(No Model.) 3 Sheets—Sheet 1.

C. S. ELLIS.

TYPE WRITING MACHINE.

No. 559,125. Patented Apr. 28, 1896.

Fig. 1.

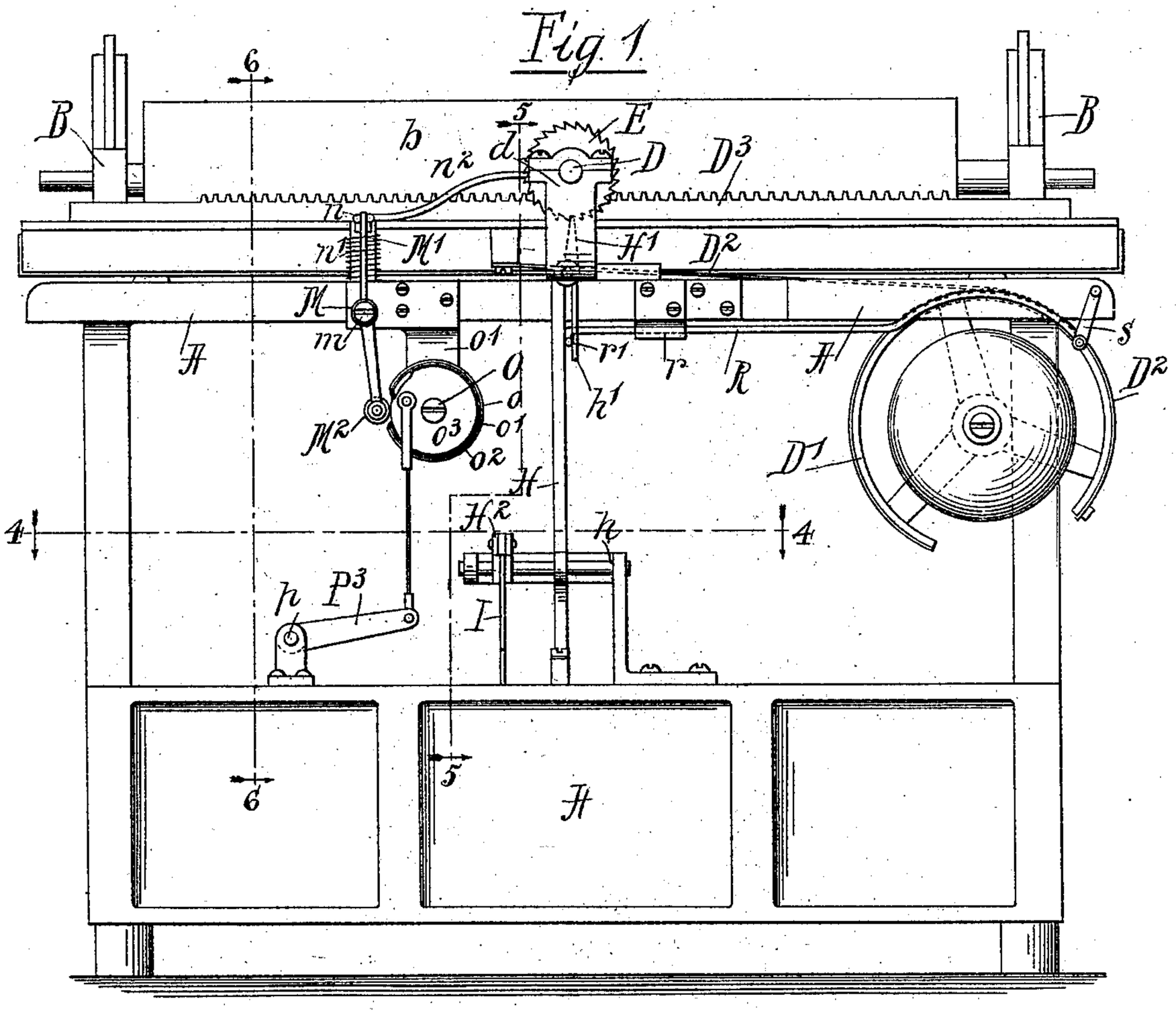
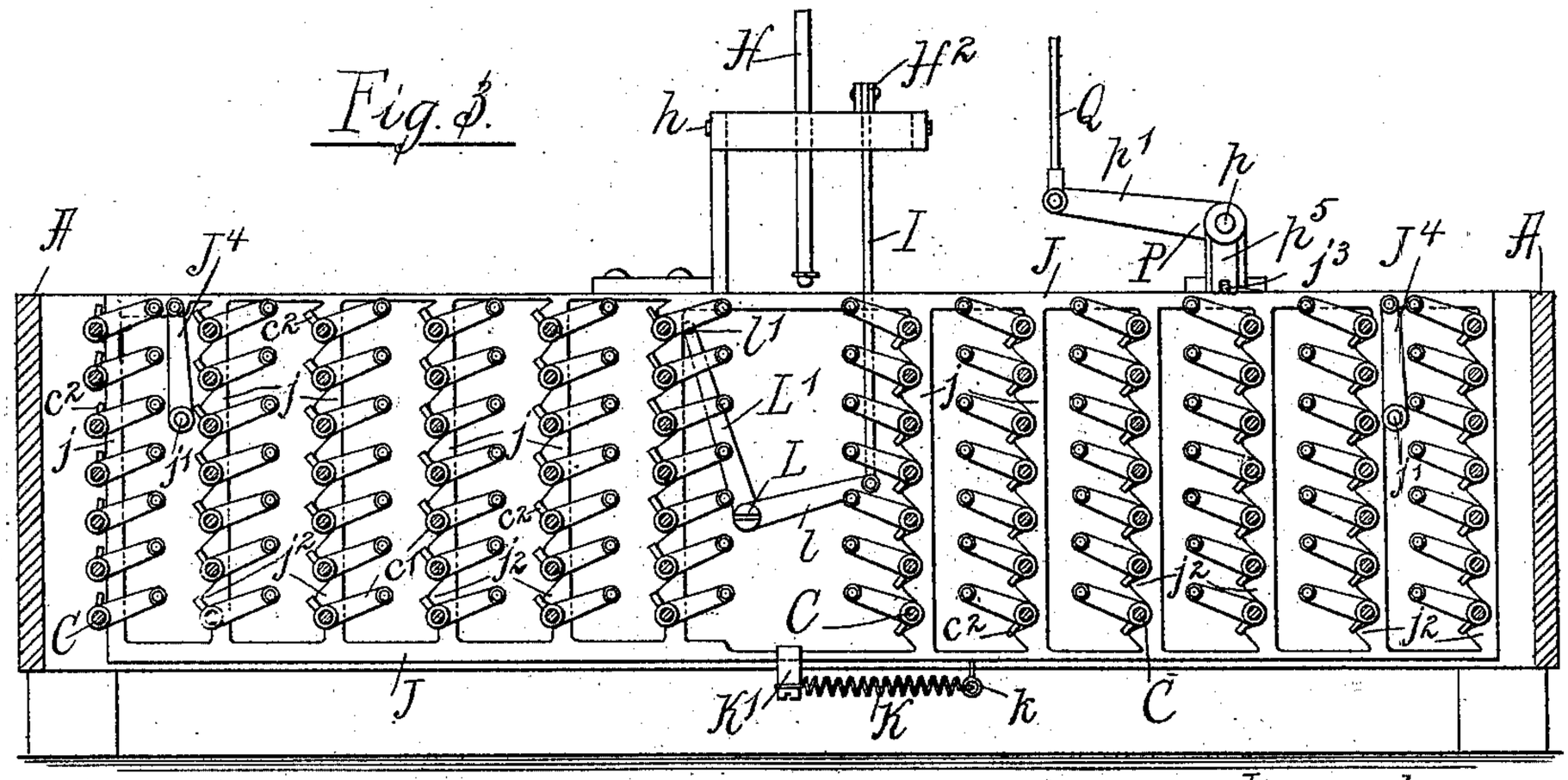


Fig. 3.



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(No Model.) 3 Sheets—Sheet 2.

C. S. ELLIS.

TYPE WRITING MACHINE.

No. 559,125. Patented Apr. 28, 1896.

Fig. 2.

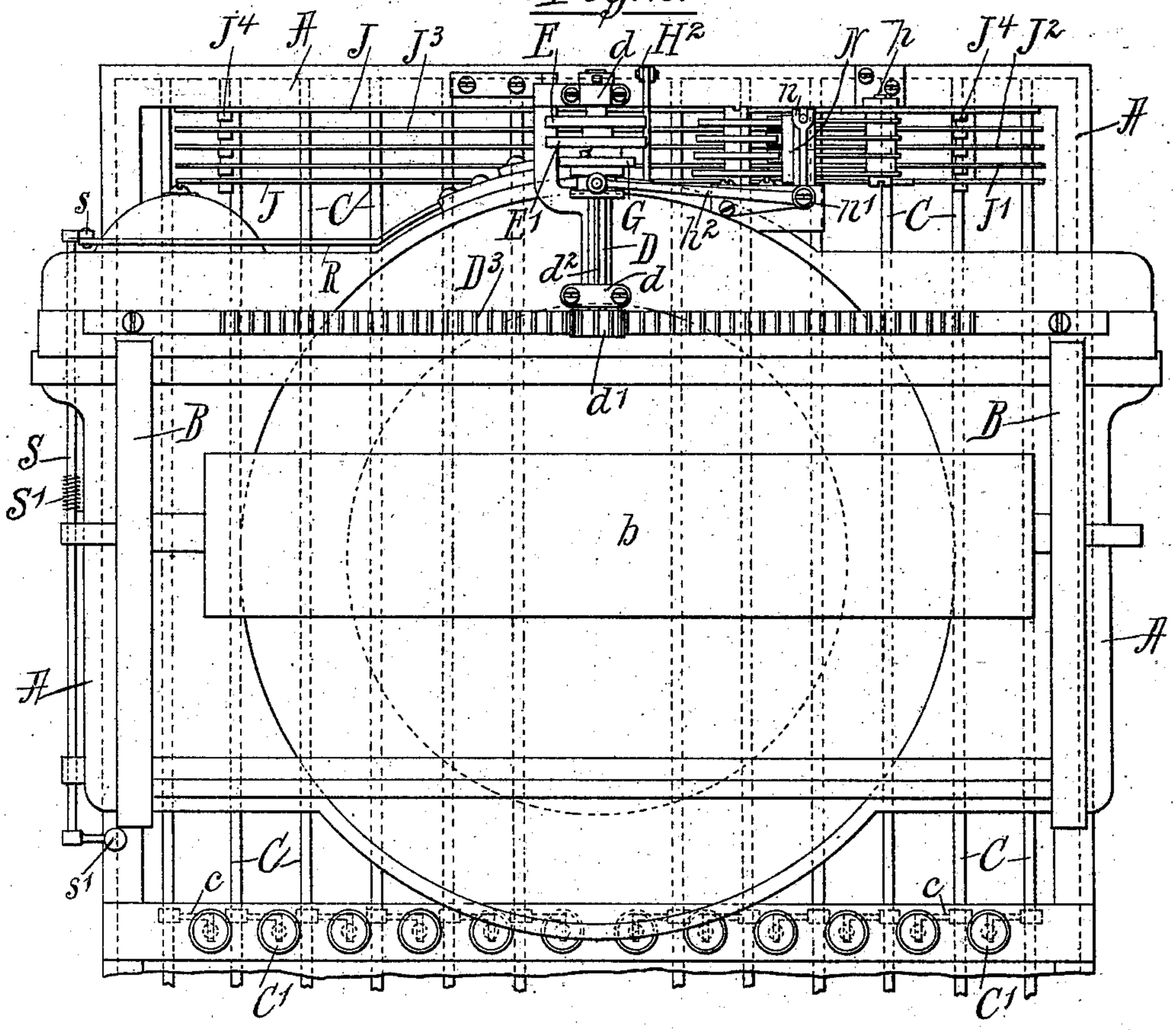
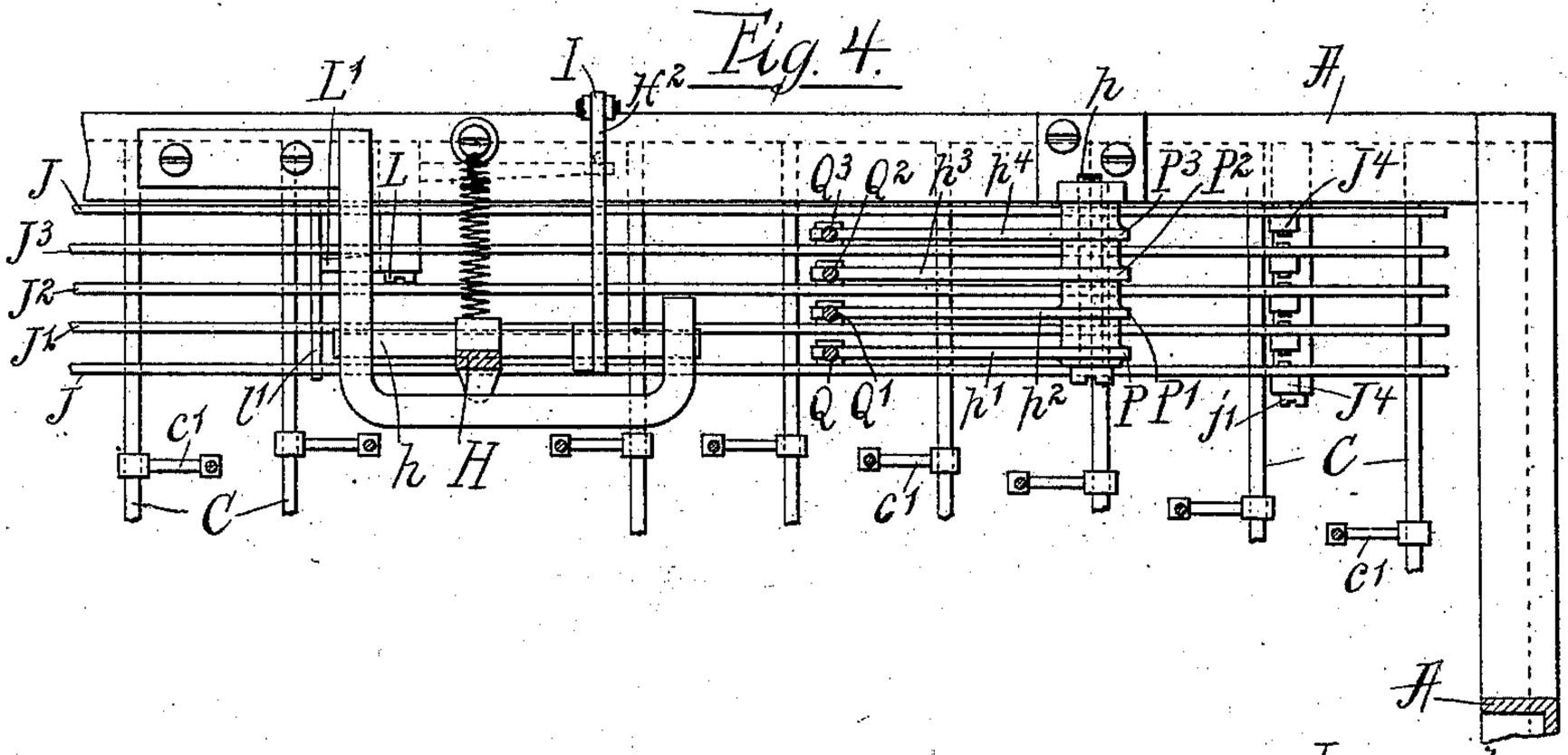


Fig. 4.



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3 Sheets—Sheet 3.

C. S. ELLIS.

TYPE WRITING MACHINE.

No. 559,125. Patented Apr. 28, 1896.

Fig 5.

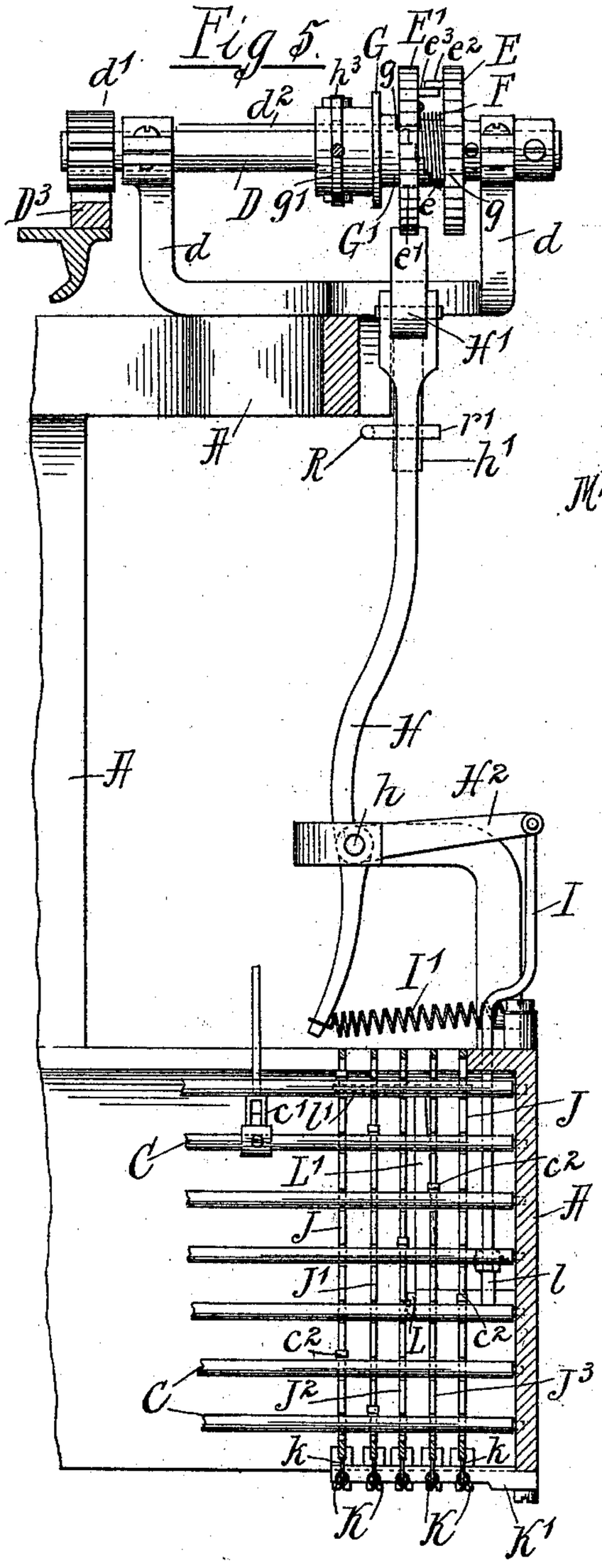


Fig. 8

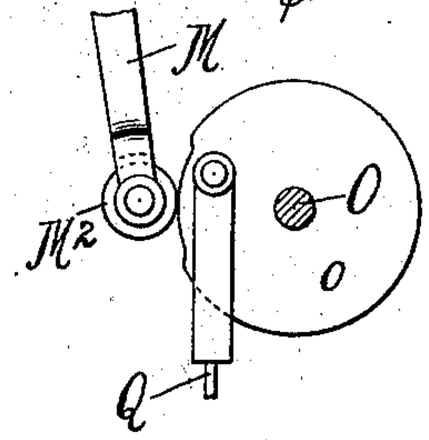


Fig. 9.

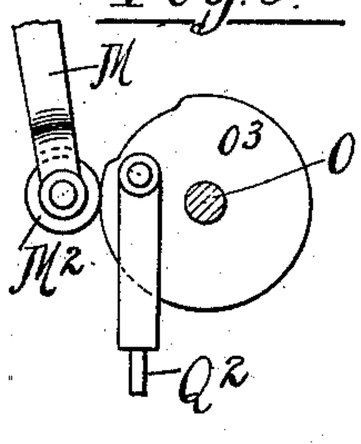


Fig. 6

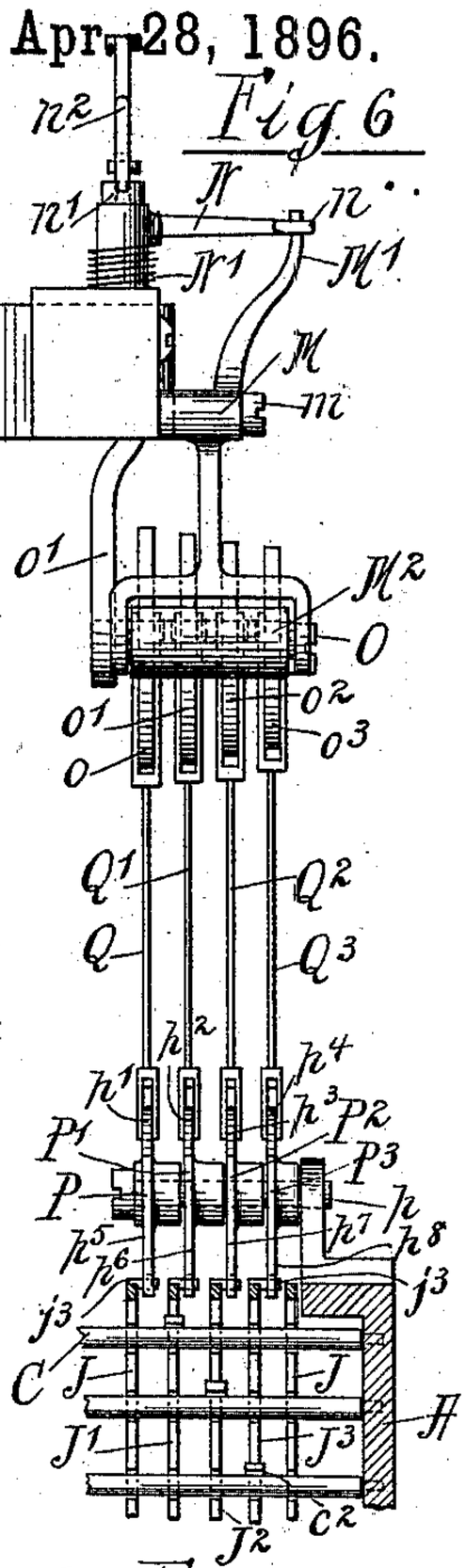
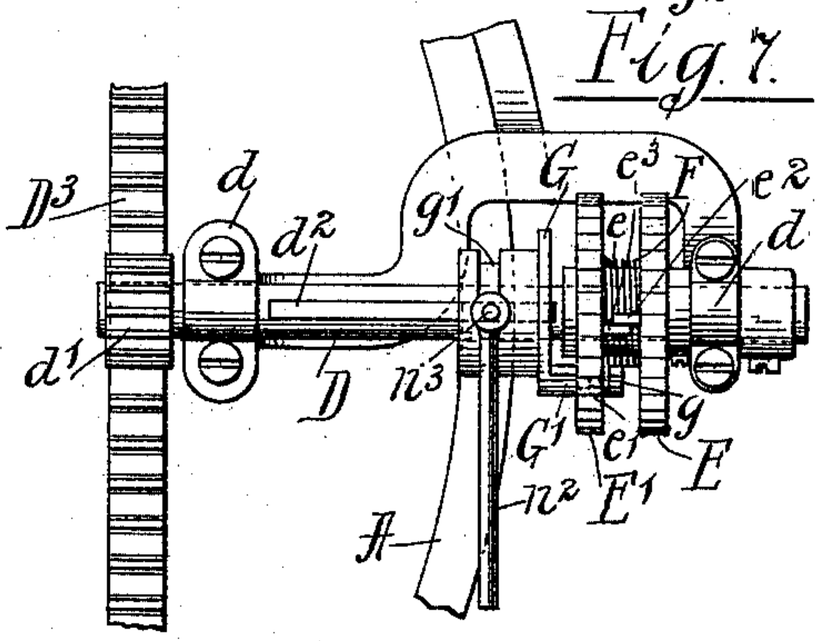


Fig. 7.



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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. 559,125, dated April 28, 1896.

Application filed March 8, 1894. Serial No. 502,791. (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 my 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 set forth, and pointed out in the appended claims.

The machine herein shown, as far as the means employed for directly controlling or determining the feed motion of the paper-carriage are concerned, is like that illustrated in a prior application, Serial No. 496,570, filed January 12, 1894, the present invention relating more specifically to means by which a feed-motion-controlling device of the kind shown in said prior application may be applied to type-writing machines of that class in which motion is transmitted from the keys to the types through the medium of rock-shafts.

In the accompanying drawings, Figure 1 is a rear end view of a machine embodying my invention. Fig. 2 is a plan view of the same. Fig. 3 is a detail sectional elevation of the rear part of the machine, showing the rear ends of the rock-shafts. Fig. 4 is a detail plan section showing the parts seen in Fig. 3, taken on line 4 4 of Fig. 1. Fig. 5 is a detail sectional side elevation, on an enlarged scale, of the devices more immediately concerned in controlling the feed of the paper-carriage, taken on line 5 5 of Fig. 1. Fig. 6 is a similar sectional elevation taken on line 6 6 of Fig. 1. Fig. 7 is a plan view of the parts shown in Fig. 5. Figs. 8 and 9 are views in side elevation of two of the cams which form part of the feed devices.

The improvements constituting my invention are herein shown as applied to a machine of the "Smith Premier" type, or those having rock-shafts for transmitting motion from the keys to the type-bars. 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 rock-shafts, which are provided with arms *c c*, connecting them with the keys C′, and the arms *c′ c′*, by which they actuate the type-bars, said rock-shafts being 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 movemet of the paper-carriage by each key a distance corresponding with the space required for the type actuated by that key.

D indicates a revolving shaft 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′ is a drum which is actuated by a spring (not shown) which constitutes the carriage-actuating spring. Attached to the said drum is a cord or chain D^2, which connects the drum with the carriage in a familiar manner.

The shaft D is, in the instance shown, arranged horizontally and at right angles with the path of the paper-carriage, the same being mounted in brackets *d d*, which rise from the rear part of the frame. Said shaft D is provided with a gear-wheel or pinion *d′*, which intermeshes with a rack D^3 on the carriage, whereby endwise motion of the carriage produces rotary motion of the said shaft.

The rotation of the shaft D under the action of the carriage-spring is controlled and the carriage thereby arrested after movements through varying desired distances upon the reaction 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 side of the machine from which the carriage is moved by the action of its actuating-spring, Fig. 1.

E′ is a second ratchet mounted to turn on the 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^2 or otherwise, but is free to slide endwise thereon. In the particular instance shown the inner end of the spline d^2 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*, which in this instance are equal in number to the number of units of movement contained in the greatest advance feed movement of which the shaft D is capable at any single impulse or step 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 rock-shafts, 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 rock-shafts, through suitable means, severally pull downward when turned. A coiled expansion-spring I′, attached to the end of 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. 2 of the drawings the parts are shown in their normal position, with the pawl H′ engaged with the loose 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 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 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 shaft D merely turning backward as the carriage is moved without affecting in any way the action of the feeding devices.

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^2, 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, and the reëngagement of the pawl with the ratchet E′ takes place upon the ascent of the key, 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.

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 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 limiting its rotation.

It will be further obvious that when the pawl is engaged with the loose ratchet E′, as seen in Fig. 5, and the stop-pins on the two ratchets are in contact with each other, if the pawl is 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*, 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 heretofore 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 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 keys the shaft D will be caused to revolve intermittingly or by a step-by-step movement by force of the carriage-spring 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 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, 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.

To now describe the mechanism herein shown for transmitting motion from the several rock-shafts to the rod I, by which the vibrating pawl H′ is operated, and for transmitting motion from said several rock-shafts to the stop-sleeve G on the shaft D, these parts are constructed as follows: At the rear of the machine are located a plurality of rectangular metal frames J J, arranged vertically and at right angles to the rock-shafts and parallel with the rear wall of the machine-frame and with each other. The rock-shafts C C are arranged in vertical rows, and each of the frames J is provided with a plurality of upright bars *j j j*, which are severally arranged adjacent to the several vertical rows of rock-shafts. Said frames J are severally movable horizontally in a direction at right angles to the rock-shafts, and for this purpose may be supported on the machine-frame by any suitable devices enabling them to freely move or slide. In the particular construction illustrated each frame J is supported by means of two upright arms or links J^4 J^4, which are pivoted at their ends to the machine-frame and to the frame J, so as to sustain the said frame J, while at the same time allowing reciprocatory movement thereof by lateral oscillation of the links on the pivots *j′*, by which they are supported on the machine-frame. The several upright bars *j j* of each frame J are provided with lugs or projections j^2 j^2, each of which is arranged in position for contact with a radially-projecting arm or pin c^2 on one of the rock-shafts C, the said lugs or projections j^2 and the pins c^2 c^2 being relatively so arranged that by the turning of either rock-shaft in the act

of printing it will operate to move the frame J in the same direction. In the particular machine illustrated the rock-shafts on one side of the central line of the machine are arranged to turn in one direction and those on the other side of the central line in the opposite direction when the keys are depressed, and the pins c^2 belonging to the shafts at one side of the center line extend upwardly from the shafts, while those belonging to the shafts at the other side of the center line extend downwardly from the said shafts, so that in the turning of the rock-shafts all of the pins will operate to move the frame J in the same direction, this direction being toward the right hand at the side of the machine, as seen in Fig. 3 of the drawings.

The several frames J are carried or moved laterally in a direction opposite to that in which they are moved by the action of the rock-shaft by means of a series of springs properly applied for this purpose, those herein shown consisting of coiled expansion-springs K K, Figs. 3 and 5, attached to a bar K′ on the machine-frame and connected with arms *k*, which are secured to the lower edge of said frames.

The rod I is intended to be moved and the pawl H′ thereby actuated upon the depression of either of the keys of the machine; and this result is accomplished by intermediate connections between the several movable frames J and the rod I, by means of which said rod is actuated upon the movement of either of said frames. Such intermediate connecting device consists, as shown in the drawings, of a rock-shaft L, having a horizontal arm *l*, to the end of which the rod I is connected at its lower end, and an upwardly-extending arm L′, having at its upper end a cross-bar *l′*, located in position to be acted upon by all of the frames J, said cross-bar for this purpose being, in the particular construction shown, arranged for contact with one of the upright bars *j* of each frame. It will be clear from this construction that upon the actuation of either one of the frames J J by the turning of one of the key-levers the rock-shaft L will be turned so as to draw downwardly upon the rod I and thereby actuate the pawl H′ in the manner hereinbefore described.

To next describe the devices shown for transmitting motion from the several rock-shafts to the stop-sleeve G on the shaft D, M is a lever mounted upon a horizontal pivot *m*, which is secured in the machine-frame below the level of the shaft D. Said lever M is provided with an upwardly-extending arm M′, which is engaged at its upper end with one arm *n* of a bell-crank lever N, which is pivoted on a vertical stud *n′* at the top of the machine-frame and is adapted to swing in a horizontal plane, the second arm n^2 of said bell-crank lever being engaged with the sleeve G by means of pins n^3 on the end of said arm, which engage an annular groove *g′* in said sleeve. These parts are so constructed that movement of the lever M will be transmitted to the sleeve through the medium of the bell-crank lever N, and the latter will act to shift the said sleeve endwise on the shaft while leaving it free to revolve with the shaft. Mounted on the lower end of said lever M is an antifriction-roller M^2, which is adapted to be acted upon by either one or the other of a series of rotative or otherwise-movable differentiated cams O O′ O^2 O^3, which are placed side by side and through the medium of one or another of which motion may be transmitted from either rock-shaft to the sliding stop-sleeve G.

The cams O O′ O^2 O^3 shown are four in number, or one less than the number of stop-shoulders *g* on the flange G′ of the stop-sleeve. The said cams are shown as mounted on a common pivot-stud *o*, which is attached to a bracket *o′*, depending from the upper frame-plate of the machine in the manner shown. For giving motion to the said cams O O′ O^2 O^3 a corresponding number of bell-crank levers P P′ P^2 P^3 are mounted on a pivot-stud *p*, arranged below and parallel with the pivot-stud *o* of the cams Said bell-crank levers are provided with horizontal arms p' p^2 p^3 p^4, which are severally connected with the cams by intermediate connections so arranged that when either of said bell-crank levers is moved the cam connected therewith will be moved or turned. The connections shown for this purpose consist of rods Q Q′ Q^2 Q^3, pivoted to horizontal arms of the bell-crank levers and to the cams in the manner illustrated. Said bell-crank levers are severally provided with depending arms p^5 p^6 p^7 p^8, each of which is provided at its lower end with a notch engaged with a pin j^3 on one of the laterally-movable frames J.

The machine shown in the drawings is provided with four cams and bell-crank levers for actuating the same, but is provided with five frames J, so that four only of the frames are employed to actuate the said cams for a purpose hereinafter fully explained. Each of the said frames J J′ J^2 J^3 is actuated by a limited number of the rock-shafts, and for such actuation of the frames the actuating-pins c^2 c^3 of the rock-shafts are so located on the said rock-shafts that each rock-shaft will operate on one only of the five frames, it being understood that in the drawings, Fig. 3, all of the pins c^2 therein appearing do not act upon the frame J which is nearest the eye, but a part only of said pins act on the said frame which is nearest the eye, and others of said pins act on the frames behind or at the rear of the one which appears in said figure, as clearly indicated in the sectional views, Figs. 5 and 6. Inasmuch as each of the frames is separately moved in one direction by the spring K and the said frames are separately connected with the cams O O′ O^2 O^3, as above described, it follows that upon the depression of each type-key and the turning of the rock-

shaft connected therewith one of the frames J will be moved so as to turn or swing the cam connected therewith through a part of a rotation, and that when the key is released the said frame and its corresponding cam will be restored to their original positions.

The bell-crank levers and connecting-rods described obviously afford merely one convenient means of transmitting motion to the several cams from the laterally-movable frames J J which are directly acted upon by the rock-shafts, and other forms of mechanical connections may be employed for this purpose as found convenient or desirable.

The cams O O′ O^2 O^3 are provided with dissimilar cam-surfaces so shaped and 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 M^2 is held in contact with the cams by means of a spring N′, applied to the pivot-stud *n′* of the bell-crank lever N and acting on said bell-crank lever in such manner as to throw the said roller toward the cams. The spring thus arranged serves to move the sleeve G in one direction, while each of the cams is adapted to separately move the sleeve in the opposite direction and serves to determine its position when so moved.

The cams may be so arranged as to move the sleeve G either toward or from the loose ratchet when a type-key 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—as, 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 to points 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. For this reason it is not necessary that every one of the rock-shafts should be connected with or give movement to one of the cams; but the several rock-shafts which actuate the types of that width of feed produced by the stop-shoulder which stands in position for contact with the loose ratchet when the sleeve G is unmoved need actuate only the pawl H′ by which the shaft D is allowed to turn. Accordingly, in the construction shown in the drawings, a fifth frame J is provided in addition to those which are connected with and actuate the cams, and said fifth frame J serves merely to move the pawl H′, through the medium of the rock-shafts L and I, in the manner described. It is desirable, however, that when the sleeve is arranged to stand normally with one of its shoulders in position to give an extent of feed movement necessary for one set of types that a minimum extent of movement should be given the sleeve for determining the feed for wider or narrower types, and to secure this result the machine herein shown is arranged to stand normally in position for contact of the loose ratchet with one of the intermediate stop-shoulders—namely, the second one—and one cam is arranged to advance the sleeve toward the ratchet, so that the latter shall strike the first stop-shoulder, 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 of the parts. The second stop-shoulder is in this instance illustrated as being the one which affords an extent of feed common to the greatest number of characters or types. The fifth shoulder will obviously be arranged to give the greatest extent of feed and the one which is called for by the least number of types, while the intermediate shoulders will be employed for types requiring intermediate degrees of feed movement.

Figs. 8 and 9 illustrate two of the cams and show clearly the manner in which the lever M is actuated to advance or retract the sleeve. The cam O (shown in Fig. 8) is one of those which acts to retract the sleeve, and in this case the roller M^2 rests normally on the smaller part of the cam, and when the latter is turned is carried to the larger part of the cam, with the result of moving the lever in a direction to retract the sleeve from the ratchet E′. The cam shown in Fig. 9 is the one which advances the sleeve, and this cam is so arranged that the roller M^2 rests on its concentric portion remote from its supporting-stud, so that when a key which actuates the cam is depressed the latter will be turned in a direction to allow the roller to approach nearer its center of rotation and thus give the desired advance movement to the sleeve, or a movement thereof in a direction opposite to that which is given by a cam such as is shown in Fig. 8.

As hereinbefore stated, certain only of the rock-shafts actuate each of the cams O O′ O^2 O^3, and it will of course be understood that all of the rock-shafts which control or actuate 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 G on the shaft D being required for 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 rock-shafts will com-

prise five groups, of which one group gives no movement whatever to the sleeve G, another group actuates the cam O^3 to move the carriage through a distance equal to one unit of movement, and the third, fourth, and fifth groups actuate the cams O, O′, and O^2 to effect the movement of the carriage through a distance of three, four, and five units of movement.

It will of course be understood that the number of stop-shoulders *g* on the sleeve and the number of cams for actuating said sleeve may be increased or decreased to provide for a greater or less number of type groups, and it follows that a machine may be provided with type characters or words of any width desired, it being necessary merely to add a cam and an actuating device therefor for each additional width of type to be provided for.

As the paper-carriage is in this instance shown it is capable of being elevated and lowered as any other machine of the type illustrated without shifting the position of the rack-bar D^3.

In order to enable the carriage to be released from the control of the automatic feed device when it is desired to move the same by hand—as is necessary, for instance, in inserting a letter in place of one erased—I have provided devices as follows: R is a sliding rod arranged parallel with the rear margin of the top plate of the machine and adapted to slide thereon endwise through a guide *r*. The rod R is provided with an arm *r′*, arranged at right angles thereto and extending between the vibrating arm N and the arm *h′* of the pawl H′, Figs. 1 and 5. The opposite end of the rod R is connected with a depending arm *s* on a rock-shaft S, which extends along the side of the machine-frame to the front of the machine and is provided with an actuating-arm *s′*. A spring S′ is applied to the rock-shaft S, so as to hold the arm *r′* in position to allow the pawl H′ to remain in engagement with the ratchets. By moving or turning the rock-shaft S in opposition to the action of the spring the arm *r′* will be moved in a direction to throw or tilt the pawl H′, so as to throw it out of engagement with the ratchets, when the latter will be free to rotate, and the carriage may be moved by hand to the desired point.

I desire to be understood that the form of either of the above-described mechanisms or devices may be varied in practice and that either of the features of the improvement set forth may be employed without the others without avoidance of my invention.

It will be noted that the part which is herein termed "pawl H′" does not in the usual operation of the feeding devices perform the functions of a pawl, as that term is commonly understood, but that in connection with the arm H, of which it is in fact a part, said pawl H′ acts as a dog or detent to control the advance movement of the ratchets, it being obvious that the said part called "pawl H′" acts in the manner of a pawl only when the ratchets are turned backwardly in the backward movement of the paper-carriage, the said pawl H′ at such time swinging on the pivot by which it is connected with the arm. In case, therefore, devices are provided enabling the carriage to be moved backward to its starting-point without the turning of the shaft D the said pawl need not be pivoted and will form merely the extremity of the arm H. 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 ratchet is controlled.

Some of the features of construction herein shown are illustrated in a prior application for patent, Serial No. 496,570, filed by me in the United States Patent Office January 12, 1894, and said features are not herein claimed as a part of the present invention, the latter embracing devices herein shown which are not illustrated in said prior application, as pointed out in the appended claims.

In a feed-controlling device embracing the general 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 detent adapted to engage either ratchet in alternation, and a stop or shouldered plate which is movable in such manner that the movable ratchet may engage either one of the stops or shoulders of said plate, said plate being actuated by the keys and connected with the same by devices whereby different key-levers will move the plate varying distances. It is not essential to the operation of the features herein claimed that the ratchets and stop-plate above referred to should be mounted on a shaft and should revolve in the operation of the machine, it being obvious that the same general mode of operation would be present if the ratchets were not of circular form and the stop-plates of other than parti-cylindric form. The arrangement of the parts or elements as shown is greatly to be preferred, however, for the reason that the teeth of the ratchets in such construction may be made of much larger size than would in the absence of a revolving shaft be possible, it being obvious that, in the construction illustrated, the ratchet-teeth may be made of any size desired, depending on the manner in which the shaft is geared to the carriage. By this construction, therefore, the teeth may be made of any size desired, and the construction in which the ratchets are circular and have rotative motion is therefore considered to be the most desirable one for use in practice.

I claim as my invention—

1. The combination with a plurality of rock-shafts which communicate motion from the keys to the types, a variable spacing mech-

anism embracing movable parts which are shifted to vary the extent of feed and a reciprocating part or detent for giving a step-by-step movement to the paper-carriage, of a plurality of laterally-movable frames movable in planes perpendicular to the several rock-shafts and each of which is adapted to be actuated by one or more of the said rock-shafts, connections between said frames and the said movable parts by which the feed is varied, a transverse bar located in position to be acted upon by either of said frames and connections between said transverse bar and said reciprocatory part whereby motion is given to the latter when either rock-shaft is moved, substantially as described.

2. The combination with rock-shafts which communicate motion from the keys to the types and a variable feed device embracing a ratchet adapted to be rotated by the paper-carriage, a second ratchet adapted to turn relatively to the first ratchet, an oscillating detent adapted to engage either ratchet, a movable bar having steps or graduated stop-shoulders, a cam or cams applied to actuate said movable bar and means for transmitting motion from the rock-shafts to said variable feed device, embracing laterally-movable frames adapted to slide in a plane perpendicular to the rock-shafts, connections between said frames and the said cams, a transverse bar located in position to be acted upon by either of said frames and connections between said bar and an oscillatory detent whereby motion is given to the latter when either rock-shaft is moved, 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.