(No Model.) 3 Sheets—Sheet 1.

C. S. ELLIS.

TYPE WRITING MACHINE.

No. 559,325. Patented Apr. 28, 1896.

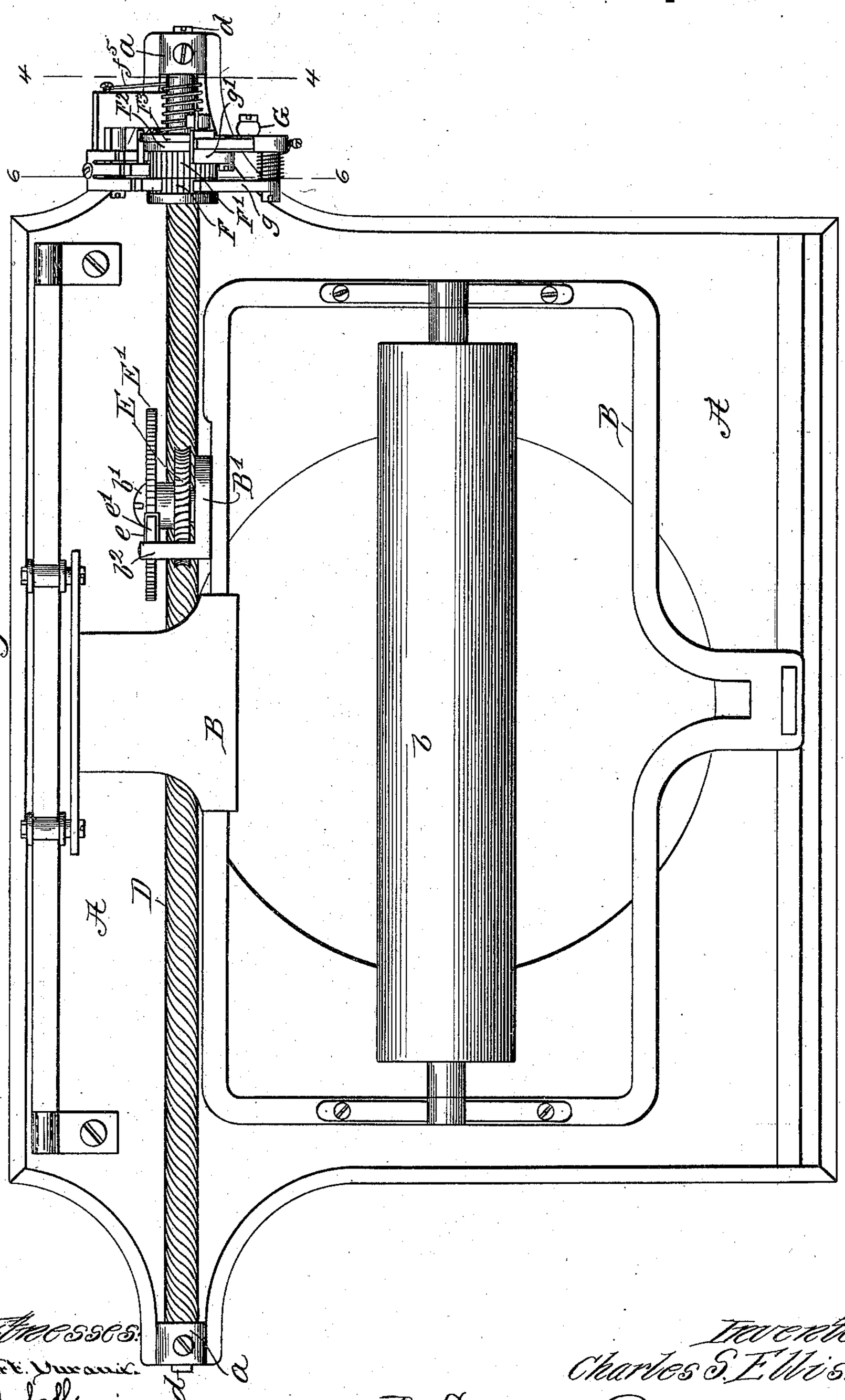

Fig. 1.

Witnesses:
Arthur E. Dunning.
Wm. F. Fleming.

Inventor:
Charles S. Ellis.
By Dayton, Poole & Brown, Atty's.

(No Model.) 3 Sheets—Sheet 2.

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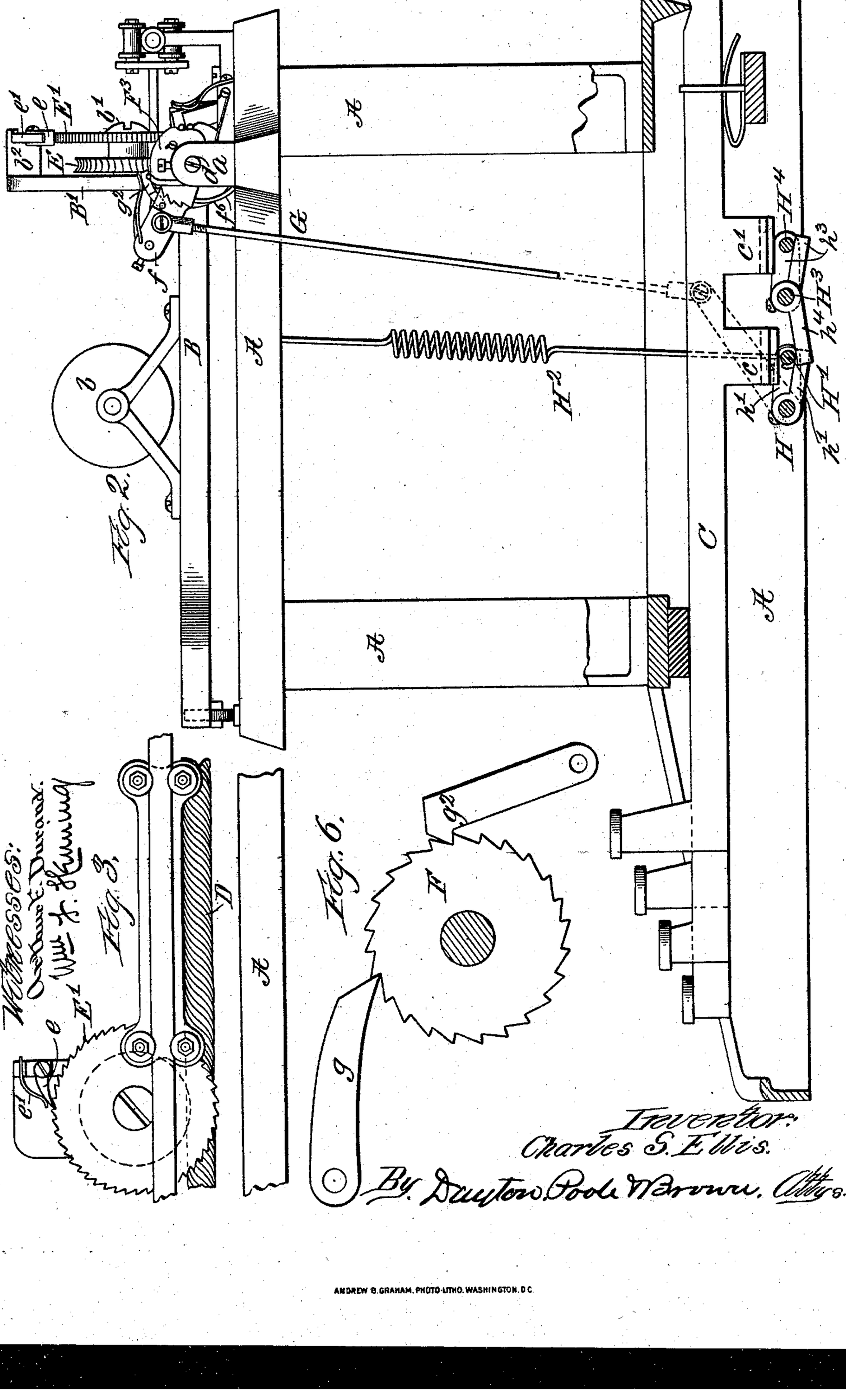

(No Model.) 3 Sheets—Sheet 3.

C. S. ELLIS.

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Fig. 1.

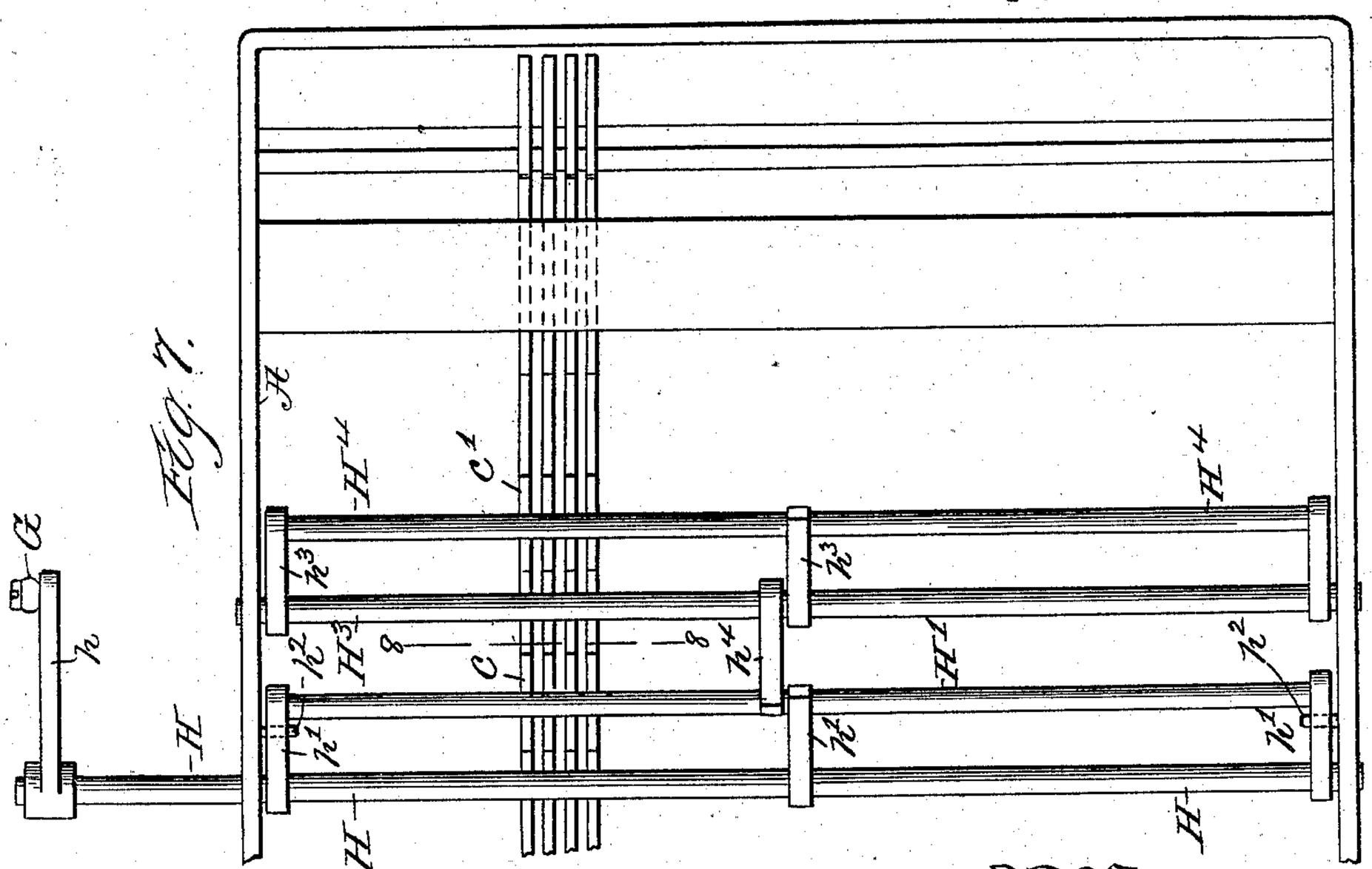
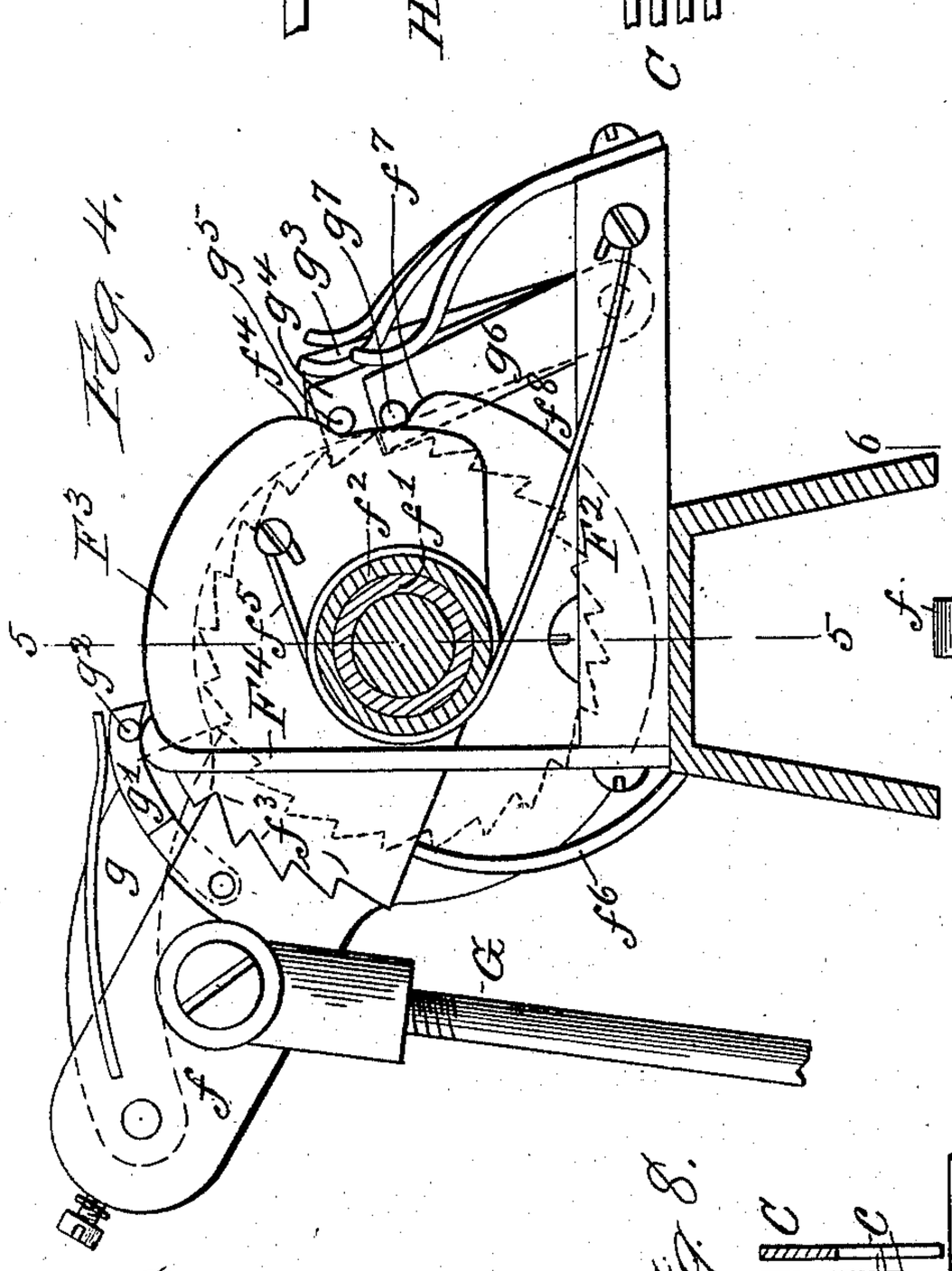


Fig. 4.



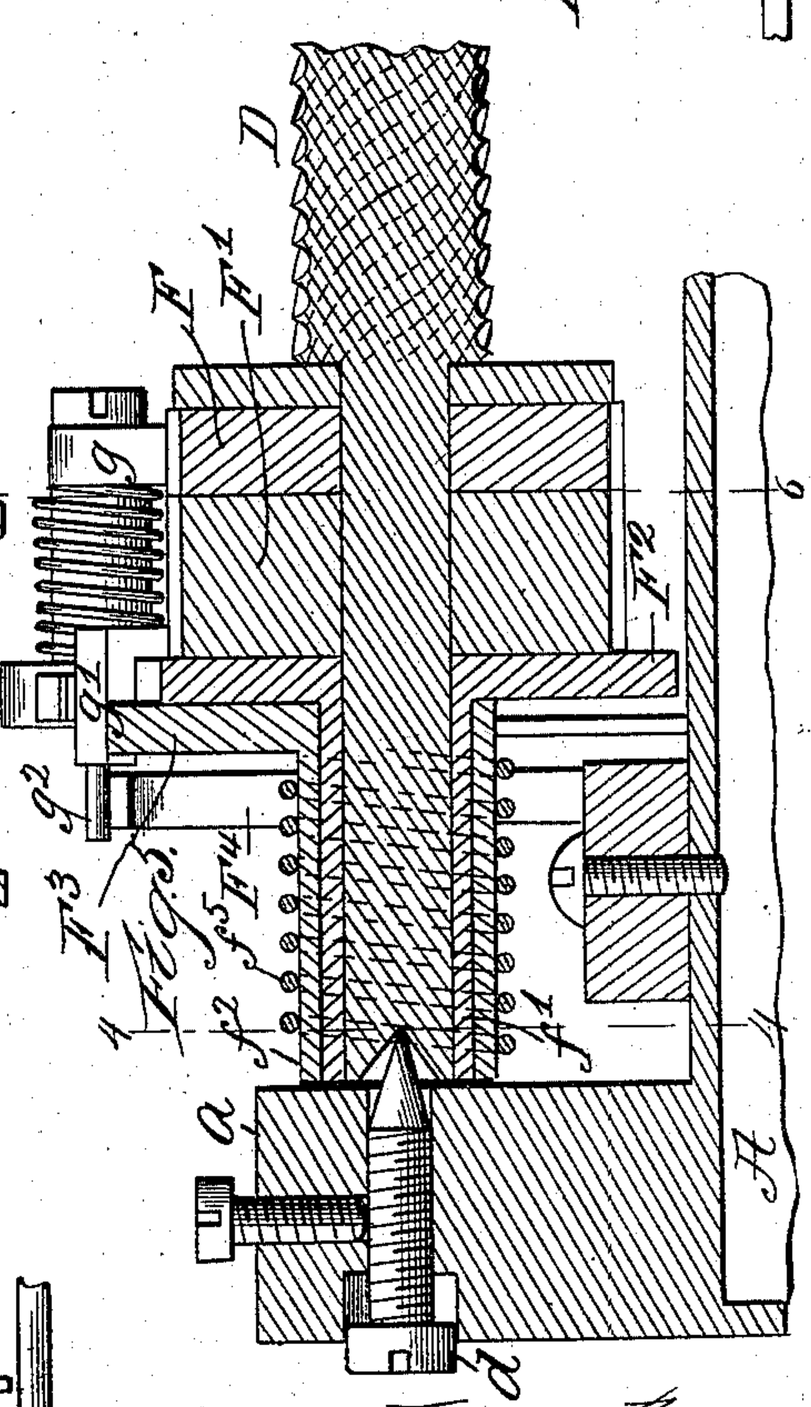
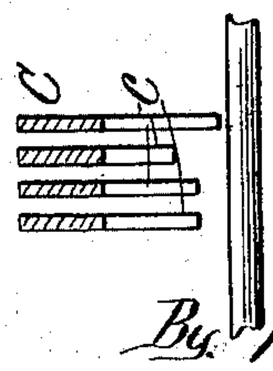


Fig. 8.



Witnesses:
Arthur E. Durand.
Wm. F. Fleming

Inventor:
Charles S. Ellis.
By Dewey & Poole & Boyden Attys.

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. 559,325, dated April 28, 1896.

Application filed November 8, 1893. Renewed April 2, 1896. Serial No. 585,990. (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 improvements in that class of type-writing machines in which the paper-carriage is moved varying distances according with the impressions of types of varying widths for the purpose of permitting the use of types of such proportions as are usually employed in printing or the use of types bearing different numbers of letters.

In this invention a screw or spirally threaded shaft is the primary means through which the key-levers give feed motion to the paper-carriage, said screw being given an extent of rotation by each key-lever called for by the width of the type actuated by said lever.

A principal improvement consists in the combination, with the screw, of a device for engaging it with the carriage whereby the latter is adapted to be returned to its starting-point without backward rotation of the screw.

Another improvement consists in a ratchet-and-pawl mechanism through which the several keys actuate the screw to advance the paper-carriage and by which the screw and carriage are positively arrested at the end of their proper movement and remain locked until a key is again struck.

Still another improvement consists in the provision of means by which each key is made to interpose a stop to its own movement and is thus rendered incapable of operating the carriage feed-screw to a greater extent than the type belonging to said key required.

The invention further consists in features of construction, substantially as described, (though not necessarily in the precise forms illustrated,) by which these and other objects of the invention are attained.

In the accompanying drawings, which illustrate my invention, Figure 1 is a top view of a machine containing my principal improvement, showing the parts concerned in the said improvement. Fig. 2 is a side view of the machine, certain parts being shown in vertical section. Fig. 3 is a fragmentary rear elevation particularly showing the medium through which the feed-screw for the paper-carriage engages the latter. Fig. 4 is an enlarged end view of the ratchet-and-pawl devices through which the feed-screw is operated by the key-levers, the view being obtained by a vertical section in the line 4 4 of Fig. 1. Fig. 5 is a vertical section in the plane of line 5 5 on Fig. 4. Fig. 6 is a detail embracing a side view of the actuating ratchet and pawl and the detent of the latter, obtained by a section in the line 6 6 of Fig. 1. Fig. 7 is a bottom view of a part of the machine, showing some of the key-levers, together with the rock-shaft which they actuate and the stop mechanism for the said levers. Fig. 8 is a transverse vertical section of several of the key-levers in the line 8 8 of Fig. 7.

While my improvements may be embodied in any form 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 upon the carriage B, and C C some of the key-levers, mounted in the frame A in the usual or any approved way.

The type-bars and their connections are omitted as having no direct concern with the 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 to the width of the type borne by the type-arm which is actuated by that lever.

The feed movement is given to the paper-carriage by the usual spring or its equivalent, and such movement is controlled by a high-pitched screw D, said screw being in this instance mounted to rotate upon center pins *d d*, screw-threaded through the brackets *a a*,

which rise from the top plate of the main frame A. In practice I have employed a screw having ten threads with one-inch pitch.

As a means of engaging the paper-carriage with the screw D, said carriage is provided with an arm B′, and upon a stud b' projecting therefrom is rotatively mounted a wheel E, answering in form to a worm-wheel and having peripheral teeth fitted to the threads of the screw D. Rigidly secured to the wheel E is a ratchet-wheel E′, with which engages a pawl e, that is pivoted to an overhanging projection b^2 of the arm B′. The teeth of the ratchet E′ present their abrupt shoulders at the top of the wheel toward the left-hand side of the machine, or in the direction in which the carriage is fed step by step in printing a line, and the pawl e is correspondingly arranged, as shown. This is in order that the carriage may not be moved by its usual feed-spring (not shown) without rotation of the screw, and also in order that in retracting the carriage after printing one line and before printing another said carriage may be drawn back by hand in the usual way by a single and rapid movement, the wheel E meantime maintaining its engagement with the screw, and therefore rotating in such retraction of the carriage, while the ratchet E′ also rotates beneath its pawl e. Preferably the teeth of said ratchet are relatively deep and short and their number a multiple of the number of teeth in the wheel E in order that the printed lines shall start in a vertical line with each other notwithstanding that the carriage may be retracted through greater or less distances to the starting-point.

For the operation and control of the screw D the devices next described are shown. Of these, F is a ratchet-wheel secured to the shaft of the screw and having its teeth so directed that those at the top of the wheel present their abrupt faces toward the front of the machine, as shown in Fig. 6, the screw D being in this instance left-handed. F′ is a second ratchet-wheel, also secured to the screw-shaft and arranged alongside the ratchet F, but having its teeth directed oppositely to those of said ratchet F, or as seen by the dotted lines in Fig. 4. Next to the ratchet-wheel F is loosely mounted on the screw-shaft a disk F^2, having an arm f, Fig. 4, and preferably provided with a hub f', which extends to the adjacent bracket a.

F^3 is a segment or partial disk arranged next to the disk F^2 with its convex edge uppermost and having a hub f^2, which loosely surrounds the hub f'. Said segment is provided on the front portion of its concentric curved edge with a series of notches f^3, corresponding in number with the number of units of movement of the screw contained in the total possible movement thereof and corresponding in length with the teeth of the ratchets F and F′, measured in degrees. At or near the opposite end of its curved edge said segment is also provided with a cam-shoulder f^4. A spring, as f^5, is arranged to normally rotate the segment forwardly against a suitable stop f^6. To the arm f of the disk F^2 is pivoted the rod G, upon which the key-levers severally pull downwardly when struck, and to said arm are also pivoted the two pawls g and g', arranged to respectively engage the ratchet F and the segment-teeth f^3 upon the upstroke of the arm f. Alongside the segment F^3 is a stationary pawl-lifter F^4, by which the pawl g' is thrown out of engagement with the segment before the pawl-carrying arm f has completed its descent. The pawl-lifter is shown as having its upper end curved backwardly and the pawl as having a laterally-projecting pin g^2, which rides the said curved end of the lifter, the pawl being supported at its free end upon the lifter when the pawl-arm is elevated, so that the segment is free to be rotated by the spring f^5 when released from the pawl. A detent g^3 (shown of hooked form in Fig. 6) engages the ratchet F, and a stop-pawl or detent g^4 engages the ratchet F′. The latter is disengaged from the ratchet F′ by the cam-shoulder f^4 on the segment F^3 through the medium of a pin g^5, which projects laterally and rigidly from the pawl into the path of the said cam-shoulder, and said pawl is held out of engagement with the ratchet until the segment resumes its normal position (given it by the spring f^5) by the concentric curved edge of the segment to which the cam-shoulder leads. In order that such disengagement of the detent g^4 may be effected just before the rotation of the ratchet or screw is begun by the pawl g, the teeth f^3 of the segment F^3 are engaged by the pawl g' a little in advance of the engagement of the ratchet F by the pawl g in the upstroke of said pawls, to which end said teeth f^3 may have their abrupt faces correspondingly in advance of those of the teeth of the ratchet F, or the pawl g' may have its free end correspondingly extended.

In addition to the stop or detent g^4 for engagement with the ratchet F′, another stop-pawl or detent g^6 may, if desired, be employed to engage the same ratchet to insure greater certainty in the arrest of the screw. This pawl g^6 is disengaged by a cam-shoulder f^7 on the edge of the disk F^2, which encounters the pin g^7, that projects laterally from the free end of said pawl, and the cam-shoulder f^7 is arranged to lift the pawl g^7 when the arm f of the disk begins to descend. Said cam-shoulder f^7 rises to and terminates in a concentric part f^8 of the edge of the disk F^2, by which said pawl is held out until the disk-arm f has nearly completed its ascent, the pawl being lowered by the incline of the cam-shoulder in time to encounter the proper tooth of the ratchet when the upward limit of the arm f is reached. Ordinarily this second stop-pawl will not be used.

For the reciprocation of the rod G and operation of the ratchet-and-pawl mechanism described by operation of the key-levers C C

the following devices are shown: Of these, H is a rock-shaft mounted in main frame transversely beneath all the key-levers and in position to be clear of the latter when depressed. To one end of this rock-shaft is secured a crank-arm h, to which is pivoted the lower end of the rod G. Beneath the key-levers the shaft H supports a parallel bar H′ through the medium of laterally-projecting arms h', said bar H′ being in position to be struck by downward projections $c\ c$ on the lower edges of said key-levers. A spring or springs, as H^2, connected with the oscillating frame H H′, normally holds the bar H′ of said frame uplifted against a stop or stops h^2, but permits said bar to be depressed by depression of the key-levers. The rod G is therefore drawn downwardly by depression of either of the key-levers and is lifted by the spring H^2, and the said spring H^2 becomes the force for giving rotation to the screw D, which controls the feed movement of the paper-carriage B.

The projections $c\ c$ upon the different key-levers are of various lengths, each being of a suitable length to produce a movement of the rod G and screw D and a resulting movement to the paper-carriage called for by the width of the type operated by the key-lever which bears such projection—that is to say, the projection on the key-lever for operating the type-letter "l" may be so short as to draw the pawls g and g' over only one tooth of their respective ratchets F and F′, that on the key-lever for operating the type-letter "n" may be long enough to cause said pawls to pass over two teeth, and that upon the lever for operating the type-letter "m" of suitable length to cause said pawls to pass over three teeth. So if a sufficient number of teeth be provided upon the segmental ratchet F^3, word-types may be employed and the appropriate movement given to the paper-carriage by suitably long projections upon the levers appropriated to the actuation of such word-types, respectively.

For the purpose of definitely limiting the downward movement of the rod G, and consequently the retraction of the throwing-pawls g and g', independently of the usual or other appropriate stop for the several key-levers C C, I have shown a second oscillating frame similar to the frame H H′ and consisting of the axial shaft H^3, arms h^3, and parallel bar H^4, the shaft H^3 being provided with an arm h^4, which projects beneath the bar H′. The key-levers C are provided with a second set of downward projections $c'\ c'$, which strike the bar H^4 and rock the arm h^4 upwardly against the bar H′, with the effect of positively arresting its further descent and of course limiting the descent of the rod G and the retraction of the pawls $g\ g'$. The projections c' of course do not correspond in length with the projections c, but are severally formed to give contact of the arm h^4 with the bar H′ at the termination of the downward movement of the key-levers to which said projections severally belong.

In the operation of the keys of a machine having the construction above set forth, the depression of a key for actuating one of the letters of the narrowest class will retract the pawl-arm f only far enough to carry the throwing-pawl g over one tooth of the rachet F and the pawl g' into the first notch at the top of the series of notches f^3 in the segment F^3. Upon the release of the key from finger-pressure the spring H^2 will swing the pawl-arm f in the opposite direction, with the effect of rotating the screw and feeding the paper-carriage their minimum movements. In this forward motion of the pawl-arm f also the segment F^3 is rotated backwardly, with the effect of lifting the detent-pawl g^4 clear of the ratchet F′ and permitting the rotation of the screw by the pawl g, and upon the further forward movement of the pawl-arm f and in the final part of such movement the pawl g' is lifted and held out of the notch of segment by the pawl-lifter F^4 in order that the segment may be rotated forwardly by its spring f^5 to drop the detent g^4 and to be in position for the next operation. When a key operating a wider type is depressed, the pawl-arm f is further retracted, and the pawl g overrides two or more teeth, and the pawl g' is carried to the second, third, or other of the notches f^3, as the case may be, and upon the release of the key the spring H^2 throws the pawl-arm f forwardly again to its limit of movement, with the effect of giving the screw D a correspondingly greater extent of rotation and the paper-carriage a correspondingly greater feed movement. The operation of the segment F^3 is the same in all cases, or, in other words, its initial action is to raise the detent g^4 and its final action is to lower it, the former to allow the screw D to be turned and the carriage fed and the latter to arrest the screw and carriage. Between operations of the keys the screw is locked by the joint action of the detents g^3 and g^4, and the detent g^3 at all times prevents retrograde rotation of said screw.

It is evident that the middle of the first unit of any type in the machine is the point with reference to which the paper-carriage is brought to rest, and the type is adjusted or set upon the type-arm, and it is also evident that the type face widened from this point towards its end may be of any desired width and may embrace any desired number of letters, provided the number of notches in the series f^3 in the segment F^3 be sufficient to allow a sweep of the pawl-arm f called for by the widest type in the machine. The number and width of type-words to be employed in the machine, if any, is a matter of judgment on the part of the maker, the construction set forth having no mechanical difficulties in the way.

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 Remington type, the arrangement of the wheel E over the screw D permitting said wheel to disengage and engage the screw by a vertical movement of said wheel along with the carriage-frame with which it is connected.

I desire it to be understood that the form of either of the above-described mechanisms may be varied and that either improvement may be employed without the others or that any one or more may be omitted or replaced without evasion or avoidance of my appended claims.

I claim as my invention—

1. In a type-writing machine the combination with the main frame and paper-carriage of a screw rotatively mounted on the frame and controlling the forward movement of the carriage, means operated by the several keys for giving intermittent rotary movement to the screw, and means including a ratchet device for operatively connecting the carriage with the screw while permitting the retraction of the carriage independently of the rotation of the screw, substantially as described.

2. In a type-writing machine the combination with the main frame, of a paper-carriage having a hinged connection with the frame adapted to permit a reciprocatory movement of the carriage on the frame, a screw rotatively mounted on the frame at a distance from said hinged connection and parallel with the pivotal axis thereof, means operated by the several keys for giving intermittent rotary movement to the screw and operative connections between the carriage and screw adapted to be released from the screw when the carriage is swung on its hinge, substantially as described.

3. In a type-writing machine the combination with the main frame of a paper-carriage having a hinged connection with the frame adapted to permit a reciprocatory movement of the carriage on the frame, a screw rotatively mounted on the frame at a distance from said hinged connection, and parallel with the pivotal axis thereof, means operated by the several keys for giving intermittent rotary movement to the screw, and operative connections between the carriage and screw adapted to be released from the screw when the carriage is swung on its hinge, and including a ratchet device whereby the carriage may be retracted independently of the movement of the screw, substantially as described.

4. In a type-writing machine the combination with the main frame of a paper-carriage having a hinged connection with the frame and adapted to permit a reciprocatory movement of the carriage on the frame, a screw rotatively mounted on the frame at a distance from said hinged connection and parallel with the pivotal axis thereof, means operated by the several keys for giving intermittent rotary movement to the screw, a worm-wheel journaled on the carriage and normally resting in control with the screw, and a ratchet applied to said wheel for preventing the rotation thereof in the feeding movement of the carriage while permitting it to revolve in the retraction of the carriage, substantially as described.

5. In combination with a paper-carriage of a type-writing machine, a high-pitched screw adapted to be intermittently rotated, a toothed wheel pivoted upon the carriage and engaged with the screw, a ratchet-wheel connected with the said toothed wheel, and a pawl engaging the ratchet, said pawl being arranged to allow retraction of the carriage by rotation of the toothed wheel and ratchet by engagement of the former with the screw.

6. In combination with a screw for controlling the feed movements of the paper-carriage of a type-writing machine, a ratchet-wheel connected with the screw-shaft, a vibratory pawl-arm carrying a pawl having actuating engagement with said ratchet, a detent engaging said ratchet whereby reversal of the screw is prevented, means adapted to vibrate the pawl-carrying arm through varying sweeps by the different key-levers of the machine, and means engaging the paper-carriage with the screw and including a ratchet device adapted to permit retraction of the carriage without breaking the engagement of the carriage with the screw and without reversing the said screw.

7. In combination with a screw for controlling the feed movements of the paper-carriage of a type-writing machine, a ratchet connected with the screw-shaft, a detent engaged with said ratchet, a pawl mounted upon a vibratory arm and having actuating engagement with said ratchet, a second ratchet connected with the screw-shaft and having its teeth directed oppositely to those of the first-mentioned ratchet, a stop-pawl engaged with said second ratchet, a cam-plate rotatively mounted on the axis of the screw-shaft and adapted to disengage said stop-pawl from its ratchet, said cam-plate being provided with a series of teeth or notches, a second pawl mounted on the vibratory pawl-arm to engage said notches in the cam-plate, a pawl-lifter arranged to disengage the pawl from the notches of the cam-plate near the end of the actuating movement of the pawl-arm, and a spring arranged to rotate the cam-plate in a direction opposite to that in which it is rotated by the pawl, together with means through which the vibratory pawl-arm may be given varying sweeps in the operation of different key-levers of the machine.

8. In combination with a screw for controlling the feed movements of the paper-carriage of a type-writing machine and a suitable ratchet-and-pawl mechanism for intermittingly rotating said screw, the key-levers of the machine provided each with two downward projections formed on all the keys, two transverse series of such projections, a vibratory frame having operative connection with the ratchet-and-pawl mechanism and ar-

ranged transversely beneath the key-levers in position to be vibrated by one of the projections on either key-lever, a second vibratory frame suitably arranged in position to be vibrated by the other projection on the same key-lever, a stop-arm connected with the latter vibratory frame and arranged to arrest the movement of the other vibratory frame, and a spring arranged to return the first-mentioned vibratory frame to its normal position when released from the key-lever.

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

CHARLES S. ELLIS.

Witnesses:
M. E. DAYTON,
C. CLARENCE POOLE.