(No Model.)

4 Sheets—Sheet 1.

G. C. GARRISON.

TYPE WRITING MACHINE.

No. 312,113. Patented Feb. 10, 1885.

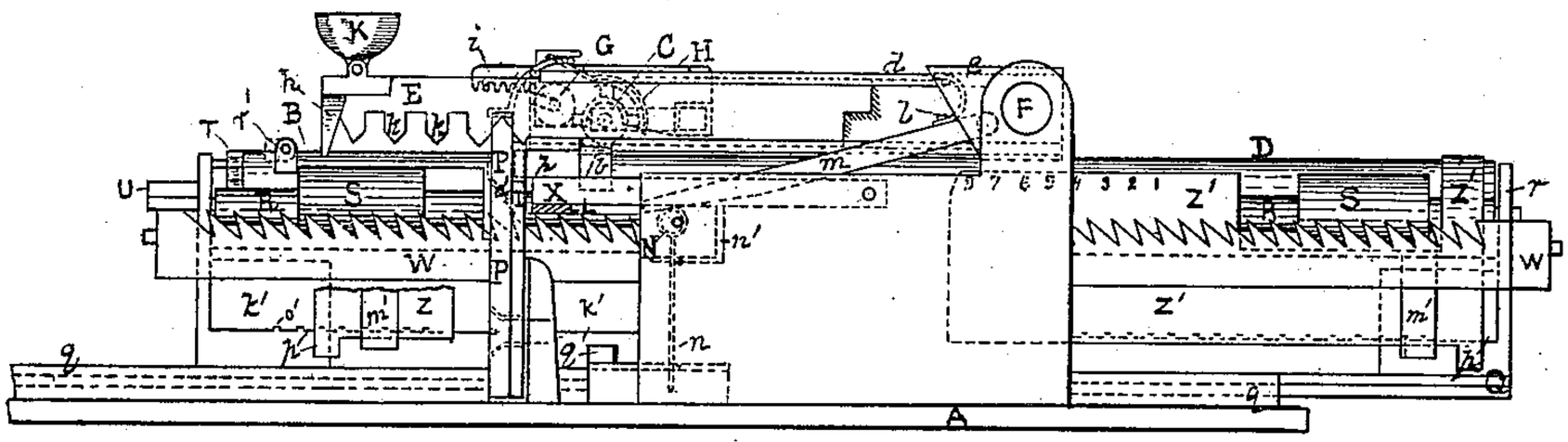

FIG 1.

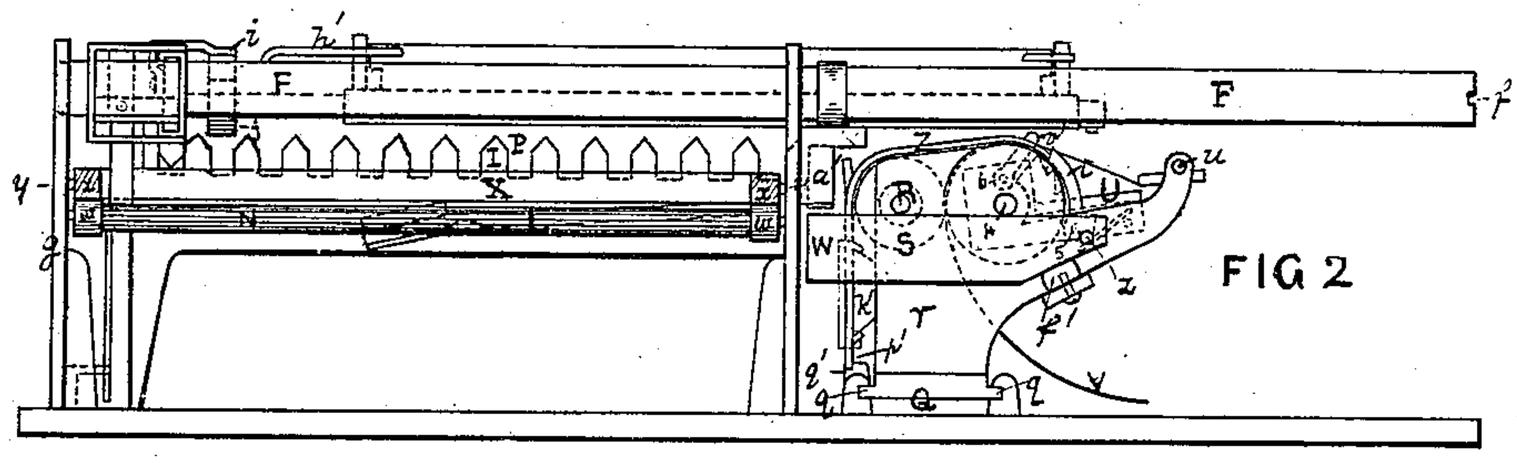

FIG 2

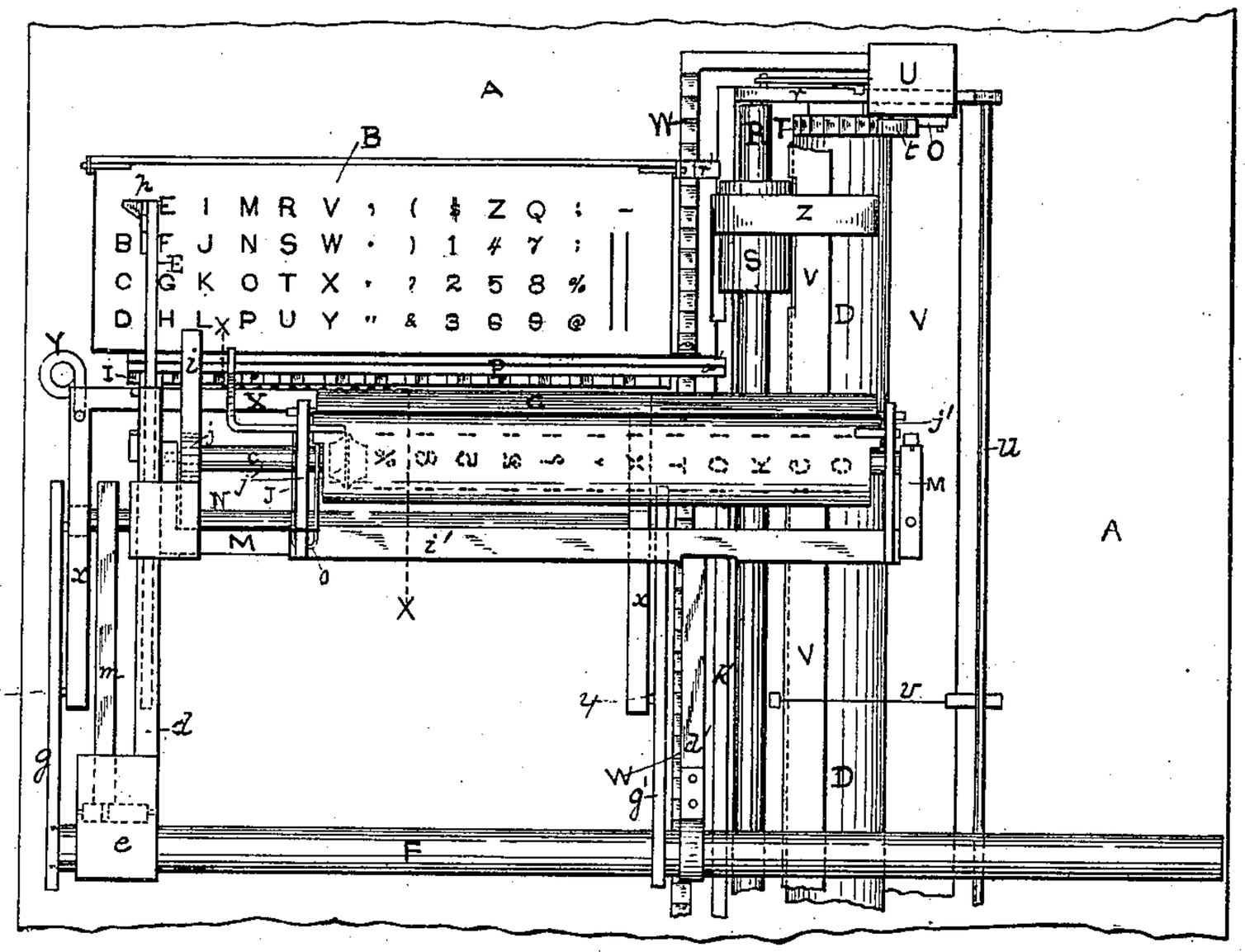

FIG 3.

Witnesses.

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by his attorneys

Bakewell & Kerr.

(No Model.)

4 Sheets—Sheet 2.

G. C. GARRISON.

TYPE WRITING MACHINE.

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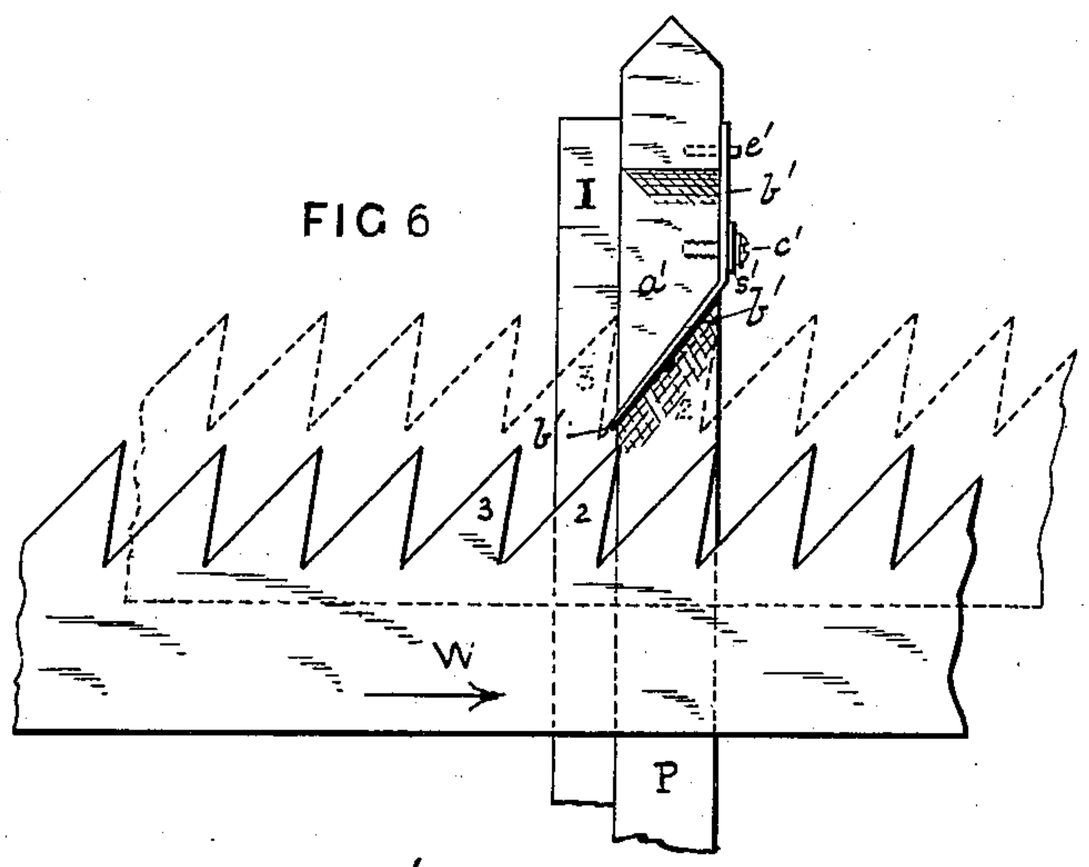
FIG 6



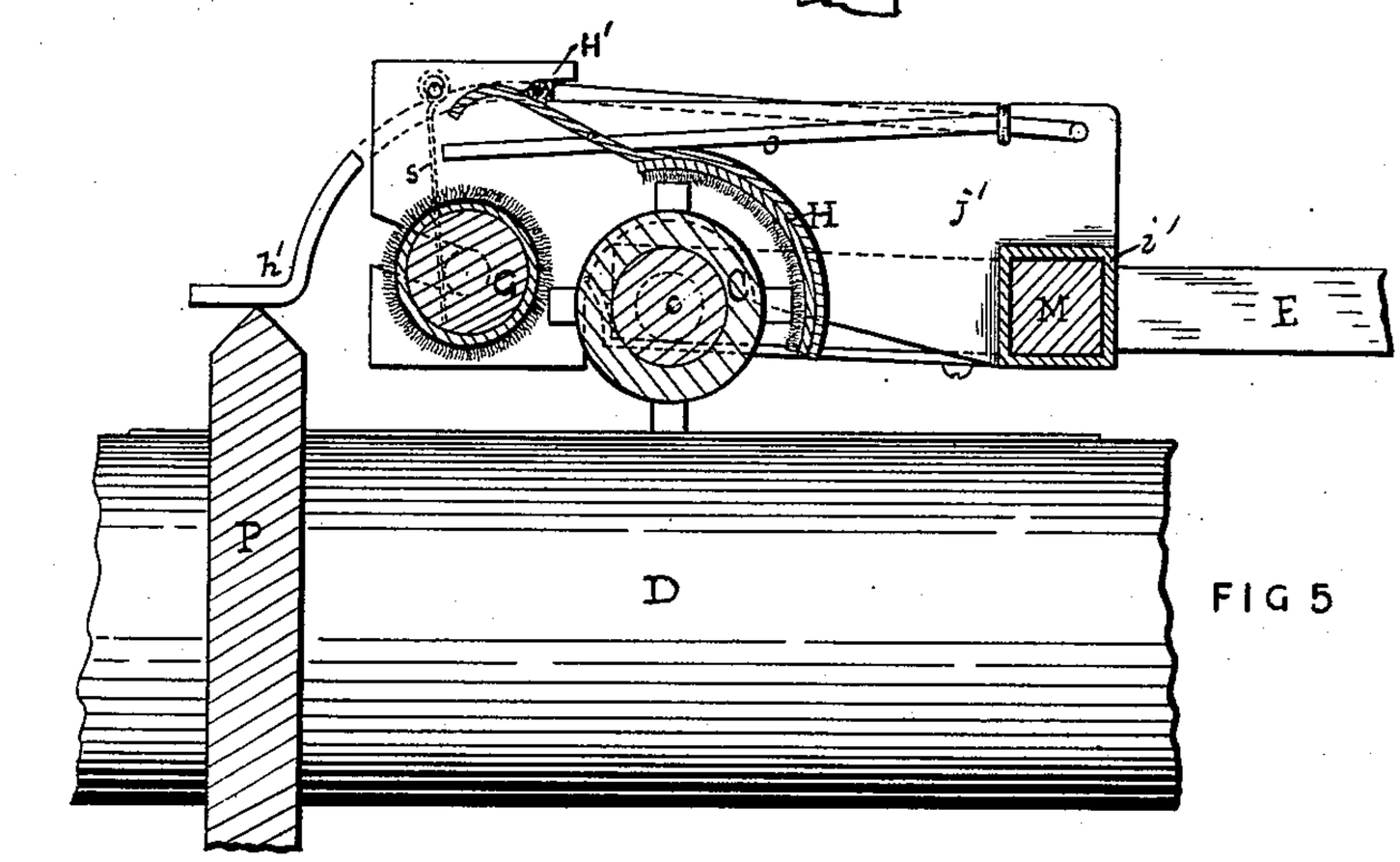


FIG 5

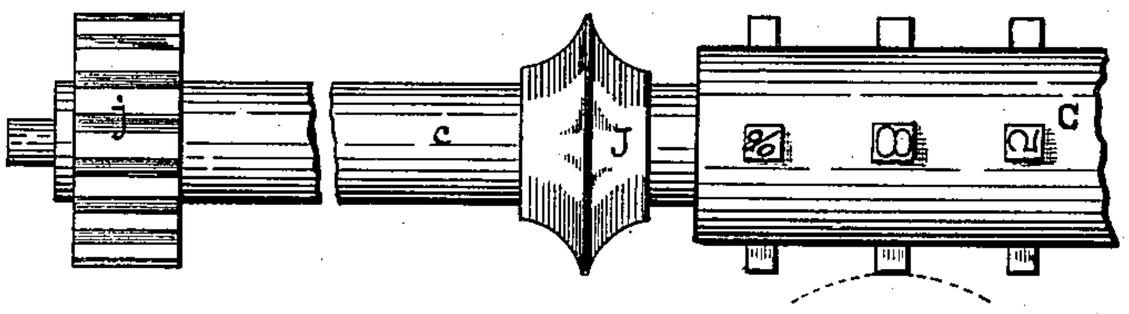


FIG 4

Witnesses.

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(No Model.)

4 Sheets—Sheet 3.

G. C. GARRISON.

TYPE WRITING MACHINE.

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FIG 7.

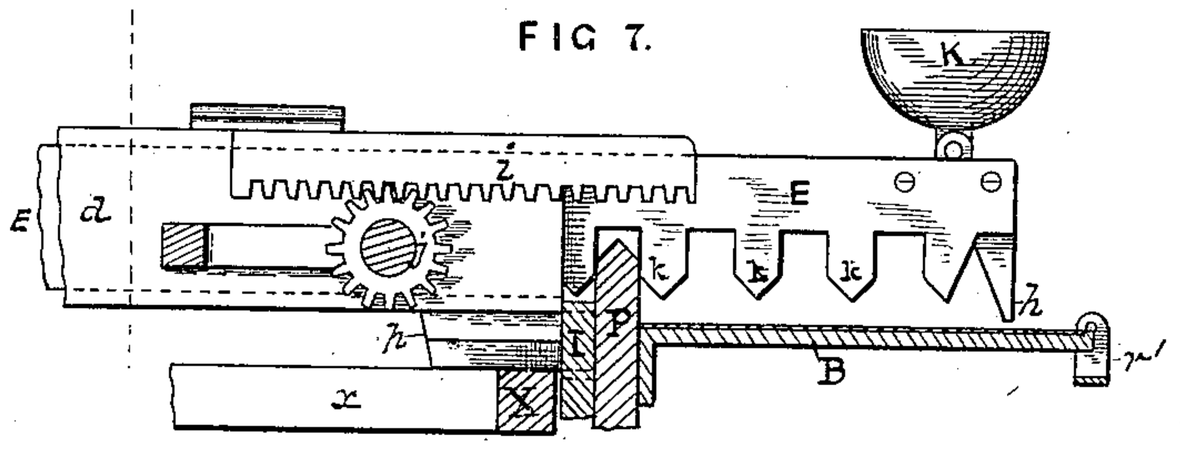


FIG 8.

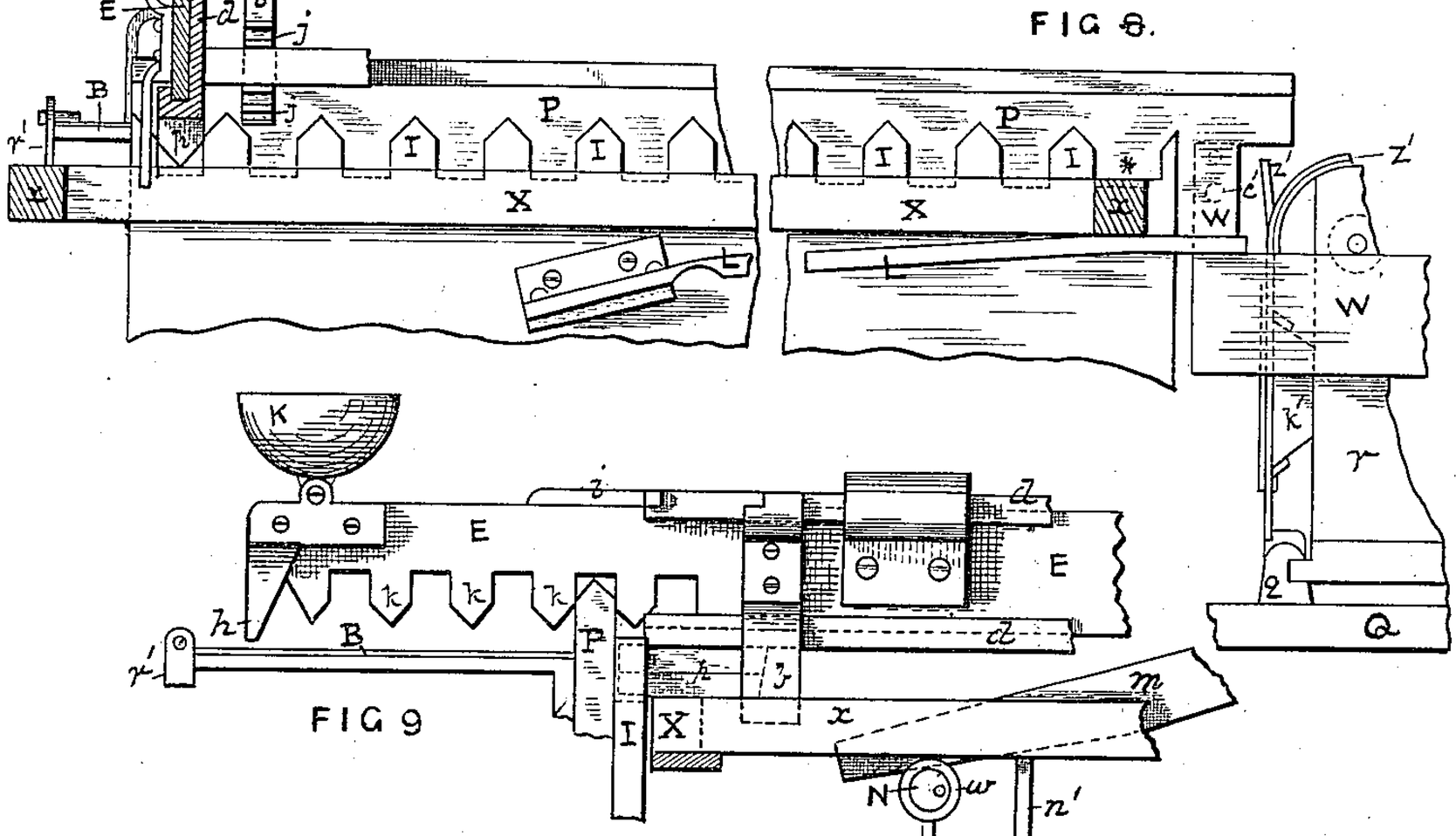


FIG 9

FIG 11.

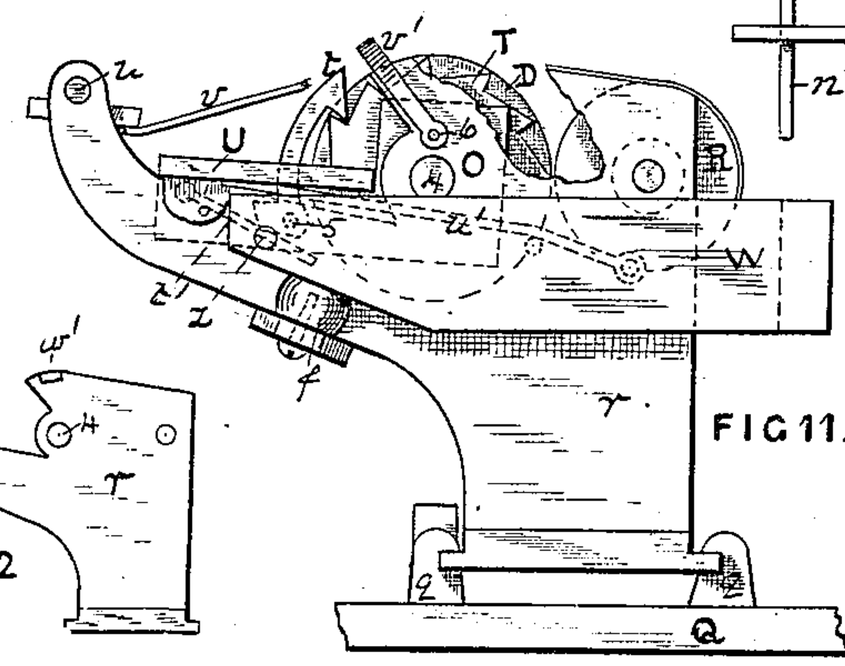
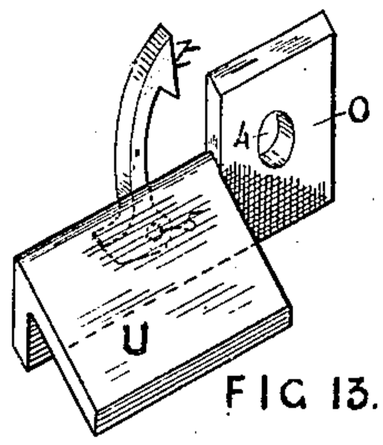


FIG 12

FIG 13.



Witnesses

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(No Model.) 4 Sheets—Sheet 4.

G. C. GARRISON.

TYPE WRITING MACHINE.

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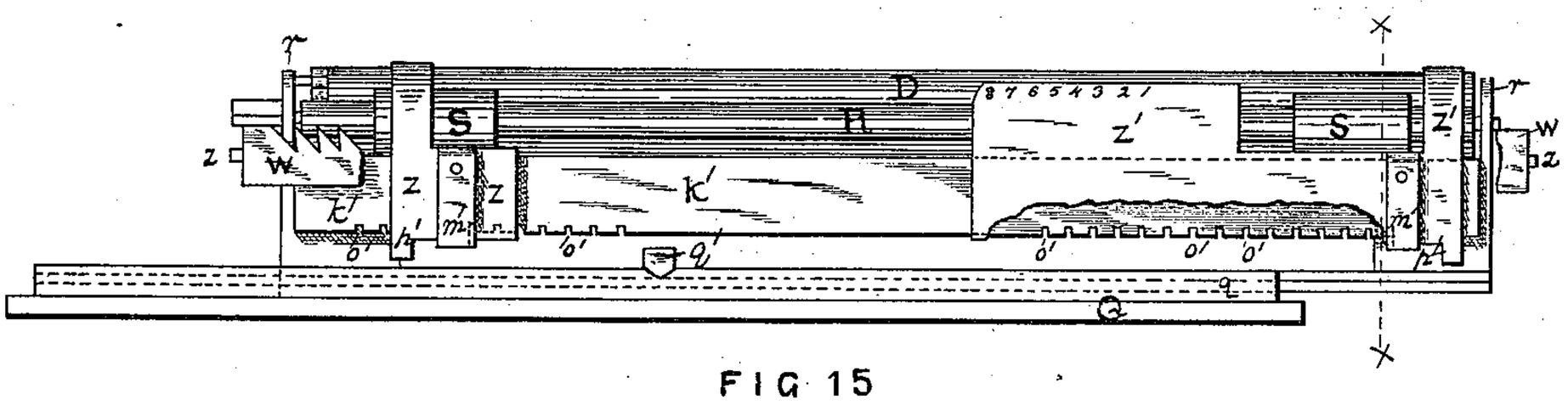

FIG 15

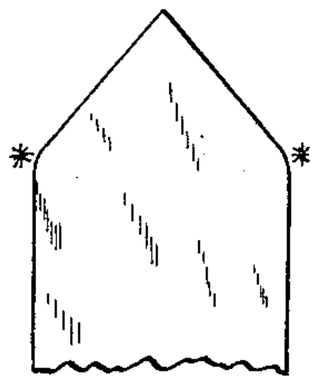

FIG 18

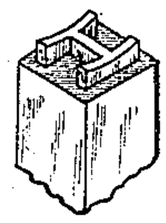

FIG 17

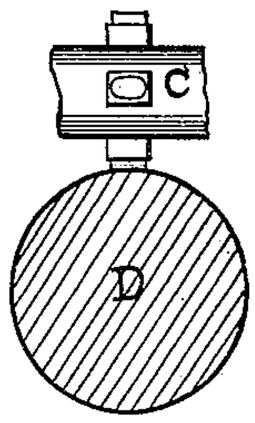

FIG 16

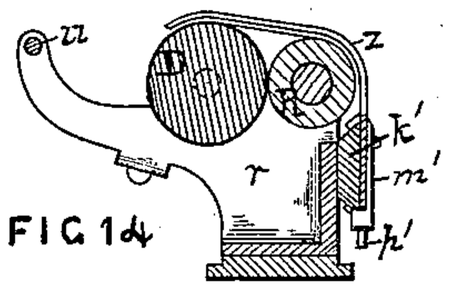

FIG 14

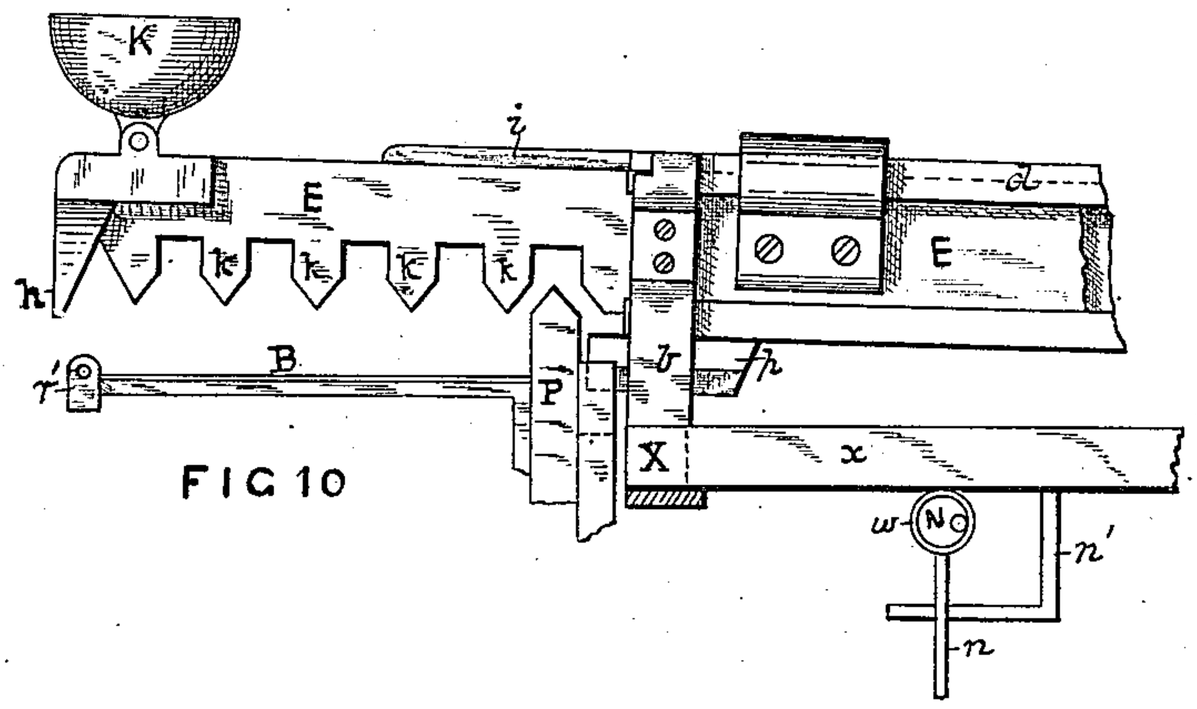

FIG 10

Witnesses.

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George C. Garrison

by his attorneys

Bakewell & Kerr

UNITED STATES PATENT OFFICE.

GEORGE C. GARRISON, OF BENNETT, PENNSYLVANIA.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 312,113, dated February 10, 1885.

Application filed February 20, 1884. (No model.)

To all whom it may concern:

Be it known I, GEORGE C. GARRISON, of Bennett, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Type-Writers; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation of my improved type-writer. Fig. 2 is a front elevation. Fig. 3 is a plan view, a portion of the rear part being omitted. Fig. 4 represents a portion of the type-roller. Fig. 5 is a transverse section of the type-roller and inking apparatus, showing also a part of the impression-cylinder. Fig. 6 illustrates the operation of the rack for producing intermittent longitudinal motion of the impression-cylinder. Figs. 7, 9, and 10 are side elevations of the letter-board and devices for operating the type-roller and space-bar. Fig. 8 is an elevation at right angles to Fig. 7 of the parts therein shown, illustrating also the devices for communicating intermittent motion to the impression-cylinder. Figs. 11 and 13 are details of the devices connected with the impression-cylinder for communicating rotary and longitudinal motion thereto. Fig. 12 is an end view of the frame of the impression-cylinder. Fig. 14 is a cross-section through *x x* of Fig. 15. Fig. 15 is a detached elevation of the impression-cylinder and devices connected therewith. Fig. 16 is a cross-section of the impression-cylinder, showing the position of the type-cylinder when printing. Fig. 17 is a perspective representation of curved-faced type. Fig. 18 is a representation of the upper extremity of one of the teeth of the spacing-combs.

In the several figures like letters of reference indicate the same parts.

Figs. 1, 2, 3, 12, 14, and 15 are drawn to the same scale, being about the full size of the parts for a small type-writer. All the other figures are drawn on a larger scale, Figs. 4, 5, and 6 being about four times and the remaining figures about twice the scale used in Fig. 1, except Fig. 18, which is much larger.

My improved type-writer, as illustrated, consists of three principal parts, viz: first, an impression-cylinder around which the paper to receive the impression is passed, with devices for feeding it forward horizontally a uniform distance after each letter has been printed thereon, and devices for rotating it intermittently on its axis for a distance equal to that of the distance between the middle of one line and the middle of the next succeeding line; second, a type-roller to which the type or printing device is attached, with inking apparatus which is capable of being moved horizontally above and at right angles to the impression-cylinder, with devices for securing the alignment of the type impressed upon the impression-cylinder with the impressions which have preceded it; and, third, a stationary letter or index board on which are depicted the letters of the alphabet, numerals, punctuation-marks, &c., for enabling the operator to move the type-cylinder to the proper position to impress the required character on the paper; and in addition to these principal parts are devices for connecting them together and securing their combined operation.

Before entering into a detailed description of these principal parts and their minor details, it may be better to give a brief statement of the mode of operation of my type-writer.

As already stated, the impression-cylinder and type-roller are placed at right angles to each other, and at the commencement of the operation of writing the forward (or right-hand) end of the type-roller is just above and nearly in contact with the forward end of the impression-cylinder. A lever is attached to the rear (or left-hand) end of the type-roller frame, by which the type-roller is moved, in printing, to the right or left, so as to bring a finger or pointer at the front end of the lever directly over the required letter or character on the letter-board, which also brings the same letter or character on the type-roller immediately over the impression-cylinder. The lever is then depressed until the pointer touches or nearly touches the required letter on the letter-board, which depresses the type-roller and brings the type of the same character in contact with the paper and leaves its impres-

sion thereon. When the type-roller is depressed, the impression-roller is stationary; but when the operator's finger is removed the type-roller rises, and the rising of the type-roller relieves the pressure on the impression-cylinder and permits it to be moved forward to the proper position to receive the next letter. If a space is required, another lever is depressed, which moves the impression-cylinder without operating the type-roller. When a line of type-writing is complete, the impression-cylinder is moved forward again as far as it will go, and at the same time it receives a partial rotation on its axis equal to the distance between the lines of type-writing plus the depth of the type. No inking-ribbon need be used, as ink is supplied to the surface of the type by means of an inking-roller, which is revolved in contact with the type by means of the revolution of the type-roller on its axis.

I will now proceed to describe the construction of my apparatus in detail.

In the drawings, A is the bed-plate of the type-writer, which may be about six inches in width, and from six to ten or more inches in depth, varying according to the desired capacity of the machine, the depth being an inch or so in excess of the width of paper to be used.

In Figs. 1, 2, and 3 of the drawings the parts are represented of full size, with the exception of the impression-cylinder and its connected parts, which are not represented of full length. In the other figures the parts are drawn larger than they need be in fact, so as to show them more clearly.

B is the letter-board, which is placed in a horizontal position at right angles to the impression-cylinder.

The alphabet and numerals and punctuation-marks and any other desired characters are delineated or engraved upon the surface of the letter-board, so as to form a series of parallel rows in a direction parallel to the type-roller, and as many rows in the opposite direction as may be necessary, as shown in Fig. 3.

Instead of marking the characters permanently on the letter-board, they may be printed on a card, which in that case is slid into ways formed at the upper and lower edges of the letter-board for that purpose, or otherwise attached to the board. The advantage of this is that the letters and characters may be arranged on the type-roller in any desired order, either their natural order of sequence or in such order as will place those characters which occur most frequently near together in the central part of the board, and the card on the letter-board may be changed to suit the order of arrangement of the characters on the type-roller, which also may be changed by substituting a different type-roller whenever desired; but the arrangement on the letter-board must correspond with that on the type-roller, the order being simply reversed, as hereinafter explained. It is also necessary that the letters in the same line should be the same distance apart from center to center as are the types on the type-roller.

C is the type-roller, the shaft *c* of which has its bearings in a pair of swingings arms, *d d'*, which extend forward and have their bearings on the shaft F, on which they slide, one of the arms, *d*, being attached to a box, *e*, which slides on the shaft F. The shaft F is supported at one end by being screwed into a standard, *g*, at one side of the machine, and passing through another standard, *g'*, so that it may extend over the impression-cylinder D far enough to allow the inner end of the type-roller to come over the impression-cylinder.

If it is desired to remove the type-roller C and its frame from the machine, a screw-driver is inserted in the notch *f* at the end of the shaft F, and it is unscrewed and drawn out.

One of the arms, *d*, of the type-roller frame on the left-hand side of the machine has a recess on one side extending sufficiently far to receive the lever E, by which the machine is operated, and which slides within the recess of the arm *d*. Attached to this lever E is a toothed rack, *i*, which is parallel to the lever E and arm *d*, and which extends over the printing-roller shaft *c* at right angles thereto, and engages a pinion, *j*, at the end of the shaft *c*, so that when the lever E is slid backward or forward in the arm *d* the printing-lever shaft revolves in one direction or the other, corresponding to the motion of the lever E.

The type-roller C may be either cylindrical or polygonal, as may be preferred. If polygonal, it has as many sides as there are longitudinal rows of type corresponding to the rows of type on the letter-board. In the drawings I have shown four rows of type; but there may be more or less, as may be desired. The greater the number of rows of type the shorter the type-roller needs to be for a given number of characters. The rows of type on the type-roller correspond with the rows on the letter-board, with the exception that their order is reversed, the letters which in the letter-board are at the right-hand end being situate at the left-hand extremity of the roller.

The type-roller may be made of one piece with its shaft *c;* or it may be made to slide onto the shaft, so that it may be removed at pleasure and another type-roller with a different size or character of type substituted, or so that the type may be renewed when necessary.

The type may be made of steel, type-metal, or of rubber, or of any other suitable material, and may be attached to the shaft *c* in any convenient manner. A sleeve made of india-rubber with the type molded on it I find very well adapted to my purpose, and it may be attached to the shaft *c*, made of steel, iron, wood, or other material, in any of the well-known ways; or the type may be cast directly onto the shaft in a solid casting of type-metal. When non-elastic type is used, the face of the

type is made slightly concave, to suit the surface of the impression-cylinder, as shown in Fig. 17.

At the outer extremity of the lever E is a pointer, *h*, projecting downward, and of such length that when the pointer is pressed down very near to the letter-board the under surface of the periphery of the type-roller is in printing-contact with the surface of the impression-cylinder D, or of the paper placed around it.

The printing is effected by pressing the pointer *h* down so as nearly to touch the required letter on the letter-board, which brings the same letter over the impression-cylinder D and prints it thereon. When the desired letter is in the row of characters nearest to the pointer, (if the finger-lever E is pressed back into the recess of the arm *d*,) it will only be necessary to slide the type-roller frame sidewise until the pointer is over the required letter, and then to depress it; but if the required letter is in any of the other rows the finger-lever E is drawn out of its recess far enough, and then pressed sidewise until the desired letter is reached. This double motion is very simple in practice, and takes little if any more time than is required to depress a key. When the pressure of the finger on the end of the finger-lever E is removed, the type-roller is raised by a spring, *l*, or by hand sufficiently to remove the face of the type from contact with the impression-cylinder D and the end of the pointer *h* sufficiently above the surface of the letter-board. (See Fig. 1.) The extremity of the finger-lever E immediately above the pointer *h* may be furnished with a handle pivoted thereto, or with a cup, K, or ring, to receive the end of one of the fingers of the operator. The spring *l* is placed near the shaft F, between the inner end of the arm *d* and a bar, *m*, which is pivoted to the box *e* and slides with it on the shaft F, while the other end of the bar *m* (which inclines forward and downward) rests upon the transverse shaft N, which is journaled at each end in the standards *g g'* of the machine. The bar *m* supports the spring *l*, which in turn affords an elastic support to the arm *d*. The journals of the shaft N are eccentric to its axis, so that by turning it on its journals by means of the depending lever *n* the space-bar X is slightly raised and lowered, for the purpose hereinafter described.

In addition to the type-roller C, and on the same shaft, *c*, at one end of the type-roller, is placed a ruling-roller, J, (see Fig. 4,) which revolves on the shaft *c*. This roller has a projecting circular disk the diameter of which is equal to the diameter of the printing-roller at the face of the type. The edge of this ruling-roller J receives ink from the inking apparatus, and if its edge is simply brought in contact with the paper on the impression cylinder it imprints a short dash, (—;) but if it is held down in contact with the impression-cylinder and the impression-cylinder is moved forward it will rule a continuous line on the paper until the type-roller rises or the motion of the impression-cylinder ceases. The proper position for the pointer of the lever E on the letter-board to bring the ruling-roller into action is indicated by two parallel lines on the letter-board B. (See Fig. 3.) The object of these two lines is that, if the pointer *h* is brought in contact with one of these lines, the ruling-roller will rule a line in the center of a line of printing, so that it may thus be used to erase what is written, ~~thus~~; or if the pointer is brought into contact with the other line on the letter-board the ruling-roller will underscore what has been written, thus, and by slightly shifting the pointer with two lines, thus. The effect thus produced is superior to that produced by printing a succession of dashes close together.

The inking of the type-roller C is effected by means of an inking-roller, G, Fig. 5, which is journaled in the frame attached to the arms *d d'* in any convenient way, so as to be readily detachable from its frame. It is pressed against the type-roller by means of springs *s*. (See Fig. 5.)

When in place, the inking-roller is parallel to the type-roller, with its surface in contact with the face of the type.

The inking-roller may be made of any suitable material; but I find that a roller covered with a silk or cotton velvet of fine nap is very suitable for the purpose, especially when aniline ink compounded with glycerine is used. The ink is applied to this roller G, which revolves with and by contact of the type-roller.

In order to secure a more uniform distribution of the ink on the type, a concave cap, H, the inner or concave surface of which is lined with velvet or cloth, is placed over the type-roller, the concave cap being pivoted to the inking-roller frame at H', and being held up out of contact with the type by a light spring, *o*. (See Fig. 5.) On the same bracket as that in which the inking-roller is pivoted is a bent-wire lever, *h'*, which is an extension of the journal of the concave cap H. The free end of lever *h'* comes in contact with the upper edge of the plate P whenever the type-roller frame is depressed by the lever E to print on the impression-cylinder, so as to close the cap H down on the surface of the printing-roller, as in Fig. 5. In place of the cap H, a second inking-roller may be used; or the concave cap H may be used without any inking-roller. The concave surface of the cap H, as well as the inking-roller, is supplied with ink by means of a brush or otherwise from time to time, as may be necessary.

The inking-roller G and cap H are pivoted to brackets *j' j'*, attached to a sleeve, *i'*, which slides on a cross-bar, M, which is parallel to the type roller shaft *c* and forms part of the frame of the type-roller apparatus. By shifting the sleeve *i'* on the bar M the position of the inking roller G and inking-cap H to the

type-roller may be changed, so that the type may not always press against the same part of the inking-surfaces.

In order to secure the accurate alignment of the type-impressions on the impression-cylinder, it is necessary that the type-roller should be moved laterally exactly the right distance to bring the type to the right point on the paper. If this were made to depend upon the pointer *h* of the finger-lever E being brought to exactly the right spot on the letter-board by the unaided action of the operator's finger, the required exact alignment would be impossible unless the machine were operated very slowly and with the greatest care.

To secure the desired result with exact precision, I place a toothed plate or comb, I, at the upper edge of the letter-board B and parallel with the row of letters thereon. The shape of the teeth of this comb is shown clearly in Figs. 2, 8, and 18. These teeth have parallel sides and are pointed at the top, and they are placed at uniform distance apart. The teeth themselves and the spaces between the teeth are all, with an exception hereinafter mentioned, of exactly the same width and depth, and the distance from the center of one tooth to the center of the other is exactly the same as the distance between the center of each of the type on the type-roller from its adjoining type. The exception just mentioned is that the last space between the teeth (see *, Fig. 8) on the right-hand side of the letter-board is about one-half wider than the others, so that by pressing the finger-lever E to one side of the space the ruling-roller J underlines, and when pressed to the other side the ruling-roller J rules out the words printed, as before described.

From the free end of the arm *d*, which carries the sliding finger-lever E, projects a short steel finger, *p*, of exactly the same width as the space between the teeth of the comb I. From this construction it will be obvious that when the arm *d* is depressed by the depression of the finger-lever E, so that the pointer *h* may almost touch the letter-board, the finger *p* will pass between the apices of two adjoining teeth of the comb I, and will slide down the inclined edge until the finger rests in the space between the two teeth, and thus the lateral movement of the type-roller is regulated to a hair's breadth, provided that the pointer *h* of the lever E indicates a point on the letter-board which is nearer to the desired letter than it is to either of the adjoining letters. This regulates the proper lateral movement of the type-roller to secure the exact alignment of the impressions on the paper of the impression-cylinder; but it is also necessary that the type-roller should frequently be rotated on its axis, in order to bring the proper type into position to print on the paper, and in order to secure accuracy and rapidity of operation this also should be effected automatically. For this purpose the under side of the finger-lever E is serrated in like manner, and with teeth *k*, similar to the comb I, as shown in Figs. 1, 7, 9, and 10.

Parallel to the comb I, and preferably between it and the letter-board B, is placed a plate, P, (preferably of steel to prevent wear,) the upper edge of which is beveled, and the thickness of which below the beveled edge is exactly that of the spaces between the teeth on the under edge of the lever E, Figs. 1, 7, 9, and 10. There are as many such spaces between the teeth on lever E as there are transverse rows of letters on the type-roller C, and the distance of these teeth from center to center is so regulated in relation to the cog-wheel *j* on the type-roller shaft *c*, and the rack *i*, attached to the finger-lever, that when the lever E is depressed two adjoining teeth on the lever E shall straddle the plate P, and when the lever E is depressed until its pointer *h* almost touches the letter-board B the plate P shall occupy the space between two teeth, and the type-roller shall not only be brought to the precise point of parallelism of the type-face with the axis of the impression-cylinder, but the type-roller shall be held rigidly in position, so that it cannot turn at all on its axis, until, the pressure being removed from the lever E, it is raised by the spring L. The depth of the spaces between the teeth on the finger-lever E below the level of the teeth is such that the parallel sides of the two adjoining teeth shall be in contact with the parallel sides of the plate P when the lever E is depressed, as shown in Fig. 7. If this were not so, the exact desired position of the printing-roller would not be secured.

The impression-cylinder D is a cylindrical roller of metal or other suitable material, which is journaled in a frame having a base-plate, Q, which extends lengthwise of and beneath the cylinder D, and slides in two parallel grooved ways, *q q*, attached to the bed-plate A of the machine. This cylinder D may be covered with rubber or cloth, if metal-faced type are used; but if rubber type are used this is not necessary.

At each end of the base-plate Q is an end piece, *r*, in which the cylinder D is journaled. The ways *q q* are so fixed to the bed-plate A that the axis of the impression-cylinder is exactly at right angles to the type-roller C. The impression-cylinder is a little longer than the width of the widest sheet of paper designed to be used in the type-writer, and may be of different lengths in different sizes of machines.

In the frame of the impression-cylinder and parallel to the impression-cylinder D is journaled a shaft, R, Figs. 1, 3, and 15, on which are one or more cylindrical sleeves, S S, or pressure-rollers of india-rubber, the surfaces of which are in close contact with the periphery of the impression-cylinder, so as to hold the paper in place. The pressure-rollers S are securely fastened to the shaft R, so as to

revolve therewith by rolling contact with the impression-cylinder or with the paper placed thereon.

At one end of the impression-cylinder D, and attached thereto, is a ratchet-wheel, T, into which a pawl, *t*, works. The pawl T is pivoted to an L-shaped plate, O, which is journaled on the shaft of the impression-cylinder, as shown in Fig. 11 and by dotted lines in Fig. 2. The shoulder of the pawl *t*, back of its pivotal point 5, has two plane faces at an obtuse angle to each other, so that the spring *t'* (shown in dotted lines in Fig. 11) holds it against the teeth of the ratchet-wheel T in the position shown in that figure, or holds it off from the ratchet-wheel when it is thrown back. A small platform, U, Fig. 11, forms part of the L-shaped plate O, and a spring, *u'*, (shown in dotted lines,) attached to the side piece, *r*, of the frame, raises the platform U, causes the L-shaped plate O to turn on its bearing, and raises the pawl *t* against the ratchet-wheel T, so that when the platform U is depressed by the finger of the operator the pawl is drawn down, turning the ratchet-wheel and causing a partial rotation of the impression-cylinder D, which advances the paper longitudinally a distance equal to the space between two lines of type-writing. When the pressure on the platform U is relieved, the pawl *t* rises again, and, passing over two teeth on the ratchet-wheel, falls into place, and the parts are then ready for a repetition of the operation whenever a line of printing is completed. As the platform U rests on the upper edge of the rack W, the depression of the platform U also depresses the rack, disengaging its tooth from the projection *a'*, Fig. 6, which leaves the carriage of the impression-cylinder free to be moved longitudinally, so as to be in place for commencing a new line of printing. If a double width between the lines is desired, this may be given by depressing the platform U a second time, and so on as often as required. If, however, a space between the lines of one-half that given by moving the ratchet-wheel T two teeth is desired, this may be effected by depressing the platform U only half-way; or the devices may be arranged so as to cause the pawl *t* to engage only one tooth of the ratchet-wheel on each depression of the platform U. To effect this a spring-stop, *v'*, is pivoted at 6 to the side piece, *r*, of the impression-cylinder. This spring-stop *v'* has a projecting end, which, when the stop is not in use, enters a notch, *w'*, in the edge of the side piece, *r*, of the frame. (See Figs. 11 and 12.) This notch holds the spring from interfering with the pawl *t* unless it is set to do so. When it is desired to limit the rotation of the impression-cylinder to the length of one tooth of the ratchet-wheel, the spring-stop *v'* is raised out of its notch and turned down far enough for its projecting end to cover the point of the second tooth from that in which the pawl is resting. Then when the platform rises after being depressed the tooth of the pawl is prevented from entering the second tooth in the ratchet-wheel, so that when it is again pressed down it engages only a single tooth of the ratchet and turns the impression-cylinder only half as far as it would otherwise.

Attached to the end pieces, *r*, of the impression-cylinder frame is a sheath, V, of sheet metal, long enough to extend the whole length of the impression-cylinder, holes being cut in the sheath to allow of the pressure-rollers S S coming in contact with the impression-cylinder. The sheath V projects sidewise beyond the impression-cylinder, as shown in Fig. 2, and, passing under the cylinder, curls around it, reaching very nearly but not quite to the point where the type-roller C, when depressed, touches the impression-cylinder. This serves as a guide to the paper, which is placed on the curved projecting flap of the sheath, and, being pressed inward, passes up between the cylinder and the sheath until it reaches the pressure-rollers S S, which engage it, so that by turning the impression-cylinder (which may easily be done by placing the thumb on one of the rollers S or on the ratchet-wheel T) the paper is drawn up to the right position. A wire rail, *u*, attached to the end pieces, *r*, of the frame, (see Fig. 3,) serves to keep the upper end of the paper from contact with the type-roller C, the sheet of paper being passed over the impression-cylinder and under the wire guard. A piece of fine wire, *v*, preferably of brass, is attached to the wire rail *u* about midway between the two ends of the cylinder, and, passing over the impression-cylinder and outside of the sheath V, is attached to the base-plate Q, or to a bracket supporting the sheath. This wire is so placed as to come between two type of the type-cylinder, so as not to interfere with the printing. It not only serves the same purpose as the sheath V, to hold the paper closely to the impression-cylinder, but also guides the upper end of the paper (as it passes through the machine) under the rail *u*. One or more such wires *v* may be used at different points on the impression-cylinder. The forward motion of the impression-cylinder after each impression of a single letter is always the same, being a distance equal to one "em" and a space. This motion is automatic when a character has been printed, but is effected by the hand of the operator at the end of each word, or wherever a space is required. This forward motion is effected by means of a rack, W, which is a plate, preferably of steel, having serrated edge, presenting a series of teeth, one side of each tooth being slightly inclined, and the other side very much inclined, as shown in Figs. 1 and 6. This rack W extends from end to end of the impression-cylinder frame, and at the two ends it is bent at a right angle, the bent ends being pivoted to the end pieces, *r*, of the frame of the impression-cylinder at the point *z* on each, as shown in Figs. 2 and 15. The toothed por-

tion of the rack W extends parallel to and between the shaft R and the standard g' of the printing-roller apparatus. The serrated edge of the rack W points upward, and is placed immediately under a projection, a', at one side of the plate P. (Shown in Fig. 2 and in detail in Fig. 6, which represents an end view of the plate P and a portion of the rack W.) The under edge of the projection a' is beveled, and a thin tongue, b', of steel, is fastened to the front side of the projection a' by a screw, c', a block of india-rubber, s', being interposed between the steel tongue b' and the head of the screw c', so as to give a slight play to the tongue b'. A steady-pin, e', attached to the projection a', passes through a slot in the tongue b' and prevents its turning on the screw c'. One of the teeth, 2, of the rack W being immediately under the beveled edge of the projection a' on the plate P, as shown in Fig. 6, the projecting end of the tongue b' causes the tooth 2 to pass under the tongue b' when the rack W is raised, and the tongue b', which is sustained by the projection a' acting on the inclined rear side of the tooth 2, forces the rack to move in the direction indicated by the arrow in Fig. 6 until the opposite side of the adjoining tooth, 3, rests against the projection a', which arrests the further motion of the rack until it has dropped down to its former position, (shown in Fig. 6,) with the projection a' above the teeth. When the rack drops and the projection a' clears the tooth, the tongue b' projects over the point of the tooth, and thus prevents the projection a' from engaging the same tooth as it did before. By this means each upward motion of the rack W causes the rack and the impression-cylinder frame, to which it is attached, to be advanced a distance equal to the width of one tooth. The rack W receives its upward motion, after being depressed, from two rubber springs, f' f', one secured to each of the side pieces, r r, of the frame, and which bear against the ends of the rack near to its pivotal points, as shown in Figs. 2 and 11. As the forward motion of the impression-cylinder D is necessary after the printing of each letter, the motion of the rack by which this is effected is communicated by the finger-lever E through the intervention of the space-bar X and spring-lever L. The space-bar X extends parallel to and immediately behind the comb I, the upper edge of the space-bar being on a level with or just above the points of the teeth of the comb I. It has two arms, x x, which are pivoted to the standards g g' of the machine at y y. (See Fig. 3.) Under the space-bar is a spring-lever, L, which is attached at one end to the frame of the machine, while its free end extends laterally to the rack W, the end of the lever being flat and wide enough to rest upon the points of two or more of the teeth of the rack W, as shown in Fig. 1. The finger p, which is attached to the forward end of the arm d of the type-roller frame, rests upon the upper side of the space-bar X, so that whenever the lever E is depressed and before the type touches the paper on the impression-cylinder the space-bar X is also depressed until the arms x x come in contact with the transverse shaft N, which limits the downward motion of the space-bar, and the space-bar thus limits the downward motion of the finger-lever E and of the type-roller C on the impression-cylinder.

As before stated, the degree of downward motion of the space-bar may be regulated by turning the eccentrically-journaled shaft N by means of the lever n. A small sleeve, of leather or rubber, w w, placed near each end of the shaft N, serves to prevent the rattling noise which would otherwise accompany the operation of the lever E. The upward movement of the space-bar is limited by means of a bent wire, n', attached to its under side and passing under the shaft N. When the space-bar X is depressed by the finger-lever E, it presses down the free end of the spring L, which in its turn lowers the rack W until it clears the projection a' on the plate P, and when the pressure is removed from the space-bar and while the printing-roller is raised from the impression-cylinder the rack W is raised by its springs f' f' and a forward movement of the impression-cylinder is effected. A wire loop, Y, projecting from the space-bar X at any convenient point, enables the operator to depress the space-bar and shift the impression-cylinder one space without operating the printing-roller, and this may be repeated rapidly and as often as required when a longer blank space is desired. Another way of making a space without printing any letter is to draw the lever-arm E out so far that its pointer h is outside of the outer edge of the letter-board B, and then depressing it. This brings a projection, b, which is formed on the side of the finger-lever E, in contact with the space-bar X, and depresses it without bringing the type-roller C down into contact with the impression-cylinder, as shown in Fig. 10. As the printing-roller would continue to print on the impression-cylinder from one end to the other unless the motion of the latter were arrested, the printing would be continued beyond the edge of the paper. In order, therefore, to confine the printing within any desired limits, I attach two adjustable guards to the frame of the impression-cylinder, which, being placed on the edges of the paper at the points where it is desired that the printing should commence and terminate, arrest the motion of the impression-cylinder at those points. These guards Z Z' slide upon a bar, k', which is fastened to the end pieces, r r, of the frame of the impression-cylinder D. The bar k' is parallel to the pressure-roller shaft R and between it and the rack W. The lower edge of the bar k' has a series of notches, o', to receive a tooth projecting from a leaf-spring, m', attached to the guard Z. The guards Z Z' (shown in detail in Fig. 15) are made of sheet

metal and extend upward from the bar *k'*, and are bent over the pressure-roller shaft R and over the impression-cylinder, so that they can pass over the pressure-rollers S S and lie so close to the surface of the impression-cylinder as to touch the upper surface of the paper, &c., placed thereon. These guards, where they pass over the impression-cylinder, need not be wider than one-fourth of an inch or less; but they are wider where they are connected with the bar *k'*, on which they slide. At the lower end of each of these guards is a downward projection or foot, *p'*, extending below the bar *k'*, so that when the impression-cylinder frame is moved in either direction one or other of these projections *p'* will come in contact with a stop or projection, *q'*, on the bed-plate A, (see Fig. 15,) thus arresting the further motion of the impression-cylinder D. This stop *q'* is placed immediately under the axis of the printing-roller shaft *c*, so that no printing can be done beyond the point at which these adjustable guards Z Z' are set. The guards Z Z' (one on each side of the center of the impression-cylinder) are similarly constructed so far as already described; but one of them, Z', at the end of the machine farthest from the letter-board B, is much longer than the other, so much so that when its foot *p'* has reached within the space of a few (say eight) letters from the stop *q'* the upper forward corner will come in contact with and raise up a signal-flap, *r'*, at the end of the letter-board B, which extends along the front edge of the letter-board and is pivoted to it at both ends. The raising of the signal-flap is an indication that only a certain number of letters more can be printed on that line. On the upper edge of the guard Z' are marked numerals to indicate the number of letters that may be printed when those numbers have passed the signal-flap *r'*.

In the construction of my machine I propose to interpose pieces of rubber or cloth between connecting parts where their contact would otherwise cause a rattling sound.

I have described an inking apparatus for applying ink to the type of the type-roller, as I regard this as being more convenient than the use of a ribbon or other similar device impregnated or coated with ink. My improved type-writer may, however, be used without the inking apparatus by using an inking-ribbon or other fabric—such as paper impregnated or coated with ink—in connection with the impression-cylinder. This may be done by passing an inking-ribbon under the type-roller, either as a continuous band supported by rollers attached to the frame of the type-roller, or supported on spools at either end of the impression-cylinder frame, or by placing carbon paper or similar material coated or impregnated with ink above the paper on the impression-cylinder.

In Fig. 18 of the drawings I have shown the upper extremity of one of the teeth of the combs I and *k*, described in this specification, for the purpose of noting a preferable construction. I make the shoulders of these pointed teeth rounded at the points ** in Fig. 18, where the inclined lines of the points join the lines of the sides of the tooth. This feature, though apparently insignificant, is really important, as it adds greatly to the smoothness and ease of operation of the machine.

In place of the signal-flap *r'* placed at one end of the letter-board, a bell or other signal device may be substituted.

In describing my machine I have represented the device for holding the paper to receive the impression of the type as a cylinder, which is convenient, as it not only sustains but feeds the paper. I do not, however, desire to limit my invention to the use of an impression-cylinder in connection with a type-roller or type-carrying device, as I am able to use an impression device which does not have any rotary motion—such, for example, as a plate or pad preferably having a convex surface, or a non-rotating cylinder. In this case the paper may be fed forward by means of feed rollers or tapes passed over pulleys, to which an intermittent feed motion may be given in the same way as that in which the rotary motion is given to the impression-cylinder hereinbefore described.

If it is desired to rule dotted or broken lines, a disk-roller similar to the roller J, but with a broken instead of a continuous surface, may be placed on the type-roller at either end; also, instead of using separate springs *f' f'* for operating the toothed rack W and pivoting the arms of the rack to the end pieces, *r*, of the frame of the impression-cylinder, as described, the arms which support the rack may be springs attached at their extremities to the frame of the machine, thus securing at once both the spring action and the oscillating motion required.

I desire also to state that for the mechanism which I have described for giving rotary and longitudinal motion to the type-roller other equivalent devices may be employed. So, also, in regard to the toothed combs which I have described for securing the proper alignment of the type-impressions on the impression-cylinder. Cylindrical pins with pointed or rounded edges may be substituted for pointed teeth, care being taken that the projecting devices which enter the spaces between such pins are of the same diameter and width as the spaces between them.

These modifications of construction and substitution of equivalents for the specific devices described in the foregoing specification I desire to cover in the following claims.

Having thus described my invention, what I claim as my improvement in type-writers, and desire to secure by Letters Patent, is—

1. The combination of an oscillating and rotating type-cylinder, having also a free axial motion, with an impression device, substan-

tially as described, arranged at right angles to the type-cylinder, and a single operating-lever for communicating the required triple movement to the type-cylinder necessary to effect a printing-contact of the types thereof upon the impression device, substantially as and for the purposes described.

2. The combination of an oscillating and rotatory type-holder, having also a free axial motion, with an impression device such as described, arranged at right angles to the type-holder, and an operating-lever for communicating such movements to the type-holder, provided with a pointer for indicating on a letter-board the particular character on the type-holder which is thereby brought into printing-contact with the impression device.

3. The combination of the axially-moving frame of the impression device and a ratchet-rack mounted thereon, an oscillating frame extending at right angles to the impression device and carrying the type-holder, a pivoted space-bar which is held normally in a raised position by a spring, and is depressed at the downward movement of the oscillating frame, and a pawl actuated by the space-bar engaging the rack of the impression device, whereby a forward motion is communicated to the impression device by the space-bar after each printing-contact of the type-holder therewith, substantially as and for the purpose described.

4. The combination of a type-roller capable of longitudinal as well as rotary motion, bearing type or characters for printing arranged in parallel transverse and longitudinal rows, a letter-board bearing like characters in corresponding longitudinal and transverse rows, with mechanism, substantially as described, for communicating such rotary motion to the type-roller, and a lever for actuating such mechanism and communicating such longitudinal motion, and having a pointer or finger for indicating the character to be printed, substantially as described.

5. The combination of a type-roller having a sliding and pivotal connection with a shaft parallel thereto, and having raised types or characters for printing arranged in longitudinal and transverse rows thereon, a revolving impression-cylinder for carrying the paper to receive the impressions of the type, and having its axis at right angles to that of the type-roller. a letter-board bearing rows of characters corresponding in arrangement with those on the type-roller, but in reverse order, and devices, substantially as described, for simultaneously communicating a combined rotary, longitudinal, and oscillating motion to the type-roller and pointing to individual characters on the letter-board, substantially as described.

6. An impression device, in combination with a type-holder having a longitudinal row of type-characters and capable of longitudinal motion in the line of its axis, a lever for communicating such longitudinal motion to the type-holder and bringing the type into printing-contact with the impression device, and a comb having pointed teeth, the distance between the points of the teeth being equal to the longitudinal distance between the centers of the type, for the purpose of receiving the edge of the lever between two such teeth, and thus securing the exact alignment of successive impressions of the type on the impression device, substantially as described.

7. In combination with an impression device, a type-roller having type-characters arranged longitudinally and circumferentially in parallel rows, mechanism, substantially as described, for communicating a rotary and longitudinal motion to the type-roller, a pair of combs having pointed teeth, one comb arranged parallel to the type-roller, and the other connected with the operating-lever at right angles to the type-roller, and a beveled-edged plate, the distance between the points of the teeth on the combs being respectively equal to or corresponding with the distance from center to center of the type-characters circumferentially and longitudinally on the type-roller, for the purpose of securing simultaneously the accurate alignment of the impression device and the square presentation of the face of the type to the surface of the impression device, substantially as described.

8. The combination of the revolving type-roller C with the inking-roller G and concave cap H, substantially as described.

9. The combination of the revoluble type-holder C, mounted on an oscillating frame, with a concave inking-cap, H. also mounted on said frame, and capable of a longitudinal movement therein, whereby a new inking-surface may be exposed to the type, substantially as described.

10. The combination, with the impression device, of the toothed spring-rack W, beveled projection a', and space-bar X, for effecting an intermittent forward motion of the impression device, substantially as described.

11. In combination with the type-roller C, its operating-lever E, and space-bar X, the eccentric transverse shaft N, for limiting and adjusting the downward printing motion of the type-roller, substantially as described.

12. The impression device and longitudinal spacing-rack, and the oscillating type-holder arranged at right angles thereto, so combined and arranged, substantially as described, with the wire v that the latter extends across the impression device between the points of impression of the types thereon, substantially as and for the purposes described.

13. In combination with the impression-cylinder D, the adjustable guards Z Z' and stop q', substantially as and for the purposes described.

14. The combination of the sliding carriage of the impression-cylinder with spring-toothed

rack W, pivoted thereto, beveled projections *a'*, spring-tongue *b'*, and mechanism, substantially as described, for bringing the rack into operative contact with said tongue and projection for effecting the intermittent forward motion of the impression-cylinder, substantially as described.

15. The combination of rack W, having inclined teeth, with the projection *a'* and spring-tongue *b'*, constructed and arranged substantially as and for the purposes described.

16. The combination, with an impression device, of a type-roller arranged at right angles thereto and capable of longitudinal motion, and a circular roller or disk arranged on the type-roller shaft for ruling continuous or dotted lines on the paper, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 25th day of January, A. D. 1884.

GEORGE C. GARRISON.

Witnesses:

W. BAKEWELL,

W. B. CORWIN.