

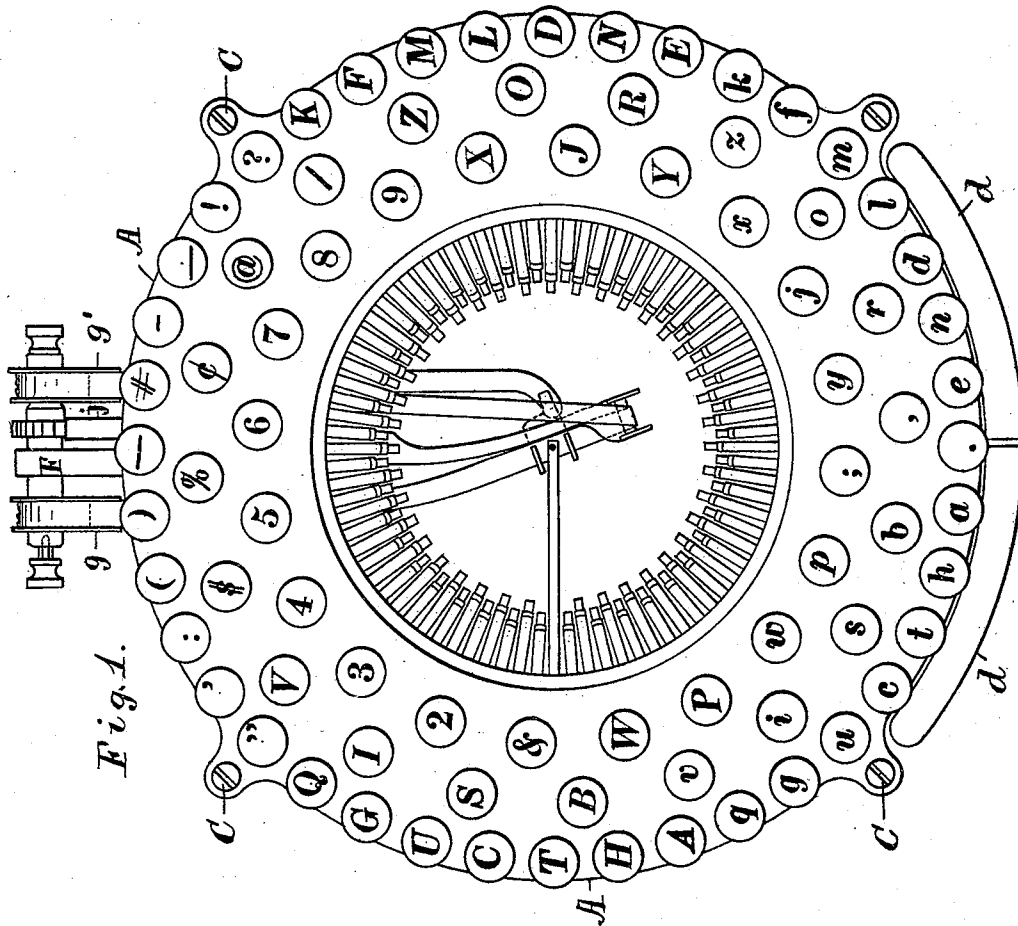
(No Model.)

10 Sheets—Sheet 1.

J. M. CRARY.
TYPE WRITING MACHINE.

No. 477,353.

Patented June 21, 1892.



Attest:
L. Lee.
F. C. Fisher.

Inventor.
Jos. M. Crary, per
Crane & Miller, attys.

(No Model.)

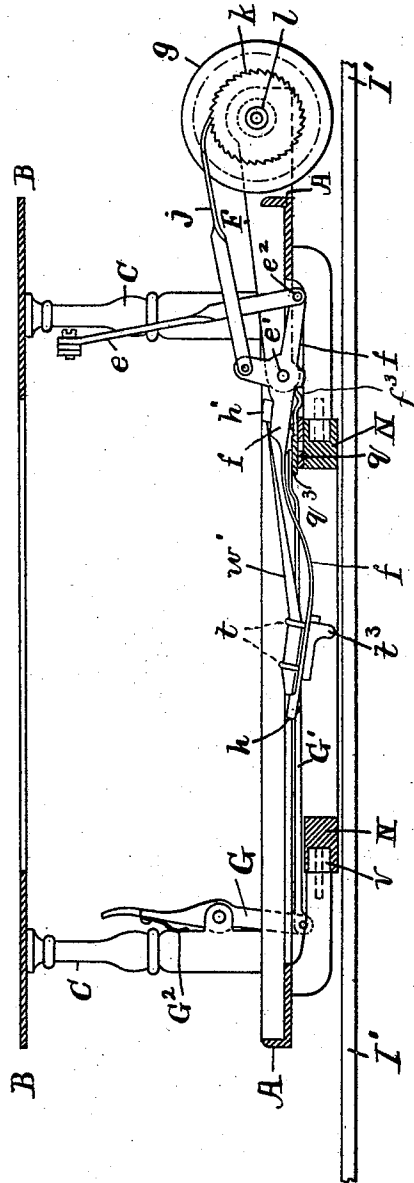
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Fig. 2.



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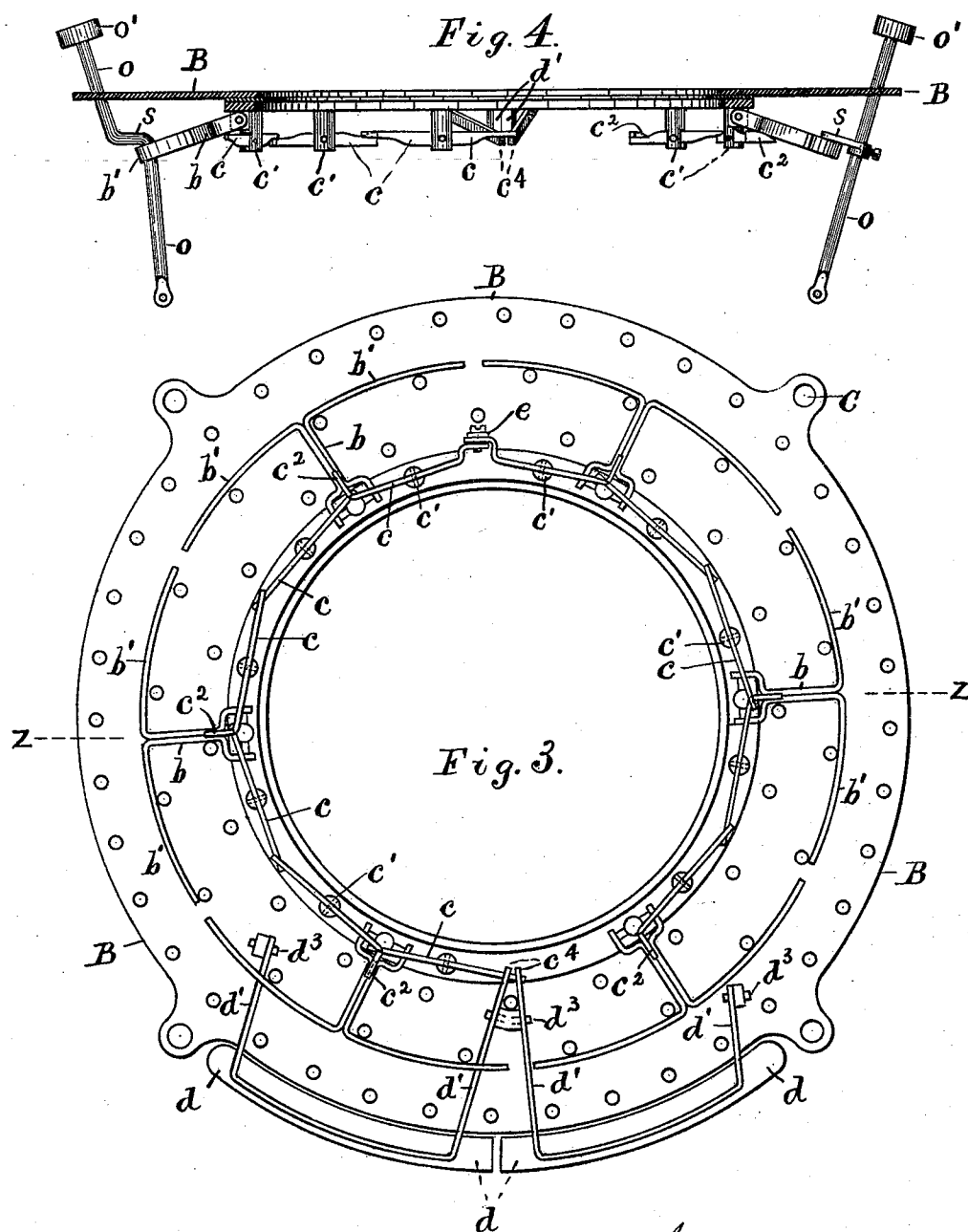
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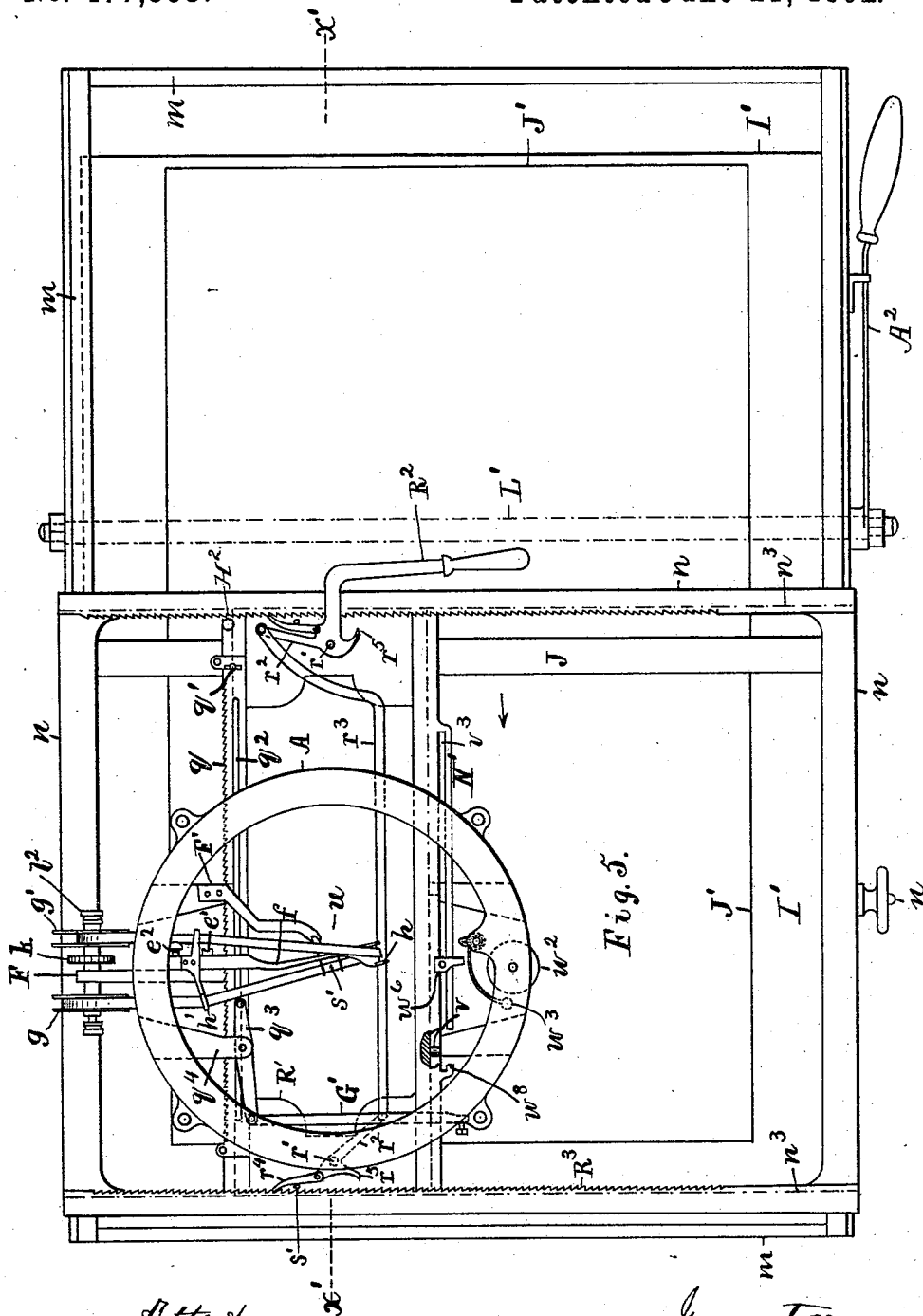
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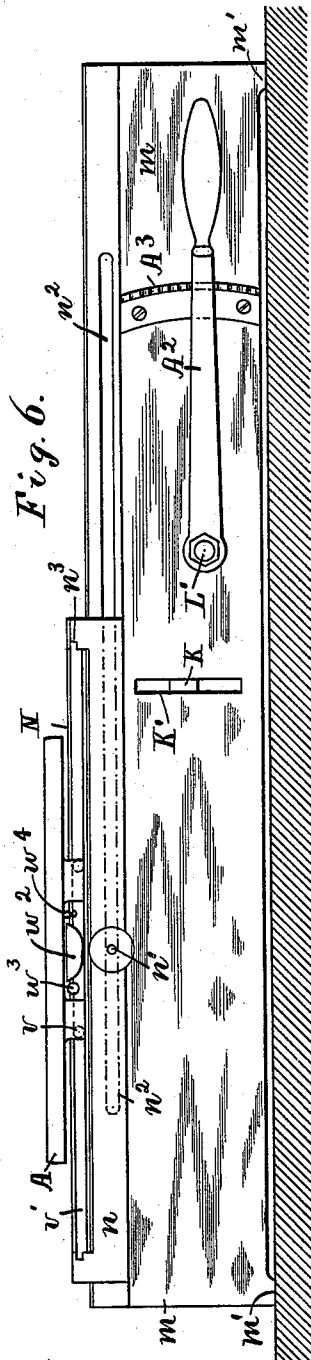
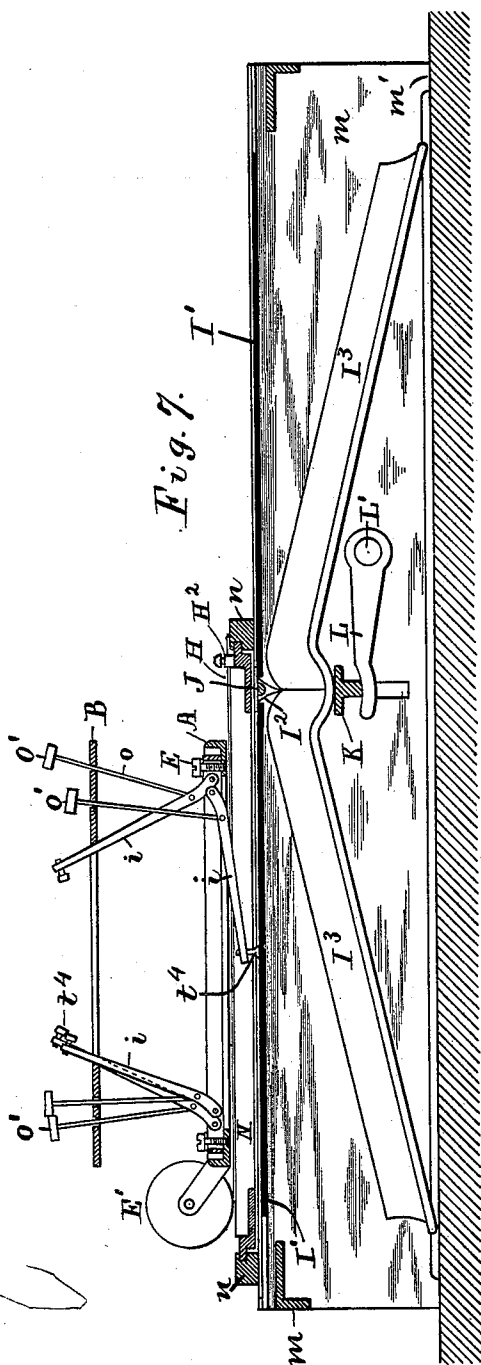
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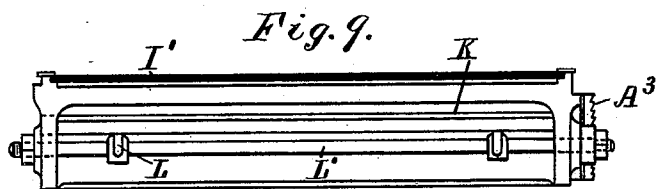
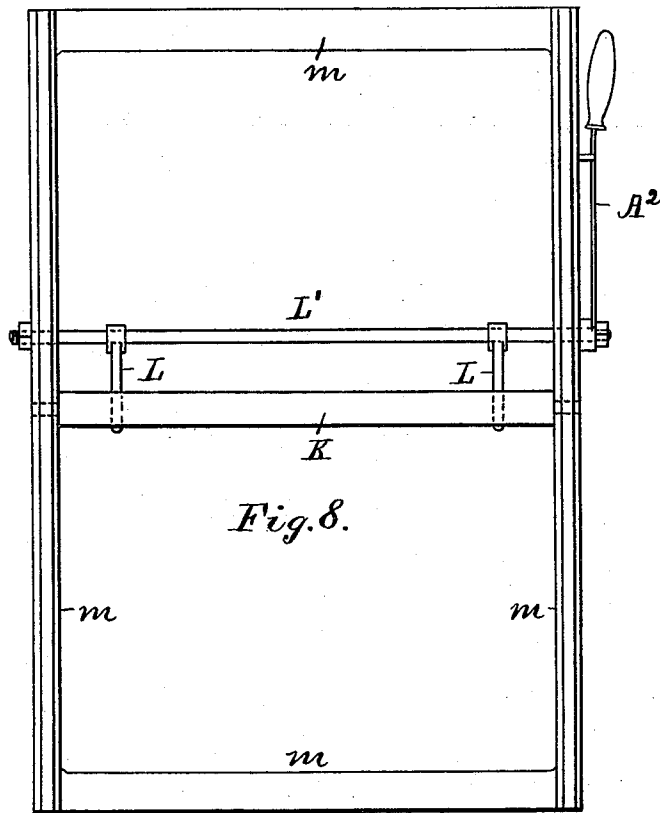
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(No Model.)

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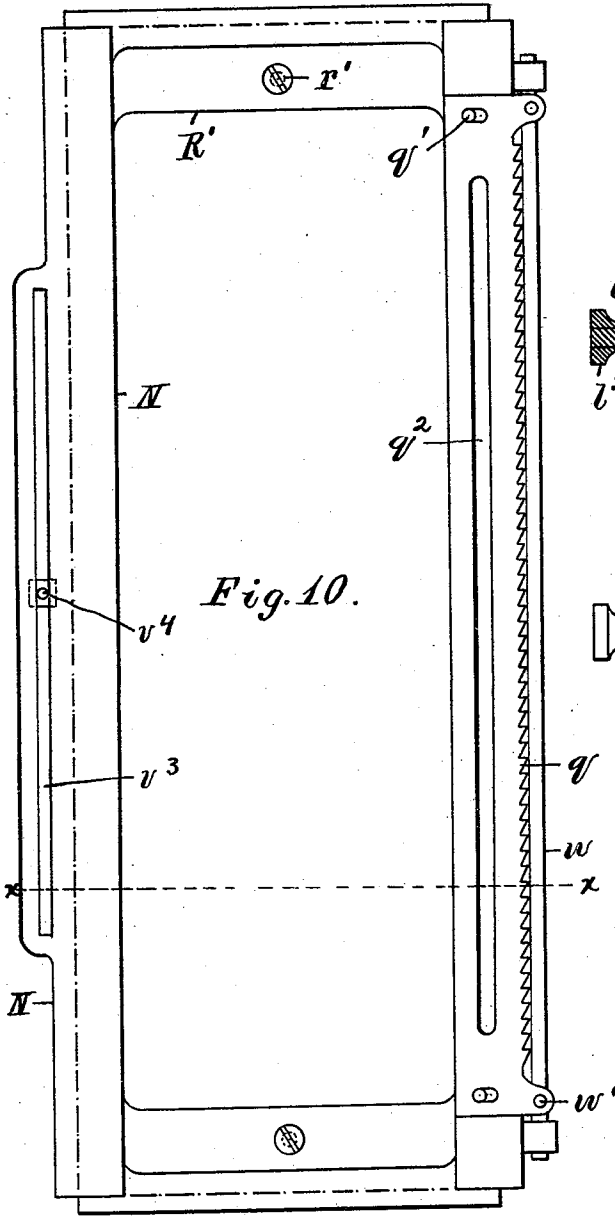


Fig. 12.

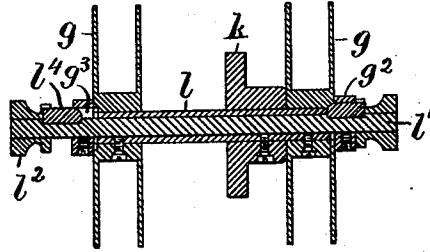


Fig. 13.

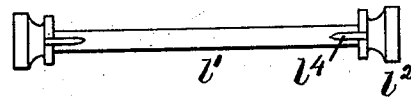
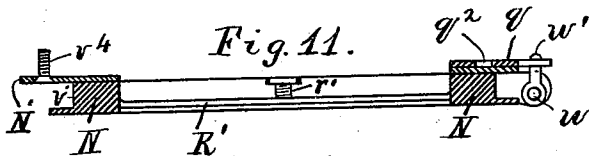
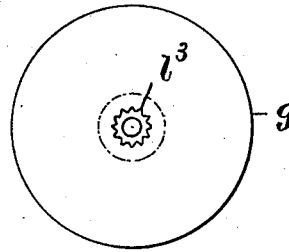


Fig. 14.



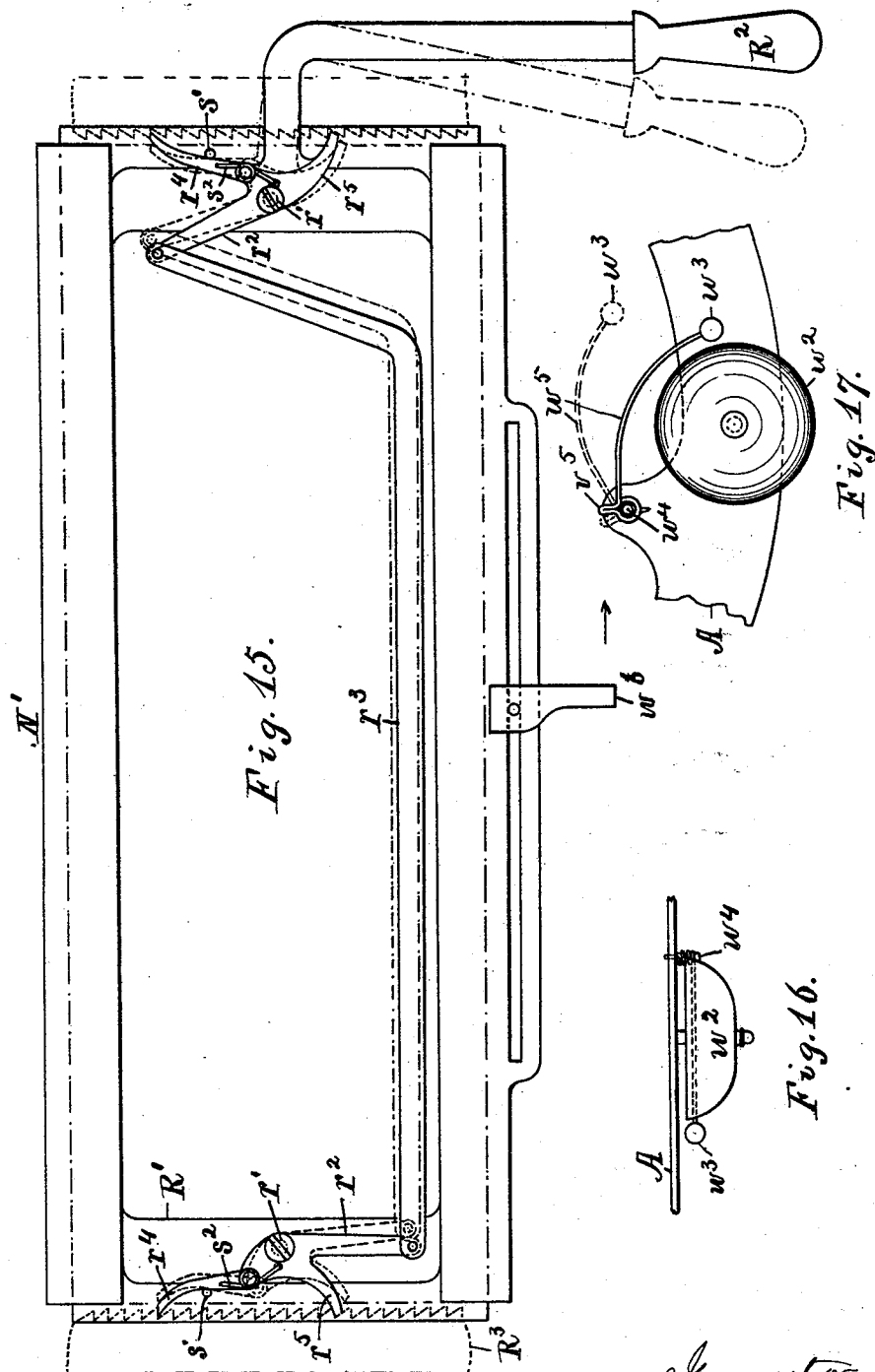
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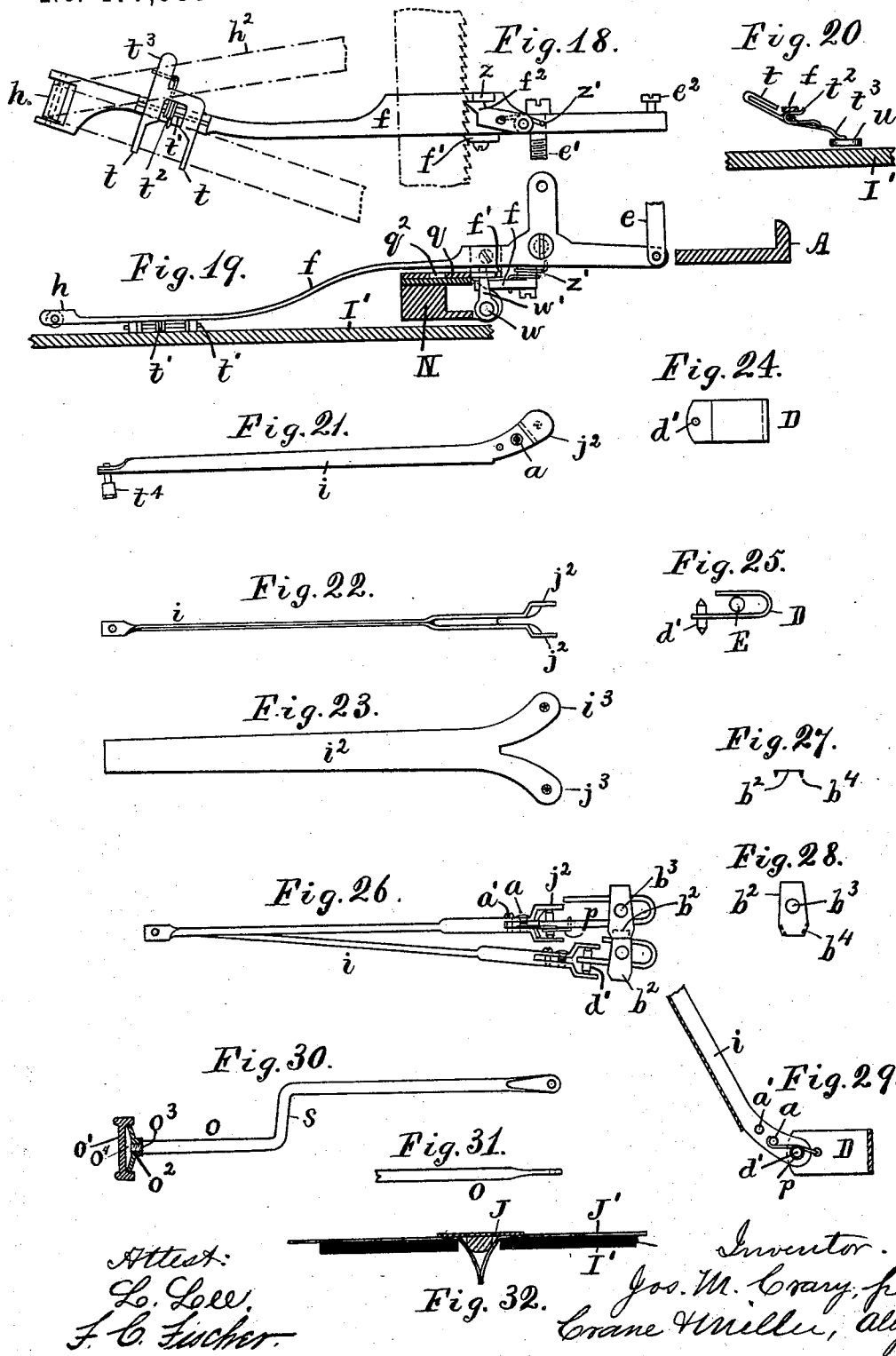
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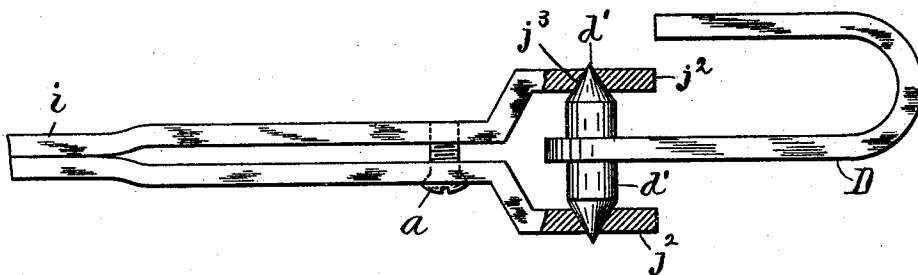
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Fig. 33.



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UNITED STATES PATENT OFFICE.

JOSEPH M. CRARY, OF JERSEY CITY, NEW JERSEY.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 477,353, dated June 21, 1892.

Application filed January 3, 1891. Serial No. 376,606. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH M. CRARY, a citizen of the United States, residing at Jersey City, Hudson county, New Jersey, have invented certain new and useful Improvements in Type-Writing Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates partly to improvements in the type-actuating mechanism of a type-writer and partly to a construction and arrangement of the mechanism for printing upon a platen below the level of such mechanism.

The invention therefore consists partly in the combination, with a type-actuating mechanism, of devices for supporting the leaf of a book upon a platen and moving the type-actuating mechanism laterally and longitudinally over such leaf to enter a record in printed impressions in such book.

The improvements in the type-actuating mechanism and in the ribbon feeding and supporting mechanism may be used with or without the book-supporting and leaf-holding devices.

The nature of the improvements will be understood by reference to the annexed drawings, in which—

Figure 1 is a plan of the type-actuating mechanism. Fig. 2 is a transverse section, where hatched, of the same on the center line of Fig. 1, with type-bars and key-rods omitted. Fig. 3 is a view of the under side of the guide-plate with the feed-levers pivoted thereon. Fig. 4 is a section of the guide-plate on line z in Fig. 3, with certain of the levers omitted. Fig. 5 is a plan of the bed for the leaf-holding mechanism with the fulcrum-plate A of the type-writing mechanism and the frame and carriage for supporting the same upon the bed. Fig. 6 is a front elevation of the same. Fig. 7 is a section on line $x'x'$ in Fig. 5. Fig. 8 is a plan of the bed and book-lifter. Fig. 9 is an end view of the bed and platen. Fig. 10 is a plan of the carriage, and Fig. 11 a section of the same on line xx in Fig. 10; Fig. 12, a section of the ribbon-spools and their spindle; Fig. 13, the clutch-rod detached; Fig. 14, a side view of one spool. Fig. 15 is a diagram of the line-spacing mechanism. Figs.

16 and 17 are details of the alarm. Fig. 18 shows the under side of the spacing-lever. Fig. 19 is an edge view of the same with adjacent parts in section, and Fig. 20 is a section of the lever adjacent to the ribbon-twister. Fig. 21 is a side view of one of the type-bars; Fig. 22, a plan of the same; Fig. 23, the blank for making the type-bar. Fig. 24 is a side view, and Fig. 25 a plan, of the hanger; Fig. 26, a plan of two key-bars and their hangers. Fig. 27 is an end view, and Fig. 28 a plan, of one of the washers for hanger-screw. Fig. 29 is a section of the hinge block and foot of the type-bar. Fig. 30 is a side view of one key-rod with the key-button and its nut in section; Fig. 31, the flattened part of the rod. Fig. 32 represents in section the adjacent edges of the platens with portions of two leaves clamped thereon. Fig. 33 is a plan, upon a large scale, of one of the type-bars pivoted to its hanger, the latter being in section through the center of the sockets j^3 .

The types in the present machine are intended to print downward and the type-bars are therefore hinged at their lower ends, with their free ends held normally raised by a spring. With this arrangement of the type-bars the key-rod may be pivoted directly to the type-bar near its hinge or fulcrum and its upper end be provided with the key to receive the pressure of the finger, and the direct impulse of the key-rod then forces the type-bar down in opposition to the spring. The type-bars are necessarily hinged upon a circular fulcrum-plate to direct the type upon a common printing-seat, and the type bars and keys may be arranged around the entire circle or upon a segment of the same, as may be required, to furnish the desired number of characters. To guide the key-rods in a vertical or inclined position over the fulcrum of the type-bars, a guide-plate B is sustained above the fulcrum-plate and the key-rods are inserted through the same.

In Fig. 2 A is an annular fulcrum-plate, and B an annular guide-plate connected thereto by posts C. Slotted hinge-blocks or hangers D are secured in a circle adjustably upon the plate A by screws E, and type-bars i are pivoted thereto, with key-rods o projected upward through the plate B. The type-bar and

hinge-block or hanger are shown upon a larger scale in Fig. 33 and in Figs. 21 to 25, inclusive, the type-bar being formed by folding longitudinally a flat piece of sheet metal cut to the desired shape, as shown in Fig. 23, and pressing the two sides of the sheet metal into close contact to form the body i of the bar, while the ears i^3 (shown upon the sheet metal in Fig. 23) are separated to form a fork. The sides of the branches j^2 , which compose the fork, are provided with conical sockets j^3 , adapted to fit the ends of the hinge-pin d' , and a screw a , with countersunk slotted head, is inserted in the branches to clamp them adj-
 15 justably upon the pin to form a closely-fitting hinge. A transverse pin a' is inserted through the branch adjacent to the hinge to receive the lower end of the key-rod o . A spring p is applied to the hinge-joint to hold the key-
 20 bar normally raised, as shown in Fig. 29, the spring being formed by a coil of wire wound around the pivot-pin d' , with one end applied beneath the screw a and the other end inserted in a hole in the hinge-block.

By forming the type-bars of a blank of sheet metal doubled the utmost lightness and stiffness are secured, and by forming branches at the foot of the type-bar with a clamp-screw a inserted through the same the bar may be
 30 hinged to the pointed pivot d' , provided upon the hanger D, and entire freedom from lost motion be secured.

In Fig. 22 it will be noticed that the sides of the sheet metal are separated a short distance adjacent to the branches J^2 , thus forming a trough shape, which adds materially to the stiffness of the bar near its foot. By such trough-like construction the lower end of the key-rod may be inserted between the two
 40 branches, and the pin a' , which forms the pivot for such rod, may be supported securely at both ends, thus greatly increasing its firmness and durability. Such pin is shown in Fig. 26 formed as a small screw, but may be riveted in instead of tapping it.

The adjusting-screw a is shown in Figs. 21 and 26 with countersunk head, by which construction it is better adapted to clear the branches of the adjacent lever, and the hang-
 50 ers D may thus be set closer together and a greater number of them accommodated within a given circle.

Heretofore the binding-screw E has, when tightened by a screw-driver, tended to wrench the hanger out of its normal position, and to prevent the twisting of the hangers in my construction I provide oblong washers b^2 , Figs. 26 to 28, inclusive, having one end wider than the other, with small ears b^4 bent down-
 60 ward from the wider end in a suitable manner to embrace the narrow end of the adjacent washer, as shown in Fig. 26. By these means the binding-screw is rendered not only incapable of deranging the fit of the type-bar upon the pivot d' , but is also prevented from wrenching the hangers themselves out of position when the binding-screws are tightened:

The type-bars may therefore be set with the greatest nicety to apply the types exactly upon the same point of the printing-seat, and their fit upon the pivot d' may also be read-
 70 justed at any time if they become loosened by wear.

The upper end of the key-rod o is reduced in size to form a shoulder o^3 and is provided with a screw-thread, and the key-button o' is provided with a nut o^2 upon its under side to screw upon the thread to the shoulder o^3 . The nut is secured in the key-button in the usual manner by forming it of sheet metal in the
 80 dish shape and expanding the nut by pressure within a recess o^4 within the button. Such expansion is performed after the key-rods are adjusted in the machine and the nuts screwed down to their shoulders with
 85 each button upon its nut, with the index character y (shown in Fig. 1) in the desired position. By this construction the buttons are made detachable from the key-rods, and at the same time may be restored to their initial
 90 position by screwing the nut down to the shoulder.

Three annular rows of keys are shown in Fig. 1, and in Figs. 3 and 4 is shown the means of transmitting the movement of the
 95 keys to the link e , which actuates the spacing or feeding mechanism. A series of levers c are pivoted upon fulcrum c' beneath the inner edge of the guide-plate B, with the opposite ends of the levers arranged alternately over
 100 and under one another to transmit the movement to the rear of the plate B, where the contiguous ends of two levers are coupled to a depending link e for actuating the feed. A series of segment-levers b are pivoted to the
 105 under side of the plate B adjacent to the alternate ends of the levers c , which at such points are provided with toes c^2 to receive the pressure of the levers b , as shown at the right side of Fig. 4. The levers b are furnished
 110 with segments b' , projected between the several annular rows of key-rods a little distance below the plate B. Each key-rod is furnished with an offset s , resting upon one of the segments, so that the actuation of any key serves
 115 to depress the segment and to actuate the connected lever b and the series of levers c . The offsets s may be made by projecting a separate piece from the key-rod, as shown at the right side of Fig. 4 and in other figures.
 120 Where the rod is offset by bending, as at s in Fig. 4, it is obviously necessary to remove the key-button from the rod to pass the rod through the guide-plate B from the under side, for which reason detachable buttons are
 125 absolutely necessary. The usual method of securing the button-disks to the key-rods by riveting and soldering would not therefore be applicable with an offset key-rod.

As the link e , Fig. 2, is actuated by any of the keys, it is obvious that a key disconnected from a type-bar may be used as a spacing-key; but to secure a spacing-key of larger area I provide levers d' , which are pivoted by pins d^3 to

the under side of the plate B and are extended inwardly at their ends c^4 across one of the levers c and outwardly beyond the front edge of the plate B. Finger-plates d are secured upon the projecting ends of the levers adjacent to the edge of the guide-plate, and thus form long spacing-keys, which are readily reached by the operator after actuating any of the character keys or buttons.

The link e is shown in Fig. 2 extended downward to the rear end of the spacing-lever f , which is pivoted upon an ear F, attached to the rear edge of the plate A. The lever is provided with separate pawls f' and f^2 to co-operate with a feeding-rack and with a pawl j to operate upon a ratchet-wheel k for shifting a fresh portion of ribbon beneath the type after each impression.

As it is necessary to view each impression when formed in a book of record, so as to obviate in the highest possible degree the introduction of errors, the ribbon adjacent to the printing-seat, where the types operate, is provided with a lifting device. This device is preferably operated to twist the ribbon upon one of its edges so as to lift the opposite edge from the paper, by which the impression last made is exposed to the eye directly over the center of the plate B. To actuate such twisting device without complicating the mechanism, I extend the spacing-lever past the printing-seat and attach the ribbon-twister thereto.

To compact the mechanism and locate the ribbon-spools near together at an accessible point, I mount a spindle l transversely in a bearing in the lug F, with the ratchet-wheel k attached thereto, and I fit the two spools g g' upon the opposite ends of the shaft and carry the ribbon w' from the same side of both spools over a loop-guide h upon the end of the spacing-lever f , thus forming a loop in the ribbon, one side of which is drawn off from one of the spools as the opposite side is wound upon the other spool. The spools, as shown in Fig. 16, are provided each upon its outer side with clutch-teeth, formed by punching a star-shaped aperture l^3 in the flange of the spool. A collar g^2 is applied to each end of the spindle to hold the spool thereon, and a notch g^3 is formed in the collar to admit a feather. A clutch-rod l' is inserted through the spindle l and provided with a knob l^2 at each end. Feathers are fitted in the opposite ends of the spindle l to slide through the notches g^3 in the collars. The ends of the feathers, as shown in Fig. 13, are tapered to readily penetrate the notches in the spool-flanges, and the feathers are so adjusted upon the clutch-rod that a longitudinal movement of the rod pushes one of the feathers into one spool as the opposite feather is withdrawn from the other spool. By this construction the ratchet-wheel for shifting the ribbon may rotate continuously as the keys are actuated, and the mere shifting of the clutch-rod operates simultaneously to disengage one spool

from the spindle and to engage the other spool with the spindle when, as the ribbon is drawn from the same side of both spools, the spool engaged with the spindle operates to wind up the ribbon, while the other spool is by the movement of the ribbon rotated in a direction contrary to the spindle, so that when the driving-spool is disengaged and the opposite spool engaged the motion of the ribbon is reversed. A ribbon-guide h' is affixed to the lever f in a line with the loop-guide h and the printing-seat s' , so that the ribbon crosses the printing-seat and is subjected to the blows of the type.

The ribbon-twister t consists in a slotted holder, through which the ribbon passes adjacent to the printing-seat, the holder being pivoted upon the spacing-lever f by pin t' at one side of the printing-seat and held normally raised with the ribbon in a twisted position by a spring t^2 . An arm t^3 is projected from the holder toward the opposite side of the lever f and is pressed by the spring upon a bearing u , attached to the plate A. A spring f^3 holds the front end of the lever f normally raised, in which position the ribbon is not only lifted bodily from the paper, but the ribbon-twister is actuated by its spring t^2 to twist the ribbon, and thus freely expose the impression beneath. The depression of a key operates to raise the rear end of the lever f , the pivot to which the link e is attached being shown at e^2 in Fig. 5 in the rear of the lever-fulcrum e' . The key-movement therefore depresses the front end of the spacing-lever and presses the loop-guide, with the ribbon, down to the paper, while the arm t , resting upon the bearing u , rotates the twister upon its pin t' and turns the ribbon into a flat position close to the paper, as in Fig. 19. Such movement of the ribbon is effected while the type-bar is being moved downward by the key, so that the ribbon lies flat before the type makes its impression.

The under side of the spacing-lever is furnished with a pawl f^2 to operate upon a feed-rack for moving the type-writing mechanism and the paper in relation to one another, and the spacing-lever thus performs the triple function of actuating the ribbon-lifter, actuating the spacing-pawl, and actuating the ribbon-feed by means of the pawl j .

The plates A and B, with the type-bars and the finger-rods mounted thereon, and the means for actuating the link e and the ribbon-shifter constitute what I have termed herein the "type-writing mechanism," and which may be combined with any suitable means of supporting and moving the paper to form a type-writing machine.

I have shown herein the application of the type-writing mechanism to printing entries in books of record, as tax-books, records of deeds, mortgages, &c. As such books are large and heavy, it would not be easy to shift them beneath the type-writing mechanism

after making each type-impression, and I have therefore devised means for moving the type-writing mechanism laterally and longitudinally over a bed sustaining a leaf of the book, so as to suitably space the letters in the lines and to space the lines upon the leaf. The leaf of a book is more readily exposed to the action of the type by inserting a platen beneath it, the book in such case lying underneath the platen, while the leaf is clamped to the upper side of the platen to hold it from shifting.

In Fig. 5 is shown a bed *m*, consisting in four bars united at the corners. The bed is of suitable depth and size internally to receive the book (with the leaves opened) in which the inscription is desired. A frame *n* is fitted transversely to the longer sides of the bed and is movable thereon to expose either leaf of the book, and may be clamped in any position by a screw *n'*, having its shank fitted to a slot *n*² in the side of the bed. A carriage *N* is fitted to grooves *n*³ in the edges of the frame to move transverse to the bed—that is, up and down over the book-pages—and the inner edges of the frame are provided with racks *R*³ to fit pawls *r*⁴ for moving the carriage *N* on the frame *n* for spacing the lines of type-writing. The plate *A* of the type-writing mechanism is provided with feet *F'*, having rolls *v*, fitted to grooves *v'* along the edges of the carriage. A feed-rack *q* is attached to one bar of the carriage beneath the spacing-lever *f* and is held movably by screws *q'*, inserted in transverse slots at the ends of the rack. A small shaft *w* (see Figs. 2, 10, and 19) is pivoted along the side of the carriage and provided with two arms *w'*, fitted to holes in the opposite ends of the rack to give it a parallel motion. A longitudinal slot *q*² is formed in the rack and a lever *q*³ is pivoted upon a brace *q*⁴ upon the plate *A* and is provided with a pin fitted to the slot. A lever *G* is pivoted upon the plate *A* and connected by a link *G'* with the end of the lever *q*³ and a spring *G*² is applied to the lever *G* to hold the rack normally toward the pawl *f*² upon the spacing-lever. Pressure upon the lever *G* operates to retract the rack from engagement with the pawls, so that the plate *A*, carrying the entire type-writing mechanism, can be retracted freely upon the carriage *N* to begin a new line. The pawl is held against a stop *z* by a spring *z'*, adjacent to a fixed pawl or tooth *f'*, and is movable toward the tooth one space of the rack *q*. A spring-barrel *E'* (see Fig. 7) is affixed to the plate *A* and a cord *H'*, wound around the same, is extended beneath the plate to a peg *H*² upon the right-hand side of the carriage *N* to shift the type-writing mechanism as the pawl is actuated. The spring *z'* is made very light, so that when the spacing-lever is raised and the pawl engaged with the rack *q* the pawl is pressed against the tooth *f'* by the tension of the cord. The pawl, as shown in Fig. 2, is made at its end of a thin plate and moved clear of the rack at each depression of the

spacing-lever when a type is operated and is then thrown against the stop *z* by the spring *z'*. The elevation of the spacing-lever after each type-impression engages the pawl afresh with the rack and permits the plate *A* to move upon the carriage by the shifting of the pawl into contact with the tooth *f'*, as already described. The entire type-writing mechanism is thus shifted upon the carriage at each vibration of the type or spacing lever.

Figs. 7 and 9 show grooves *I* inside the long edges of the bed *m* to admit a platen *I'*, formed of hard rubber or other suitable material. In Fig. 7 two such platens are shown to support simultaneously two leaves *I*² from a book *I*³. The adjacent edges of the platens are crowded under a thin-edged clamp-bar *J*, which is fitted movably at its opposite ends in the grooves *I*. A transverse bar *K* is fitted at its ends to slots *K'* in the sides of the bed and moved vertically by arms *L* upon a cross-shaft *L'*. A spring-lever *A*² and a ratchet *A*³, attached to the side of the bed, furnish the means of rotating the shaft to lift the bar *K* and to sustain it in any position. By withdrawing the platens from the grooves *I* the book *I*² may be laid inside the open bed with the back resting upon the bar *K*. When laying the book upon the bar *K*, the frame *n*, with all the printing mechanism, would be pushed to the extreme end of the bed, the contact of the screw *n'* with the end of the slot *n*² preventing it from moving too far. The book may be then readily inserted in the bed and elevated to the level of the platens by the handle *A*². By raising the book close to the platens the entire width of a leaf may be exposed upon either one of the platens, excepting a narrow margin at the back of the book. The opposite ends of the clamp-bar *J* are then inserted in the grooves *I* in the bed over the joint of the book, as shown in Fig. 7, and the leaf or leaves upon which the inscription is desired are then raised from the book and the platen or platens slid into the grooves and pressed beneath the clamp and leaf or leaves, the elastic edges of the clamp thus securing the leaf or leaves in place.

The clamp *J*, as shown in Figs. 7 and 32, is a thin plate of elastic material (as sheet steel or brass) reinforced at the middle with a stiffening-bar. The elastic edges of such a clamp are self-adjusting to the thickness of the leaf *J'*, and thus operate to clamp it automatically as soon as the edge of the platen is shoved underneath the clamp and leaf lying thereon, thus holding the leaf extended upon the platen with sufficient firmness to retain it in place during the printing operation. The frame *n* may then be moved over either page of the book, Fig. 5 representing it over the left-hand page, with the leaf *J'* resting upon the platen beneath the carriage. The frame *A* of the type-writing mechanism is then adjusted to print a line across the page, and when such line is printed the carriage is moved downward over the page by line-spac-

ing mechanism, as shown in Figs. 5 and 15. In these figures studs r' are shown inserted in plates R' , extending across the bottom of the carriage at its opposite ends, and pawl-levers are shown pivoted upon the studs, with arms r^2 extended in opposite directions and connected by a link r^3 . Each pawl-lever has a pawl r^4 pivoted thereon, and one of the levers is furnished with a handle R^2 to move both levers and pawls at once. The pawls engage racks R^3 along the edges of the frame n , and the movement of the handle R^2 a suitable distance to the left, as indicated by the arrow in Fig. 5, operates to press the studs r' toward the operator and to shift the carriage downward in the frame the necessary space to print another line. A little farther movement of the handle in the same direction brings the middle of each pawl in contact with a pin s' and throws the pawls out of the racks R^3 , as indicated by the dotted lines in Fig. 15. The movement of the handle in the reverse direction draws the pawls downward to engage the next tooth in the rack R^3 , and at the same time throws a dog r^5 (formed upon the arm r^2) into contact with another tooth of the rack, as shown in the full lines in Fig. 17. Springs s^3 , applied to the arms, serve to press the pawls into the racks and to hold the dog normally into contact with the rack, which serves to lock the carriage from any displacement until the handle R^2 is again moved to shift the carriage downward. An adjustable bell or alarm may be applied to indicate when the line of printing has reached the edge of the leaf J' . The line-spacing mechanism is operated at the end of each line until the carriage N' has been traversed downward to print upon the entire leaf J' , and the handle R^2 is then adjusted to set the line-spacing mechanism in the position indicated by dotted lines in Fig. 17, when the carriage and type-writing mechanism may all be shifted again to the top of the leaf. When both the leaves exposed upon the platens I' are printed, the frame n , with the type-writer mechanism, would be shifted alternately to the right and left hand end of the bed m . The operator would thus alternately expose both the leaves of the book, the platens would be withdrawn, and fresh leaves would be raised from the book to clamp upon the platens, as before. All the pages in the book may thus be written in succession while it is held within the bed m .

The bed m is shown without any bottom plate, merely resting upon its corners or feet m' ; but, if preferred, a bottom may be secured in the frame, so that it may be lifted and moved with the book therein, and the book thus prevented from displacement in case the apparatus is moved during an intermission of the work.

From the above description it will be seen that if the bed m be made to admit the largest book that is intended to be printed any book of smaller dimensions may be readily inserted therein, supported upon the bar K , and

its leaves clamped upon the platen with entire facility.

It will be noticed that the ribbon over the printing-seat is actuated with a double movement, being not only lifted from the paper by the vibration of the arm f , as shown in Fig. 2, but also twisted along one edge immediately over the printing-seat. By such double movement the printed impression made by the last type is incessantly exposed to view before a subsequent impression is made and is visible to the eye of the operator, which can be applied only directly over the middle of the plate B inside the circle of type-bars shown in Fig. 1.

An alarm is shown in Figs. 5 and 6, consisting in a bell w^2 , secured upon the underside of the plate a , with a hammer w^3 pivoted adjacent to it. The hammer-handle is formed of a spring-wire w^5 , wound around a pin w^4 , with its free end carrying the hammer w^3 . The wire is formed with a loop v^5 projecting in the path of a dog w^6 , which is attached to the carriage N .

In Figs. 10 and 15 a slot v^3 is shown formed in the gib N' along one edge of the carriage, with a pin v^4 , which is shown in Fig. 11, fitted therein, with a threaded shank and a dove-tail head which holds it from turning in the slot. The dog is formed with a thread to fit the shank of the pin, and when turned in an operative position is securely held therein by clamping upon the gib.

Fig. 17 shows a portion of the plate A inverted, with the bell and hammer attached, but arranged in their proper relation to the dog w^6 , which is shown secured upon the gib N' in the adjacent Fig. 17. The hammer-wire w^5 is shown in its normal position in full lines and in dotted lines in the position to which it is shifted when actuated by the dog at the end of a line. When the dog moves in a reverse direction, as indicated by the arrow adjacent to the dog in Fig. 15, the hammer would be pressed toward the bell and the wire w^5 would be bent sufficiently to let the dog pass over the projection or loop b^5 , formed upon the wire. It will be understood that one end of the wire, after it is wound around the pin w^4 , is inserted in the plate A , as shown in Fig. 16, or otherwise secured. The coils of the wire permit the hammer to move elastically, when the coils are strained by the movement of the dog, over the loop v^5 .

I am aware that type-writing machines have been designed before to print directly upon the leaves of a book; but such machines differ from mine in two essential particulars. They are either destitute of any platen or other support for the book or they are provided with a vertically-adjustable table to sustain the book bodily and to press its exposed surface upward against a gage-bar. Such an adjustable table has been provided with means for feeding it to space the letters and lines beneath a stationary printing mechanism; but such a construction necessitates the shifting

of the entire book, whatever its size or weight, after every stroke of the type. It is obvious that without any platen or any specific means of sustaining the book the machine can be merely set upon the exposed leaf and held there by its weight. It is also obvious that the feeding mechanism of a machine would require to be very powerful to shift a table with a large book of record weighing over fifty pounds thereon after each stroke of the type, and my invention furnishes a means for obviating the objections to all of these constructions by providing a platen to support a single leaf of a book, with a space beneath the same to accommodate the entire book and means for raising the back of the book close to the platen. With such mechanism for holding the book stationary it is obvious that the leaf can be clamped and held with perfect accuracy, while the printing mechanism may be by my construction made light enough to move freely for letter-spacing and line-spacing after each type-impression.

I have not claimed herein the combination, with the racks R^3 , of the arms r^2 , connected by links r^3 and provided with the dog r^5 and the pawls r^4 for shifting the carriage in the supporting-frame after writing each line, as I have claimed the same in a pending application, Serial No. 411,773, filed November 13, 1891, for improvements in composite type-writer.

Having thus set forth the nature of my invention, what I claim herein is—

1. The combination, with a type-bar hinged at its lower end and a type affixed to its free end, of a spring applied to the pivot of the type-bar to hold the free end normally raised, and a key-rod jointed to the bar between the type and the pivot and extended upward, with a button at its upper end to press it downward in opposition to the spring, substantially as herein set forth.

2. A type-bar forked at one end and having its branches j^2 provided internally with conical sockets j^3 , in combination with a hanger having a transverse stationary pin d' with conical ends fitted to said sockets, and a screw a inserted through the branches to clamp the sockets adjustably upon such pin, substantially as herein set forth.

3. A type-bar forked at one end and having its branches j^2 provided internally with conical sockets j^3 , in combination with a hanger having a transverse stationary pin d' with conical ends fitted to said sockets, a screw a , inserted through the branches to clamp them adjustably upon such pin, and a pin a' , inserted through the branches adjacent to the hinge to receive the end of a key-rod, substantially as herein set forth.

4. A type-bar formed of sheet metal folded together laterally, with both thicknesses of the sheet metal at one end twisted, and a type secured therein and provided at the opposite end with integral branches having each a

conical socket upon its inner side to form a hinged joint with a stationary pivot, substantially as herein set forth.

5. The combination, with the plates A and B and the series of type-bars and key-rods arranged around the entire circle, as set forth, of the series of levers c for actuating the feed, the series of segment-levers b , operating upon the levers c and provided with the segments b' at their outer ends, springs to sustain the segment-levers, and the offsets b^2 upon the key-rods to press the segments downward, as and for the purpose set forth.

6. The combination, with the plates A and B and the series of type-bars and key-rods arranged around the entire circle, as set forth, of the series of levers c for actuating the feed, the series of segment-levers operating upon the levers c , the offsets s upon the key-rods to press the segments downward, and the spacing-keys d with levers d' to actuate the levers c , substantially as set forth.

7. The combination, with the plates A and B and the series of type-bars and key-rods arranged around the entire circle, as set forth, of the feeding-levers c , the link e , coupled therewith, and the spacing-lever f , actuated by the link and provided with separate pawls to operate the feed and to shift the ribbon, substantially as set forth.

8. The combination, with the plates A and B and the series of type-bars and key-rods arranged around the entire circle, as set forth, of the feeding-levers c , the link e , coupled therewith, and the spacing-lever f , actuated by the link and provided with separate pawls to operate the feed and to shift the ribbon and with an arm carrying a ribbon-twister beneath the type, substantially as set forth.

9. In a type-writing machine, a ribbon-feeding mechanism consisting in the ribbon g^2 , the spools g g' , journaled side by side, a loop-guide adjacent to the printing-seat, a lever for vibrating the guide to and from the seat, a ribbon-twister pivoted upon the lever, and the ribbon being extended from the same side of both spools over the ribbon-twister and the said guide, substantially as set forth.

10. In a type-writing machine, a ribbon-feeding mechanism consisting in the ribbon g^2 , the spools g g' , journaled side by side, a lever vibrated with the type-bars and sustaining a ribbon-guide and ribbon-twister adjacent to the printing-seat, and a pawl upon the lever to actuate the ribbon-feed, substantially as herein set forth.

11. In a type-writing machine, the means for actuating the ribbon-spools, consisting in the spindle l , rotated as set forth, and having the spools fitted thereon near its opposite ends, collars attached to the spindle outside of the spools and grooved for the passage of a feather, a rod inserted through the spindle and provided at each end with a feather having a wedge-shaped end fitted within the grooved collar, and clutch-teeth formed upon

each spool adjacent to the collar, substantially as herein set forth.

12. The combination, with the bed *m*, sustaining a platen, with a space beneath the same to receive a book, of a frame adjustable longitudinally upon the bed, means for clamping the frame rigidly thereto in its adjusted position, a carriage movable transversely to the bed upon the frame, and a type-actuating mechanism movable longitudinally upon the carriage and provided with type-bars and finger-keys, and means connected with the keys to feed the carriage to space the type-impressions upon the platen, as and for the purpose set forth.

13. The combination, with the bed *m*, having the platen *I'* movable longitudinally therein at the level of the printing-impression, of a frame adjustable longitudinally upon the bed, means for clamping the frame rigidly thereto, a carriage movable transversely to the bed upon the frame, and a type-actuating mechanism movable longitudinally upon the carriage to space the type-impressions upon the platen, as and for the purpose set forth.

14. The combination, with the bed *m*, having the platen *I'*, movable longitudinally therein at the level of the printing-impression, of a clamp extended transversely to the bed for pressing the leaf of a book to the edge of the platen, a frame adjustable longitudinally upon the bed, a carriage movable transversely to the bed upon the frame, and a type-actuating mechanism movable longitudinally upon the carriage, with means to space the type-impressions upon the platen, as and for the purpose set forth.

15. The combination, with the bed *m*, having the platen *I'*, movable longitudinally therein at the level of the printing-impression, of a book-lifter actuated within the bed *m* below the platen to raise the book toward the platen, a frame adjustable longitudinally to upon the bed, a carriage movable transversely to the bed upon the frame, and a type-actuating mechanism movable longitudinally upon the carriage, with means to space the type-impressions upon the platen, as and for the purpose set forth.

16. The combination, with the bed *m*, provided with longitudinal grooves *I*, of two platens *I'*, fitted to slide longitudinally within the grooves, the clamp *J*, extended transversely to the bed between the platens, the frame *n*, adjustable longitudinally upon the bed and provided with means for clamping it thereto, the carriage *N*, movable transversely to the bed upon the frame, and type-actuating mechanism movable longitudinally upon the carriage, and means for shifting the type-actuating mechanism and carriage for letter-spacing and line-spacing, as and for the purpose set forth.

17. The combination, with the bed *m*, provided with longitudinal grooves *I*, of two platens *I'*, fitted to slide longitudinally within the groove, the clamp *J*, extended transversely to the bed between the platens, the frame *n*, adjustable longitudinally upon the bed and provided with means for clamping it thereto, the carriage *N*, movable transversely to the bed upon the frame, type-actuating mechanism movable longitudinally upon the carriage, means for shifting the type-actuating mechanism and carriage for letter-spacing and line-spacing, and a book-lifter consisting in the transverse bar *K*, the rock-shaft *L'*, the arms *L*, and hand-lever *A*², substantially as herein set forth.

18. The combination, with a series of slotted hangers secured adjacent to one another and having the type-bars pivoted thereto, of the binding-screws *E*, inserted through the slots in the hangers to hold the same, and the washers *b*², formed at one end with the bent ears *b*⁴ and having the other end shaped to fit between the ears on the end of the next adjacent washer to hold the successive washers in the series from turning, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOSEPH M. CRARY.

Witnesses:

THOS. S. CRANE,
HENRY J. MILLER.