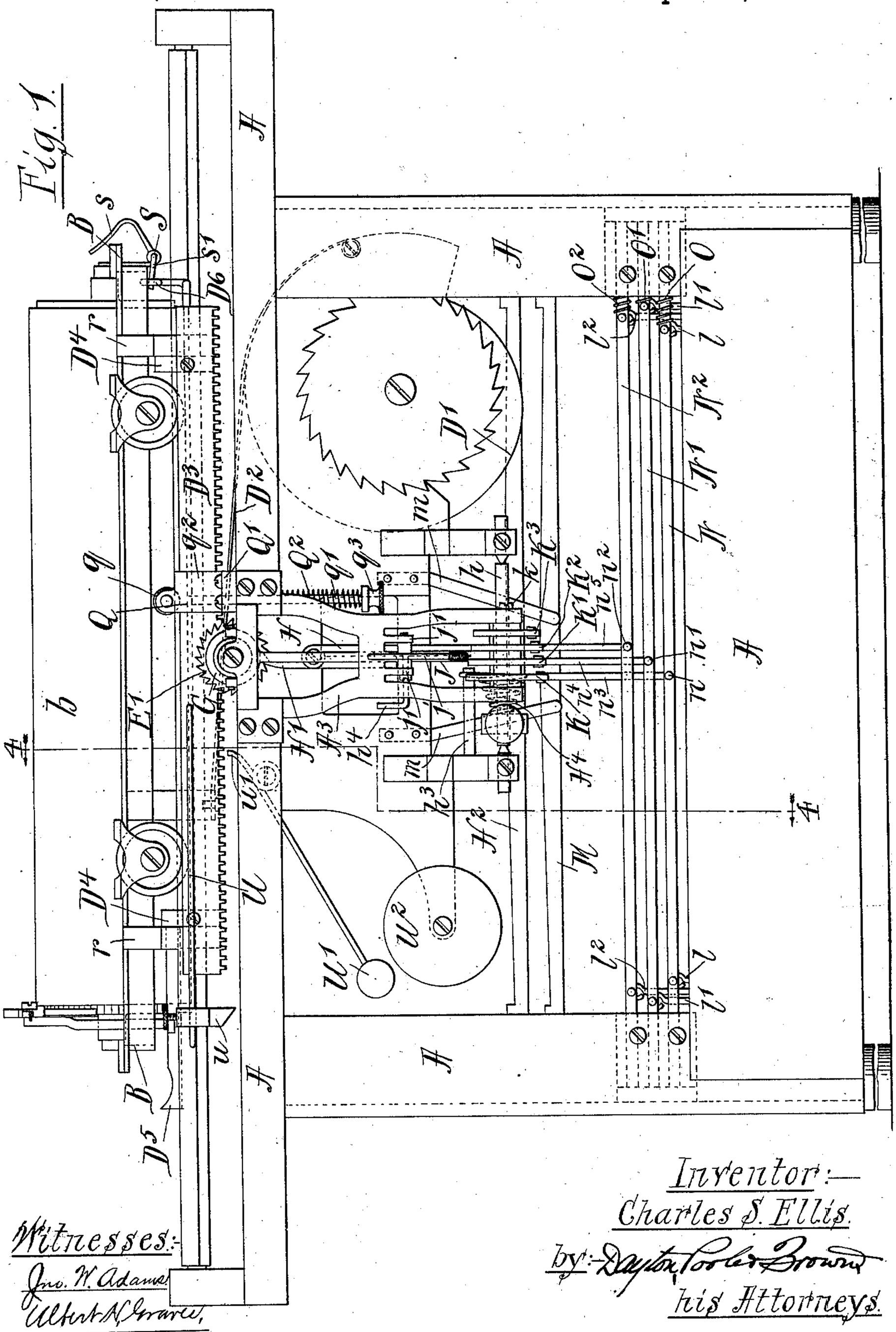
(No Model.) 4 Sheets—Sheet 1.

C. S. ELLIS.

TYPE WRITING MACHINE.

No. 559,126. Patented Apr. 28, 1896.

Fig. 1.



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Albert H. Graves,

Inventor:-
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his Attorneys.

(No Model.) 4 Sheets—Sheet 2.

C. S. ELLIS.

TYPE WRITING MACHINE.

No. 559,126. Patented Apr. 28, 1896.

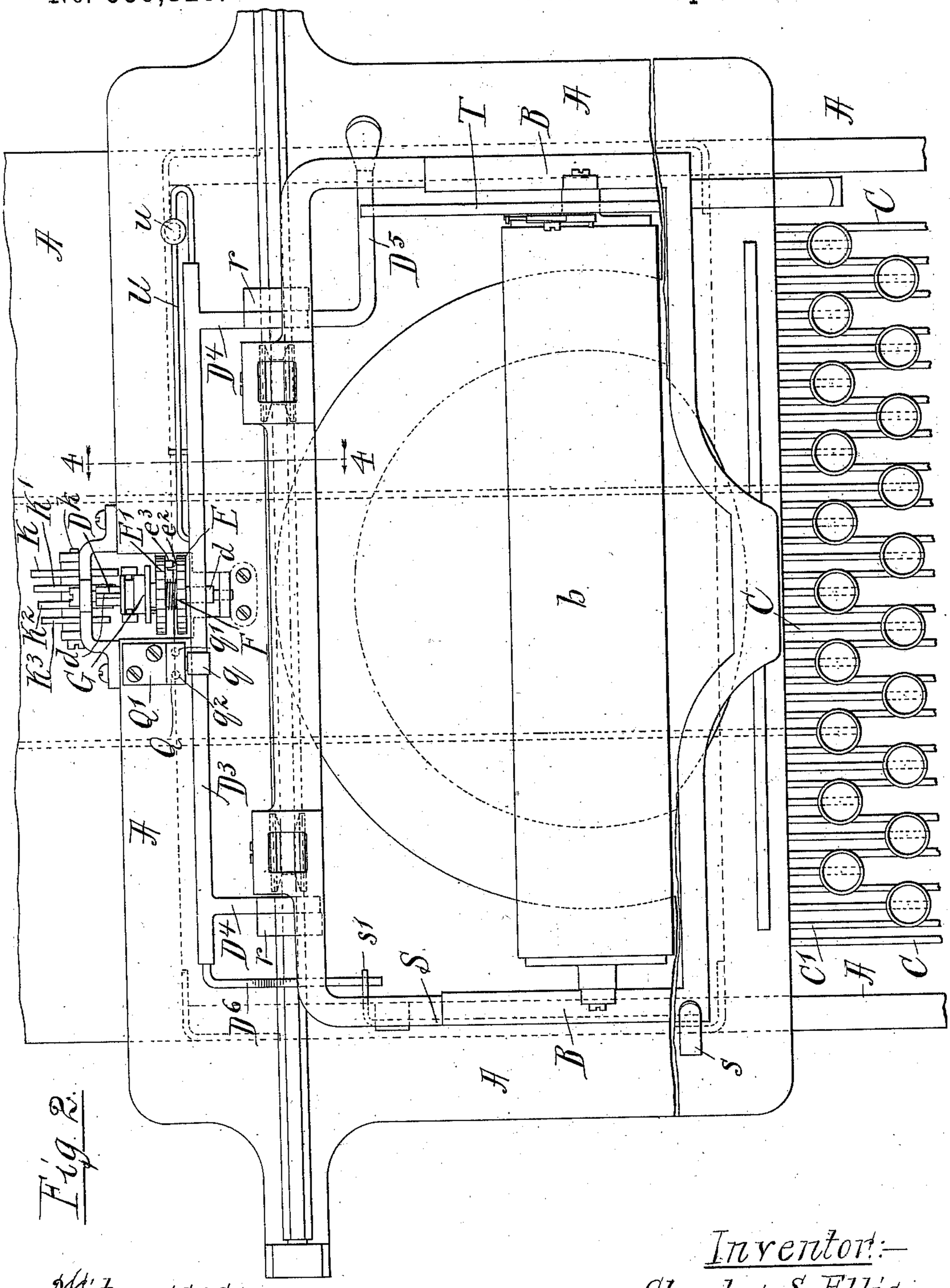

Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

C. S. ELLIS.

TYPE WRITING MACHINE.

No. 559,126. Patented Apr. 28, 1896.

Fig. 3.

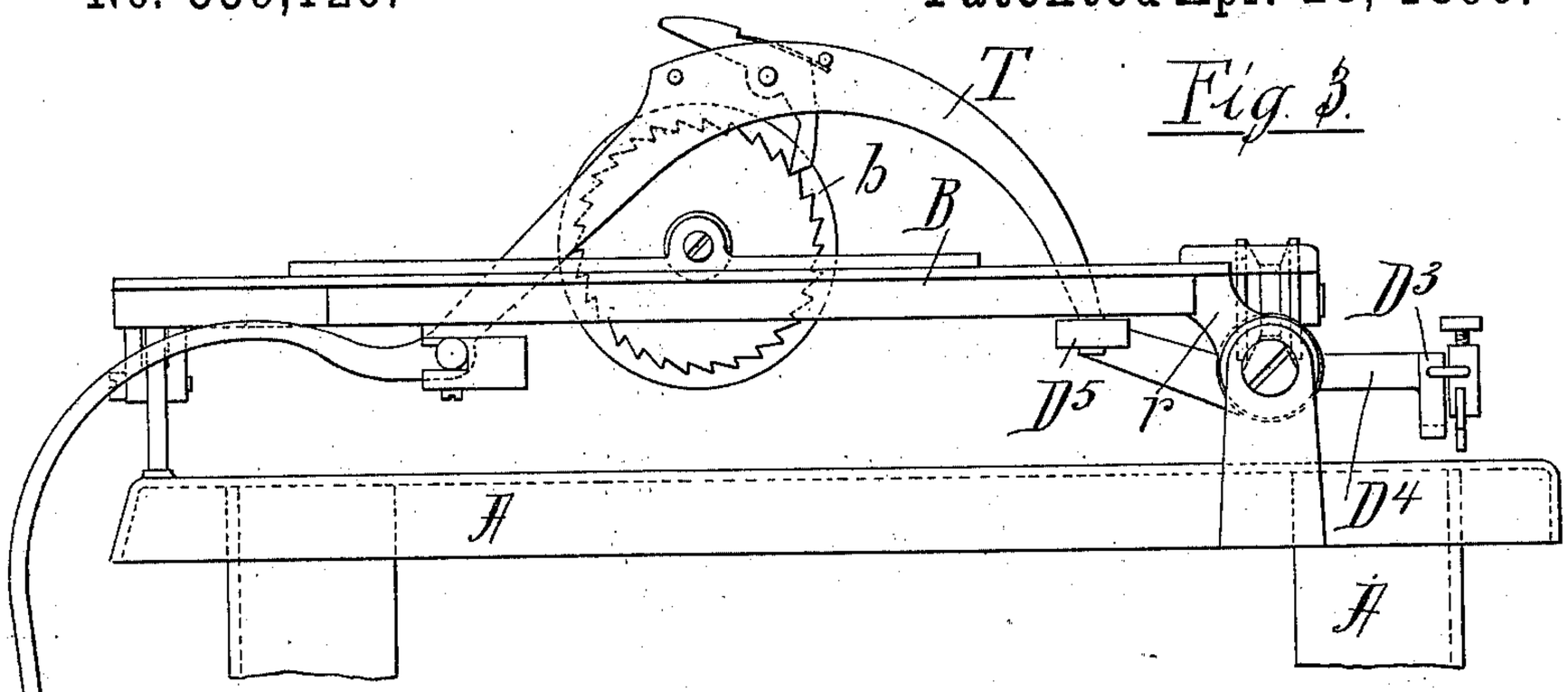

Fig. 4.

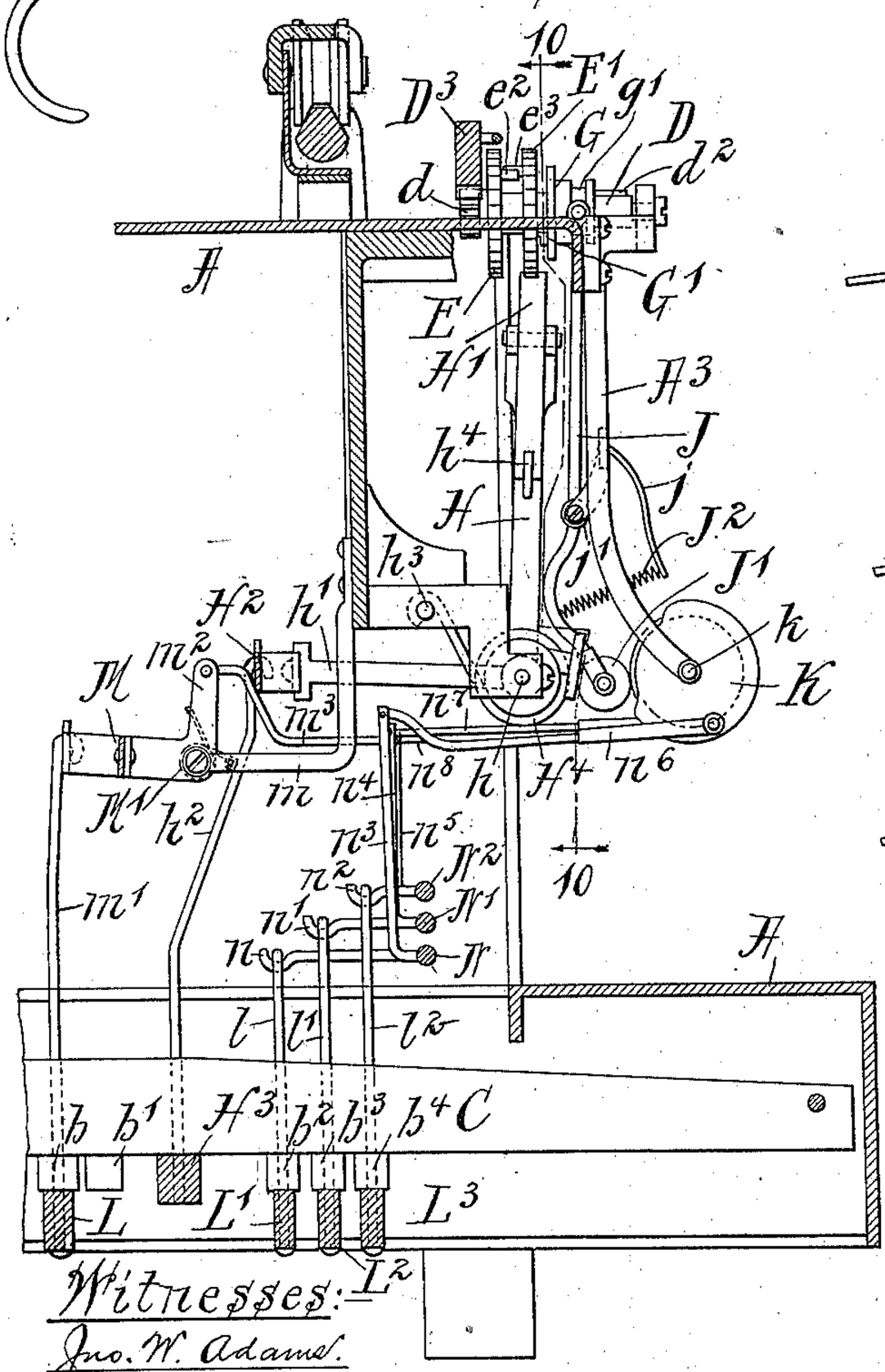

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Fig. 5.

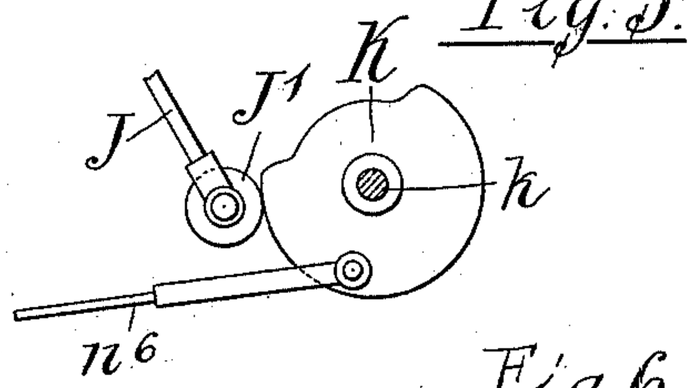


Fig. 6.

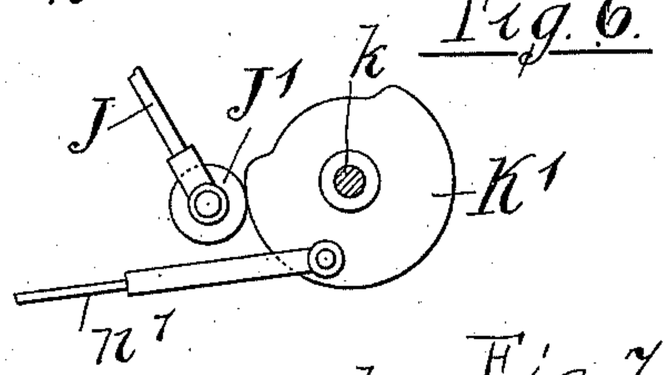


Fig. 7.

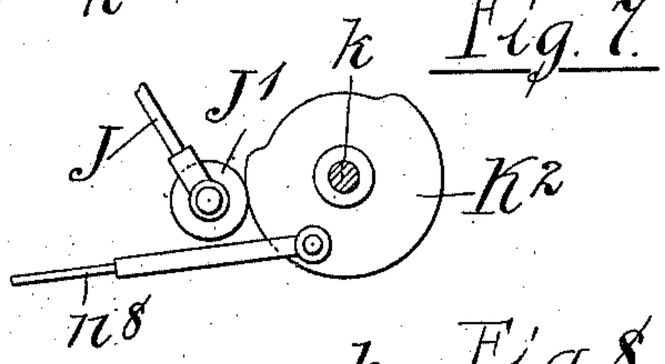
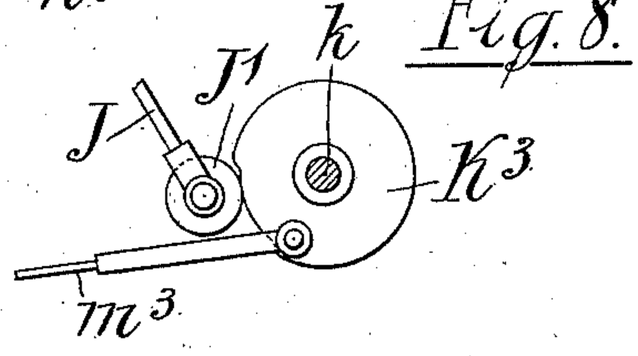


Fig. 8.



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(No Model.) 4 Sheets—Sheet 4.

C. S. ELLIS.

TYPE WRITING MACHINE.

No. 559,126. Patented Apr. 28, 1896.

Fig. 9.

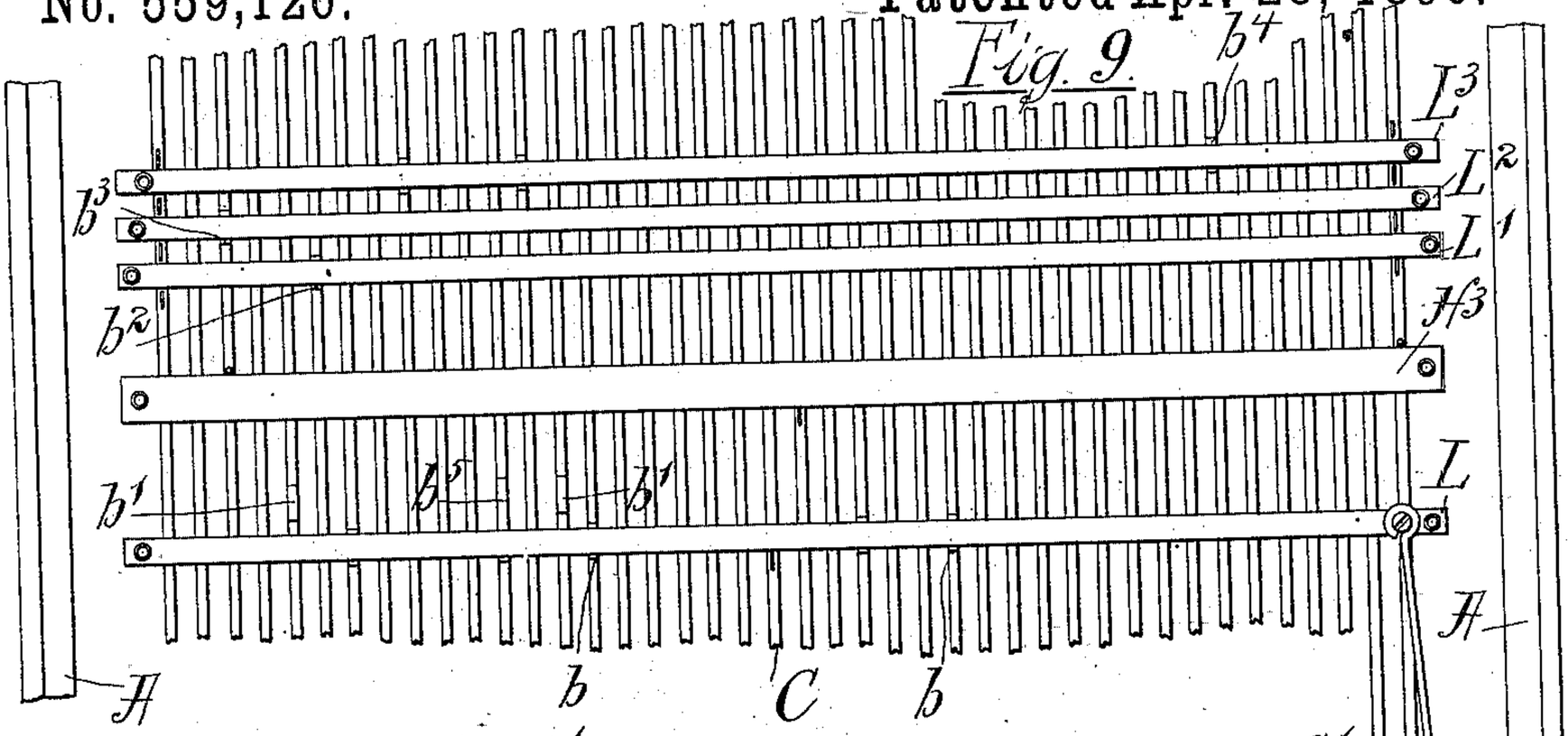


Fig. 10.

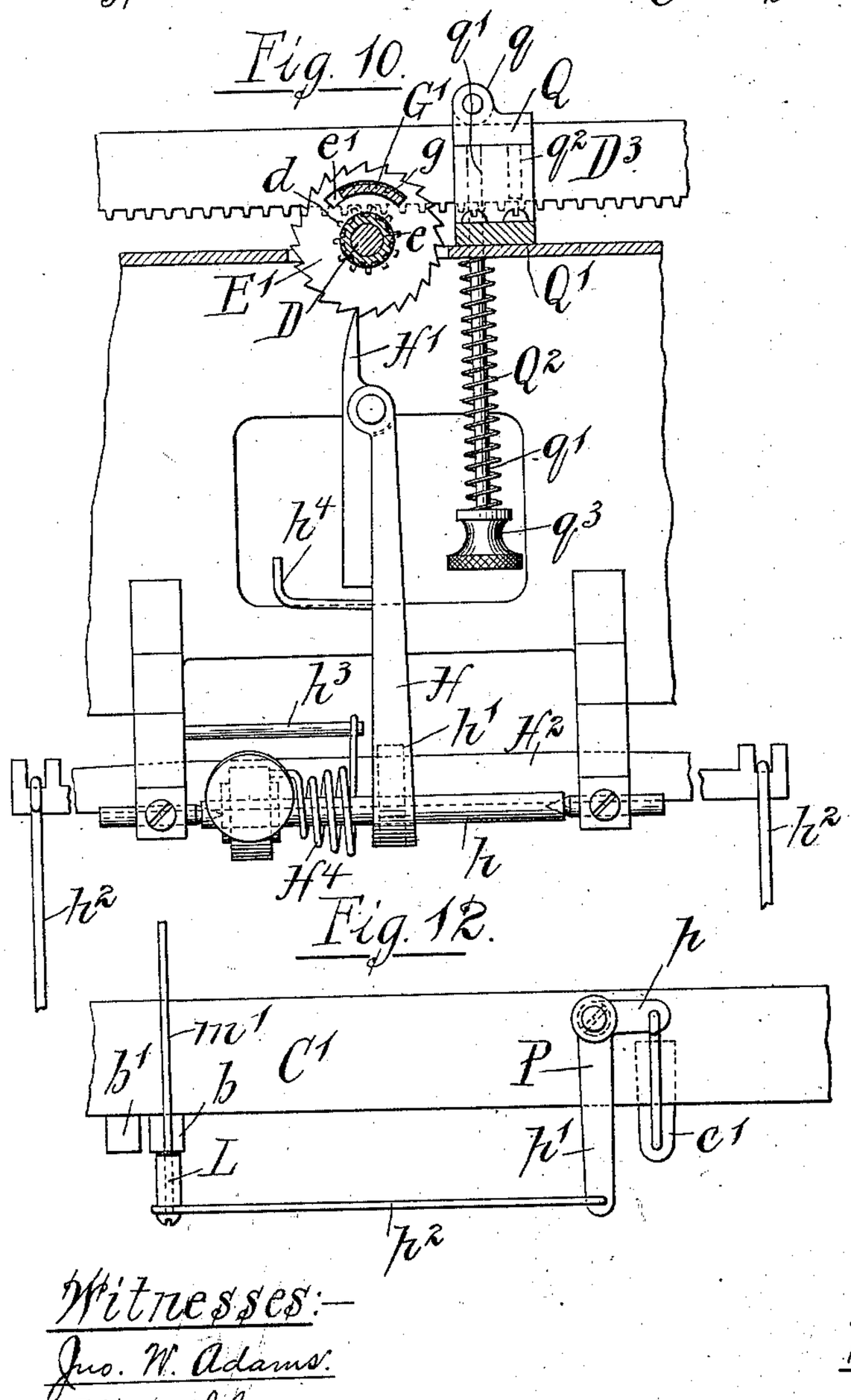


Fig. 11.

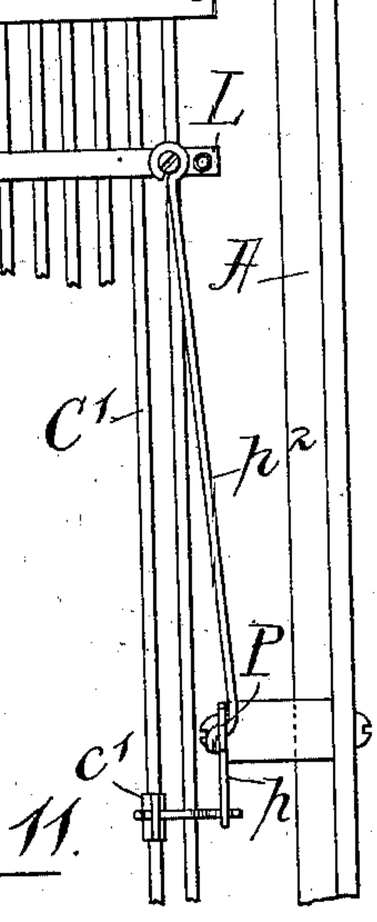
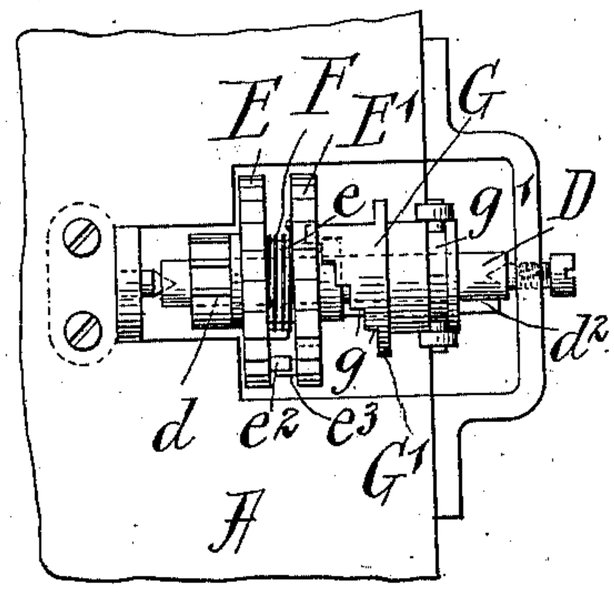


Fig. 12.

Fig. 13.



Witnesses:—
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his Attorneys.

UNITED STATES PATENT OFFICE.

CHARLES S. ELLIS, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE ELLIS-SOUTHWICK COMPANY, OF SAME PLACE.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 559,126, dated April 28, 1896.

Application filed April 23, 1894. Serial No. 508,652. (No model.)

To all whom it may concern:

Be it known that I, CHARLES S. ELLIS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Type-Writing Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to type-writing machines of that class in which the paper-carriage as it is advanced step by step to bring the paper into position for successive action of the types thereon is moved through varying distances to permit the use of types having varying widths of faces and whether bearing single letters or groups of letters.

The present invention embraces a feed motion of the kind above referred to in connection with means by which the same is adapted for use on that class of type-writing machines in which one set of keys is employed to actuate type-bars carrying two characters or types, and a shifting key is used to move the paper-carriage, so as to bring the paper into position to receive an impression from either set of characters—as, for instance, upper or lower case letters.

The features constituting this invention are herein shown in connection with a machine having paper-carriage-feeding devices of the same general character as those illustrated in prior applications for patents Serial No. 496,570, filed January 20, 1894, and Serial No. 502,791, filed March 8, 1894.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

My invention may be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a view in rear elevation of a type-writing machine embodying my invention. Fig. 2 is a plan view of the same. Fig. 3 is a detail side elevation showing the parts at the top of the machine as seen from one end of the same. Fig. 4 is a vertical section through the rear part of the machine, taken on line 4 4 of Figs. 1 and 2. Figs. 5, 6, 7, and 8 are views showing separately the several actuating-cams of the machine. Fig. 9 is a view from beneath, showing the parts of the key-levers adjacent to the cross-bars through the medium of which the feed devices are actuated. Fig. 10 is a detail sectional elevation taken on line 10 10 of Fig. 4. Fig. 11 is a detail plan view of the ratchet-shaft and ratchets. Fig. 12 is a detail side view of the shifting bar shown in Fig. 9 and its connections.

While my improvements may be embodied in other forms of machine, I have chosen to illustrate them in a machine of the Remington type, A being the main frame; B, the paper-carriage; *b*, the impression-roller mounted on the carriage B, and C C the key-levers which are mounted in the frame A in the usual manner.

The type-bars and their connections are omitted, as having no direct concern with the invention. It is to be understood that the types carried by the several bars may be of any desired width and may embrace any desired number of letters since the feed-controlling devices are so constructed that the paper-carriage will be moved upon the actuation of either key-lever a distance corresponding with the width of the type which is borne by the type-arm actuated by that lever.

D indicates a revolving shaft, which is located horizontally at the upper part of the machine-frame at the rear of the paper-carriage and at right angles with the path of movement of the latter and which is employed as a medium through which the movement of the paper-carriage is controlled. Said carriage is actuated by the usual actuating-spring, the drawings illustrating the usual drum D′, which is actuated by the spring (not shown) and over which is trained a cord or chain D^2, which connects the drum with the carriage in a familiar manner. Said shaft D is provided with a gear wheel or pinion *d*, Figs. 4 and 11, which intermeshes with a rack D^3 on the carriage, so that endwise movement of the carriage under the action of its actuating-spring will produce rotary motion of said shaft.

The rotation of the shaft D under the action of the carriage-actuating spring is controlled

through the medium of the following devices: E indicates a ratchet, which is rigidly secured to the shaft D and which has its teeth so directed that those at its top present their abrupt faces toward the side of the machine toward which the carriage is moved by the action of the actuating-spring. E′ is a second ratchet, mounted to turn on the shaft D and having its teeth directed in the same way as those of the ratchet E. Said ratchets are separated from each other by a short interval and between them is located a spring F, so applied that its resilient action tends to turn the loose ratchet E′ in the same direction that the shaft revolves in the advance movement of the upper carriage. Said spring is herein shown as having the form of a coiled wire placed around a hub *e* on the ratchet E′ and attached to the adjacent faces of the ratchets. Stop-pins e^2 e^3 extend from the adjacent faces of the ratchets and are adapted to engage each other when the ratchet E′ is restrained from forward rotation and the shaft D is turned forward by the movement of the carriage. A sleeve or collar G is mounted on the shaft D, so as to turn therewith, but is free to slide endwise thereon, the sleeve being engaged by a spline d^2 on the shaft or otherwise held from rotation on the latter. Said sleeve G is provided adjacent to the ratchet E′ with a concentric parti-cylindric flange G′, adapted to enter a parti-circular slot *e′*, formed in the ratchet E′ opposite said flange. The flange G′ is provided on its outer edge with a series of steps or offsets *g g*, corresponding in number with the number of units of movement of the shaft D contained in the possible total rotary movement thereof, said steps or offsets being separated from each other by an angular distance corresponding with the angular distance between the teeth of the ratchets E E′. The several steps or shoulders *g g* constitute stops, either of which may be made to limit the forward rotary movement of the ratchet E′ under the action of the spring F by contact of the end of the slot *e′* in said ratchet with one or another of said shoulders, according to the distance to which the shouldered flange has been thrust into the slot of the ratchet by the movement of the sleeve G endwise on the shaft. Said sleeve G is given variable endwise movement on the shaft for the purpose of bringing a desired stop into action through the medium of devices actuated by the several key-levers, as will be hereinafter described.

H is an oscillating detent-arm attached to a rock-shaft *h* in a plane parallel with the shaft D and carrying at its free end a separately-movable piece or pawl H′, which is adapted to immediately engage the teeth of the ratchets E E′, said pawl being arranged to engage one or the other of the said two ratchets at opposite limits of the vibratory movement of the detent-arm H. Secured to said rock-shaft *h* is a rigid arm *h′*, which extends horizontally therefrom and to the free end of which is connected a bar H^2, which extends across the machine-frame above and at right angles with the key-levers and to the ends of which are connected two depending rods h^2 h^2, which extend downwardly past the outer key-levers and are attached at their lower ends to a cross-bar H^3, on which the several key-levers act when depressed. A coiled spring H^4, placed around the rock-shaft *h* and attached at one end to said shaft and at its opposite end to a pin h^3 on the frame, tends to hold the upper end of the detent-lever and the pawl H′ in position to engage the loose ratchet E′. Upon the depression of either key-lever the detent-lever will be moved, through the medium of the rods h^2 h^2 and bar H^2, against the action of the spring H^4, so as to carry it in engagement with the fixed ratchet E. In Fig. 4 of the drawings the parts are shown in their normal position with the pawl H′ engaged with the loose ratchet. Said pawl H′ is shown as provided below its pivot with a rigid arm h^4, which in this instance forms an integral part of said pawl and is adapted for contact with the arm H in such manner that the pawl will be held from backward movement when in contact with the abrupt face of either of the ratchet-teeth, and will thereby act to positively hold the ratchet with which it is engaged from forward rotation. The pawl thus constructed will, however, allow the ratchet engaged by it to turn freely backward, and thereby permit backward turning of the said shaft. The said pawl H′ may be yieldingly held in working position either by a spring or weight, the arm h^4 in the particular construction shown being made sufficiently heavy to retain the pawl in such working position. By the yielding of the pawl H′ in the manner stated the paper-carriage may be moved backwardly to its starting-point when the end of a line is reached or at any other time, the shaft D merely turning backward as the carriage is pushed backwardly without affecting in any way the action of the feeding devices. Devices are, however, provided by which the rack-bar D^3 may be released from the pinion *d* at the time of shifting the carriage, as will be hereinafter described.

The end of the pawl H′ which engages the ratchets is made wider than the space between said ratchets, so as to continue in engagement with one ratchet until it becomes engaged with the other, and the teeth of the ratchets are of equal size, and the stops or pins e^2 e^3, as well as the shoulders *g g* of the stop-flange G′, bear such angular relation to the ratchet-teeth that when the shaft and ratchets are at rest the teeth of the ratchets will be opposite each other. The pawl H′ may thus be swung laterally at any time from engagement with a tooth of one ratchet into engagement with the opposite tooth of the other ratchet.

Lateral movement of the pawl H′ from engagement with the fixed ratchet takes place at each depression of a key, and the reën-

gagement of the pawl with the loose ratchet E′ takes place upon the ascent of the key-lever. The connections described for throwing the pawl are so arranged that the operation of each key moves said pawl to the same extent.

It will be seen that the shaft D will be held from turning under the action of the carriage-actuating spring by engagement of the pawl H′ with either the fixed ratchet E or the loose ratchet E′, and that when the pawl is engaged with the loose ratchet said turning of the shaft will be prevented by contact of the stop-pins e^2 e^3 with each other. It is also obvious that when the pawl H′ is engaged with the fixed ratchet, as seen in Fig. 4, and the stop-pins on the two ratchets are in contact with each other, if the pawl be then swung into engagement with the fixed ratchet the loose ratchet will be turned forward by the action of the spring F until arrested by contact of the end of its curved slot with one of the shoulders *g g* of the stepped or shouldered segment. It will also be obvious that the extent of angular movement of the loose ratchet under such action of the spring will depend upon which one of the shoulders *g g* is at the time in position for contact with said loose ratchet, and that inasmuch as the said shoulders are located at an angular distance apart equal to the angle between the ratchet-teeth the loose ratchet will be turned to an angular distance of one, two, three, or more of the ratchet-teeth, according to the angular distance of the shoulder G, which is then in position of rest, from starting-point of the said loose ratchet, said starting-point being the position at which it stands when released by the movement of the pawl.

It follows from the above that when the pawl H′ is vibrated or shifted alternately from one ratchet to the other by successive operations of the key-lever the shaft D will be caused by the force of the carriage-spring to revolve intermittingly or by a step-by-step movement, and that the extent of each advance movement or step of the paper-carriage will be determined by the extent to which the loose ratchet has previously been allowed to turn on the shaft under the action of the spring F before striking one of the shoulders of the stop-segment. The forward movement of the carriage and the attendant rotary movement of the shaft of course takes place immediately after and in consequence of the retraction of the pawl H′ from engagement with the fixed ratchet, or, in other words, upon release from pressure of the key-lever. Each time the shaft is thus turned by the action of the carriage-actuating spring the spring F will be put under its maximum tension, and said spring F is made of such strength that it may be readily overcome by the carriage-spring, while at the same time it is strong enough to properly turn the loose ratchet.

Next, concerning the devices shown for transmitting motion from the key-levers to the stop-sleeve G on the shaft D; these parts are made as follows: J is a lever mounted on a horizontal pivot *j*, which is mounted on the machine-frame below the said sleeve, the means shown for supporting said pivot consisting of a depending bracket A^3, which is secured to the rear margin of the top plate of the frame and serves to support said pivot, as well as other parts below the same, as will hereinafter appear. The lever J is forked at its upper end and provided with inwardly-extending pins, which engage an annular groove *g′* in the said stop-sleeve G, Figs. 4 and 11, these parts being so constructed in a familiar manner that the movement of the lever will shift the stop-sleeve endwise on the shaft, while at the same time the sleeve is free to revolve with the shaft. Mounted on the lower end of said lever J is an antifriction-roller J′, which is adapted to be acted upon by either one of the series of rotative or otherwise movable differentiated cams K K′ K^2 K^3, placed side by side. Through the medium of one or another of these cams motion is transmitted from a key-lever when the same is depressed to the lever J and sliding stop-sleeve G. The cams K K′ K^2 K^3, as shown in the accompanying drawings, are four in number, or one less than the number of stop-shoulders *g* on the flange G′, and they are mounted on a common pivot-stud *k*, which is secured in the lower forked end of the bracket A^3, hereinbefore mentioned, Fig. 1. For giving motion to the said cams K K′ K^2 K^3 a corresponding number of bars L L′ L^2 L^3 are arranged beneath the key-levers transversely thereto. Said bars are vertically movable and are severally connected with said cams by suitable intermediate connections so arranged that when either of said bars is depressed the cam connected therewith will be moved or turned.

The cams K K′ K^2 K^3 are provided with dissimilar cam-surfaces so shaped or proportioned that each cam will move or shift the sleeve G into a different position on the shaft and thereby bring one or another of the several stop-shoulders *g g* into position for engagement with the loose ratchet E′. The cams illustrated are of the kind having peripheral cam-surfaces, and the roller J′ is held in contact with the cams by means of a spring J^2, connected with an arm *j′* on the machine-frame and with the lever J in such manner as to throw the said roller toward the cams, the spring thus arranged serving to move the sleeve G in one direction, while each of the cams may move the sleeve in the opposite direction and serves to determine its position when so moved. The said cams may be so arranged as to move the sleeve G either toward or from the loose ratchet when a key-lever is depressed, and in any case the sleeve may occupy, when unmoved by either cam, a position affording the extent of feed motion required for a type or types of a certain width. For instance, the sleeve G may stand

normally in position for contact of the loose ratchet with the first stop-shoulder, so as to afford only one unit of movement in the sleeve G when neither cam is moved, and the four cams may be arranged to throw the sleeve at such unequal distances from the loose ratchet that the same will strike either the second, third, fourth, or fifth stop-shoulder, according to the extent of motion produced by that one of the cams which is moved.

In order, however, to enable the parts to be operated with a minimum extent of movement of the sleeve, the latter, in the machine herein shown, is arranged to stand normally in position for contact of the loose ratchet with the second stop-shoulder, and one cam is arranged to advance the sleeve toward the ratchet, so that the latter shall strike the first stop-shoulder, (or that nearest the sleeve G,) while the other three cams are constructed to retract the sleeve from the loose ratchet, so that said ratchet will be arrested by either the third, fourth, or fifth stop-shoulder, as desired. In this way the feed devices are operated with a minimum extent of movement in the sleeve, the second stop-shoulder being the one which affords an extent of feed common to the greatest number of characters or types, the first, third, and fourth giving the extent of feed required by a less number of types, while the fifth shoulder gives the greatest extent of feed and one which is called for by the least number of types.

Figs. 5, 6, 7, and 8 illustrate the several cams separated from each other and show clearly the manner in which the lever J is actuated to advance or retract the sleeve. The cam K^3 (shown in Fig 8) is the one which advances the sleeve, and this cam is so arranged that the roller J′ rests on its concentric portion most remote from its supporting-stud when the cam stands in its normal position, so that when a key actuating the cam is depressed the cam will be turned in a direction to carry the roller upon that part of its surface nearer the stud, as seen in Fig. 8, and thus give the desired advance movement to the sleeve. Similarly the cams K, K′, and K^2, Figs. 5, 6, and 7, are shown with the roller J′ resting on the larger parts thereof when the same are shifted by the action of the keys, the cams in this instance being so arranged that depression of the key-levers will carry the larger part of the cam beneath the roller J and thus retract the sleeve from the ratchet E′.

As before stated, only certain of the key-levers actuate each of the cams K K′ K^2 K^3, and it will of course be understood that all the levers which control types requiring the same extent of feed will actuate the same cams, so that the number of cams employed in any case will be one less than the number of units of feed movement provided for in the machine, no movement of the sleeve being required for the types of one certain width, as hereinbefore explained. The machine shown in the accompanying drawings affords five units of movement, and therefore contains four cams. It follows that in said machine the type-levers will comprise five groups, of which one group gives no movement whatever to the feed-controlling devices, another group actuates the cam K^3 to move the carriage through a distance equal to one unit of movement, a third group actuates the cam K^2 to effect the movement of the carriage through a distance equal to three units of movement, the fourth group actuates the cam K′, so as to permit a movement of the carriage through a distance equal to four units of movement, and the fifth group similarly actuates the cam K, so as to afford five units of movement, this being the greatest movement contemplated in the machine shown.

It will of course be understood that the number of steps or stop-shoulders *g* on the stop-flange G′ and the number of cams for actuating the sleeve G will be increased when it is desired to provide for a greater number of type-groups and that the extent of feed may be increased to any extent within the limits determined by the number of shoulders *g g* with which the stop-flange G′ may be conveniently provided. It follows that the machine may be provided with type-words of any width desired by adding a cam for each additional width of type.

Each of the bars L L′ L^2 L^3, by which the cams are actuated, is adapted to be moved by a limited number only of the key-levers, and one of the bars L is capable of movement and adapted for actuation by either one of two sets or groups of key-levers, while the other three bars L′ L^2 L^3 are adapted for actuation each by one set or group of said key-levers. For such actuation of the bars by the key-levers the latter are provided with depending projections *b b′* b^2 b^3 b^4, of which the projections *b b′* are adapted to act upon the bar L when the latter bar is shifted backward or forward to bring it under one or the other set, while the projections b^2 b^3 b^4 act on the bars L′ L^2 L^3, respectively, as clearly seen in Fig. 4.

As hereinbefore mentioned, the machine shown is of that class in which each type-lever carries two types or characters, and in which the carriage is shifted back and forth to print one or another of the characters by means of a special lever or "shifting key" C′, the same type-lever in case of the letters of the alphabet carrying both the capital and small or lower-case letters. The two sets of projections *b b′* are applied to those key-levers which control type-arms carrying types of different widths or those carrying a different extent of feed—as, for instance, those carrying the letters "F f" or "T t." The projections b^2 b^3 b^4 are applied to levers which control the type-arms which carry two types of the same width and which require the same extent of feed—that is to say, in the case of the letters "T" and "L" the capital letters will require wider spaces and a greater extent of

feed than the lower-case letters. It is necessary, therefore, that depression of the key-levers carrying such types of unequal width should not produce an equal feed, and by the use of the two sets of projections *b b'*, together with connections between the spacing-key and the bar L, by which the said bar may be moved from beneath the projections *b* or *b'* at the time the carriage is shifted, I am able to secure a varying extent of feed for the two types carried by the type-arm, the extent of feed produced when the bar L is depressed by the action of one of the projections being that afforded by the cam with which said bar is connected, and the extent of feed produced when the bar L is shifted clear of the projections being that which is produced when the top sleeve remains unmoved; this, in the present instance, being two units of movement.

In the case of other letters—such, for instance, as "M" and "W"—the amount of feed may be the same for both the capital and small or lower-case letters, and in that case no change in the extent of feed movement is required when the carriage is shifted to print one letter or the other and the feeding is accomplished on the depression of each key, whether the carriage be shifted or not, in the same manner as in the machine set forth in my said concurrently-pending application, Serial No. 496,570, filed January 20, 1894. The machine shown is provided with four key-levers having projections *b*, beneath which the bar L normally rests, these being the levers for printing "F," "J," "L," and "T." The bar L in this instance controls the cam K^3, which affords a movement equal to one unit of movement, this being all that is required for the lower-case or small letters "f," "j," "l," and "t." When the shifting key is actuated, the bar L is carried rearwardly from beneath said projections *b*, so that when either of the key-levers carrying said projections is depressed neither of the cams will be operated and the carriage will be moved a distance of two units of movement, this being the distance which the carriage will be allowed to move in the machine shown when the stop-segment is unmoved.

As a convenient means of communicating motion from the bar L and the cam K^3, devices are provided as follows: A rocking bar M is pivotally supported on a bracket *m* attached to the machine-frame, said bar extending horizontally above the key-levers to a point some distance in advance of the cams. Said bar M is connected at its ends with the bar L by means of rods *m' m'*. Near its center the bar M is provided with an upwardly-extending arm m^2, the upper end of which is connected by means of a horizontally-arranged connecting-rod m^3 with the cam K^3. A spring M' is applied to lift the bars M and L.

To communicate motion from the bars L' L^2 L^3 to the cams K K' K^2, rock-shafts N N' N^2 are arranged horizontally above the type-levers and said rock-shafts are provided at each end with horizontal arms *n n' n²*, which are engaged by rods *l l' l²*, which rods extend downwardly to and are connected with the ends of the bars L' L^2 L^3. Attached to said rock-shafts N N' N^2 are upwardly-extending rigid arms n^3 n^4 n^5, to the upper and free ends of which are pivotally connected three connecting-rods n^6 n^7 n^8, which extend to and are pivotally connected with the cams K K' K^2. The said rock-shafts are shown as provided with springs O O' O^2, which are connected with the frame and with the rock-shafts in such manner as to turn the rock-shafts in a direction to lift the several bars L' L^2 L^3 and to thereby maintain said bars adjacent to or in contact with the projections b^2 b^3 b^4 of the key-levers. The several cams are thus held normally in one position and turned in one direction by the springs M' O O' O^2, and movement of said cams in the opposite direction is produced by pressure of the key-levers acting against the bars L L' L^2 L^3 in opposition to said spring.

The device above described obviously affords merely one convenient means of transmitting motion from the vertical immovable bars L L' L^2 L^3, which are directly acted upon by the key-levers, to the several cams, and other forms of mechanical construction may be employed for this purpose as may be found convenient and desirable.

The device for transmitting motion from the shifting-key lever C' is seen at the right-hand side of Fig. 9 and is shown in side view in Fig. 12. This key-lever is provided with a depending lug *c'*, and mounted on the side frame of the machine adjacent to said lug is a bell-crank lever P, provided with a horizontal arm *p*, which is connected with the lug *c'*. The lever P is also provided with a depending arm *p'*, the lower end of which is connected by means of a rod p^2 and the bar L. As will be clearly seen from the drawings, Figs. 9, 10, and 12, when the spacing-key lever is depressed the lower end of the bell-crank lever P will be swung rearwardly, thereby shifting or moving the bar L the required distance to carry it out from beneath the projections *b b*.

It will be noted that projections *b' b'*, hereinbefore referred to and clearly seen in Figs. 9 and 12, are so located that when the bar L is shifted rearwardly, as described, it will come beneath said projections. This construction is employed for those key-levers which actuate type-arms carrying two characters, of which the wider one stands in position for printing when the paper-carriage is in its normal position and the narrower one is adapted to act when the paper-carriage is shifted by the action of the shifting key, this being just the reverse of the action occurring in the case of the upper and lower case letters "F," "J," "L," and "T," hereinbefore referred to. One of the key-levers is shown

as provided with a projection b^5, which is of such length as to act upon the bar L when the latter is in either its forward or rearward position. This key-lever controls a type-arm which carries two characters—such, as the colon and semicolon—both of which require a small and equal amount of feed movement.

The machine made as described is operated in the same manner as is any other machine having a shifting key, the movement of the latter for giving different characters in all cases when the characters are of different widths producing a different extent of feed. Characters of the same width are, however, as far as possible, placed on the same type-levers, so that in a machine adapted for common use, such as is herein shown, a few only of the keys need operate characters of different widths and these are mainly the keys which control the type-arms carrying the letters "F," "J," "L," and "T," as before described. It will, of course, be understood that in operating the machine shown if the shifting key be untouched the depression of either of the keys controlling the letters "F," "J," "L," and "T" will result in the printing of the lower-case letters, and that the bar L will be unmoved laterally, but will be depressed by one of the projections b, so that the cam giving one unit of movement will be thereby actuated. If, however, the shifting key be first depressed, then the actuation of one of said keys will result in the printing of the capital letter, and the bar L will be moved so as to be free from the action of said projection and no cam will be moved, but the paper will be fed a distance equal to two units of movement. The action of the keys bearing the projections b' b' is similar but opposite to that of those which actuate letters of the alphabet bearing the projections b b.

While I have shown only one of the bars L L' L^2 L^3 as adapted to be shifted for changing the extent of feed consequent on the depression of a single lever, yet the same principles of construction may be applied to any other or all of the said bars. It is to be understood, however, that the arrangement of one of the bars so that it may be shifted will not effect its action in connection with those key-levers which control two types of the same width, provided the projection on said key-levers controlling types of the same width are made like the projection b^5, above described—that is to say, of sufficient length to act on the bar equally in both its forward and rearward positions.

In case two of the bars are made movable and both are actuated by the shifting key, one key-lever may have two projections severally adapted for operating on the two movable bars. In such case the shifting of both bars will carry one bar from beneath one projection on a key-lever at the same time the other bar is carried beneath the other projection on the same lever, so that the two types of any widths desired may be carried by the type-arm which is actuated by that type-lever—as, for instance, in such case one type-lever may control types requiring an extent of feed in the carriage of one and three, one and four, or three and four units of movement.

As the paper-carriage is in this instance shown to be mounted, it is capable of being lifted and lowered as in other machines of the type illustrated, the arrangement of the connection between the rack-bar and the carriage permitting the said rack-bar to remain in engagement with the pinion d on the shaft D when the carriage is swung upon its pivotal support in being lifted and lowered.

In the operation of a type-writing machine of the character shown it is often necessary to release the carriage from control of the automatic feed devices, so as to permit said carriage to be moved by hand to a desired point. This is required, for instance, in inserting a letter in place of one erased. In the machine shown provision is made for so releasing the carriage from the feed devices by so constructing the rack-bar D^3 that the same will be vertically movable, thereby enabling it to be disengaged at will from the pinion d on the shaft D, the devices illustrated for lifting the rack-bar being substantially the same as those heretofore used in machines having a feed device of escapement form for lifting the ratchet-bar thereof clear of the feed-pawl. In the construction herein illustrated, however, devices are provided in addition to those present on machines of the character referred to adapted for holding the rack-bar D^3 normally in engagement with the pinion, while at the same time permitting the retraction of the bar away from the pinion when sufficient force is applied to the bar for the purpose.

The device illustrated for the purpose last mentioned consists of an antifriction-roller q, which is mounted upon a vertically-movable block Q in such manner as to overhang the rack-bar and to bear on the upper edge of the latter. The block Q has sliding connection with a bracket Q', which is attached to the top surface of the upper frame-plate, as clearly seen in Fig. 2. Means for providing such sliding connection, herein shown, consists of two guide-rods q' q^2, Fig. 2, which guide-rods are secured at their upper ends in the block Q and extend downwardly through vertical guide-apertures in the bracket Q'. A spring Q^2 is so applied as to thrust and carry the block Q downwardly and thereby hold the roller q in contact with the upper edge of the rack-bar; but the downward movement of the block is limited by a suitably located stop, so that the rack-bar will be held by the roller in position to engage the pinion without being pressed forcibly against the latter. Such stop, as shown, is formed by the top of the bracket Q', in contact with which the block Q normally rests. The spring Q^2 is shown as made of spirally-coiled form and as surrounding the depending end of the rod q', which is

extended downwardly below the bracket Q′ for this purpose, said spring being located between a head q^3 at the lower end of the rod and the bottom surface of the said bracket. The roller q, being held in the position described by the spring Q′, retains the vertically-movable rack-bar D^3 in engagement with the pinion under all ordinary circumstances, while at the same time it is adapted to yield upwardly to allow the rack-bar to be disengaged from the pinion when necessary.

The rack-bar D^3, as before stated, is made vertically movable by devices such as have heretofore been employed on Remington type-writers, the same being made as follows: Said rack-bar is carried by two arms D^4 D^4, which are pivotally connected with the sleeve r r, permitting the rack-bar to move or oscillate vertically, in the manner heretofore described. For lifting the rack-bar free from the pinion d an actuating-arm D^5 is attached to one of the arms D^4, and such actuating-arm is provided with a thumb-piece extending beyond the side of said carriage in the same manner as does the corresponding actuating-arm in said Remington machine. A device is also provided like that used in the Remington machine for lifting the rack-bar, adapted for operation by the thumb or finger of the left hand. The same consists of a rock-shaft S, having an upwardly-extending actuating-arm or finger-piece s, located near the forward edge of the carriage, Fig. 1, and having also a horizontal arm s', which is adapted to engage and press downwardly upon an arm D^6, which is rigidly attached to the rack-bar and extends forward past the pivotal axis on which said rack-bar swings to a point beneath and in position for engagement with the arm s'. By pressing on the finger-piece s at the time the carriage-frame is in its horizontal position the arm s' will press downwardly upon the free end of the arm D^6 and thus lift the rack-bar. As in the Remington type-writer, also, the lever T, by which the impression-roller is turned, is also adapted to act upon the arm D^5, as clearly seen in Fig. 3, so as to depress the said arm and lift the rack-bar at the time said lever T is moved, for the purpose of turning the impression-roller and also moving the carriage back to its starting-point at the completion of each line in printing.

The rack-bar D is shown as provided at one end with a guide rod or wire U, which is arranged parallel therewith and carries an adjustable stop u, which is adapted for engagement with the bell-hammer-actuating arm u', by which the hammer U′ is actuated to strike the alarm-bell U^2 at the end of the forward travel of the paper-carriage.

I desire to be understood that the form of either of the above-described mechanisms or devices may be varied and that either feature of the improvement set forth may be employed without the others, or that any one or more of them may be omitted or replaced, without avoidance of my invention.

I claim as my invention—

1. In a type-writing machine of the class in which the carriage is adapted to be shifted to print from either one of a plurality of types, the combination, of carriage-feeding mechanism, a variable spacing device for controlling the movement of the carriage under the action of said feeding mechanism, movable projections operated by the keys, a shifting bar located in position to be acted upon by said movable projections, connections between said shifting bar and the variable spacing device, shifting devices for the paper-carriage, and connections between the movable bar and the carriage-shifting devices, substantially as described.

2. In a type-writing machine of the class in which the carriage is adapted to be shifted to print from either one of a plurality of types, the combination, of carriage-feeding mechanism, a variable spacing device for controlling the movement of the carriage under the action of said feeding mechanism, key-levers provided with depending projections, a shifting bar located in position to be acted upon by said movable projections, connections between said shifting bar and the variable spacing device, shifting devices for the paper-carriage, and connections between the shifting bar and the carriage-shifting devices, substantially as described.

3. In a type-writing machine of the class in which the carriage is adapted to be shifted to print from either one of a plurality of types, the combination, of carriage-feeding mechanism, a variable spacing device for controlling the movement of the carriage under the action of said feeding mechanism, movable projections operated by the keys, a plurality of bars located in position to be acted upon by said movable projections, one of which bars is movable laterally, a plurality of cams actuated by said bars, connections between said cams and the variable spacing device, shifting devices for the paper-carriage, and connections between said movable bar and the carriage-shifting devices, substantially as described.

4. In a type-writing machine of the class in which the carriage is adapted to be shifted to print from either one of a plurality of types, the combination, of paper-feeding mechanism, a variable spacing device for controlling the movement of the carriage under the action of said feeding mechanism, movable bars adapted to be acted upon by the keys, one of said bars being adapted to be shifted, cams which are acted upon by said movable bars, connections between said cams and the variable spacing device, a shifting key for the paper-carriage, and connections between said shifting key and said movable bar, substantially as described.

5. In a type-writing machine of that class

in which the carriage is adapted to be shifted to print from either one of a plurality of types, the combination, of carriage-feeding mechanism, a variable spacing device for controlling the movement of the carriage under the action of said feeding mechanism, key-levers provided with depending projections, movable bars adapted to be acted upon by said projections, cams connected with and actuated by said bars, connections between said cams and the variable spacing device, a shifting-key lever for the paper-carriage, and connections between said shifting-key lever and one of said movable bars, substantially as described.

6. The combination with key-levers each controlling a plurality of types of a shifting lever, means for giving a variable feed, comprising a ratchet movable with the paper-carriage, a second ratchet movable relatively to the first ratchet, a laterally-movable detent actuated by the key-levers and adapted for alternate engagement with said ratchets, a movable part having steps or graduated stop-shoulders adapted to limit the relative movement of the two ratchets, operative connections between the key-levers and the said movable part embracing movable bars adapted to be acted upon by the key-levers, one of which bars is adapted to be laterally shifted, and connections between the shifting lever and said shifting bar, substantially as described.

7. The combination with key-levers each controlling a plurality of types and a shifting lever, of means for giving a variable feed comprising a ratchet movable with the paper-carriage, a second ratchet movable relatively to the first ratchet, a laterally-movable detent actuated by the key-levers and adapted for alternate engagement with said ratchets, a movable part having steps or graduated stop-shoulders adapted to limit the relative movement of the two ratchets, and operative connections between the key-levers and the said movable part embracing movable bars adapted to be acted upon by the key-levers, one of which bars is adapted to be shifted laterally, connections between the shifting lever and said shifting bar, and cams which are moved by the said movable bars and which are connected with and give movement to the said movable part which carries the stop-shoulders, substantially as described.

8. In a type-writing machine of that class in which the carriage is adapted to be shifted to print from either one of a plurality of types, the combination, of carriage-feeding mechanism, a variable spacing device for controlling the movement of the carriage under the action of said feeding mechanism, movable bars operated by the keys, one of said bars being adapted to be shifted laterally, connections between said movable bars and the variable spacing device, a shifting-key lever for shifting the paper-carriage, and connections between said shifting-key lever and the said shifting bar embracing a bell-crank lever, substantially as described.

9. The combination with a paper-carriage and means for giving feed motion to the same embracing a pinion on the machine-frame, the rotation of which is controlled by the action of the keys, a rack-bar connected with the carriage and engaged with said pinion, said rack-bar being vertically movable to permit its engagement with and disengagement from the said pinion, means yieldingly engaging the upper surface of the said rack-bar to hold the same normally in engagement with the pinion, embracing an antifriction-roller engaging the rack-bar, and an upwardly-yielding support for said antifriction-roller, substantially as described.

10. The combination with a paper-carriage and means for giving feed motion to the same embracing a pinion on the machine-frame, the rotation of which is controlled by the action of the keys, a rack-bar connected with the carriage and engaged with said pinion, said rack-bar being vertically movable to permit its engagement with and disengagement from the said pinion, a vertically-movable antifriction-roller engaging the rack-bar so as to hold the same in its normal or operative position, and a spring applied to depress the said roller to hold the same in engagement with the rack-bar, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

CHARLES S. ELLIS.

Witnesses:
ALBERT H. GRAVES,
TAYLOR E. BROWN.