise, with a ratchet-wheel  $c^{15}$ , which, as shown, preferably overhangs the hub  $c^{10}$  on section  $c^9$ . Between the ratchet-wheel  $c^{15}$  and the standard-section  $c^9$ , and loose on hub  $c^{10}$ , is mounted a collar  $d^2$ , which is provided with a toothed or ratchet cam  $d^3$  (see more plainly Fig. 22) and an arm  $d^4$ , upon which is pivoted a thumb pawl or lever

$d^5$ , the lower end  $d^6$  of which is in line with and engages with the ratchet-wheel  $c^{15}$  on thumb-wheel  $c^{12}$ . The collar  $d^2$  is maintained in its normal position by a spiral spring  $d^7$ , one end of which is fastened to collar  $d^2$  and the other end to the sleeve  $c^{11}$ , or an outer end collar  $c^{16}$ , fastened thereto. (See Fig. 19.) In the standard-section  $c^9$  and in line with the thumb-wheel ratchet  $c^{15}$  is a downwardly-acting retaining-pawl  $c^{17}$ , the action for said pawl being obtained by means of a spring or equivalent device  $c^{18}$ . In line with the collar  $d^2$ , adjacent to its cam-ratchet  $d^3$  and mounted in the section-bracket  $c^9$ , is a screw  $d^8$ , which engages with one of the teeth of the ratchet-cam  $d^3$  of collar  $d^2$  and limits its oscillating motion, and in turn the rotary movement of the roller D, to space the lines for the paper on each roller, as hereinafter more particularly described.

Above the roller D is a second roller E, which may be of any suitable construction, as desired; but I prefer to construct and arrange the same for operation as shown—that is to say, it consists of a rod  $e$ , having thereon at intervals along its length a number of rubber or other elastic collars  $e'$   $e''$ , which hold themselves in position on rod  $e$  by frictional contact, preferably, and yet admit of being adjusted lengthwise on rod  $e$  to suit different widths of paper inserted in the paper-carriage. The free end  $e^2$  of rod  $e$  enters the slot  $c^7$  of standard  $c^2$ , and it may be configured, as desired or as shown, for engagement with a catch  $e^3$ , pivoted at  $e^4$  in a vertical slot  $e^5$  on standard  $c^2$  and provided with a spring  $e^6$ , suitably supported in standard  $c^2$ , which acts to normally keep the catch  $e^3$  in engagement with the end  $e^2$  of rod  $e$  to form a bearing therefor. The opposite end  $e^7$  of rod  $e$  is mounted, as shown at  $e^8$ , in a swivel or forked connection  $e^9$ , pivoted at  $e^{10}$  in a vertical slot  $e^{11}$  in standard-section  $c^2$  and provided with a downwardly-acting spring  $e^{12}$ . (See Fig. 19.) By rotating the thumb-wheel  $c^{12}$  the roller D is correspondingly moved to feed or move the paper as desired. By adjusting the screw  $d^8$  the limit of oscillation of the pawl or lever  $d^5$  is altered, as described, to obtain the necessary spacing for the lines. By mounting the end  $e^7$  of roller E in the swivel or hinged connection  $e^9$  said roller can be raised at its free end  $e^2$ , as indicated in Fig. 20, for convenience in inserting and removing the paper onto and from the carriage. By pivoting the catch  $e^3$  and the hinged or swivel connection  $e^9$  in vertical slots in the standards  $c^2$   $c^3$ , respectively, any thickness of single paper or any number of sheets of papers can be easily and readily inserted between the rollers D and E and subjected to pressure of a uniformly-increasing character, so that the same will not slip one upon the other as they are fed through the rollers. By mounting the end  $d$  of roller D in the sleeve  $c^{11}$  it is adapted for easy and quick removal for repairs or for substitution, and this feature provides for the substitu-

tion of a soft for a hard faced roller, or vice versa, according to the character of the work to be typewritten.

Adjacent to the front and bottom of roller D is a curved presser-plate F, Figs. 20 and 21, pivoted at  $f$  and  $f'$  to the standard  $c^2$  and standard-section  $c^3$ , respectively, and having pressure spring or springs  $f^2$  for normally maintaining the upper edge  $f^3$  of plate F in contact with the roller D or the paper thereon. If desired, the outer face of plate F at its edge  $f^3$  may be graduated, as shown at  $f^4$ . To limit the extent of travel of the carriage C, adjustable collars  $f^5$  may be located on one of the rods  $c'$  at one or both ends of the same, as more plainly seen in Fig. 20, which collars strike against the sides of the frame A to limit the travel of the carriage.

To insert the paper in the carriage C, the catch  $e^3$  is first withdrawn from engagement with the end  $e^2$  of roller E, and the latter, with the roller D, is raised, as indicated by full lines in Fig. 20. The paper is then placed upon the plate F. The roller D is then dropped into position, the end of the paper brought to the top of roller D, and the roller E is returned to its normal position, the catch  $e^3$  automatically re-engaging itself with the roller E to lock it in position. As the thumb-lever  $d^3$  is moved to feed the paper through the rollers D and E, they both rotate to effect such feed, and as the roller E has a forcible pressure on the paper it is prevented from slipping, and as the roller E is made up of a number of separate elastic collars  $e'$  they can be adjusted to suit different widths of papers.

Upon the top of the front side of the way  $a^2$  and adjacent to the carriage C are located the underscoring, canceling, or other like marking devices G, which consists of a pivoted plate  $g$ , having a reacting spring  $g'$ , suitably connected therewith for maintaining it in its normal position. The plate  $g$  has two faces  $g^2$  and  $g^3$ , preferably placed obliquely to one another, as shown, and parallel with said faces and located upon the top of plate  $g$  are boxes  $g^4$  and  $g^5$ , respectively, in which are mounted the marking-wheels  $g^6$  and inking-rollers  $g^7$ . These wheels  $g^6$  and rollers  $g^7$  in the different boxes may be differently arranged, according to the marking to be done. Thus, for instance, the wheel  $g^6$ , when used for underscoring, has its shaft vertically located, as is also that of its inking-roller, as shown at  $x$ , Figs. 1 and 3, and when used for marginal scoring or for lines running lengthwise of the paper said wheel and roller have horizontally-located shafts, as indicated at  $y$ , Figs. 1 and 3. The wheels  $g^6$  have, preferably, serrated or toothed peripheries to mark a dotted or broken line; but in case a full line is desired said peripheries will be unbroken, and an additional toothed wheel  $g^8$  is secured to the said wheel-shafts for engaging with and causing a positive rotation of the inking-rollers, as shown in the drawings. By turning the plate  $g$  until either of its faces  $g^2$   $g^3$  are

parallel with the carriage-roller D the wheels  $g^6$  come into contact with the paper, and then by either sliding the carriage C to and fro or by having the thumb-wheel  $c^{12}$  to rotate the roller D and the paper the proper marking on the latter is effected. When the plate  $g$  is released, its spring  $g'$  returns it to its normal position.

Where different-colored inks are required for underscoring and analogous operations, more than one plate  $g$ , with marking-wheels  $g^6$ , may be used, as shown in Fig. 1, wherein said devices are indicated in their normal position, Fig. 3 representing one of said devices turned in position for use.

Suitable openings  $g^9$  are provided either in the top or in one of the sides of the boxes  $g^4$   $g^5$ , adjacent to the inking-rollers  $g^7$ , for supplying them with ink. The fastening of the boxes  $g^4$   $g^5$ , with contained marking devices, to the single plate  $g$  provides a compact and economical form of underscoring devices G, which are easily and quickly placed in position for use and which are automatically returned to their normal positions.

H represents the type-wheel, which may be of any suitable construction, preferably having all the characters of a field in a single peripheral row, and is mounted loosely upon the upper end of a shaft  $h$ , resting upon a collar  $h'$ , fixed on said shaft. The said shaft  $h$  is mounted in a frame  $h^2$ , rigidly secured to a cross-shaft  $h^3$ , said shaft  $h$  passing down through said frame  $h^2$  and shaft  $h^3$  and depending below the shaft  $h^3$ , as more plainly shown in Fig. 14. The top of the frame  $h^2$  is provided with a finger  $h^4$ , which enters an annular recess  $h^5$  in a sleeve  $h^6$  on shaft  $h$ . To sleeve  $h^6$  is secured a pinion  $h^7$ , an eccentric stopping-ratchet  $h^8$ , and a concentric steady-ing ratchet-wheel  $h^9$ , said parts being rigidly secured to said sleeve  $h^6$  between top nut  $h^{10}$  and bottom collar  $h^{11}$ . The ratchet has teeth of different length graded from an initial point and moving in different paths. It is preferably double, with each part having teeth of different length and graded from an initial point in opposite directions.

Projecting from the eccentric stopping-ratchet  $h^8$  is a crank-pin  $h^{12}$ , which engages the type-wheel by passing through an eccentrically-located opening therein, as more plainly shown in Fig. 14, so that while said type-wheel is free to be raised, as hereinafter described, to bring the different rows of letters into the field of action it rotates positively with the pinion  $h^7$  and the stopping and steadying ratchets  $h^8$  and  $h^9$  to position the letters or characters of said rows.

I and I' represent the segmental racks meshing with pinion  $h^7$ . These racks are loosely mounted on the cross-shaft  $h^3$  and are each provided with a laterally-extending frame  $i'$ , which is loosely journaled on shaft  $h^3$ .

J represents the movable pawl in front of the stopping-ratchet  $h^8$ , which pawl J is secured to frame J', also loosely mounted upon

cross-shaft  $h^3$  in front of the frame  $i' i'$ , and is provided with a retracting-spring  $J^2$  for normally keeping the pawl out of engagement with the stopping-ratchet  $h^8$ .

5 Located upon the cross-shaft  $h^3$  between the racks I and I' and their respective frame ends  $i'$  are a series of tumblers K, one for each key-lever B in operation with said racks, and which may be of any suitable configuration to actuate said racks I I' and the  
10 pawl J by contact with their frames. I have shown in the drawings (see more plainly Fig. 18) a preferable form of said tumblers, which has a slot  $k$  open at the rear edge  $k'$  and concentric with the axial support of the tumbler.  
15 It also has a forwardly-projecting arm  $k^2$  and a segmental gear part  $k^3$  on its front edge, which mesh with consorting teeth  $b'$  on the end  $b^2$  of the key-lever B in connection therewith. The tumbler-arms  $k^2$  rest upon the top  
20 of said key-levers B, and the upper rear corner of the end  $b^2$  of said levers B above their toothed part  $b'$  are made rounding, as shown at  $b^3$ , for a purpose hereinafter described.  
25 The racks I and I' each with their separate frames  $i' i'$  are independent of each other, as they are loosely mounted on the cross-shaft  $h^3$  on opposite sides of the shaft  $h$ . The upper part of the edge  $k'$  of the tumblers K, as will  
30 be more plainly seen in Figs. 4 and 18, are normally in contact with or abut against the frame-bars  $i$ , while the depth of the tumbler-slots  $k$  is varied in the different tumblers contacting with each frame, as indicated by dotted lines in Fig. 18, so that the bottoms of  
35 said slots of the different tumblers will variously come into contact with the frame J' for pawl J to move it into engagement with the tooth on the ratchet corresponding to the key-lever depressed, said movement of the pawl  
40 J occurring at the end of the rotation of the type-wheel in positioning a letter. As the racks I and I' are independent of each other, a movement of one rack causes the pinion  $h'$  to roll upon the other rack, which remains stationary. This rolling movement of the pinion  
45 is imparted to the sleeve  $h^6$ , and hence to the ratchets  $h^8 h^9$  and to the type-wheel, and as this rolling motion is also a forward movement said parts, together with the type-wheel shaft and its supporting-frame  $h^2$ , are  
50 propelled toward the carriage C while the type-wheel is rotatively moving. In other words, the initial depression of a key-lever B through the medium of the tumbler edge  $k'$   
55 instantly moves one of the racks I or I' to impart to the type-wheel a combined axial movement and a vibratory movement toward the carriage C, said combination movement being due to the rolling of the pinion upon  
60 either the rack I or I', as the case may be, which is not being moved. The advantages of this construction are important and quite manifest. When the type-wheel is first rotated and then moved laterally during the  
65 continuous downward movement of the key, the inertia of the parts has to be overcome,

as follows: first, to start the wheel moving rotatively, then to stop its rotation, then to start it moving laterally; but in the construction just described the wheel is started  
70 moving both laterally and rotatively simultaneously, and at the beginning of the stroke of the key-lever when it receives an impetus from the impact of the finger upon  
75 the key, and the continuous downward movement of the key-lever, which is effected by the pushing action of the finger, is not retarded by the added work of overcoming the inertia of the moving parts. It should be  
80 noted that in my construction the initial movement of the type-wheel is a dual movement—that is, it moves both rotatively and laterally simultaneously from the start—and that the type-wheel has such dual movement  
85 from the beginning until the type is positioned and then only a lateral movement, and that this entire action is effected by a single mechanism and not by a dual mechanism. Hence the resistance from friction and from  
90 overcoming the inertia of parts is reduced to a minimum, and the chief part of this resistance is overcome at the beginning of the movement of the key-lever when it receives the impact of the finger. A further  
95 advantage is that the action of the machine may be more rapid when the rotary and lateral movements are effected simultaneously. It will be observed that as any tumbler K commences to act upon a rack-frame  $i' i'$  the  
100 center of axial motion of the type-wheel and its associated and coincidently-moving parts—such as the stopping-ratchet  $h^8$ —is moved away from the pawl J; but as the said stopping-ratchet is eccentric and has its lobe normally on the opposite side of the shaft from  
105 the pawl J the teeth of the ratchet will, as it moves axially and also laterally, pass in close proximity to the pawl J, which remains stationary until moved at the proper time, and  
110 hence it will only require a slight movement of the pawl J to engage any of the passing teeth of the ratchet  $h^8$ . The movement of the pawl J is effected by the bottom of the slot  $k$  on the tumbler K coming in contact  
115 with the frame J'. The axial movement of the type-wheel N is stopped when the tumbler K has come in contact with the frame J', and thus moves the pawl J into contact with the stopping-ratchet  $h^8$ . After this has  
120 occurred the continuous movement of the key-lever will continue the lateral movement of the type-wheel until said wheel comes in contact with the platen. As the pawl J has to be moved through only a very short space to engage  
125 with the eccentric ratchet-teeth, such pawl does not jump or rebound from the ratchet under rapid manipulation and thus permit the velocity of rotation of the type-wheel and eccentric ratchet to carry the latter  
130 past the pawl and thereby defeat the positioning of the letter required; but if the type-wheel and its accompanying ratchets have made an extended traverse be-

fore they are stopped by the pawl J the momentum they have acquired may cause the ratchet to rebound from the pawl J and move backward and then be caught by an improper tooth. To avoid this, a second pawl L, which is located diametrically across the ratchet from the pawl J, is provided. This pawl L is supported by a frame  $l$ , which is loosely journaled on the cross-shaft  $h^3$ , so that it may move independently of that shaft or with it if engaged by other parts moving with said shaft  $h^3$ . A spring  $l'$  is in engagement with the frame  $l$  to hold the pawl L toward the ratchet, and a stop  $l^2$  on the frame A holds the pawl from premature engagement with the ratchet. In order for the pawl L to engage the ratchet  $h^3$ , the type-wheel must move forward until the ratchet is brought in contact with said pawl L. The two pawls J and L normally stand in line with the lobe of the ratchet with the shaft  $h$  nearest the pawl J, and as the type-wheel is moved axially and laterally at the same time and the pawls stand still the lobe of the ratchet moves to one side and the shaft approaches the pawl L in a straight line, and both pawls are at all times in the same close proximity to the teeth of the ratchet. As soon as the pawl J is moved into contact with the ratchet  $h^3$  by the bottom of the slot  $k$  on the tumbler K contacting with the frame  $J'$ , the ratchet is pressed simultaneously against the pawl L, which engages a tooth on the opposite side of the ratchet which points oppositely to the tooth engaged by pawl J, so that the ratchet is not only stopped, but locked, and cannot rebound from the pawls. The two pawls J and L act like a pair of pinchers, which grasp the ratchet on opposite sides and in contact with oppositely-pointed teeth. This construction is very important, as it insures the absolute precise and instantaneous stoppage of the type-wheel. It is illustrated clearly in Figs. 16, 17, and 18. As the type-wheel has a combined axial and lateral movement from the start, it follows that the inertia of all the parts moving with the type-wheel in making its forward movement must be overcome at the beginning of the depression of the key-levers, and to make this action of said levers as delicate and easy as possible I provide the tumblers K with the arms  $k^2$ , the under straight sides of which rest on the curved ends  $b^3$  of the key-levers, thus obtaining a long leverage at the beginning of the depression of the key-levers, which long leverage is quickly changed to a short one as the teeth  $b'$  of levers B mesh with the teeth  $k^3$  of tumblers K, the object of this construction being to obtain an easy-starting movement without lessening the time of the stroke or lengthening the arc of movement of the key-levers materially.

I have shown the tumblers K provided with the teeth  $k^3$ , the arm  $k^2$ , and the lever ends  $b'$ , thus giving a combined cam or wiper and gear movement; but it is evident that the

tumblers K and the end  $b'$  of levers B may be variously configured to provide for such described leverage, and I do not therefore desire to be limited to the precise construction shown.

Just before the type-wheel makes the impression one of the notches of its concentric ratchet-wheel  $h^9$  engages with a fixed pawl  $l^3$  on the frame of the machine, which steadies the same and holds it against any movement that might occur through lost motion due to looseness or wear of any of said parts, and thus perfect positioning of the impressions are secured. Said pawl  $l^3$  is more plainly shown in Fig. 7, which illustrates the type-wheel in position at the end of its forward movement.

The frame  $h^2$ , in which the shaft  $h$  of the type-wheel H is swiveled, is fixed to the shaft  $h^3$ , and when the said frame  $h^2$  and the parts carried thereby are vibrated by the other actuating parts the shaft  $h^3$  is moved on its journals. Hence to retract said frame  $h^2$  and the parts which are carried by it I put on said shaft a spring  $l^4$ , which has one end in engagement with the arm  $l^5$ , extending from said shaft, and the other end in engagement with a tension-rack  $l^6$  on the frame, (see Fig. 11,) and by changing the end of the spring  $l^4$ , which is in engagement with said rack  $l^6$  from notch to notch, the degree of resistance of said spring is varied. This spring  $l^4$ , when the operating-keys are released, moves the operating parts back to normal position.

Any suitable form of inking device may be used for the type-wheel. In the drawings I have shown an inking-roller  $l^7$ , mounted in a pivoted or swinging arm  $l^8$ , having a stop end  $l^9$ , which arm is supported upon a rod  $l^{10}$  in a bracket  $l^{11}$ . (See Figs. 1 and 7.) This inking-roller is vibrated solely by the vibratory motion of the type-wheel, thereby dispensing with all mechanism for moving said vibrating roller independent of the vibrating wheel. If desired, the rod  $l^{10}$  may be provided at both ends with a pivoted inking-roller for different-colored inks to be independently used, and by making the arm or rod  $l^{10}$  removable from bracket  $l^{11}$  the different inking-rollers may be changed for use as desired. In some cases I prefer the form of inking device shown in Fig. 12, wherein the ink-roller  $l^7$  is made of soft rubber or other elastic material and has a separate supply-roller  $l^{11}$ , so as to avoid having an undue amount of ink on roller  $l^7$ , and thus preventing blurred impressions. In this case the arm  $l^8$  has a bifurcated end  $l^{12}$  for limiting the extent of its swinging motion, and the rod  $l^{10}$  has a cross-pin  $l^{13}$  for engagement with the slotted end  $l^{14}$  of bracket  $l^{11}$  to maintain the rod  $l^{10}$  in position, whereas in Fig. 7 such securement is provided for by the spring-catch  $l^{14}$  entering a groove  $l^{15}$  in the rod  $l^{10}$ . The inking-roller  $l^7$  is located in line with the type-wheel adjacent to the carriage C, so that said type-wheel at or near the end of its propelling movement

will strike the roller  $\bar{U}$  to ink the positioned letter or character. The act of such striking will cause the roller to revolve to ink said letter, and also cause it to fly up out of the way of the type-wheel as it makes the impression. It will be noted, therefore, that the type-wheel alone actuates the inking-roller  $\bar{U}$ . The rack  $c^4$  of the carriage C meshes constantly with an actuating-pinion  $n$  on a shaft N, (see Figs. 8, 11, 20, and 23,) which, as shown, runs lengthwise of the machine to one side of the same, as more plainly indicated in Figs. 1 and 8. Upon the cross-shaft  $h^3$ , adjacent to shaft N, is a double-faced pawl  $n^2$ , which is connected to said shaft  $h^3$ , so as to oscillate with it and yet have a lateral oscillation of its own on said shaft. This pawl  $n^2$  has a cam-face  $n^3$  in advance of a side flanged face  $n^4$ , which is curved concentric with the axis of the pawl while the cam-face  $n^3$  is eccentric to the axis. The pawl  $n^2$  hangs from the shaft  $h^3$ , parallel with and at one side of the shaft N, adjacent to a ratchet-wheel  $n^5$ , which is rigidly secured to said shaft N. This wheel  $n^5$ , as more plainly shown in Figs. 11 and 23, is indented with substantially parallel-sided notches, and the ends of the teeth thus formed are slanted inwardly, so that one side of the radial notches is longer than the other. These slanting ends of the teeth are, when opposite the pawl  $n^2$ , substantially parallel with said pawl as held in its normal position by a spring  $n^7$ . When a key-lever B is depressed to actuate the type-wheel and propel it toward the carriage C, the cross-shaft  $h^3$  is rocked in the direction of arrow 1, Fig. 8, and correspondingly moves the pawl  $n^2$ . This causes the cam  $n^3$  of the pawl  $n^2$  to contact with the end of the longer side  $n^6$  of one of the teeth, and imparts a downward motion to the wheel  $n^5$  and turns the shaft N and wheel  $n$  to feed the carriage the necessary space for the letter or character to be printed, which feed is effected before the impression is made. As soon as the cam end  $n^3$  of the pawl passes off of said tooth the curved flange  $n^4$ , immediately following on the pawl, enters into the radial notch between said tooth and the succeeding tooth, as shown in Fig. 11, and locks said wheel  $n^5$ , shaft N, wheel  $n$ , and consequently the carriage C in position after it has been positioned to receive the imprint of a letter and continue to hold it while the impression is being made. As the shaft  $h^3$  reversely rocks upon the return of the type-wheel the pawl is correspondingly moved to cause its flange to disengage itself from wheel  $n^5$ , and as the cam end  $n^3$  of the pawl passes by the wheel the spring  $n^7$ , which bears against the top of the pawl oscillates or throws it to one side on shaft  $h^3$  to its normal position, which is at an angle to shaft  $h^3$ , for successive action upon the wheel  $n^5$  to effect the further feeding of the paper-carriage.

O represents a second ratchet-wheel on shaft N, similar in all respects to wheel  $n^5$ , except that the wheel O is provided with a

collar  $p$ , against which normally rests a second pawl P, connected at  $p'$  to a rock-shaft  $p^2$ , to rock with said shaft and at the same time be capable of swinging laterally, and provided with a spring  $p^{12}$ , which acts to move said pawl laterally onto or in the direction of said collar. Said pawl has a lower inside-edge flange  $p^3$  and cam-edge  $p^4$ , the same as for pawl  $n^2$ , except that the former are located reversely to the latter. In front of the wheel O stands a spring-guard  $p^5$ . The pawl P has a link connection  $p^6$  with an arm  $p^7$  on a cross rock-shaft  $p^8$  near the front end of the machine, to which is secured the spacer-bar  $p^9$ , the same having a suitable retracting-spring  $p^{10}$ . If desired, the link  $p^6$  may be provided with stop-lugs  $p^{11}$  and an abutting-roller  $p^{13}$ , the latter of which may be of leather or analogous material to lessen the noise of operation. A depression of the spacer-bar  $p^9$  rocks shaft  $p^8$  to cause its arm  $p^7$  to draw the link  $p^6$  forward and correspondingly oscillate the pawl P and in so oscillating it passes to the outside of the spring-guard  $p^5$  until it passes by the same, whereupon its spring  $p^{12}$  swings it laterally toward the wheel, so that upon the return stroke its cam end  $p^4$  and flange  $p^3$  act upon the ratchet-teeth, as in the case of the pawl  $n^2$ , and moves the wheel O and shaft N with its wheel  $n$  to feed the carriage for spacing between words, the flange  $p^3$  on the pawl P locking said parts in position while the impression is made as it passes through the spaces between the teeth on the return movement of the pawl P. As the pawl  $n^2$  moves the shaft N and feeds the carriage on the forward movement and the pawl P effects a like result on its return stroke, it follows that if a key-lever B and the spacer-bar  $p^9$  be depressed simultaneously the carriage will first be fed before the impression is made, and after it is made it is further fed to space between the character or letter so made and the next succeeding impression, and in this way the last letter of a word and the spacing between such and the succeeding words can be made at one instead of by two operations.

The operation of the foregoing-described pawls is easy and delicate and practically noiseless. It will be noticed that the carriage-rack  $c^4$  is always in engagement with its actuating-wheel  $n$ ; but as the pawl devices  $n^2$  and P are normally out of engagement with the ratchet-wheels  $n^5$  and O the carriage C can be freely moved in either direction for wide spacing, underscoring, canceling, or other purposes. It will further be noticed that both pawls  $n^2$  and P move the shaft N, so that one actuating-wheel  $n$  successively feeds the carriage for spacing for the impressions and for spacing between words or letters or characters, as desired.

R and R' represent the shifting-keys for the type-wheel, so as to bring its different rows of letters or characters into the field of action. These keys pass through slots  $r$  in the front plate  $r'$  of the machine, and said

slots are provided with shoulders or offsets  $r^2$  for holding the keys in their depressed position when desired to do so. These keys, together with the keys B, are mounted upon the cross-bar  $a^3$ , and their inner ends abut against an arm  $r^4$ , projecting from a swinging rack  $r^5$ , mounted on bar  $a^3$ , which rack meshes with a pinion  $r^6$  on a shaft  $r^7$ , running lengthwise of the machine and provided with a suitable retracting-spring  $r^8$  for returning said shaft and the coacting parts in connection therewith to their normal positions. The keys R R' are also provided with retracting-springs  $r^9$ . (See Fig. 6.) At the rear end of shaft  $r^7$  is a downwardly-projecting arm  $r^{10}$ , which is bifurcated at its lower end  $r^{11}$ , and engages with a sliding collar s, (see Fig. 11,) having a downwardly-projecting arm  $s'$ , with roller  $s^2$ , for engagement within a slot  $t$  in an arm T, pivoted at its end  $t'$  to an arm  $t^2$ , affixed to shaft  $h^3$ , and provided with a retracting-spring  $t^3$ . The opposite end  $t^4$  of arm T engages with the type-wheel shaft  $h$ . A depression of either of the keys R R' oscillates the rack  $r^5$  to rock the shaft  $r^7$  and its arm  $r$ , which in turn slides the sleeve  $s$  on shaft  $h^3$  to rock the arm T to raise the shaft  $h$  and the type-wheel H to bring the desired row of characters into action. As the sleeve  $s$  is loose upon shaft  $h^3$  and as the arm T is supported by said shaft, said sleeve and arm rock with shaft  $h^3$  as it is moved, so as to keep said sleeve and arm always in the line of the type-wheel shaft  $h$ .

It is obvious that the construction and arrangement of the novel features of my invention may be variously provided for without departing from the spirit of the same. Hence I do not limit myself to the constructions and arrangements shown. The tumblers K and the ends  $b^2$  of the levers B are separated by or work in the slots of the comb V, being preferably so arranged that the teeth of said levers and tumblers mesh with each other in the comb, so as to maintain such engagement from end to end of the movement of the toothed parts of the levers and tumblers without lateral motion. In other words, there are no side supports for the joint formed by the tumblers and levers other than the comb, which prevents said parts from moving laterally, and thereby destroy the alignment. The key-levers B are notched on their under side and are hung upon the shaft  $a^3$ . To prevent them from binding upon these supports, a comb V is provided. This comb is placed over the levers and prevents dust and dirt from accumulating at the joint, and also separates and holds the several levers in place. This is an especially desirable result, so far as the outer levers are concerned, as it prevents them from bending over sidewise or tilting. The comb is placed directly over the shaft or bar  $a^3$  and is secured in place in any desired way.

I do not herein claim a paper-carriage having a tubular roller-bearing with recess or

slot in combination with a roller D, having a pin connection for engagement with said recess or slot, nor such a construction combined with means for rotating the roller, as such a construction forms the subject-matter of application, Serial No. 399,789, filed July 16, 1891.

What I claim is—

1. In a type-writing machine, the combination, with a series of type-key levers and a paper-carriage, of a shaft free to rotate and in operative connection with said carriage, and a ratchet mechanism for rotating said shaft and moving the carriage, the pawl thereof being normally out of engagement with the ratchet and operated by the type-key levers.

2. In a type-writing machine, the combination, with a series of type-key levers and a paper-carriage carrying a rack, of a shaft normally free to rotate and having a pinion meshing with said rack, and a ratchet mechanism for rotating said pinion and shaft to feed the carriage, the pawl of said ratchet mechanism being normally out of engagement with the ratchet and controlled by the key-levers.

3. In a type-writing machine, the combination, with a paper-carriage and a series of type-key levers, of a shaft in operative connection with said carriage and having a ratchet, a rock-shaft under control of said key-levers and carrying a type-wheel, and a pawl for said ratchet, whereby the type-wheel and paper-carriage are moved simultaneously.

4. In a type-writing machine, the combination, with a paper-carriage and a series of type-key levers, of a shaft in operative connection with said carriage and having a ratchet, a rock-shaft under control of said key-levers and carrying a type-wheel, and a moving and locking pawl for said ratchet, whereby the type-wheel is moved toward a platen and at the same time the carriage is moved one step and then locked until after the type-wheel has moved against the platen.

5. In a type-writing machine, the combination, with a paper-carriage, a shaft free to rotate and in operative connection with said carriage, and a series of type-key levers, of a ratchet on said shaft and a rock-shaft carrying a type-wheel and a pawl normally free from said ratchet and engaging therewith when the type-wheel is moved toward a platen.

6. In a type-writing machine, the combination, with a spacer-bar, a series of type-key levers, and a paper-carriage, of a shaft normally free to rotate in either direction and having operative connection with said carriage, a ratchet-and-pawl mechanism under the control of the type-key levers, and a second ratchet-and-pawl mechanism under the control of the spacer-bar for actuating said shaft to feed the carriage, said pawls being normally disengaged from said ratchets.

7. In a type-writing machine, the combination, with a series of type-key levers, a spacer-bar, and a paper-carriage, of a shaft free to rotate and having operative connection with said carriage, a rocker-shaft carrying a type-



wheel and under the control of the type-key lever, a ratchet mechanism connecting said carriage-operating shaft and the rock-shaft, and a second ratchet mechanism under the control of the spacer-bar.

8. In a type-writing machine, the combination, with a series of type-key levers, a spacer-bar, and a paper-carriage, of a shaft normally free to rotate in either direction and in operative connection with said carriage, a ratchet-and-pawl mechanism under the control of the type-key levers, and a second ratchet and pawl under the control of the spacer-bar, said pawl being normally disengaged from said ratchets and said ratchet mechanism operating successively in the order mentioned upon said shaft to give the carriage two successive impulses.

9. In a type-writing machine, the combination, with a series of type-key levers and a paper-carriage, of a shaft having operative connection with said carriage, a ratchet mechanism the ratchet of which is on said shaft, and the pawl on a moving part under control of the type-key levers and normally out of engagement with the ratchet.

10. In a type-writing machine, the combination, with a series of type-key levers and a paper-carriage, of a shaft free to rotate and in operative connection with said carriage, a ratchet mechanism the ratchet of which is on said shaft, and a pawl normally out of contact with said ratchet and on a moving part under control of the type-key levers.

11. In a type-writing machine, the combination, with a series of type-key levers and a carriage having a rack, of a shaft free to rotate and having a pinion meshing with said rack, and a ratchet mechanism the ratchet of which is on the said shaft and the pawl on a moving part under control of the type-key levers and normally out of engagement with the ratchet.

12. In a type-writing machine, the combination, with a paper-carriage and spacer-bar, of a shaft normally free to rotate and in operative connection with said carriage and having a ratchet, and a pawl under control of the spacer-bar and which is normally disengaged from said ratchet and normally out of contact with said ratchet when the spacer-bar is depressed and engages and moves said ratchet while said spacer-bar is returning to its normal position.

13. In a type-writing machine, the combination, with a paper-carriage, of a shaft normally free to rotate and in operative connection with said carriage and having a ratchet, a spacer-bar having a spring for returning it to its normal position when depressed, and a pawl normally out of engagement with said ratchet and connected to said spacer-bar by a link which moves said pawl in engagement with said ratchet when the spacer-bar is depressed and causes said pawl to move said ratchet when the spacer-bar is returning to its normal position.

14. In a type-writing machine, the combination, with a paper-carriage and a spacer-bar, of a shaft having mechanism thereon for moving said carriage, a ratchet for rotating said shaft and having a spring-guard, and a rocking pawl which passes outside said guard when the spacer-bar is depressed and between the guard and ratchet while the spacer-bar is returning to its normal position.

15. In a type-writing machine, the combination of a carriage-feeding shaft having a ratchet, a guard for said ratchet, a pawl having a cam-edge and a lateral flange, and a finger-lever controlling said pawl.

16. In a type-writing machine, the combination, with the paper-carriage, of a shaft having mechanism thereon for moving said carriage, a ratchet for rotating said shaft, and a pawl for moving said ratchet, having a cam-face which acts upon the teeth of said ratchet.

17. In a type-writing machine, the combination, with the paper-carriage, of a shaft having mechanism thereon for moving said carriage, a ratchet for rotating said shaft, having angular teeth with radial notches at the base of said teeth, and a pawl for moving and locking said ratchet, having a cam-face which acts upon said teeth and a flange-face which engages said radial notches.

18. In a type-writing machine, the combination, with a paper-carriage, of a shaft having mechanism thereon for moving said carriage, a ratchet for rotating said shaft, having angular teeth with radial notches at the base of said teeth, and a pawl for moving and locking said ratchet, having a cam-face to act upon said teeth and a flange-face to engage said radial notches and which pawl is normally out of engagement with said ratchet.

19. In a type-writing machine, the combination, with a paper-carriage and a series of type-key levers, of a shaft having mechanism thereon for moving said carriage, a ratchet for rotating said shaft having angular teeth with radial notches at the base of said teeth, and a pawl for moving and locking said ratchet and having a cam-face to act upon said teeth and a flange-face to engage said radial notches and is operated by the action of any of said type-key levers.

20. In a type-writing machine, the combination, with a paper-carriage and a series of type-key levers, of a shaft having mechanism thereon for moving said carriage, a ratchet for rotating said shaft having angular teeth with radial notches at the base of said teeth, and a pawl normally out of engagement with and for moving and locking said ratchet and having a cam-face to act upon said teeth and a flange-face to engage said radial notches and is operated by the action of any of said type-key levers.

21. In a type-writing machine, the combination, with a paper-carriage, a type-wheel, a series of type-key levers, a rock-shaft carrying said type-wheel and operated by said key-

levers, and a shaft for moving said carriage, of a pawl on said rock-shaft and moving therewith and having a cam-face and a flange-face thereon, and a ratchet on said carriage-moving shaft for rotating the same, which is moved and locked by the action of said pawl when any of the said type-key levers are operated.

22. In a type-writing machine, the combination, with a paper-carriage, a type-wheel, a series of type key-levers, and a spacing-lever, of a rock-shaft carrying the type-wheel and operated to impress the type-wheel by the downward stroke of the type-key levers, a connecting-pawl carried by said rock-shaft and forwardly actuated during the downward movement of the type-key levers, a second rock-shaft operated by the spacer-lever, a second cam-acting pawl carried by said second rock-shaft and forwardly actuated as the spacer-lever is moving up, a shaft for moving the paper-carriage, and two ratchet-wheels on said carriage-moving shaft and for rotating the same, one of which is actuated by the pawl controlled by the key-levers and the other by the pawl controlled by the spacer-levers.

23. In a type-writing machine, the combination, with the paper-carriage, the type-key levers, and a shaft in gearing with the paper-carriage, of a ratchet on said shaft and a pawl moved by said key-levers for acting upon said ratchet and having a cam-face and a laterally-acting joint on its axis, whereby it can swing laterally while moving axially to engage said ratchet.

24. In a type-writing machine, the combination, with rotating paper-carriage-moving shaft and a type-wheel-moving rock-shaft at right angles to said carriage-moving shaft, of a ratchet on said carriage-moving shaft for rotating the same, and a pawl on said type-wheel-moving rock-shaft for moving said ratchet.

25. In a type-writing machine, the combination, with a rotating paper-carriage-moving shaft and a type-wheel-moving rock-shaft at right angles to said carriage-moving shaft, of a ratchet on said carriage-moving shaft for rotating the same and having angular teeth with radial notches at the base of said teeth, and a pawl on said type-wheel-moving rock-shaft for moving said ratchet, having a cam-face for acting on said teeth and a flange for engaging said notches.

26. In a type-writing machine, the combination, with rotating paper-carriage-moving shaft and a type-wheel-moving rock-shaft at right angles to said carriage-moving shaft, of a ratchet on said carriage-moving shaft for rotating the same having angular teeth with radial notches at the base of said teeth, and a spring-resisted laterally-movable pawl on said type-wheel-moving rock-shaft for moving said ratchet, having a cam-face for acting on said teeth and a flange for engaging said notches.

27. In a type-writing machine, the combination, with a rock-shaft carrying the type-wheel and at right angles to the type-key levers,

and a rotating shaft for moving the paper-carriage and at right angles to said rock-shaft, of a ratchet on said carriage-moving shaft having angular teeth with radial notches at their base, and a pawl on said rock-shaft moving with the same and movable pivotally longitudinally of said shaft and having on its forward acting face a cam for acting upon said ratchet-teeth and on its rear face a flange concentric with said rock-shaft for engaging said radial notches and type-key levers which rock said rock-shaft.

28. In a type-writing machine, the combination, with a rock-shaft at right angles to the type key lever, and a rotating shaft for moving the paper-carriage and at right angles to said rock-shaft, of a ratchet on said carriage-moving shaft having angular teeth with radial notches at their base, and a pawl on said rock-shaft moving with the same and movable pivotally longitudinally of said shaft and having on its forward acting face a cam for acting upon said ratchet-teeth and on its rear face a flange concentric with said rock-shaft for engaging said radial notches and a finger-lever for rocking said rock-shaft.

29. In a type-writing machine, the combination, with a type-wheel and mechanism for rotating and vibrating said wheel and type-key levers, of tumblers acting upon said mechanism to both rotate and vibrate said wheel and in changing contact with said levers, whereby the leverage is compounded and made variable during the downward movement of the key-levers.

30. In a type-writing machine, the combination, with a type-wheel, mechanism for both rotating and vibrating said type-wheel simultaneously, and type-key levers, of tumblers acting upon said rotating and vibrating mechanism and having arms  $K^2$  in changing contact with said key-levers when the latter are depressed.

31. In a type-writing machine, the combination, with a type-wheel and its immediate actuating connections, and type-key levers for actuating said actuating connections, of tumblers having arms  $k^2$  changeably contacting with said key-levers and having gear-teeth  $k^3$  engaging like teeth  $b'$  on said key-levers.

32. In a type-writing machine, the combination of a type-wheel, mechanism for both propelling it toward the roller or platen and rotating it during such propelling movement, and key-levers for actuating said mechanism by a changeful leverage, substantially as set forth.

33. In a type-writing machine, the combination of key-levers having a bearing-face  $b^3$  and teeth  $b'$ , and the tumblers  $K$ , having arm  $k^2$  and teeth  $k^3$ , substantially as set forth.

34. In a type-writer, the combination of a type-wheel, driving-racks  $I I'$ , having frames  $i i'$ , ratchet-pawl  $J$ , having frame  $J'$  supporting shaft  $h^3$ , tumblers  $K$ , and key-levers  $B$ , substantially as set forth.

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



nation, with a series of type-key levers, of a type-wheel, a ratchet for stopping the axial movement of said type-wheel, mechanism for moving said type-wheel and having an operating-frame, a pawl for engaging said ratchet and having an operating-frame, and a series of tumblers connected with said key-levers for actuating both of said frames, which act upon the type-wheel-moving frame continuously during their movement and upon the pawl-moving frame at varying later points in their movement.

36. In a type-writing machine, the combination, with a series of type-key levers, of a type-wheel, a ratchet for stopping the axial movement of said type-wheel, an operating-frame, a pawl for engaging said ratchet and having an operative frame, and a series of tumblers connected with said key-levers for actuating both of said frames, which act upon the type-wheel-moving frame continuously during their movement and with varying leverage and upon the pawl-moving frame at varying later points in their movement.

37. In a type-writing machine, the combination, with a series of type-key levers, of a type-wheel, a ratchet for stopping the axial movement of said type-wheel, mechanism for moving said type-wheel and having an operating-frame, a pawl for engaging said ratchet and having an operating-frame, and a series of tumblers connected with said key-levers for actuating both of said frames and having uniformly positioned and bearing faces  $k'$  and variably-positioned bearing-faces  $k$ , which bearing-faces act, respectively, upon the type-wheel-moving frame continuously during their movement and upon the pawl-moving frame at varying later points in their movement.

38. In a type-writing machine, the combination, with a type-wheel which moves axially at the same time it moves laterally, and an eccentric ratchet which moves coincidently with said type-wheel, of a pawl for engaging said ratchet which stands in the plane of lateral movement of said ratchet and remains stationary while the said ratchet moves axially and laterally from or toward said pawl, and thereby passes its teeth in uniform proximity to said pawl, and mechanism for moving said pawl into contact with said ratchet as any desired tooth comes opposite said pawl.

39. In a type-writing machine, the combination, with a type-wheel, of a ratchet which moves axially coincidently with said type-wheel and has teeth of different length graded from an initial point, and a pawl acting upon said ratchet.

40. In a type-writing machine, the combination, with a type-wheel, of an eccentric ratchet which moves axially coincidently with said wheel and has teeth of differing length graded from an initial point, and a pawl acting upon said ratchet.

41. In a type-writing machine, the combination, with a type-wheel, of a ratchet that

moves axially coincidently with said wheel and has teeth of differing length graded from an initial point, which move in different paths, and a pawl which engages said ratchet.

42. In a type-writing machine, the combination, with a type-wheel which moves axially in opposite directions from an initial point, of a double ratchet, each part of which has teeth of differing length graded from an initial point, and a pawl which engages said ratchet.

43. In a type-writing machine, the combination, with a type-wheel which moves axially in opposite directions from an initial point, of a double ratchet which moves axially coincidently with said wheel and has the teeth of each of its parts correlatively positional of different lengths, graded oppositely from an initial point, and moving in different paths, and a pawl for engaging said ratchet.

44. In a type-writing machine, the combination, with a laterally-vibrating shaft, of a type-wheel which moves axially concentrically with said shaft, a ratchet-wheel which moves axially coincidently with said type-wheel and has teeth of differing length graded from an initial point, and a pawl which engages said ratchet.

45. In a type-writing machine, the combination, with a laterally-vibrating shaft, of a type-wheel which moves axially concentrically with said shaft in opposite directions from an initial point, a double ratchet which moves axially coincidently with said wheel and has the teeth of each part thereof of differing length graded from an initial point, and a pawl which engages said ratchet.

46. In a type-writing machine, the combination, with a rotating and laterally-vibrating shaft, of a type-wheel which moves axially concentrically with said shaft, a ratchet which moves axially coincidently with said type-wheel and has teeth of differing length graded from an initial point, and a pawl which engages said ratchet.

47. In a type-writing machine, the combination, with a rotating and laterally-vibrating shaft, of a type-wheel which moves axially concentrically with said shaft in opposite directions from an initial point, a double ratchet which moves axially coincidently with said wheel and has the teeth of each part thereof of differing length graded from an initial point, and a pawl which engages said ratchet.

48. In a type-writing machine, the combination, with a laterally-vibrating shaft, of a type-wheel which moves axially concentrically with said shaft, vibrates laterally with said shaft, and moves in opposite directions axially from an initial point, a double ratchet, the teeth of each part of which are of differing length graded from an initial point, moves axially coincidently with said wheel, is in operative connection to stop said wheel, and has the teeth of each part thereof moving in separate paths, and a pawl for engaging said

ratchet which has a graduated movement inversely proportional to the movement of said ratchet.

49. In a type-writing machine, the combination, with a rotating and laterally-vibrating shaft, of a type-wheel which moves axially concentrically with said shaft, vibrates laterally with said shaft, is shiftable in the direction of said shaft, and moves in opposite directions axially from an initial point, a double ratchet, the teeth of each part of which are of differing lengths graded from an initial point, moves axially coincidently with said wheel, is in operative connection to stop said wheel, and has the teeth of each part thereof moving in separate paths, and a pawl for engaging said ratchet which has a graduated movement inversely proportional to the movement of said ratchet.

50. In a type-writing machine, the combination, with a laterally-vibrating shaft, of an axially-moving type-wheel carried by said shaft, a ratchet for arresting the axial movement of said wheel which has an axial movement coincident with said wheel and has teeth of differing length graduated from an initial point, a pawl for engaging said ratchet, operating mechanism for actuating said type-wheel, shaft, and pawl, and a system of key-levers for actuating said operating mechanism.

51. In a type-writing machine, the combination of a type-wheel which is laterally vibrated to produce an impression of its type upon a pad or paper and is moved axially more or less in opposite directions from an initial point to position a letter or character, a ratchet for arresting the axial movement of the type-wheel at any degree thereof and which has oppositely-toothed faces, the teeth of both faces being of differing length and graded from a common initial point which coincides with the initial point of axial movement of the wheel, a pawl for engaging said ratchet which has a varying movement inversely proportional to the varying axial movement of said wheel, operating mechanism for imparting both the axial and vibrating motions to the wheel and the varying movement to the pawl, and a system of key-levers for actuating said operating mechanism.

52. In a type-writing machine, the combination, with a type-wheel which moves axially variably in opposite directions from an initial point to position its type and laterally to impress its positioned type, a ratchet for arresting the axial movement of said wheel at any degree thereof and which has oppositely-toothed faces, the teeth of both faces being of differing length and graded from a common initial point which coincides with the initial point of axial motion of said wheel, and a pawl for engaging said ratchet which has a varying movement inversely proportional to the varying axial motion of said wheel, of operating mechanism for imparting

the aforesaid movements to the said pawl and type-wheel, and a series of key-levers for actuating said vibrating mechanism to impart said varying action to said pawl and wheel and which move like distances to effect their purposes.

53. In a type-writing machine, the combination, with a type-wheel having all the characters of a field in a single peripheral row which moves axially to position a type and laterally to impress said type, of mechanism for moving said type-wheel laterally and axially simultaneously, and mechanism for stopping the axial movement of the wheel where the proper type is positioned without retarding or interfering with the lateral movement.

54. In a type-writing machine, the combination of a type-wheel which moves axially to position a type and vibrates laterally to impress said type, actuating mechanism which moves said type-wheel laterally, and thereby imparts to it a simultaneous axial movement until said axial movement is prevented, and then continues the said lateral movement until the type-wheel strikes the platen, a double-faced eccentric ratchet connected to and moving coincidently with said type-wheel, two pawls arranged on diametrically-opposite sides of the center of axial movement of said ratchet, which remain stationary until the proper type is to be positioned, and then engage said ratchet substantially simultaneously on opposite sides and in oppositely-pointed teeth, and then move laterally together with said type-wheel and key-levers, and connecting-gearing for imparting said movements to said type-wheel, ratchet, and pawls while any one of them is being depressed.

55. In a type-writing machine, the combination of a type-wheel which moves axially to position a type and vibrates laterally to impress said type, actuating mechanism which moves said type-wheel laterally, and thereby imparts to it a simultaneous axial movement until said axial movement is prevented, and then continues the said lateral movement until the type-wheel strikes the platen, a double-faced eccentric ratchet connected to and moving coincidently with said type-wheel, two pawls arranged on diametrically-opposite sides of the center of axial movement of said ratchet, which remain stationary until the proper type is to be positioned, and then engage said ratchet substantially simultaneously on opposite sides and in oppositely-pointed teeth, and then move laterally together with said type-wheel, a paper-carriage, a shaft and pinion for moving said carriage, a pawl-and-ratchet device for moving said shaft which is operated during the forward vibratory movement of the type-wheel and key-levers, and connecting-gearing for imparting said movements to said type-wheel, ratchet, pawls, shaft, and carriage while any one of them is being depressed.

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

- nation of a rotating or oscillating type-wheel, a pawl for arresting the rotation of the wheel, and a second pawl acting upon the same ratchet for arresting rebounding of said wheel, substantially as set forth.
57. In a type-writing machine, the combination of key-levers, a rotating type-wheel, and a single mechanism under the control of said key-levers, which mechanism rotates said wheel and at the same time vibrates it toward the platen or roller.
58. In a type-writing machine, the combination of key-levers, a rotating wheel, and a single mechanism which initially vibrates the wheel toward the platen or roller, and simultaneously rotates the type-wheel.
59. The combination, in a type-writing machine, of a type-wheel, a pinion connected with said type-wheel, and two toothed racks which are in simultaneous engagement with said pinion for rotating and vibrating it at the same time, one of said racks moving by the other to cause the motion of the type-wheel.
60. In a type-writing machine, the combination of a shaft, a type-wheel and pinion carried by said shaft, and two racks in engagement with said pinion and adapted to simultaneously rotate and laterally vibrate said type-wheel.
61. The combination, with type-key levers, of a type-wheel shaft, a pinion on said shaft, segmental racks on either side of and meshing with said pinion, and driving mechanism under the control of the key-levers for propelling the racks to cause the wheel-shaft to move toward the platen and rotate during such movement, substantially as set forth.
62. In a type-writing machine, the combination, with a type-wheel having axial movement and an eccentric ratchet, and a concentric ratchet-wheel moving coincidently with said type-wheel, of arresting-pawls, two for the eccentric ratchet and one for the concentric ratchet-wheel.
63. The combination of type-wheel shaft  $h$ , sleeve  $h'$  on said shaft, pinion  $h^2$ , an eccentric ratchet and a concentric ratchet-wheel on said sleeves, and two arresting-pawls for said eccentric ratchet and a third pawl acting on such concentric ratchet, substantially as set forth.
64. The combination of shaft  $h^3$ , supporting a type-wheel and type-wheel shaft  $h$ , a pinion  $h^2$  on shaft  $h$ , racks  $II'$ , with frames  $ii'$ , loosely supported on shaft  $h^3$  and engaging said pinion-arresting pawls  $J$  and  $L$ , loosely supported on shaft  $h^3$ , tumblers  $K$  on said shaft  $h^3$ , engaging said tumblers, and key-levers  $B$ , substantially as set forth.
65. In a type-writing machine, the combination, with a type-wheel having axial and vibratory movement and an eccentric ratchet, and a concentric ratchet-wheel moving coincidently with said type-wheel, of arresting-pawls, two for the eccentric ratchet and one for the concentric ratchet-wheel.
66. In a type-writing machine, the combination, with the cross-shaft  $a^3$  and the key-levers loosely hung upon said shaft, of a comb or separating device  $W$ , applied to the top of said levers above their pivots.
67. In a paper-carriage  $C$ , the combination of a roller  $D$  and a second or bearing roller  $E$ , consisting of a bar having at intervals along its length the adjustable rollers  $e'$ , adjustable laterally and normally held in place by friction, substantially as set forth.
68. In a paper-carriage, the combination, with a hinged roller  $D$  and a hinged roller  $E$ , which is supported in adjustable bearings, of a catch for engaging said roller  $E$  and holding both rollers in place.
69. In a paper-carriage, the combination of a hinged roller  $D$  and a roller  $E$ , journaled at one end in a hinged bearing and having a catch at the opposite end, substantially as set forth.
70. In a paper-carriage, the combination of a slotted standard  $c^2$ , the hinged rollers  $D$  and  $E$ , and catch  $e^3$ , pivoted in an elongated slot  $e^5$  in standard  $c^2$  and having a reacting spring, substantially as set forth.
71. In a paper-carriage, the combination of a standard  $c^3$ , having an elongated slot  $e^{10}$ , a journal  $e^9$ , pivoted in said slot, a reacting spring for said journal, a roller  $E$ , supported at one end in bearing or journal  $e^9$ , and a spring-catch at the opposite end of roller  $E$ , substantially as set forth.
72. In a paper-carriage, the combination of a rotating roller  $E$ , hinged at one end and free at its other end, and the removable roller  $D$ , substantially as set forth.
73. In a paper-carriage, the combination, with the hinged rollers  $D$  and  $E$ , of the presser-plate  $F$ , substantially as set forth.
74. In a paper-carriage, the combination, with the paper roller or platen, of a sleeve or collar  $d^2$ , having ratchet-cam  $d^3$  and pawl  $d^5$ , and adjusting-screw for said ratchet-cam, substantially as set forth.
75. In a paper-carriage, the combination of a tubular sleeve  $c^{11}$ , having turning wheel with ratchet  $c^{15}$ , a collar  $d^2$ , having cam-ratchet  $d^3$  and lever  $d^5$  for engagement with ratchet  $c^{15}$ , a retaining-pawl  $c^{17}$  for ratchet  $c^{15}$ , and an adjusting-screw  $d^8$  for cam-ratchet  $d^3$ , substantially as set forth.
76. In a type-writing machine underscoring or analogous device, the combination, with a pivoted plate, of separate boxes containing marking-wheels and ink-rollers or supplies and said marking-wheels in the separate boxes being arranged in different planes, substantially as set forth.
77. In a type-writing machine, the combination, with the pivoted plate  $g$ , of boxes  $g^4 g^5$ , one containing a vertically-located and the other a horizontally-located marking-wheel with ink-supply, substantially as set forth.
78. In a type-writer, the combination, with the plate  $g$ , having oppositely-inclined faces,

of marking-wheel boxes with ink-supplies on said plate, and a reacting spring for the plate, substantially as set forth.

79. In combination with a type-wheel and its shaft, a supporting cross-shaft  $h^3$ , levers  $R$   $R'$ , and devices interposed between said levers and mechanism supported on shaft  $h^3$  and the lower end of the type-wheel shaft for raising the latter and the type-wheel, substantially as set forth.

80. In combination with a cross-shaft  $h^3$ , the type-wheel and its shaft supported on shaft  $h^3$ , mechanism mounted on shaft  $h^3$  and in engagement with the lower end of the type-wheel shaft, and separate key-levers and actuating devices for said mechanism on shaft  $h^3$  for raising the type-wheel and its shaft, substantially as set forth.

81. The combination of a vibrating type-wheel, a rod secured to the frame of the machine, and a vibrating arm pivotally secured to the rod and having an ink-roller projected in the path of said wheel and vibrated thereby.

82. In a type-writing machine, the combination of a type-wheel and the reversible standard  $l^9$ , having at each end pivoted arms with inking-rollers constructed to be independently used, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE C. BLICKENS DERFER.

Witnesses:

JOHN RODGERS,  
S. J. VAN STAVOREN.