(No Model.)

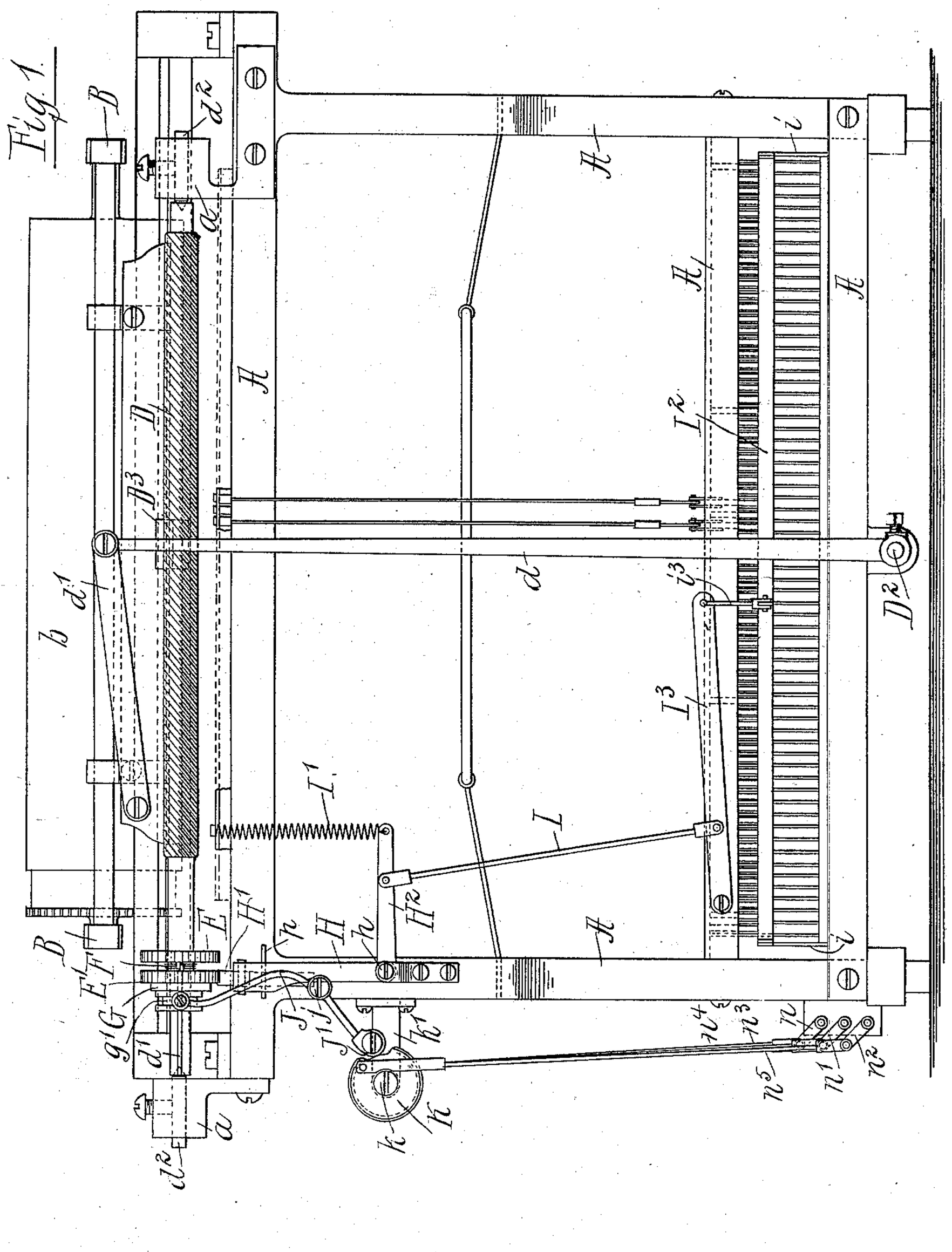
4 Sheets—Sheet 1.

C. S. ELLIS.

TYPE WRITING MACHINE.

No. 559,326. Patented Apr. 28, 1896.

Fig. 1.



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Inventor
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by Dayton, Poole & Brown
his Attorneys.

(No Model.)

4 Sheets—Sheet 2.

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Fig. 2

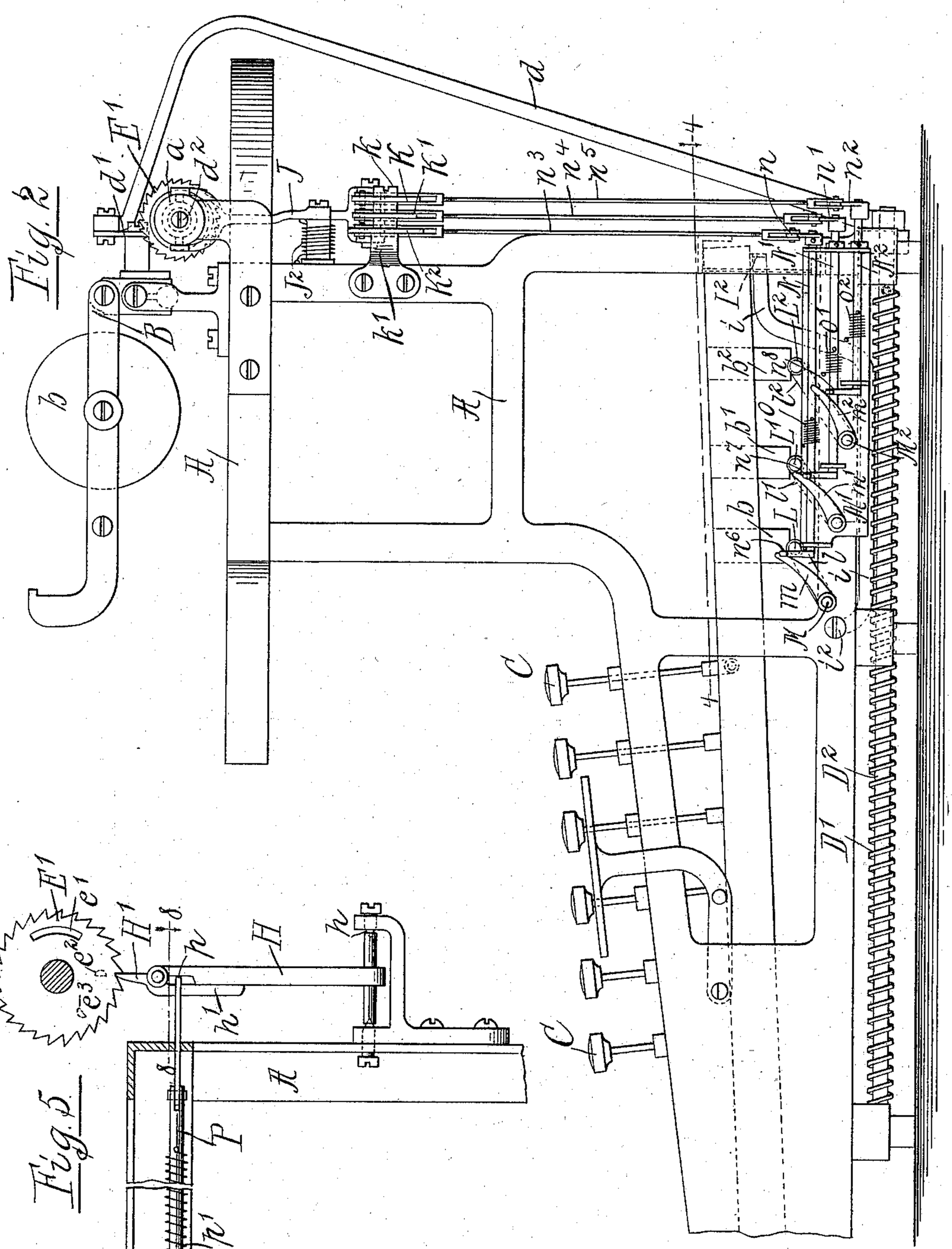

Fig. 5

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(No Model.) 4 Sheets—Sheet 3.

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Fig. 3

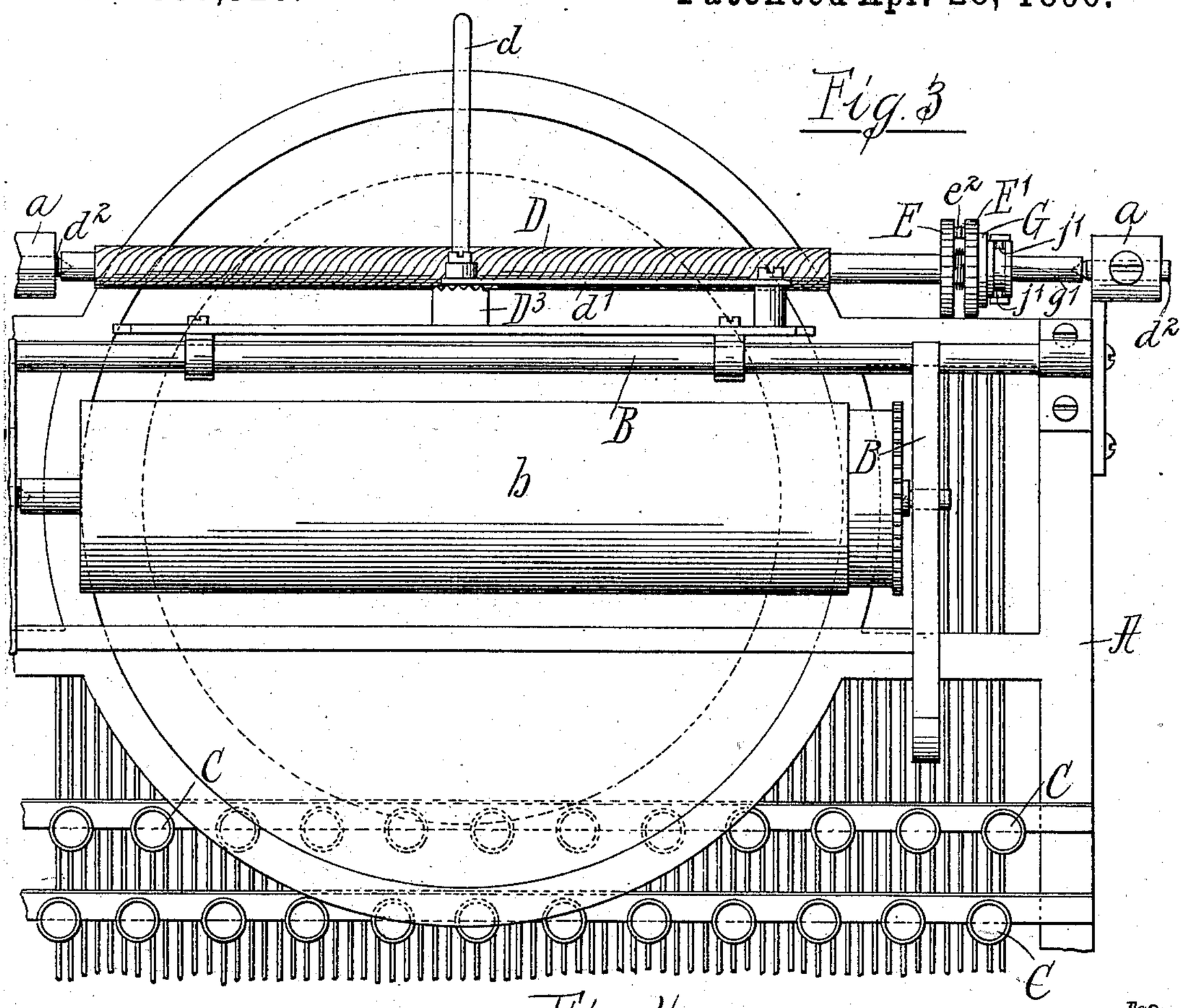

Fig. 4.

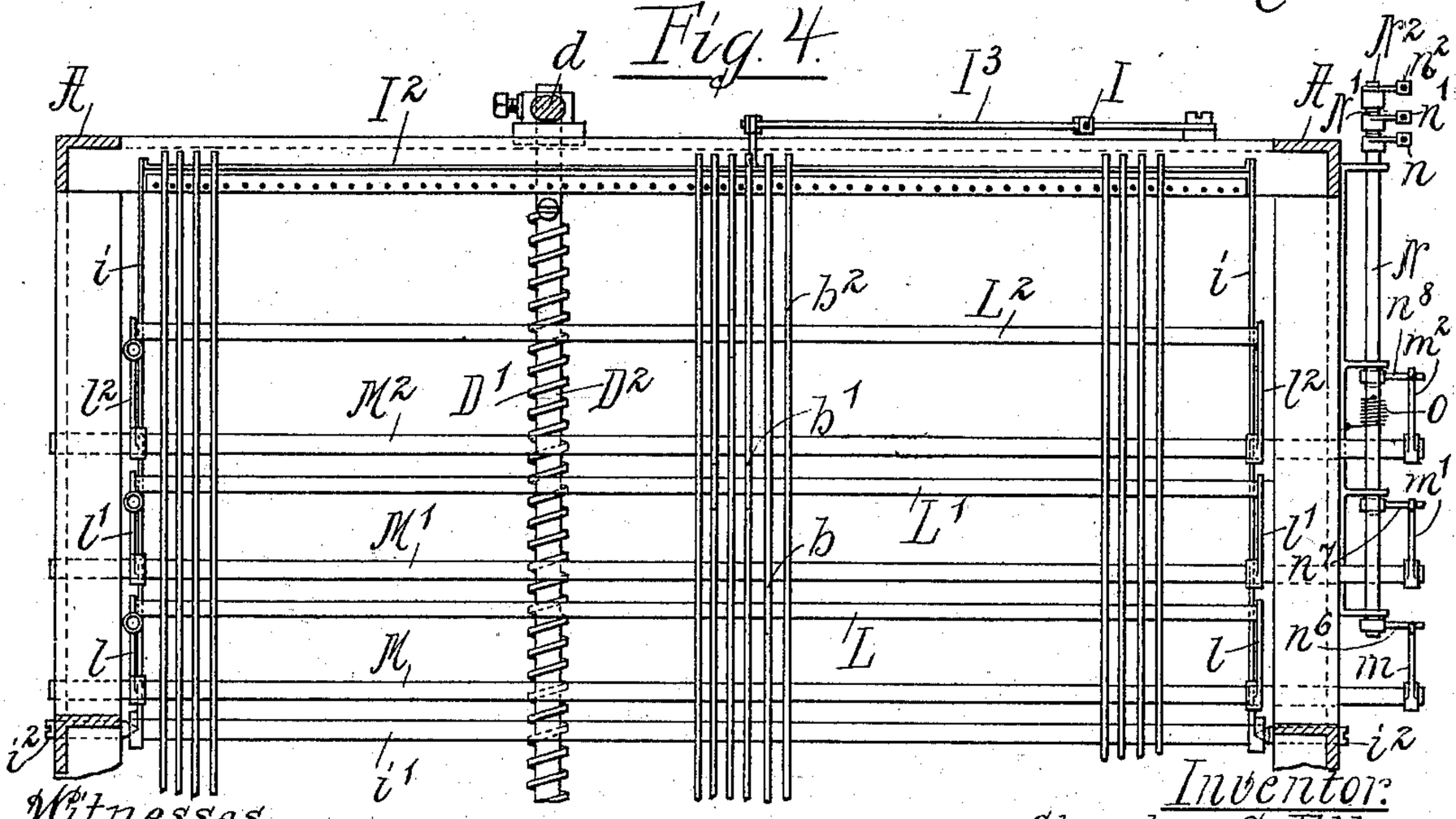

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Fig. 6.

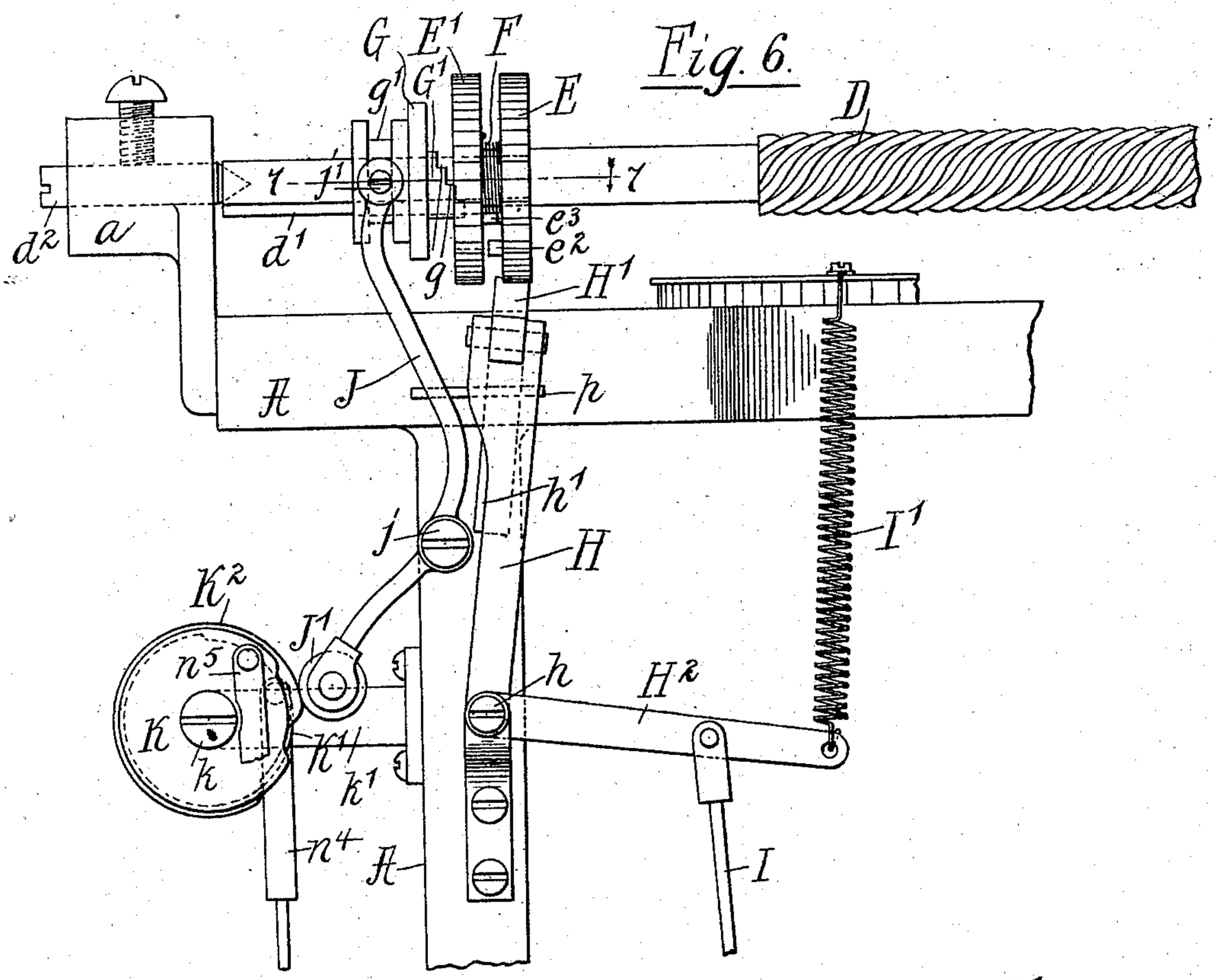


Fig. 9

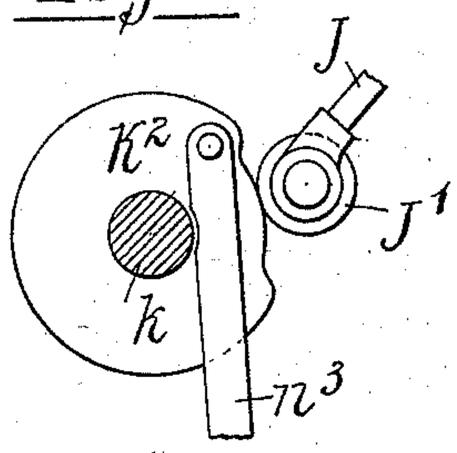


Fig. 10.

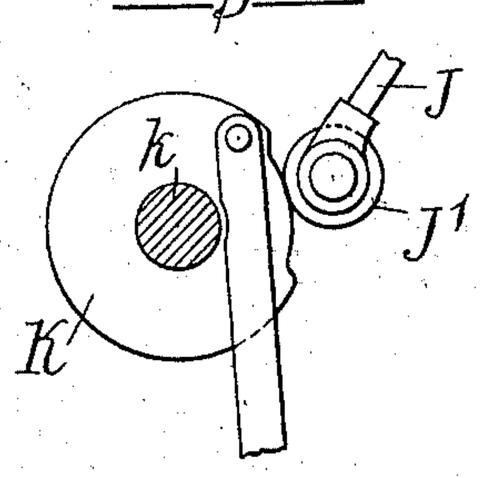


Fig. 7.

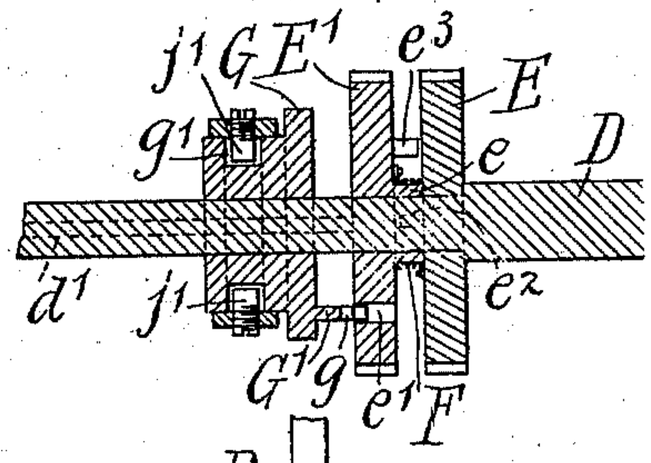


Fig. 11.

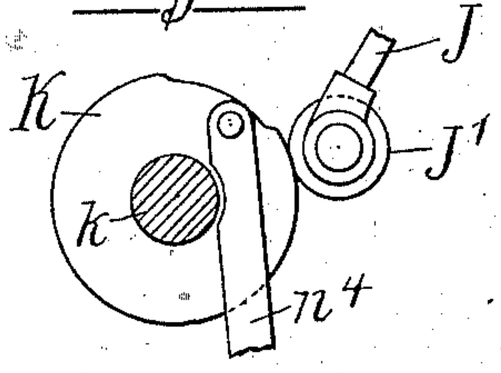


Fig. 12

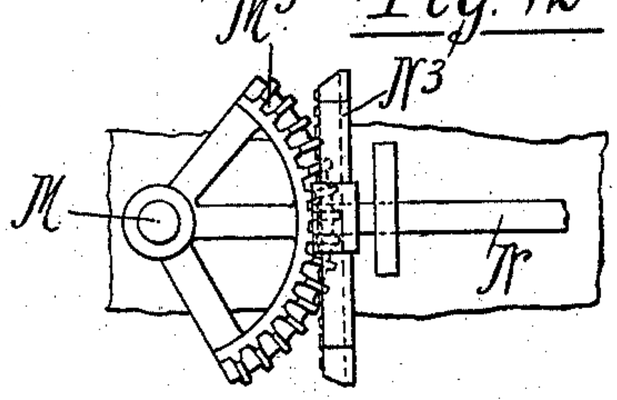
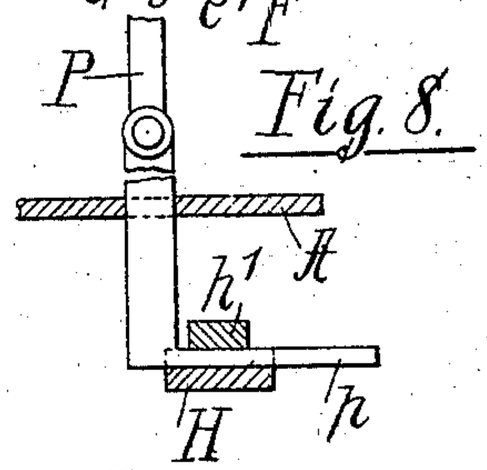


Fig. 8.



Witnesses

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Inventor:

Charles S. Ellis.

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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. 559,326, dated April 28, 1896.

Application filed January 12, 1894. Renewed April 2, 1896. Serial No. 585,991. (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, whether bearing single letters or groups of letters.

The object of the invention is to simplify and improve the construction of the devices by which feed motion is given to the paper-carriage; and it consists in the matters hereinafter claimed and illustrated in one practical form by the accompanying drawings.

In the machine herein shown as an embodiment of my invention feed motion is given to the paper-carriage through the medium of a screw or spirally-threaded shaft, which is given rotative movement to accomplish the feed or travel of the paper-carriage and the extent of rotation of which is controlled by the key-levers, this screw being generally similar to that shown and described in a prior application for Letters Patent, Serial No. 490,335, filed by me November 9, 1893. The features of construction constituting the present invention may, however, be applied in a construction embodying a rotating shaft which engages the carriage otherwise than by a screw-thread, the screw-threaded shaft being illustrated herein merely as one convenient way of establishing connection between the feed-controlling devices and the carriage.

In the accompanying drawings, Figure 1 is a view in rear elevation of a type-writing machine embodying my invention. Fig. 2 is a view in side elevation of the same. Fig. 3 is a plan view of the same. Fig. 4 is a plan section of the rear portion of the machine, taken on line 4 4 of Fig. 2. Fig. 5 is a detail section taken on line 5 5 of Fig. 1. Fig. 6 is a detail view, on an enlarged scale, of the parts more immediately concerned in controlling the feed of the paper-carriage. Fig. 7 is a detail section taken on line 7 7 of Fig. 6. Fig. 8 is a detail plan section taken on line 8 8 of Fig. 5. Figs. 9, 10, and 11 are views in side elevation of the three cams constituting part of the feed devices. Fig. 12 illustrates a modified construction in the devices, through the medium of which motion is transmitted from the key-levers to the said cams.

The improvements constituting my invention are herein shown as applied to a machine of the calligraph type; but they may be embodied in any form of machine.

As shown in the said drawings, A is the main frame of the machine; B, the paper-carriage thereof; *b*, the impression-roller mounted upon the paper-carriage, and C C some of the key-levers, which are mounted in the frame A in the usual or any approved manner.

The type-bars and their connections are omitted from the drawings as having no direct connection with the present invention, it being 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 invention contemplates a movement of the paper-carriage by either key-lever a distance corresponding with the width of the type actuated by that lever.

D indicates a screw-shaft having a thread of high pitch, which in the instance illustrated is employed as a medium through which the movement of the paper-carriage is controlled, said carriage being actuated by the usual spring or its equivalent.

D′ indicates the carriage-actuating spring which surrounds and acts upon a horizontal rock-shaft D^2, extending from front to rear beneath the machine-frame and provided with an upwardly-extending arm *d*, connected with the paper-carriage by means of a link *d′*.

The screw-shaft D is in the instance shown mounted to rotate upon center pins d^2 d^2, screw-threaded through brackets *a a*, which rise from the top plate of the main frame A. As a means of engaging the paper-carriage

with the screw-shaft D said carriage is provided with a toothed projection D^3, the teeth of which are inclined to fit the screw-threads of the shaft, so that they in effect constitute part of a nut. The pitch of the threads on the screw-shaft is such that said shaft may be easily turned by pressure of the toothed projection thereon in the endwise movement of the paper-carriage, the screw-shaft which I have successfully used in practice being three-eighths of an inch in diameter and having ten threads with one-inch pitch.

The rotation of the screw-shaft D under the action of the carriage-spring D′ is controlled and the carriage thereby arrested after movements through varying desired distances upon the retraction of the several key-levers through the medium of the following devices.

E indicates a ratchet which is rigidly secured to the screw-shaft D and which has its teeth so directed that those at its top present their abrupt faces toward the rear of the machine, Fig. 2.

E′ is a second ratchet mounted to turn on the screw-shaft and arranged adjacent to the ratchet E, the teeth of the ratchet E′ being directed in the same way as those of the ratchet E. The ratchets E and E′ are separated from each other by a short space or interval, the ratchet E′ in the particular construction described being provided with a central hub or sleeve *e* on its side nearest the ratchet E, which hub affords a more extended bearing of the said ratchet on the shaft and at the same time keeps the ratchets at a desired distance apart.

Between the ratchets E and E′ is located a spring F so applied that its resilient action tends to turn the ratchet E′ in the same direction that the shaft revolves in the advance movement of the paper-carriage, said spring being shown as a coiled spring placed about the hub *e* and attached to the adjacent faces of the ratchets, though it may obviously be of other form and otherwise applied, as found desirable in practice. The rotative movement of the ratchet E′ on the shaft under the action of the spring F is limited by means of suitable stops, herein shown as having the form of stop-pins e^2 e^3 extending from adjacent faces of the ratchets E and E′ and adapted to engage each other when the ratchet E′ is restrained from forward rotation and the shaft D is turned forward by movement of the carriage. On the said shaft D, adjacent to the ratchet E′, is a sleeve or collar G, which is held from rotation on the shaft by the spline *d′* or otherwise, but is free to slide endwise thereon. In the particular instance shown the inner end of the spline *d′* reaches to the face of the ratchet E′ and forms the shoulder by which the said ratchet is held from endwise movement on the shaft. Said sleeve G is provided at its end 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 screw contained in the possible total movement thereof and 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 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 hereinafter described.

H is an arm arranged to oscillate on a pivot *h* in a plane parallel with the axis of rotation of the shaft D and carrying at its free end a pawl H′, which is adapted to engage one or the other of the two ratchets E E′ at opposite limits of the vibratory movement of the arm H. Attached to the arm H is a lever H^2, to which is pivoted a rod I, upon which the key-levers, through familiar or suitable means, severally pull downward when struck. A coiled expansion-spring I′, attached to the end of the lever H^2 and to a part of the machine-frame, tends to hold the rod I normally elevated and the pawl H′ in engagement with the loose ratchet E′.

In Fig. 1 of the drawings the parts are shown in their normal positions with the pawl H′ engaged with the ratchet E′, while in the detail view in Fig. 6 the parts are shown in the positions which will be occupied by them when one of the key-levers is depressed, the rod I being shown as drawn down and the pawl H′ engaged with the fixed ratchet E. The pawl H′ is pivoted to the vibrating arm H and is provided with a rigid arm *h′*, 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 one of the ratchet-teeth, so as to positively hold the ratchet with which it is engaged from forward rotation or from turning in the direction in which the screw-shaft is turned by the carriage-actuating spring, but so as to permit said pawl to yield and allow the ratchet engaged by it to turn freely backward, and thereby permit backward turning of the said screw-shaft. The said pawl H′ may be yieldingly held in working position either by a spring or weight, the arm *h′* in the particular construction shown being made sufficiently heavy to retain the pawl in such working position.

The construction of the ratchets E and E′ and the pawl H′, as described, enables the paper-carriage to be moved backwardly to its

starting-point by the hand of the operator, either when the end of a line is reached or at any other time, the screw-shaft merely turning backward as the carriage is moved without affecting in any way the action of the feeding devices. In the use of a screw-shaft as a means of connecting the feed-controlling devices with a carriage such as is shown, however, the pitch of the screw-thread employed will be such that the shaft may be easily turned by longitudinal pressure of the toothed projection D′ of the carriage upon the screw-threads engaged therewith.

The engaging end of the pawl H′ is wider than the space between the ratchets E E′, so as to continue in engagement with one until it is engaged with the other, and the teeth of the ratchets E E′ 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, so that the pawl H′ may be swung laterally 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 ratchet E′ to engagement with the ratchet E takes place at each depression of a key-lever, and the reëngagement of the pawl with the ratchet E′ takes place upon the ascent of the key-lever, and the connections for throwing the pawl are such and so arranged that the operation of each key moves the vibrating pawl H′ to the same extent. The mechanism herein shown for transmitting motion from the several key-levers to the rod I consists of a horizontal bar I^2, located beneath the rear ends of all of the key-levers and connected by rigid arms i i with a transverse rock-shaft i', which is pivotally supported by means of bearing-pins i^2 i^2 on the machine-frame. The bar I^2 is connected with the rod I through the medium of a lever I^3, pivoted on the machine-frame so as to swing in a vertical plane, and to the free end of which the bar I^2 is connected by a rod i^3.

It will be seen from the construction described that the shaft D will be held from turning under the action of the carriage-actuating spring D′ 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 such 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 E, as seen in Fig. 6, the loose ratchet will be free to turn under the action of the spring F so far as will be permitted by that one of the shoulders g g of the stop-flange G′, which may be at the time in position for so limiting its rotation.

It will be further obvious that when the pawl is engaged with the loose ratchet E′, as seen in Fig. 1, and the stop-pins on the two ratchets are in contact with each other if the pawl is then swung laterally into engagement with the fixed ratchet the loose ratchet will be turned or moved forward by the action of the spring F until arrested by contact with one of the shoulders g g, as in Fig. 6, and 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. Furthermore, said shoulders being separated from each other by angular distances, each equal to the length of one of the ratchet-teeth, measured in degrees, it follows that the loose ratchet will be turned to an angular distance of one, two, three, or more teeth, according to the angular distance from the rear end of the slot in the loose ratchet to the shoulder which is at the time in position for contact with said rear end of the slot.

It will be further understood that the shoulders g g of the stop bear a fixed angular relation to the stop-pin e^2 on the fixed ratchet inasmuch as the sleeve G is held from turning on the shaft, so that when the sleeve is shifted to bring a certain one of the shoulders g into position to arrest the loose ratchet and the pawl H′ is then shifted from the loose to the fixed ratchet the loose ratchet (which has theretofore been held from turning with its stop-pin e^3 in contact with the stop-pin e^2 of the fixed ratchet) will be allowed to turn so as to carry its said stop-pin a distance away from the stop-pin on the fixed ratchet an angular distance of one, two, three, or more teeth, according to the angular distance of the shoulder g which is then in position to arrest the loose ratchet from the starting-point of the loose ratchet, such starting-point being the position at which it stands when released.

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-levers the screw-shaft will be caused to revolve intermittingly or by a step-by-step movement by force of the carriage-spring D′ acting through the carriage, and that the extent of each movement of the shaft and of the accompanying movement 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 G′. The forward movement of the carriage and the attendant rotary movement of the shaft of course take place immediately after and in consequence of the retraction of the pawl H′ from engagement with the fixed ratchet, or, in other words, upon the release of the key-lever, which is being operated from pressure. Each time the shaft is thus turned by the carriage-actuating spring D′ the spring F, which turns the loose ratchet, must of course be put under its maximum tension, to which end it must be of only such strength that it

may be readily overcome by the carriage-spring D′, while at the same time it must be strong enough to promptly turn the loose ratchet through the greatest distance the latter may ever be required to be moved.

Next describing the devices shown for transmitting motion from the key-levers to the stop-sleeve G on the shaft D, J is a lever mounted on a horizontal pivot *j*, which is secured in the machine-frame below the said sleeve, said lever being forked at its upper end and provided with inwardly-extending pins *j′ j′*, Fig. 7, which engage an annular groove *g′* in the said stop-sleeve G, these parts being so constructed in the usual manner that movement of the lever will shift the stop-sleeve endwise on the shaft, while at the same time the sleeve will be 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 of a series of rotative or otherwise movable differentiated cams K K′ K², placed side by side, through the medium of one or another of which cams motion is transmitted from a key-lever to the lever J and sliding stop-sleeve G.

The cams K K′ K², as here shown, are three in number, (according to the number of stop-shoulders *g* on the flange G′,) and they are mounted on a common pivot-stud *k*, which is attached to a bracket *k′* on one of the side standards of the machine-frame. For giving motion to the said cams K K′ K² a corresponding number of transverse bars L L′ L² are arranged beneath the key-levers in a position at right angles thereto, said bars being vertically movable and being severally connected with the 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. Each of the said bars L L′ L² is actuated by a limited number only of the key-levers, and for such actuation of the bars the key-levers are provided with depending projections *b b′ b²*, arranged to act on the bars L L′ L², respectively, the projections *b* being only on those key-levers which are to actuate the bar L, and the projections *b′* and *b²* on those respectively which actuate the bars L′ and L².

As a convenient means of communicating motion from the bars L L′ L² to the cams referred to the parts concerned, as herein shown, are made as follows: Said bars L L′ L² are supported by means of arms *l l*, *l′ l′*, *l² l²*, projecting from rock-shafts M M′ M², mounted in the lower part of the machine-frame. At the side of the machine-frame, beneath the cams K K′ K² and in a position at right angles to the rock-shafts M M′ M², are other rock-shafts N N′ N², which receive motion from the said rock-shafts M M′ M² by suitable means and transmit motion to the cams by means of crank-arms *n n′ n²*, which are rigidly attached to the rear ends of said rock-shafts and are connected with the said cams by rods *n³ n⁴ n⁵*, which are severally pivoted to the said arms and to the cams in the manner illustrated. The said rock-shafts are shown as provided with springs O O′ O², which are connected with the frame and with the rock-shafts in such manner as to turn the same in a direction to lift the rods *n³ n⁴ n⁵*, and operative connection between the rock-shafts M M′ M² and N N′ N² is obtained by means of crank-arms *m m′ m²* on the said rock-shafts M M′ M², which extend across and act upon the free ends of similar rock-shafts *n⁶ n⁷ n⁸* of the rock-shafts N N′ N², the said arms *n⁶ n⁷ n⁸* acting upwardly against the arms *m m′ m²* under the tension of the springs O O′ O², so as to hold said arms *m m′ m²* elevated and the bars L L′ L² also elevated and in position adjacent to or in contact with the projections *b b′ b²* of the key-levers. The several rock-shafts and the cams K K′ K² are thus held normally in one position and turned in one direction by the springs O O′ O², and movement of said parts in the opposite direction is produced by pressure of the key-levers acting against the bars L L′ L² in opposition to said springs.

The devices above described obviously afford merely one convenient means of transmitting motion from the vertically-movable bars L L′ L², which are directly acted upon by the keys to the several cams, and other forms of mechanical connection may be employed for this purpose, as found convenient or desirable. I have shown, for instance, in Fig. 12 another means of transmitting motion from the rock-shafts M M′ M² to the rock-shafts N N′ N², the same consisting of beveled gears M³ on the rock-shafts M M′ M², engaged with similar beveled gears N³ on the rock-shafts N N′ N². Still others may be employed, if preferred.

The cams K K′ K² 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 J², connected with 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 cams K K′ K² 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 three 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, or fourth 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, the sleeve 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 two other cams are constructed to retract the sleeve from the loose ratchet, so that said ratchet will be arrested by either the third or fourth 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 and third giving the extent of feed required by a less number of types, while the fourth shoulder gives the greatest extent of feed, and one which is called for by the least number of types.

Figs. 9, 10, and 11 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′ shown in Fig. 11 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 its surface nearer the stud and thus give the desired advance movement to the sleeve. Similarly the cams K and K², Figs. 9 and 10, show the roller J′ resting on the smaller part of the cams when the same are in their normal positions, 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′ K², and it will of course be understood that all of the levers which control types requiring the same extent of feed will actuate the same cam, 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 four units of movement, and therefore contains three cams. It follows that in said machine the type-levers will comprise four groups, of which one group gives no movement whatever to the feed-controlling devices, another group actuates the cam K′ to move the carriage through a distance equal to one unit of movement, a third group actuates the cam K to effect the movement of the carriage through a distance equal to three units of movement, and the fourth group actuates the cam K² so as to permit a movement of the carriage through a distance equal to four 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, it being necessary merely to add a cam and actuating device for each additional width of type.

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 toothed projection D′ in connection with the screw-shaft D permitting the projection to remain in engagement with the screw when the carriage is swung upon its pivotal support when being lifted and lowered.

It is sometimes desired in the operation of the machine to release the carriage from control of the automatic feed devices, so as to permit the same to be moved by hand to a desired point—as, for instance, for inserting a letter in place of one erased. To accomplish this in the machine shown I have provided means for throwing the pawl H′ backwardly and out of position for engagement with either ratchet. The device herein shown for this purpose, Figs. 5 and 6, consists of a sliding rod P, extending from front to rear of the frame and provided at its rear end with a horizontally-arranged transverse bar *p*, which extends between the arm *h*′ of said pawl and the vibrating arm H, which supports the same. A spring *p*′, applied between the rod P and the arm, holds the same at the rearward limit of its movement and maintains the transverse bar *p* in position to allow the normal vibratory action of the pawl H′. When, however, it is desired to release the pawl from the ratchet, the rod P is drawn forward by the operator, thereby swinging or tilting rearwardly the pawl H′, throwing it out of engagement with the ratchet, so that the screw-shaft will be free to rotate, and the carriage may be moved freely by hand to the desired point.

I desire it to be understood that the form of either of the above-described mechanisms or devices may be varied and that either fea-

ture of 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.

One important advantage gained by the use of that feature of my invention which embraces cams as a means for giving motion to the sliding sleeve G is that by such cams the sleeve is moved or shifted accurately to desired positions without requiring definite extent of movement in the key-levers or accuracy of adjustment in the parts by which motion is transmitted from the key-levers to the said cams, it being obvious that, provided the cams are turned a sufficient distance to carry the roller which acts on the cam from one concentric part of the cam to the other, any variation in the extent of movement of the cam will have no effect, the roller merely rolling on the inner or outer concentric surface and thus holding the sleeve accurately in the desired position for a considerable space at each limit of the effective movement of the cam.

In a feed-controlling device embracing the principles of construction above set forth the main elements by which the feed motion is controlled are a ratchet which is movable with the paper carriage, a second ratchet having motion in the same direction as, but movable relatively to, the first ratchet, a spring applied to move the second ratchet relatively to the first ratchet, a vibrating or oscillating dog adapted to engage with said ratchets in alternation, and a stepped or shouldered plate which is movable in such manner relatively to the movable ratchet that the latter may engage either one of the steps or shoulders of said plate, according to the position of the latter, said plate being actuated by the key-levers and connected with the same by devices whereby different key-levers will move the plate varying distances. It is not, however, essential to the operation of a device embracing these features that the ratchets and stop-plate should be mounted on a shaft and should revolve in the operation of the machine, it being obvious that the same general construction and mode of operation will be present in a structure in which the ratchets are not of circular form and the stop-plate is of other than parti-cylindric form. The arrangement of the parts or elements named in the manner shown is greatly to be preferred, however, for the reason that by mounting the ratchets on a rotating shaft which is geared to the carriage the teeth of the ratchet may be made of much larger size than would otherwise be possible. The employment of small or closely-spaced ratchet-teeth would have the obvious disadvantages of requiring a degree of exactness in the form and proportions of the teeth and accuracy of adjustment and delicacy of movement in the oscillating dog and other parts practically incapable of being obtained or maintained in a machine of this character, which must be made substantial in all its parts to withstand the severe and sometimes rough usage to which such machines are subjected. In these forms of the controlling device in which the ratchets are mounted on a shaft which is turned with or by the carriage the ratchet-teeth may be made of any size desired, depending on the manner in which the shaft is geared to the carriage and the diameter of the ratchets, it being obvious that in the construction shown in the accompanying drawings the peripheries of the ratchets E and E′ move through a much greater distance than does the carriage at each forward movement of the carriage.

It follows from the above that while a construction in which the ratchets are otherwise than circular in form will be practicable and useful in some cases where the units of movement are relatively large and the variations in feed provided for are few, yet for practical use in those machines to which the invention is more especially designed the construction set forth, in which the ratchets are circular and have rotative motion, has great value and the same in itself therefore embodies an important improvement in the art.

It will be noted that the part herein termed "the pawl H′" does not in the usual operation of the feeding devices perform the functions of a pawl, as that term is commonly used and understood, but that in connection with the arm H, of which it, in fact, forms a part, said pawl H′ acts as a dog or detent to control the advance movements of the ratchets, it being obvious that the said pawl acts in the manner of a pawl by swinging or moving on the pivot connecting it with the arm at times only when the ratchets are turned backwardly in the backward movement of the paper-carriage, and that in case devices are provided of a kind to enable the carriage to be moved backward to its starting-point without the turning of the screw-shaft, as illustrated in said prior application hereinbefore referred to, the said pawl H′ need not be pivoted to the arm H and will merely form the extremity of the arm. In view of these facts I do not desire to be limited to the use of a pawl as a means through which the movement of the ratchets is controlled except in those clauses of the claim in which the pawl is specifically set forth as an operative element.

I claim as my invention—

1. As a means of controlling the feed motion of a type-writing machine, operative connections between the type-levers and the paper-carriage embracing a movable part having steps or graduated stop-shoulders either of which may be brought into position to determine the extent of forward movement of the carriage, and a cam or cams each provided with two concentric portions of different radii and each actuated by one or more of the keys for giving motion to said movable part, substantially as described.

2. As a means of controlling the feed motion of a type-writing machine, a ratchet mov-

able with the paper-carriage, a second ratchet movable relatively to the first ratchet, a spring adapted to advance the second ratchet relatively to the first ratchet, a detent mechanism 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, one or more cams each provided with two concentric portions of different radii and through the medium of which motion is transmitted to said movable part, and operative connections between one or more of the keys and said cams, by which the latter are actuated, substantially as described.

3. As a means of controlling the feed motion of a type-writing machine, a revolving shaft connected with the paper-carriage, a ratchet affixed to the shaft, a second ratchet mounted to turn loosely on the shaft, a spring applied to turn the loose ratchet on the shaft, a detent mechanism actuated by the keys and adapted to engage either of said ratchets, a stop-segment adapted to turn with the shaft but movable endwise thereon and provided with a plurality of fixed steps or shoulders for limiting the rotation on the shaft of the loose ratchet, and operative connections between the keys and the said stop-segment for giving different degrees of endwise movement to the same, substantially as described.

4. As a means of controlling the feed motion of a type-writing machine, a revolving shaft connected with the paper-carriage, a ratchet affixed to the shaft, a second ratchet mounted to turn loosely on the shaft, a spring applied to turn the loose ratchet on the shaft, a detent mechanism actuated by the keys and adapted to engage said ratchets in alternation, a stepped or shouldered stop-segment which is held from turning with the shaft but movable endwise thereon, cams applied to give endwise movement to said stop-segment, and connections between the keys and said cams for actuating the latter, substantially as described.

5. As a means of controlling the feed motion of a type-writing machine, a ratchet movable with the paper-carriage, a second ratchet movable relatively to the first ratchet, a spring adapted to advance the second ratchet relatively to the first one, a detent mechanism adapted to engage either ratchet, a movable part having steps or graduated stop-shoulders, cams applied to actuate said movable part and each provided with two concentric portions of different radii, and means for actuating said cams, comprising bars extending transversely of the key-levers, and each of which is acted on by said key-levers, and operative connections between said bars and the cams for giving movement to the latter, substantially as described.

6. As a means of controlling the feed motion of a type-writing machine, a ratchet movable with the paper-carriage, a second ratchet movable relatively to the first ratchet, a detent mechanism adapted to engage either ratchet, a movable part having steps or graduated stop-shoulders, a cam or cams applied to actuate said movable part and each provided with concentric portions of different radii, and means for actuating each of said cams comprising a bar extending transversely of the key-levers, a rock-shaft arranged transversely of said bar and having operative connection with the same, said rock-shaft being provided with a crank-arm, and a connecting-rod uniting said crank-arm with the said cam, substantially as described.

7. As a means of controlling the feed motion of a type-writing machine, a ratchet movable with the paper-carriage, a second ratchet movable relatively to the first ratchet, a spring applied to advance said second ratchet relatively to the first one, a detent mechanism actuated by the keys and adapted for alternate engagement with said ratchets, a movable part having stepped or graduated stop-shoulders, said movable part being adapted to rest normally at an intermediate point in its path of movement in position for engagement of one of its intermediate steps or shoulders with the second ratchet, and connections between the keys and said movable part, adapted to shift the same in either direction from the said intermediate point in its path of movement, substantially as described.

8. As a means of controlling the feed motion of a type-writing machine, a revolving shaft connected with the paper-carriage, a ratchet affixed to the shaft, a second ratchet mounted to turn loosely on the shaft, a spring applied to turn the loose ratchet on the shaft, a detent mechanism actuated by the keys and adapted to engage said ratchets in alternation, a stepped or shouldered stop-segment mounted on the shaft and adapted to turn with but movable endwise thereon, said stop-segment being adapted to rest normally in position for engagement of one of its intermediate steps or shoulders with the loose ratchet, cams applied to give endwise movement of the stop-segment in either direction from its normal position, and connections between the keys and said cams for actuating the latter, substantially as described.

9. As a means of controlling the feed motion of a type-writing machine, a revolving shaft connected with the paper-carriage, a ratchet affixed to the shaft, a second ratchet mounted to turn loosely on the shaft, a spring applied to turn the loose ratchet on the shaft, a stop limiting the forward movement of the said loose ratchet under the action of the spring, a detent mechanism actuated by the keys and adapted to engage said ratchets in alternation, a stop-segment mounted on and adapted to turn with the shaft but movable endwise thereon and provided with steps or shoulders for limiting the rotation of the loose ratchet on the shaft, and operative connections between said keys and said stop-seg-

ment for giving endwise movement to the same, substantially as described.

10. As a means of controlling the feed motion of a type-writing machine, a revolving shaft connected with the paper-carriage, a ratchet affixed to the shaft, a second ratchet mounted to turn loosely on the shaft, a spring applied to turn the loose ratchet on the shaft, a stop for limiting the forward movement of the loose ratchet on the shaft under the action of the spring, a detent mechanism actuated by the keys and adapted to engage said ratchets in alternation, a sleeve which is held from turning on the shaft but is movable endwise thereon, said sleeve being provided with a stop-segment having a plurality of fixed steps or shoulders, cams each of which is actuated by one or more of the keys, and a lever pivoted to the frame for communicating motion from the said cams to the said sleeve, substantially as described.

11. As a means of controlling the feed motion of a type-writing machine, a ratchet movable with the paper-carriage, a second ratchet movable relatively to the first ratchet, a spring applied to advance said second ratchet relatively to the first one, a stop carried by the shaft for limiting the advance movement of the loose ratchet under the action of said spring, a detent mechanism actuated by the keys and adapted to act alternately upon the said ratchets, said detent being provided at its free end with a pivoted pawl adapted for immediate engagement with said ratchets, a stop-segment having a plurality of fixed steps or shoulders and which is mounted on and adapted to turn with the shaft but is movable endwise thereon, and operative connections between one or more of the keys and said stop-segment, 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:
C. CLARENCE POOLE,
TAYLOR E. BROWN.