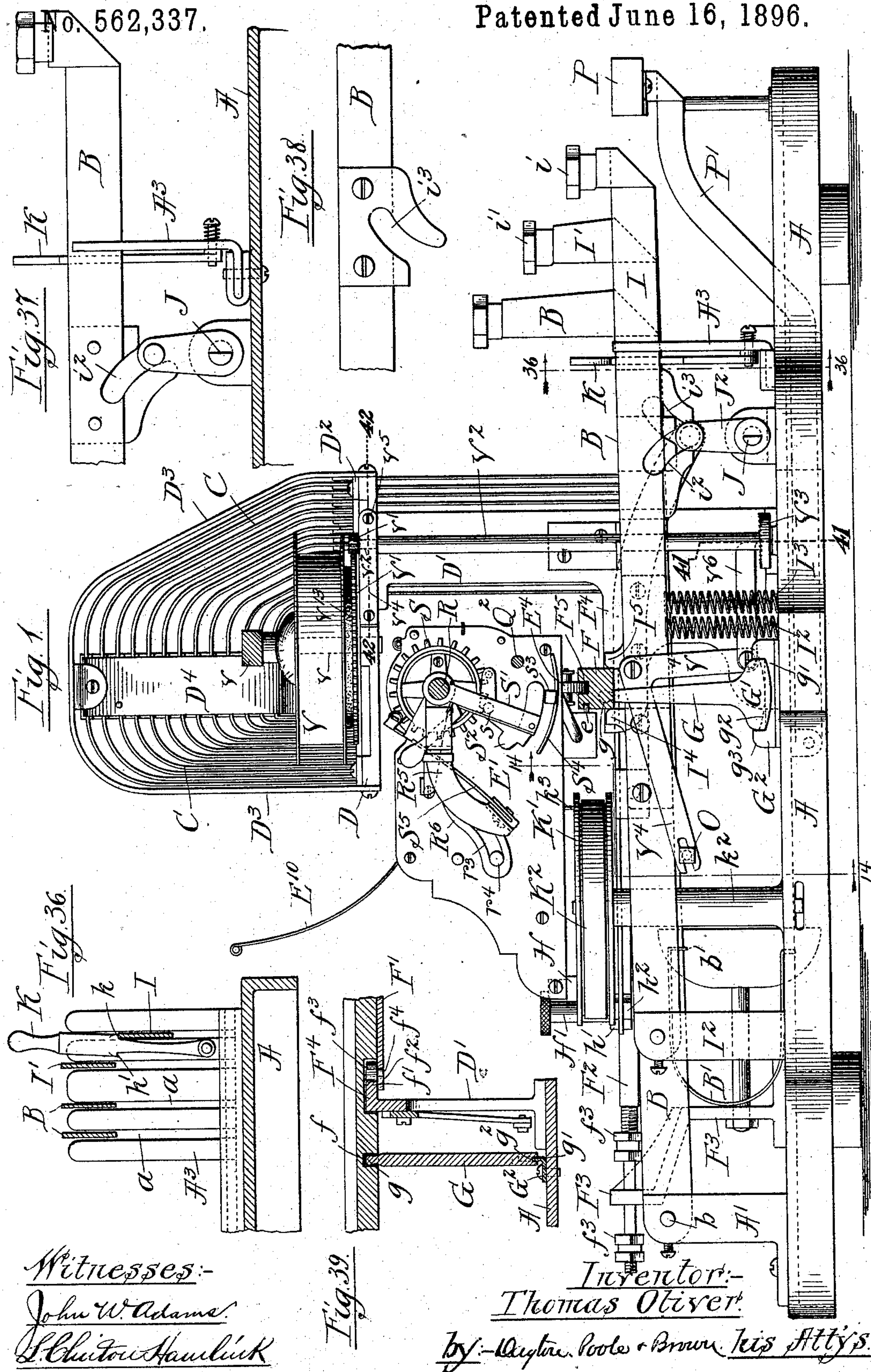


(No Model.)

8 Sheets—Sheet 1.

T. OLIVER.
TYPE WRITING MACHINE.

Patented June 16, 1896.



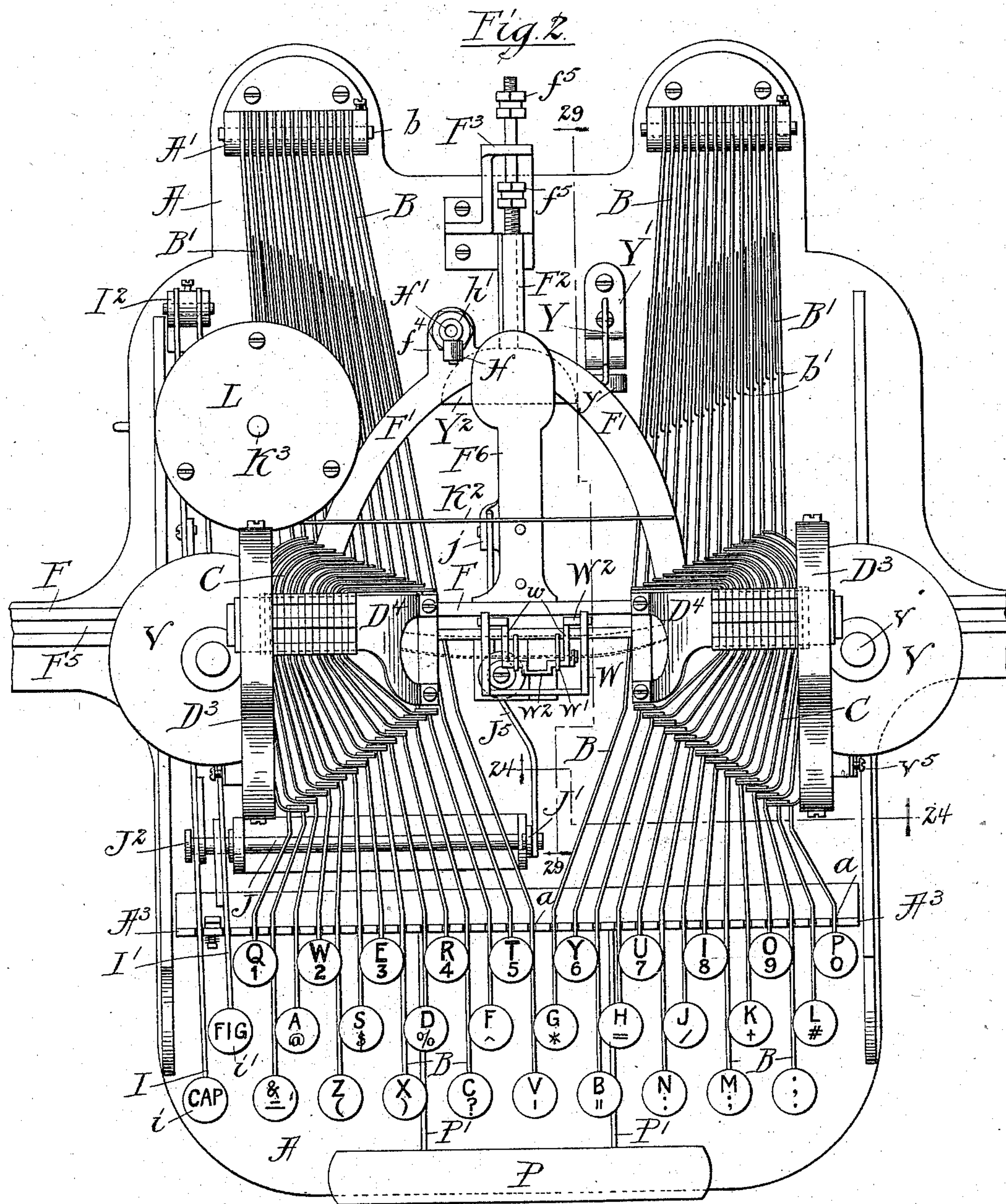
(No Model.)

8 Sheets—Sheet 2.

T. OLIVER.
TYPE WRITING MACHINE.

No. 562,337.

Patented June 16, 1896.



Witnesses:-
John W. Adams.
Clinton Hamlin.

Inventor:-
Thomas Oliver.
by: Mayton, Poole & Brown,
his Attys.

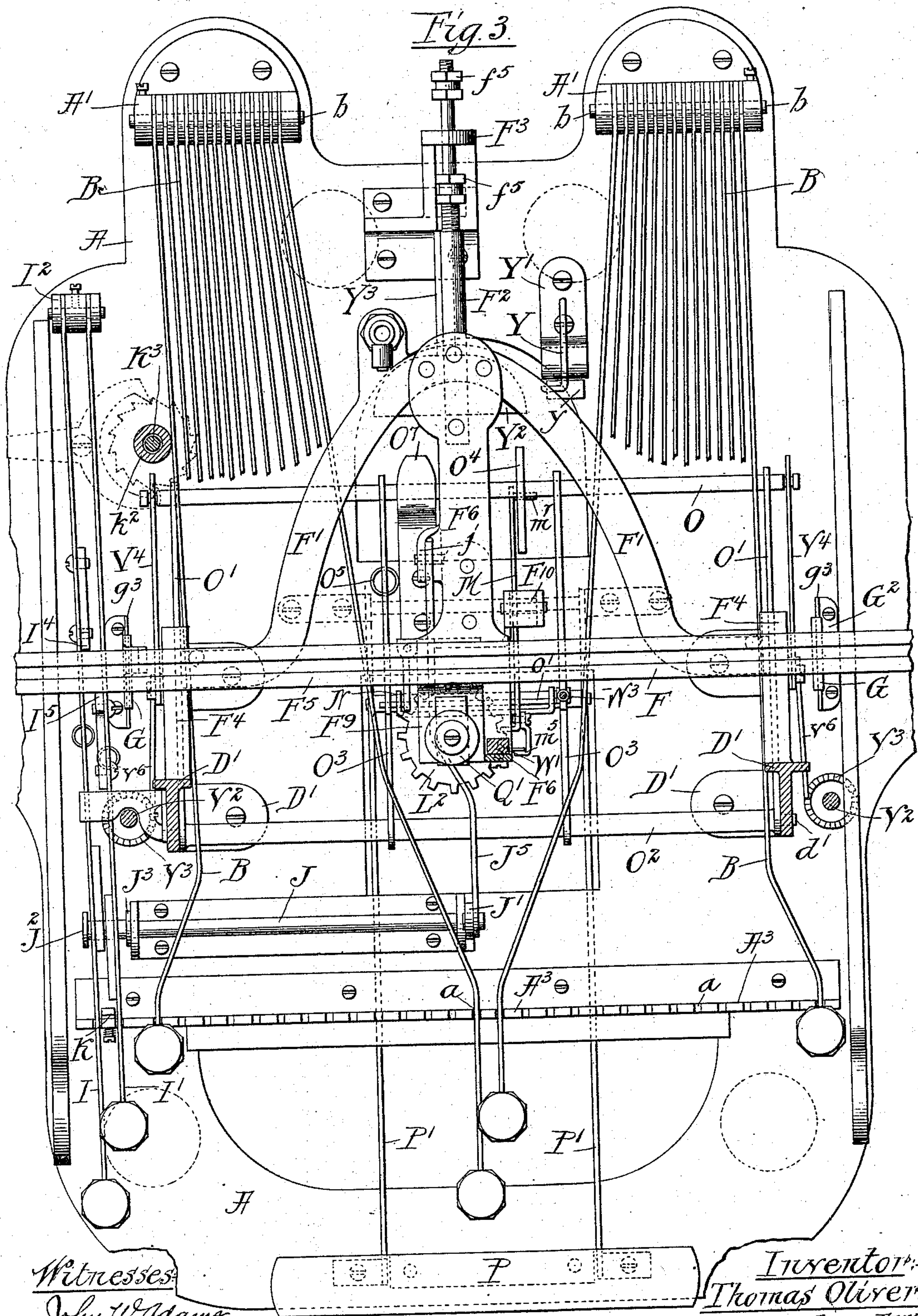
(No Model.)

8 Sheets—Sheet 3.

T. OLIVER.
TYPE WRITING MACHINE.

No. 562,337.

Patented June 16, 1896.



Witnesses:

John W. Adams.
L. Clinton Hamlin.

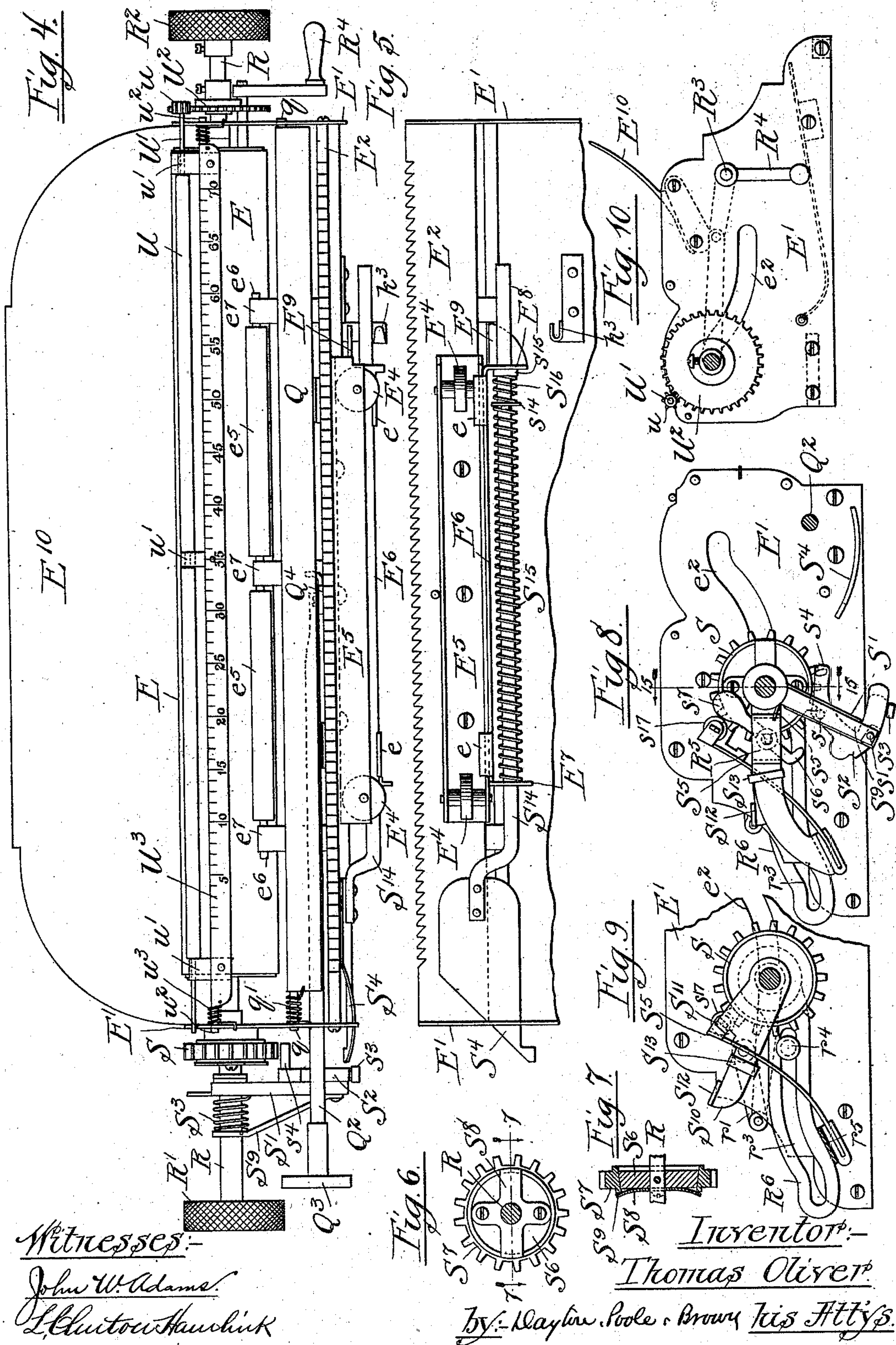
Inventor:
Thomas Oliver.

by: Clayton, Poole & Brown his Attys.

8 Sheets—Sheet 4.

Patented June 16, 1896.

No. 562,337.



(No Model.)

8 Sheets—Sheet 5.

T. OLIVER.
TYPE WRITING MACHINE.

No. 562,337.

Patented June 16, 1896.

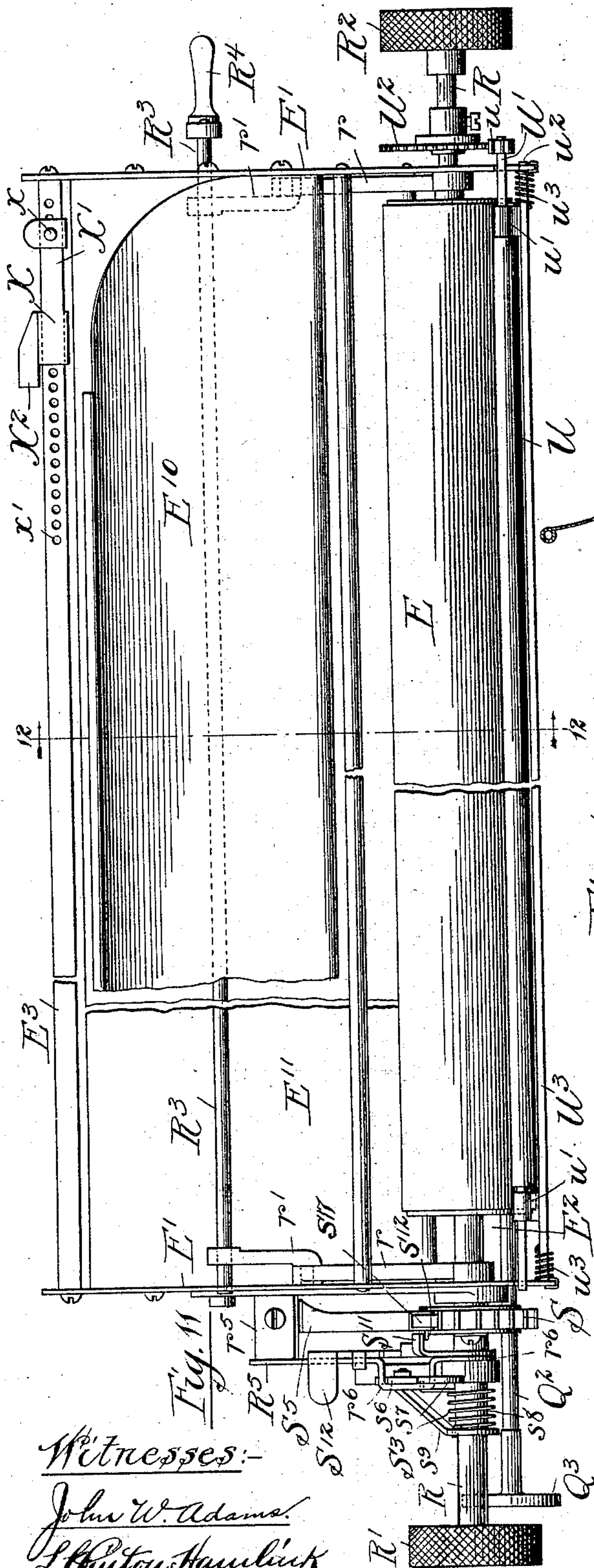


Fig. 11

Fig. 13

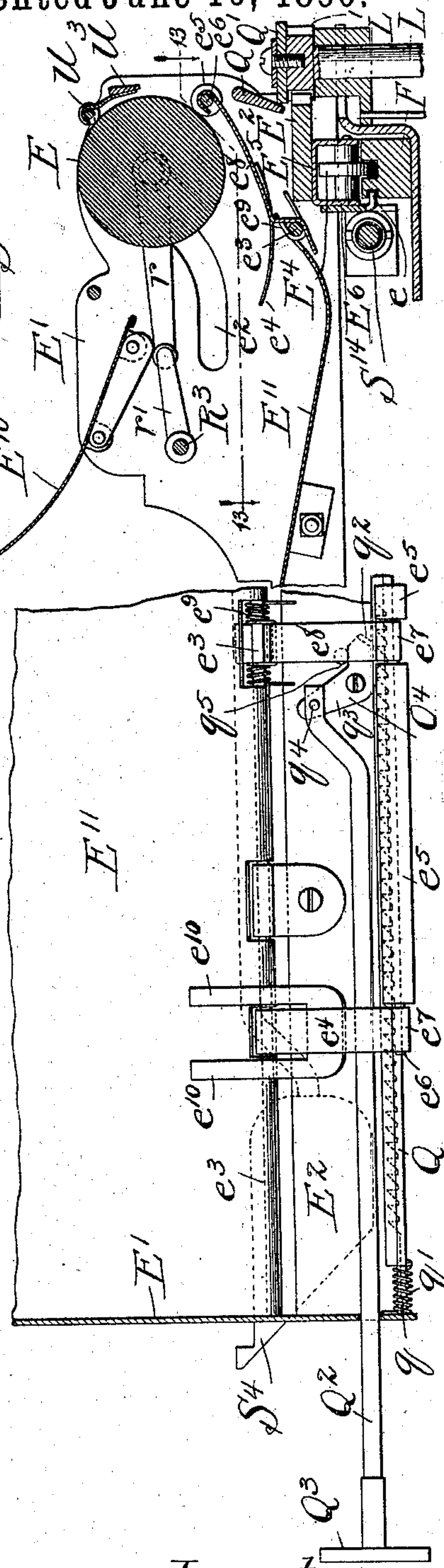


Fig. 12

Witnesses:-

John W. Adams.
L. Clinton Hamlin.

Inventor:-
Thomas Oliver.
By:- Clayton Poole & Brown
his Attys.

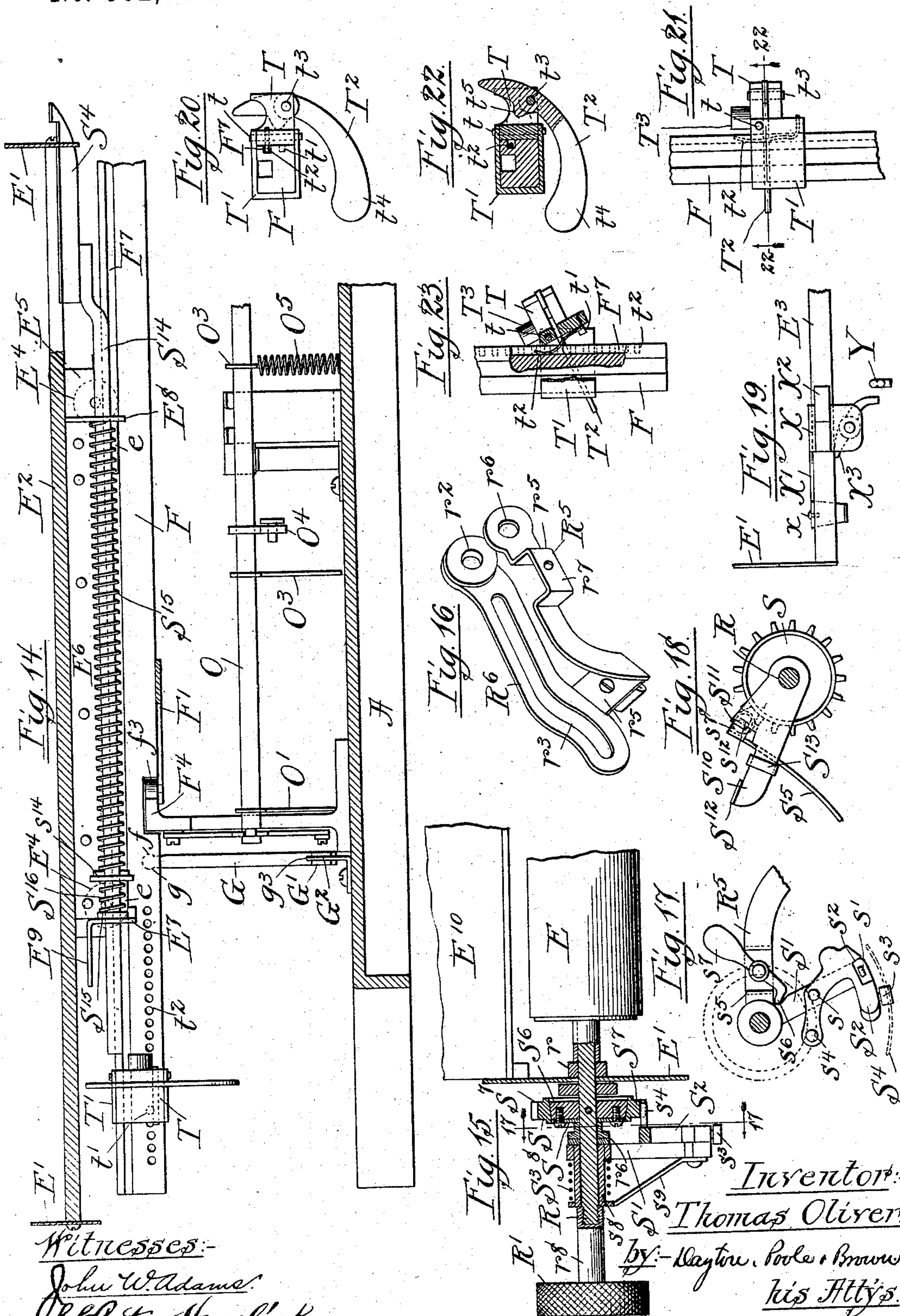
(No Model.)

8 Sheets—Sheet 6.

T. OLIVER.
TYPE WRITING MACHINE.

No. 562,337.

Patented June 16, 1896.



Witnesses:-

John W. Adams.
L. Clinton Hamlin

Inventor:-

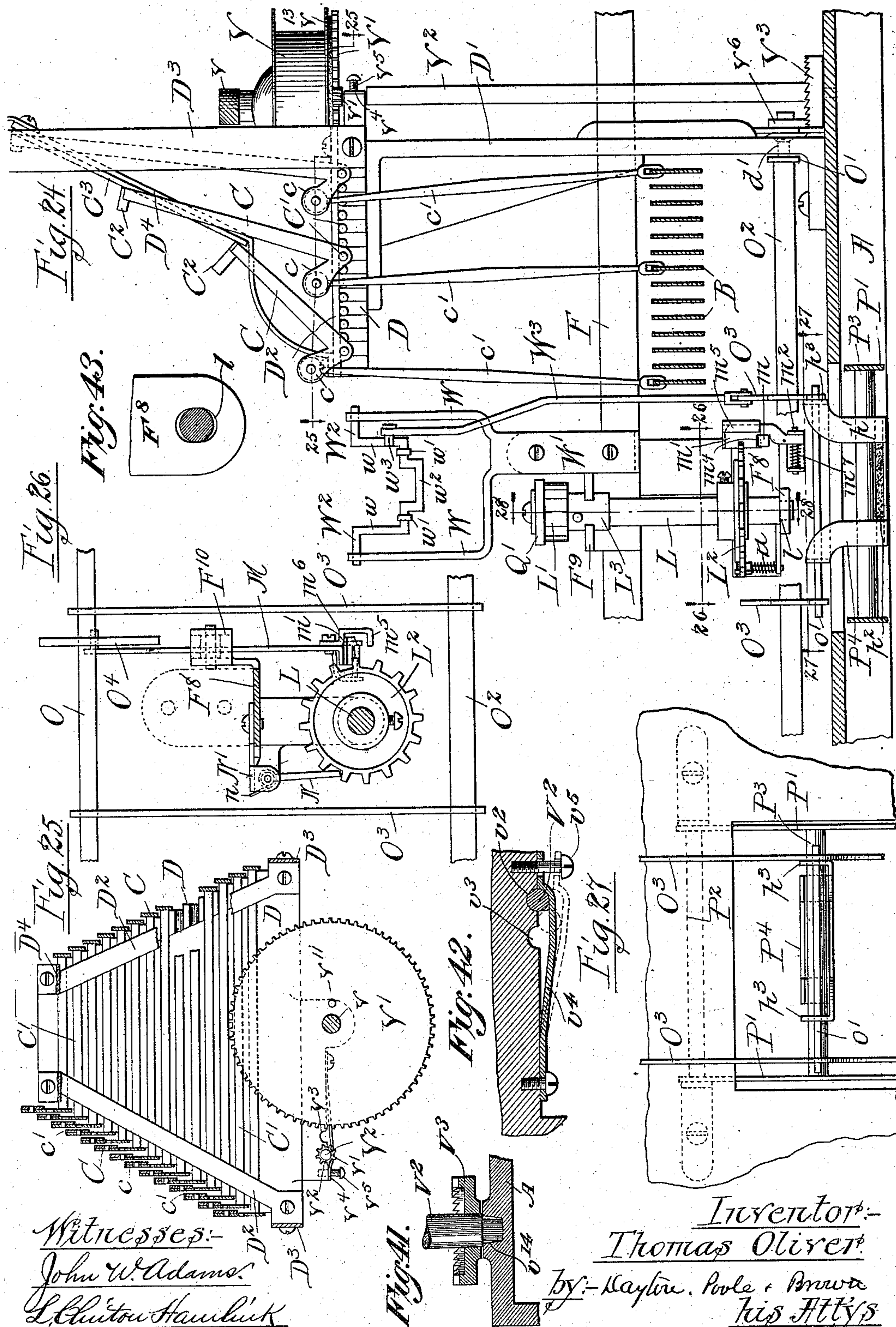
Thomas Oliver

by:- Clayton, Poole & Brown,
his Attys.

8 Sheets—Sheet 7.

No. 562,337.

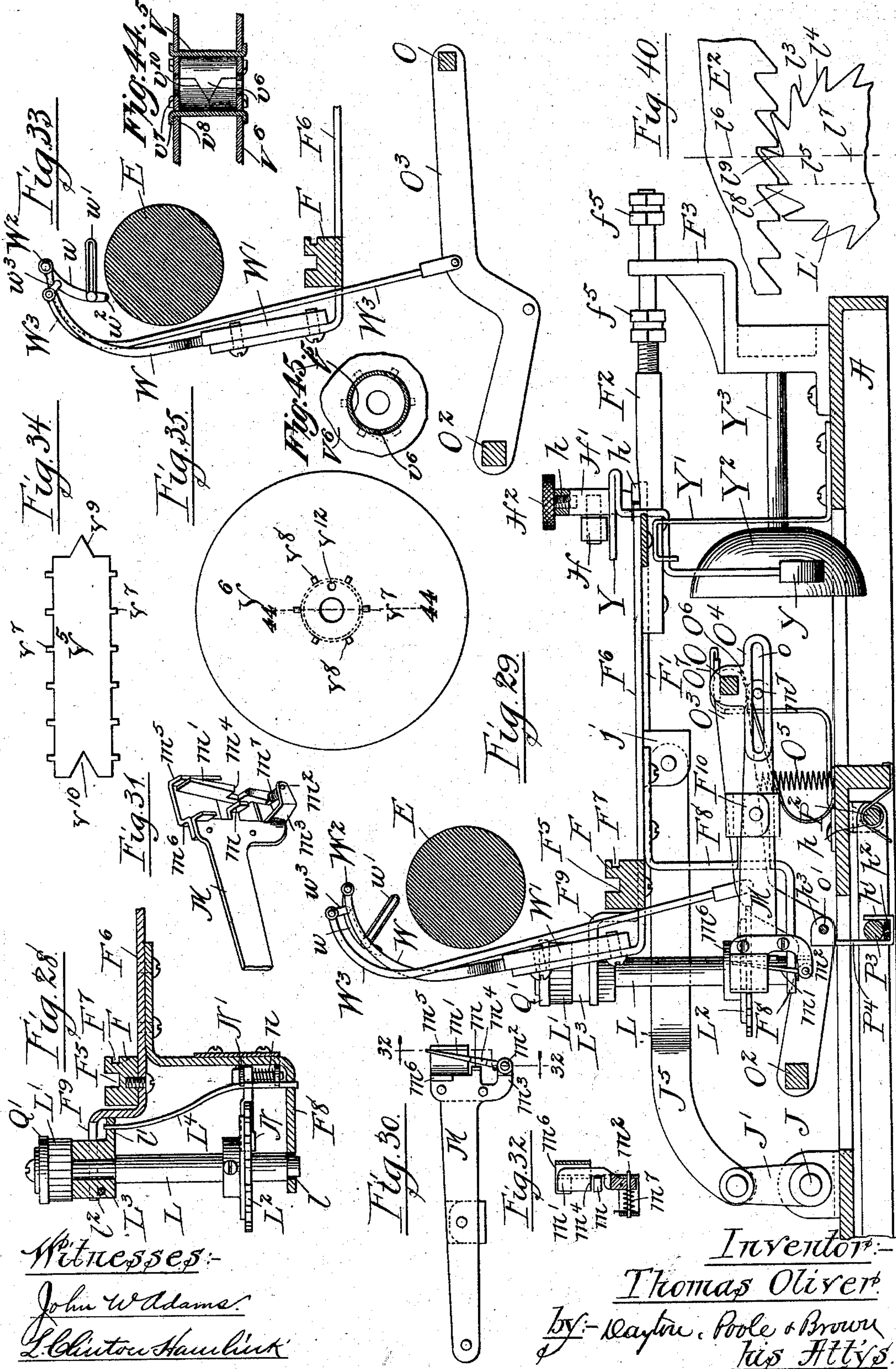
Patented June 16, 1896.



8 Sheets—Sheet 8.

No. 562,337.

Patented June 16, 1896.



UNITED STATES PATENT OFFICE.

THOMAS OLIVER, OF WOODSTOCK, ILLINOIS.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 562,337, dated June 16, 1896.

Application filed March 2, 1896. Serial No. 581,431. (No model.)

To all whom it may concern:

Be it known that I, THOMAS OLIVER, of Woodstock, in the county of McHenry 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 type-writing machines which are applicable mainly to machines of that kind in which the impression is produced on the upper side of a platen in view of the operator and wherein type-bars of U form are employed, such as is shown, for instance, in prior Letters Patent, No. 528,484, granted on the 30th day of October, 1894, and No. 524,275, granted on the 9th day of July, 1895, but several of the improvements herein described may be applied to type-writing machines of other kinds, as will hereinafter appear.

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

In the accompanying drawings, Figure 1 is a side view of a type-writing machine embodying my invention with the side plate of the frame removed to show the working parts. Fig. 2 is a plan view of said machine with the paper-carriage removed to show the parts beneath the same. Fig. 3 is a plan view with the paper-carriage, with most of the type-levers removed for showing the parts immediately adjacent to the base-plate. Fig. 4 is a view in front elevation of the paper-carriage removed from the machine. Fig. 5 is a view from beneath of the rack-bar of the paper-carriage and the adjacent parts. Fig. 6 is a detail view of the ratchet-wheel attached to the platen-shaft. Fig. 7 is a cross-section taken on line 7 7 of Fig. 6. Fig. 8 is a detail end view of the carriage-frame, showing the devices for actuating the platen to effect the line-feed. Fig. 9 is a similar view showing a changed position of the parts. Fig. 10 is a view of the opposite end of the carriage, illustrating the device for shifting the platen. Fig. 11 is an enlarged plan view of the carriage, illustrating the devices for actuating

the platen. Fig. 12 is a cross-section of the carriage, taken on line 12 12 of Fig. 11. Fig. 13 is a detail plan section of one end of the carriage, taken on line 13 13 of Fig. 12, showing the parts below the platen. Fig. 14 is a view of the rear part of the carriage with adjacent parts of the machine-frame, this being a sectional view taken on line 14 14 of Fig. 1. Fig. 15 is a detail vertical sectional view of the platen-actuating devices, taken on line 15 15 of Fig. 8. Fig. 16 is a perspective view of the slotted slide and attached bearing-arm shown in Fig. 15. Fig. 17 is a sectional elevation of the feed-arm and dog, taken on line 17 17 of Fig. 15. Fig. 18 is a detail view of the platen ratchet-wheel and its retaining-pawl. Fig. 19 is a detail rear elevation of the bell-trip device on the carriage. Fig. 20 is an end view of the carriage guide-bar, showing the margin-stop and platen-actuating stop thereon. Fig. 21 is a plan view of the parts shown in Fig. 20. Fig. 22 is a cross-section taken on line 22 22 of Fig. 21. Fig. 23 is a sectional plan view showing the margin-stop in changed position. Fig. 24 is a detail sectional elevation taken on line 24 24 of Fig. 2, showing the type-bar-actuating devices and parts of the spacing mechanism. Fig. 25 is a plan section taken on line 25 25 of Fig. 24, showing the type-bar pivots and their bearings. Fig. 26 is a plan section taken on line 26 26 of Fig. 24, showing the escape-wheel and other parts of the spacing mechanism. Fig. 27 is a detail plan view taken on line 27 27 of Fig. 24, showing the pivotal support of the rocking frame by which the spacing devices are actuated. Fig. 28 is a central vertical section of the escapement-wheel shaft and parts supporting the same, taken on line 28 28 of Fig. 24. Fig. 29 is a detail vertical section taken on line 29 29 of Fig. 2, showing in side elevation the spacing and the ribbon-shifting devices. Fig. 30 is a side elevation of the oscillating detent-lever which controls the escapement-wheel. Fig. 31 is a perspective view of the same. Fig. 32 is a sectional view of the same, taken on line 32 32 of Fig. 30. Fig. 33 is a detail section of the ribbon-guides and actuating devices therefor, showing a position of the same different from that shown in Fig. 29. Fig. 34 is a detail view of the blank from which is

made the barrel of one of the ribbon-spools. Fig. 35 is a face view of the blank forming the head or end of one of the ribbon-spools. Fig. 36 is a cross-section showing the locking devices for the spacing levers, taken on line 36 36 of Fig. 1. Fig. 37 is a detail side view of one of the key-shifting levers, showing the curved slot by which motion is transferred to the shifting carriage-support. Fig. 38 is a view of the other one of said levers, showing the curved slot therein. Fig. 39 is a detail section taken longitudinally through the guide-bar of the paper-carriage and one of the rocking standards on the frame which supports said bar. Fig. 40 is a detail view of the rack-bar on the paper-carriage and the pinion which engages the same, showing the shape of the teeth on said parts. Fig. 41 is a detail section of the lower bearing of one of the ribbon-feed shafts, taken on line 41 41 of Fig. 1. Fig. 42 is a detail section of the bearings for the upper end of one of the ribbon-feed shafts, taken on line 42 42 of Fig. 1. Fig. 43 is an enlarged detail plan view of the lower bearing of the escape-wheel shaft. Fig. 44 is a cross-section of the ribbon-spool, taken on line 44 44 of Fig. 35. Fig. 45 is a section of the same, taken longitudinally of the barrel, on line 45 45 of Fig. 44.

As shown in said drawings, A designates the base of the machine, consisting in the instance shown of a single flanged metal casting, to the top surface of which are attached posts or standards supporting and affording bearings for the several operative parts of the machine, as will hereinafter appear.

B B indicate the key-levers, which extend from the front to the rear of the machine, above and generally parallel with the base, and are pivotally supported at their rear ends by means of transverse pivots *b*, supported in standards A' A', secured to and rising from the base-plate. Said levers are divided into two groups, in each of which the rear ends of the levers are brought together and pivoted at opposite sides of the machine-frame, as clearly seen in plan view, Fig. 1, there being two standards A' A', each provided with slots in which the rear ends of the levers are inserted. At their front ends the key-levers are held in vertical guide-slots *a*, formed in a transverse guide-bar A³, secured to and extending across the base-plate near the front of the machine, Figs. 1, 2, 3, 36, and 37.

The several key-levers are lifted and held normally in an elevated position by means of springs B' B', Fig. 1, herein shown as made of U form and located between the base-plate and the key-levers, with their upper ends engaged with the lower edges of the key-levers by means of hooks *b'*, formed in the ends of said springs.

C C indicate the type-bars, which are of loop or U form and are mounted on supporting-frames D D in two groups at opposite sides of the center of the machine, so as to swing on horizontal axes, extending from the

front to the rear of the machine and which act on a platen or paper-supporting roller E, arranged transversely of the machine beneath the type-bars, in position for the action thereon of the type-bars of both groups and mounted in an endwise-movable carriage, which is moved or shifted endwise to feed the platen and the paper thereon past the printing or striking point of the type-bars, generally in the manner described and shown in said prior patent.

The supporting-frames D D are arranged so as to overhang the platen E, Figs. 1, 24, and 25, and are supported at such distance above the base-plate and the key-levers as to afford space for the platen and its supporting-carriage by means of posts or uprights D', secured to the base-plate and adapted to rigidly sustain the said supporting-frames. The several type-bars are rigidly attached at their ends to horizontally-arranged rock shafts or spindles C', which are mounted at their ends in bearings formed in the said supporting-frames and held therein by cap plates or bars D², Figs. 24 and 25. Said type-bars are provided with type-heads C², supported on the central parts or bends of the bars, and adjacent to their pivots are provided, Fig. 24, with radial crank-arms *c*, which are connected by means of upright links *c'* with the key-levers at points intermediate of the ends of the latter.

At the outer ends of the supporting-frame D are located upright yokes D³, and attached to the same are inclined supports or rests D⁴, which are arranged in an inclined position between the arms of the yokes, their lower extremities being secured to the inner ends of the supporting-frames and their upper ends attached to the said yokes. Said rests are provided on their inner faces with impact-cushions C³, against which the rear sides of the type-heads rest when in their normal or retracted position.

The looped or U-shaped type-bars and type-heads thereon herein shown differ in two important respects from those shown and described in said prior patents. First, both arms of the type-bars are made of tapered form and are thereby given graduated stiffness or rigidity from their pivoted ends to the points of attachment of the type-heads, and, secondly, the type-heads are made of graduated weight, those carried by the shorter type-bars being heavier than those on the longer type-bars. By making the arms of the looped type-bars of tapered form it is found that vibratory motion of the type-heads under the impact of the same against the platen is greatly decreased, with consequent improvement in the character of the impression made. It is also found, by making the type-heads of varying weight, all of the types may be made to strike with practically the same force in making the impression, notwithstanding the varying lengths of the type-arms. Uniformity of impression and in the

appearance of the several letters is thus obtained.

The type-bar heads carry each a plurality of type-faces or types, preferably three, where-
 5 by an upper and lower case letter and a numeral or a punctuation-mark may be arranged on each type-head, the platen and its carriage being movable and controlled by suitable shifting devices, so that either of the
 10 types on the type-heads may be printed from at will. The type-bars are shown as made of sheet-metal strips bent into proper shape, and the type-heads consist of metal blocks slotted in their rear faces to receive the sheet-
 15 metal type-bars and secured to the same by soldering or in any other suitable manner.

The paper-carriage frame, in the preferred construction illustrated, consists of two end plates E' E' , a longitudinal bar E^2 at the lower
 20 front part of the frame, which constitutes the rack-bar of the spacing mechanism, and a rear frame-bar E^3 , Fig. 11. The said carriage as a whole is mounted to slide endwise on a supporting-frame, which consists of a trans-
 25 verse guide-bar F and a horizontal yoke-piece F' , extending rearwardly therefrom and having attached at its rear end a horizontal guide-rod F^2 , which slides in a supporting-bracket F^3 , attached to the rear part of the bed-plate.
 30 A centrally-arranged plate F^6 is attached to the rear end of the yoke and to the central part of the guide-bar F . Said plate forms part of the shifting frame and serves to support parts of the operating devices, as will hereinafter appear. The guide-bar F consti-
 35 tutes the main support for the carriage, and said bar is sustained in such manner that it may be moved horizontally backward and forward to afford the shifting of the carriage
 40 with relation to the type-heads necessary in order to print from either one of the three types upon said type-heads, while it is held positively from endwise or vertical movement.

The devices illustrated for sustaining the
 45 shifting guide-bar consist of two rocking standards G G , Figs. 1 and 39, which are located beneath the guide-bar and support the same from the base-plate. Said standards have flexible connection with the said guide-
 50 bar by means of pivotal or ball-and-socket connections formed by means of a ball or head g on the upper end of each standard engaging a socket f , Fig. 39, in the bottom surface of said guide-bar, while the lower ends of
 55 said standards are extended from front to rear of the machine to form rockers G' , which rest on shoes G^2 , secured to the bed-plate A . Said rockers are so carried in a circular arc concentric with the pivot or ball and socket at
 60 the opposite end of the standard that when the upper ends of the standards are moved backward or forward they will remain practically in the same horizontal plane, and the guide-bar may be thereby moved backward
 65 and forward without being raised or lowered. In order that the standards may be held from moving or shifting on the base-plate, suitable

means are provided for confining them. For this purpose the said shoes G^2 are provided with elevated parts or flanges g' , engaging
 70 grooves g^2 , formed in the lower surfaces, and the shoes are provided at their ends with upwardly-projecting lugs g^3 at the front and the rear of the rockers G^2 . The engagement of
 75 the said flanges with the grooves of the rockers hold the standards from moving or shifting laterally, while the lugs g^3 serve to loosely confine the rockers and hold them from back-
 80 ward or forward movement. The rocking standards G are located near the ends of the guide-bar F , outside of the key-levers. The said supporting-standards may be reversed and the shoes attached to the shifting frame
 85 instead of to the base without affecting the operation of these parts.

The guide-bar F , together with the yoke F' , constitute the shifting frame of the machine,
 and the engagement of the rod F^2 with the guide F^3 affords a support for the frame
 90 which, in connection with the rocking standards G G , serves to hold the frame in a horizontal position, while at the same time leaving it free to be shifted backwardly or forwardly with the carriage which is supported
 95 by said frame.

To hold the guide-bar F from endwise movement and from being lifted vertically, the same is engaged with horizontal stationary
 100 guides F^4 , Figs. 3, 14 and 39, which extend from front to rear of the machine-frame, and are provided with overhanging parts or flanges f' , Fig. 39, which are engaged by projecting lugs f^2 on the said bar in such
 105 manner as to hold the bar from rising. Said lugs f^2 are herein shown as formed by the extremities of the yoke F' , which extend beneath the guide-bar and are turned outwardly parallel with the bar, being secured thereto by screws
 110 or rivets. The said guide-bar is also provided with an antifriction-roller f^3 at its left-hand end, which, by engagement with the inner edges of the adjacent flange f , serves to resist the tendency to endwise movement in
 115 the bar due to the action of the carriage-actuating spring. As herein shown, the guides F^4 are formed upon or cast integral with the standards D' , by which the guide-bars and their supports are sustained, and the roller
 120 f^3 is mounted on a stud or pivot f^4 , attached to one end of the yoke F' , the guide-bar being cut away or notched on its under surface to receive the said guides F^4 and said roller. The backward-and-forward movement of the
 125 shifting frame is limited and controlled by means of shifting stops or nuts f^5 f^5 , placed on the stem F^2 at either side of the guide-bracket F^3 .

The paper-carriage is sustained at its front edge upon the guide-bar F by means of sup-
 130 porting-rollers E^4 , which engage a longitudinal guide-groove F^5 , formed in the top surface of the guide-bar F , Fig. 12. Said supporting-rollers are preferably two in number, Fig. 5, and are connected with the carriage-frame by

means of a longitudinal channel-bar E^5 , Figs. 5, 12, and 14, which is secured to the bottom or under surface of the bar E^2 of the carriage and between the depending flanges of which the said rollers E^4 are journaled by means of bearing-pivots inserted through the central hubs formed on the rollers and through the depending flanges of said channel-bar, the hubs of the rollers being made long enough to extend between said flanges and thereby hold the rollers from lateral movement, as clearly seen in Fig. 5.

The carriage is held from rising or being lifted from its place by means of a longitudinal groove F^7 , formed in the rear face of the guide-bar F near its top, which groove is engaged by two lugs $e e$ on the carriage-frame. Said lugs are shown as formed on the lower edge of a plate E^6 , which is secured by rivets to the rear flange of the channel-bar E^5 , Figs. 5, 12, and 14.

The rear part of the carriage is sustained by means of a supporting-roller H , Figs. 1, 2, and 29, which is mounted on a standard H' , attached to the frame-yoke F' , in position to extend beneath the rear frame-bar E^3 of the carriage-frame, which latter rests and travels on said roller H in the endwise traverse of the carriage. To hold the carriage from rising at its rear part, a movable stop H^2 is secured to the upper end of the post H' in such manner as to overhang the said bar. Said stop is herein shown as having the form of a thumb-screw, Fig. 29, to which is attached a threaded shank h , which enters a socket in the upper end of the post H' . The said post H' is shown as secured to the yoke F' by passing through a hole formed in a rearwardly-projecting lug f^4 on said yoke and having nuts $h' h^3$ placed on the screw-threaded lower end of the post above and below said yoke, thereby enabling the post to be adjusted vertically with the effect of raising or lowering the rear part of the carriage, which construction enables the carriage to be adjusted accurately to a horizontal position.

The shifting frame is so constructed that the platen E and its carriage may be shifted in either direction from a central point, the carriage being shifted backwardly for one set of types or characters and forwardly for another set, while it remains unmovable or in its central position for the third or intermediate set of types. To accomplish such movement of the carriage backward and forward from its central position, devices are connected with the shifting frame as follows:

$I I'$ represent shifting-levers, having their keys $i i^7$ in the keyboard, preferably at the left-hand side of the same, and pivoted at their rear ends to a standard I^2 , rising from the base-plate A , Figs. 1 and 3, said levers being guided in vertical slots formed in the left-hand end of the guide-plate A^3 . Mounted on the frame-base at the rear of the guide-plate A^3 is a rock-shaft J , Figs. 1, 2, 3, 29, and 37, which extends from a point beneath

the shifting-levers to the center of the machine and is provided with upwardly-extending crank-arms J' , J^2 , and J^3 . The crank-arm J' , Figs. 3 and 29, is located near the center of the machine and is connected with the shifting frame by means of a rearwardly-extending rod J^5 , Fig. 29, the rear end of which is pivoted to a depending lug j on the central plate F^6 of the shifting frame, Figs. 3 and 29.

The two crank-arms $J^2 J^3$ are adapted for engagement, respectively, with the shifting-levers I and I' . Said shifting-levers are provided with curved slots $i^2 i^3$, which are so shaped or curved that the depression of one key-lever will throw the rock-shaft J in one direction, while the depression of the other key-lever will turn the same said rock-shaft in the opposite direction, thereby giving corresponding movement in opposite directions to the shifting frame, in the same manner as described in the said prior patent, No. 542,275.

I^2 and I^3 , Fig. 1, are lifting-springs applied between the base-plate and the shifting-levers to hold the latter normally elevated. The shifting-levers I and I' are provided with stop projections I^4 and I^5 , adapted for contact with the guide-bar F , so as to limit the movement of the same and hold the carriage immovable when in its central position, in the same manner as the corresponding parts shown in said prior patent, No. 542,275. It is sometimes desired to hold the carriage for some length of time in its shifted position, and for this purpose I have provided means of locking the spacing-keys in their depressed position. The device illustrated for this purpose is like that shown in said prior patent, No. 542,275, and consists of a hand-lever K , Figs. 1 and 36, which is arranged vertically and extends between the levers I and I' and is pivoted at its lower end to the guide-plate A^3 . Said lever K is provided with outwardly-facing stop-shoulders $k k'$, located in such position as to hold the spacing-keys depressed when engaged therewith. By shifting said hand-lever K to the right or left and in engagement with that one of the shifting-keys which is depressed, the depressed key will be locked or held from rising by the locking-lever so long as the latter remains in engagement therewith.

For giving endwise motion or feed to the paper-carriage the machine herein shown is provided with a spring-actuated mechanism for giving motion to such carriage, and also a spacing or feed device by which the carriage is allowed to move under the action of said spring one space at each time the key is depressed for printing a letter.

The carriage-actuating device is like those heretofore used for the same purpose and is constructed as follows:

K' , Figs. 1 and 2, indicates a drum which contains the usual carriage-actuating spring and in the instance illustrated is mounted to turn about a vertical axis and is supported

upon the upper end of a standard k^2 , which rises from the machine-base. Said spring-drum has wrapped about it a strap K^2 , the free end of which is attached to a hook k^3 , Figs. 4 and 5, on the carriage-frame. Said drum is attached to the vertical shaft K^3 , which extends downwardly through the base of the machine and is provided below the base with the familiar device of a ratchet-wheel and escapement-lever (shown in dotted lines in Fig. 3) by which the tension of the spring may be regulated.

The spacing device for effecting the letter-spacing or feed device operates in connection with the rack-bar E^2 , hereinbefore referred to, and embraces features of novelty in several particulars. Said spacing device is constructed as follows:

L , Figs. 28 and 29, indicates an upright escape-wheel shaft, located near the center of the machine in front of the guide-bar F . Said shaft is mounted in a bearing connected with the said guide-bar, so that the shaft moves horizontally with the shifting frame, and said shaft carries at its upper end a gear-pinion L' , adapted to engage the rack-bar E^2 of the carriage-frame, Fig. 12. The upper end of the shaft L is, moreover, adapted to move in its bearings toward and from the rack-bar, so that the pinion L' may be engaged and disengaged from said rack-bar at will. Said shaft carries near its lower end an escape-wheel L^2 , by which is controlled the rotation of the shaft produced by the endwise movement of the carriage under the impulse of the carriage-actuating spring. The said shaft, in the particular construction illustrated, Figs. 24, 26, 28 and 29, is supported at its lower end in a bracket F^8 , which is attached to the horizontal plate F^6 of the shifting frame. The lower end of said shaft engages the bearing-aperture l in said bracket F^8 , being sufficiently loose therein to enable the upper end of the shaft to be moved horizontally toward and from the rack-bar, in the manner above described. This construction is illustrated in the drawings, Fig. 43, in which the said aperture is shown as made slightly longer in a direction from front to rear than the diameter of the lower end of the shaft. The upper end of the shaft L engages a bearing-aperture in a sliding block L^3 , which block engages the sides of a guide-slot in an arm or bracket F^9 on the shifting frame, which arm or bracket is conveniently formed by means of a forward extension of the plate F^6 , which is prolonged beyond the guide-bar, in position to support the said bearing-block. A pin l^2 , inserted through the block below the arm F^9 , engages the lower surface of the arm, so as to hold the block from rising. The bearing-block L^3 is held normally in its rearward position or adjacent to the guide-bar F and the said pinion is retained in mesh with the rack-bar by means of a suitably-applied spring, herein shown as having the form of a plate-spring L^4 , which is secured to the bracket F^8 at its lower end,

and at its upper or free end engages an aperture in a lug l' , which extends rearwardly from the block L^3 .

To now describe the escape device, by which the escape-wheel L^2 is allowed to turn step by step when the several keys are operated, the same is constructed as follows: M is an oscillatory escapement-lever, Figs. 26, 29, 30, and 32, which is pivoted on a laterally-extending arm F^{10} on the bracket F^8 and is adapted to swing in a vertical plane. Said lever extends from front to rear of the machine, and its forward end is located at one side of and adjacent to the escape-wheel L^2 and carries stiff and limber pawls $m m'$, which are adapted for engagement with the teeth of the escape-wheel, so as to permit the wheel to turn tooth by tooth when the latter is oscillated in a manner common to other escape mechanism. The stiff pawl m has the form of a rigid projection or tooth on the end of the lever M , and the limber pawl m' is pivotally supported at its lower end, by means of a transverse pivot, between laterally-separated arms $m^3 m^4$ on said lever, so as to swing in a vertical plane parallel with the axis of the escape-wheel. The stiff pawl m is adapted for alternate engagement with and disengagement from the teeth of the escape-wheel by vertical movement or oscillation of the front end of the escape-lever M , the said stiff pawl being adapted for engagement with the teeth of the wheel when the escape-lever is elevated. The limber pawl is also adapted for the engagement and disengagement with the teeth of the escape-wheel by a vertical movement of said lever M , said pawl, for this purpose, being provided with a notch m^4 in its side nearest the escape-wheel and opposite the stiff pawl m , said notch being so located as to permit the passage of the teeth of the escape-wheel when the lever is elevated. The parts are so arranged that, when the escapement-lever is depressed, the lug m' will engage the teeth of the same, and when it is elevated the stiff pawl m will be engaged by the said teeth and the limber pawl will be released therefrom. A back stop m^5 for the limber pawl is formed by means of a lateral projection on the lever M , and a front stop m^6 for said limber pawl is similarly formed on said lever. The limber pawl is held normally in contact with the back stop by means of a suitably-applied spring, herein shown as having the form of a coiled spring m^7 , Figs. 31 and 32, placed around the pivot m^2 of the limber pawl. The escape-wheel turns in a direction to carry the limber pawl away from back stop m^5 , when engaged with said pawl, as clearly seen in Fig. 26, and said wheel, when in contact with the limber pawl, carries the same toward the back stop m^6 against the action of the spring m^7 and holds it in contact with the same. When the parts are at rest, the escapement-lever stands at the lower limit of its movement, and one tooth of the escape-wheel rests in contact with the limber pawl, which holds the

escape-wheel from turning. If, now, the escape-lever be moved so as to lift its free end, the limber pawl will be lifted until free from the escape-wheel, at which time the tooth previously engaged by the limber pawl will come in contact with, and be arrested by, the stiff pawl m , while the limber pawl will be released, and, under the action of its spring m^7 , will return into contact with the back stop m^5 , as seen in Fig. 30. Upon the subsequent descent of the escape-lever the teeth of the escape-wheel in contact with the stiff pawl will be released so as to permit the turning of the wheel; but in the descent of the escape-lever the next succeeding tooth will be caught by the descending limber pawl, which will be moved thereby until arrested by the front stop, thus permitting the turning of the escape-wheel a distance of one tooth at each oscillation of the escape-lever. Any backward turning of the escape-lever is prevented by the detent N, Fig. 26, which is mounted on a supporting-arm N', attached to the bracket F', and held by means of a coiled actuating-spring n in engagement with the teeth of the escape-wheel.

Now referring to the means illustrated for giving motion to the escape-lever, these parts are constructed as follows: O, Figs. 3 and 29, indicates a vertically-movable space-bar which extends transversely beneath the several key-levers, and is adapted for actuation by all of said key-levers. Said space-bar is attached to the rear ends of the two arms O', Fig. 3, the forward ends of which are rigidly attached to a rock-shaft O², having bearings at its ends d' in standards D' of the frame, as seen in Fig. 24. The said space-bar O is connected with the said rock-shaft O², not only by the arms O', located at the ends of said bars, but also by means of two intermediate bars O³ O³, Figs. 25 and 29, arranged at either side of the escape devices, as clearly seen in the plan views, Figs. 3 and 29. The escape-lever M is operated directly from the bar O by means of a slotted yoke O⁴, Figs. 3, 25, and 29, which is secured to the bar adjacent to the rear end of the lever M, and is provided with a horizontal slot o , extending from the front to the rear of the machine, beneath the space-bar, and adapted to receive a pin m^7 , which is secured in the rear end of said lever. Through the medium of the slotted yoke O⁴ vertical movement of the space-bar is transmitted directly to the escapement-lever M, while backward and forward movement of said lever with the shifting frame is permitted by the said slot o , without affecting the action of the escape devices.

The intermediate arms O³, which connect the space-bar O with the rock-shaft O², as above described, afford means for connecting a space-key P, Figs. 1 and 3, located in front of the keyboard, with the said escape devices. This space-key P is shown as having the form of an elongated bar attached to two parallel levers P' P', which pass downwardly through

an opening in the base-plate A, near the front of the machine, and extend beneath said plate to a point at the rear of the escapement devices, where they are attached to a rock-shaft P², (shown in Figs. 27 and 29,) around which is placed a coiled spring p , which acts to hold the space-key normally in its elevated position. At a point some distance forward from the rock-shaft P² is located a cross-bar P³, Figs. 24, 27, and 29, which rigidly connects the levers P P. Pivoted to the lever-arms O³ O³ by means of a transverse pivot-pin o' is a depending yoke-piece P⁴, having at its lower end a recessed or hook-shaped part p' , which extends beneath and embraces the cross-bar P³. A cushion p^2 , Figs. 24 and 29, is preferably located in the recessed part p' , below the rod P³, so as to afford a cushion between the parts and prevent noise in the operation of the spacing-key. The yoke-piece P⁴ is conveniently made of sheet metal, bent at its lower edge to form a recessed or hook-shaped part p' and having at its upper end plugs or ears p^3 , which are bent at right angles to the body of the yoke-piece, Fig. 27, and pierced for the passage of the pivot-rod e' , as clearly seen in Figs. 24 and 29. The space-bar is held normally at the upper limit of its movement and in contact with the key-levers by a suitably-applied spring (herein shown as having the form of a coiled spring O⁵) placed in compression between one of the levers O³ and the base-plate of the machine, as clearly seen in Fig. 29. An auxiliary leaf-spring O⁶ also aids in lifting the space-bar. The upward movement of said space-bar is limited by a stop O⁷, secured to the base-plate.

The movement of the upper end of the shaft L and the pinion L' thereon toward and from the rack-bar of the carriage is for the purpose of releasing said carriage from the spacing devices when it is desired to shift or move the carriage backward to its starting-point for beginning a new line of writing or at other times. Devices are provided on the carriage for accomplishing such movement of the said shaft, as follows:

Pivotally connected to the carriage above the rack-bar E², with its lower, free edge adjacent to the latter, is a longitudinally-arranged releasing-bar Q, having pivotal connection with the end plates E' of the carriage-frame, by means of pivot extensions q q at its upper edge, Figs. 4 and 11. The lower or free edge of said releasing-bar is located in position to engage an antifriction-roller Q', Fig. 12, mounted on the upper end of the shaft L above the said pinion L'. A suitably-applied spring, in this instance having the form of a coiled spring q' , surrounds one of the pivoted extensions q of the releasing-bar and is engaged at one end with the end plate of the frame and its opposite end with the said bar. Said spring serves to throw the free edge of the releasing-bar rearwardly and thereby tends to hold it in its retracted position. For actuating said releasing-bar a trip-

rod Q^2 , Figs. 4, 11, and 13, is arranged to extend longitudinally of the carriage at the rear of said releasing-bar, said trip-rod being adapted to slide longitudinally on the carriage and extending beyond the end of the carriage at the left-hand side of the machine, Figs. 4 and 11, where it is provided with a finger-piece or button Q^3 . Pivoted to the rack-bar E^2 , at the rear of the releasing-bar, is a bell-crank lever Q^4 , Fig. 13, one arm, q^2 , of which engages the rear surface of the releasing-bar, and the other arm, q^3 , of which is connected by the pivot-pin q^4 with the inner end of the trip-rod Q^2 . To bring the trip-rod in proper relation with other parts, it is located close to the front of the carriage, and is bent or offset at its inner end to engage the bell-crank lever, as clearly seen in Fig. 13. A stop q^5 , secured in the rack-bar E^2 , serves to arrest the movement of the bell-crank lever in both directions, the arm q^2 being arranged to strike the said stop for limiting the inward movement of the releasing-bar under the action of its spring, while the arm q^3 is adapted to strike the same, to limit the movement of the trip-rod when pushed inwardly by the operator.

The releasing-bar, arranged to engage the upper end of the escape-wheel shaft, as described, together with its actuating devices, obviously enables the pinion on said shaft to be thrown out of engagement with the rack-bar on the carriage, so as to release the carriage and leave it free to be moved backward and forward by the operator by merely pressing on the button Q^3 .

The actuating-spring of the releasing-bar and the spring which throws the escape-wheel shaft toward the rack-bar are together of less strength than the carriage-actuating spring, so that when pressure is applied to the trip-rod the pinion will be released from the rack-bar and will remain free therefrom.

As an improved construction in the teeth of the rack-bar and pinion, I make the same of the shape of ratchet-teeth with abrupt working faces, and I further provide a special construction by which the said teeth of the rack-bar and pinion are better adapted to remain in engagement with each other and by which the liability is obviated of slipping of the teeth past each other, which sometimes occurs in the use of ordinary gear-teeth where the pinion is yieldingly held by the spring in contact with the rack-bar. This peculiar feature of the construction is more clearly shown in the diagram Fig. 40 and may be described as follows:

The teeth of the rack-bar are of the usual ratchet shape, having their working or contact faces at right angles with or perpendicular to the edge of the rack-bar or slightly inclined in a direction to give undercut form to the teeth, if desired. The teeth of the pinion L' , however, are made of hooked form, so as to overhang their bases, or in other words, both their faces are oblique to ratchet-lines

of the pinion, while their contact-faces l^3 are undercut and the point of each tooth overhangs the base of the next tooth, as clearly shown in the drawings. As a result of this construction, the contact-faces of the pinion-teeth will come into parallel relation with and bear flatwise against the contact-faces of the rack-teeth at a time before the said contact-faces reach a point opposite the center of the pinion, as will be clear from an examination of Fig. 40, wherein l^6 l^6 indicate a line drawn through the center of the pinion at right angles with the rack-bar. The point l^7 in this figure indicates the center of the pinion, and the dotted line l^5 drawn through the contact-faces of the two teeth which are engaged with their working faces in contact and clearly shows the inclination of the said contact-face of the pinion-teeth. When the teeth are in this position, if l^8 be the pinion-tooth, which is so engaged with the rack, the adjacent pinion-tooth will bear at its extremity or point against the working face of the next rack-tooth at a point intermediate of the length of said rack-tooth, so that in practice two teeth will commonly be in bearing or engagement at once. The main advantage gained by this construction is, however, that the pressure of the rack-bar on the pinion-teeth so formed has no tendency whatever to throw the pinion outwardly, but on the contrary, such pressure has a greater tendency to hold the teeth interlocked or engaged with each other, and thereby entirely avoids liability of the teeth slipping at the time the rotation of the pinion and movement of the carriage are arrested by the action of the escape mechanism after each forward movement or step of the carriage under the action of its actuating-spring.

The employment of teeth of ratchet shape has the general advantage also of enabling the carriage to be moved back to the starting-point by the outward yielding of the pinion and the upper end of the shaft on which it is mounted without the actuating of the releasing devices. In practice, however, the carriage will be usually moved backward to the starting-point by pressure on the end of the trip-rod Q^2 , which pressure, acting against the tension of the carriage-spring, will release the driving-pinion from the rack, and thus free the carriage without any motion or movement on the part of the operator except to press on the button Q^2 in the direction the carriage is to move, and continue the pressure until the carriage reaches its starting-point, or any point where it is desired to leave the same. On releasing the pressure on the trip-rod, the driving-pinion immediately reengages the rack, it being, however, necessary to hold the carriage from backward movement at the instant the trip-rod is released, which is accomplished by the pressure of a finger of the left hand against a stationary part of the carriage adjacent to the button Q^3 .

The platen E is located in the forward part

of the carriage and is mounted on a spindle R, which extends through the end plates of the carriage, and is provided at its ends with hand-wheels or milled knobs R' and R². The knob R² at the right-hand side of the carriage is more especially intended for turning the platen and adjusting the paper, while the knob R' at the left-hand end of the carriage is located just above and adjacent to the end of the trip-bar Q, so that one finger may be placed thereon in the same manner as set forth in said prior patent, No. 542,275, which shows a similarly-acting trip-rod operating in connection with another form of spacing mechanism.

The platen E is movable bodily on the carriage into and out of its operative position, in order to facilitate the insertion of the paper, in the manner set forth in my prior patent, No. 450,107, the ends of the platen-spindle being constructed to slide in slots e^2 e^2 in the end plates E' E' and the platen being moved and held in its operative position by means of a rock-shaft R³, mounted on the end plates and connected with the spindle e at each end of the carriage by means of pivotally-connected toggle-arms r r' , Figs. 11 and 12. The said rock-shaft R³ is provided with a crank R⁴ by means of which it may be easily actuated by the hand of the operator and the toggle-arms are so arranged as to stand slightly in a flexed position against stops on the end plate when the platen is in its operative position, so as to automatically lock the platen in from backward movement.

The machine shown is provided with automatic line-spacing devices generally similar to those shown in said Patent No. 542,275 by which the platen is turned to advance the paper automatically in the backward movement of the carriage to its starting position. These parts as herein shown embody some features of novelty, and are constructed as follows: Mounted on the platen-spindle R is a ratchet or gear wheel S, Figs. 1, 4, 8, 9, 14, 15, 16, 17 and 18, the same being located on the outside of the adjacent end plate E' at the left-hand side of the machine. Loosely mounted on said spindle, adjacent to said gear-wheel, is an oscillating feeding-lever S', which carries a loosely-pivoted gravity-pawl S², of angular or bell-crank shape and adapted for engagement with the teeth of said gear-wheel. Said pawl S² is pivoted between its ends, by a pivot s , to the feed-lever, and has a limited oscillatory movement on said feed-lever, the extent of which is controlled by means of a stop-pin s' on the lever engaging an elongated or segmented notch S' in the pawl, Fig. 17. Said pawl also carries at its outer or free end an antifriction-roller s^3 , to which power is applied for moving the pawl and the feed-lever. At the end of its inner part or arm said pawl carries a tooth s^4 , adapted for engagement with the gear-wheel S. The inner arm of the pawl is arranged at such an angle to its outer part that the swinging of the

pawl on its pivot will carry the tooth s^4 toward and from the said wheel. The feeding-arm and pawl are moved or swung in one direction by means of a spring S³, herein shown as made of coiled form and placed around the spindle, and are moved in the opposite direction by means of an endwise-sliding cam S⁴, which is mounted on the carriage and provided with an oblique or cam edge S⁵, adapted to act on the antifriction-roller s^3 , and thereby turn or move the feed-arm on its point when the cam is advanced, and thus turns the same in such manner as to carry the feed-arm through an arc of such length as to give the desired extent of line-feed. The devices for actuating said sliding cam will be hereinafter described. The feed-pawl being loosely mounted on the feed-arm, is adapted to swing far enough to release the tooth s^4 from, and allow it to pass over, the teeth of the gear-wheel, in the backward movement of the feed-lever; but in the forward movement of said lever the sliding cam S⁴ first strikes the antifriction-roller s^3 , and thus swings the outer or free end of the feed-pawl in a direction to cause the engagement of the tooth thereon with the gear-wheel, so that when the sliding cam strikes the friction-wheel it first effects the engagement of the pawl with the gear-wheel, and thereafter moves the pawl and feed-arm bodily through a desired angular distance.

Provision is made for giving a variable line-spacing by varying the distance to which the feed-arm is allowed to swing backward under the action of its actuating-spring S³, and in the construction illustrated, where provision is made for single and double spacing, said arm is adapted to strike and is arrested by a shoulder s^5 on an arm R⁵, which is stationary with respect to the shaft R, to give a double space, while a movable stop s^6 , having the form of a lever pivoted to the said arm R⁵, is adapted to be swung into position to arrest the feed-lever at half a stroke, and thus give a shorter movement to the same for single line-spacing. The stop-lever s^6 is shown as provided with a weighted upper end s^7 , which, by being thrown to one side or the other of the feed-lever, acts by gravity to hold the stop-lever either in its operative or inoperative position, said lever being shown in Fig. 1 of the drawings in operative position and in Fig. 8 as being out of action.

The platen and its spindle R being movable on the carriage-frame, the arm R⁵ is constructed to move with the spindle, and to afford support for said arm it is rigidly attached to a sliding plate R⁶, Fig. 16, which is located against the outer face of the carriage end plate, and is provided with a bearing-aperture r^2 , which engages the said spindle R, so that the sliding plate shall be moved with said spindle. In order to maintain the said plate R⁶ constantly in the same position with respect to the feeding-lever and other working parts, said plate is provided with a slot

r^3 , which is engaged by a stud r^4 , secured in the end plate E' , and which slides in said slot as the plate is moved. The arm R^5 is connected at its outer end with the plate R^6 by means of a transversely-bent part r^5 , Fig. 16, which supports the arm at some distance from and parallel with the plate R^6 . The outer end of the said arm is provided with an eye or bearing-aperture r^6 , which engages the spindle R outside of the ratchet-wheel S , Figs. 8, 11, and 15. Said arm is also provided with an outwardly-extended or offset part r^7 , to the inner face of which the movable stop s^6 is pivoted. The transverse parts which join the said offset part r^7 with the body of the arm form stops for limiting the swing of the pivoted half-space stop s^6 in both directions, and the lower edge of the transverse part nearest the spindle also forms the shoulder s^5 , which constitutes the stop for the feeding-lever when a double space is desired, as above stated. The feeding-lever S' is shown as attached to a sleeve s^8 , which surrounds the spindle R and extends outwardly therefrom for some distance to afford an extended bearing for the said lever on the shaft, adapted to withstand the outward pressure of the actuating-cam s^4 on the extremity of said feeding-lever. A brace s^9 extends from the end of said feeding-lever to the outer end of the said sleeve s^8 , Fig. 15. The actuating-spring S^3 of the feeding-lever is conveniently arranged to surround the sleeve s^8 , the outer end of said spring being attached to the outer end of the brace s^9 and the inner end of said spring being attached to the arm R^5 by insertion in a hole in the offset part r^7 of said arm, as clearly shown in Fig. 11. A part of the spindle R , outside of the end plate E' , is preferably made of a separate short shaft r , to which the knob R' is attached. Said shaft r^8 is shown as attached to the outer end of the main part of the spindle R by means of a screw or other joint located outside of the sleeve s^8 , Fig. 15.

The usual spring-pawl S^5 is provided for holding the platen-spindle from turning, said pawl being shown as provided with an anti-friction-roller s^{17} , which enters the spaces between the teeth of the gear-wheel, so as to hold the same from turning except under a pressure sufficient to flex the spring of the pawl and allow the wheel to ride over the intervening teeth. Said pawl S^5 is shown as attached at its outer end to the transversely-bent part r^5 of the arm R^4 .

In order to enable the platen and the paper thereon to be turned or adjusted independently of the line-feeding devices, I propose to connect the ratchet-wheel with the spindle R by means of a frictional connecting device or yielding connection adapted to allow the spindle R to be turned relatively to the said ratchet-wheel. To this end I have shown one practical form of such yielding connection, wherein the wheel S consists of two parts, namely, an inner part S^6 , which is rigidly attached to the spindle R , and an outer annu-

lar part S^7 , which surrounds the inner part, said outer and inner parts having conical contact-surfaces, Figs. 7 and 15. The said conical contact-surfaces of the outer and inner parts are drawn and held in frictional contact with each other by means of a flat spring S^8 , which is secured by screws or otherwise to the central part S^6 and is provided with arms S^9 , which overlap and bear against the outer part S^7 , which latter is provided with a raised flange or rim, Fig. 7, against which the ends of the spring rest and bear.

In connection with a yielding or frictional connection between the ratchet-wheel and platen-shaft I have provided a locking device to hold the spring-pawl S^5 positively engaged with the ratchet-wheel, and thereby hold the same from turning, when it is desired to rotate the platen for the purpose of adjustment. For this purpose a swinging detent-arm S^{10} , Figs. 9 and 18, is pivoted on the spindle R , outside of and adjacent to the wheel S , and said arm is provided with a locking-lug S^{11} , Fig. 11, adapted to engage the free end of the pawl S^5 when the same is engaged with the wheel S , in such manner as to hold or lock the same from outward movement. As herein shown, the said locking-lug is adapted to engage the end of the pivot s^{12} of the roller s^{17} , which pivot is constructed to project from the side of the pawl in position for engagement with said lug. The detent-arm S^{10} is shown as provided with an outwardly-extending finger-piece S^{12} , by which it may be more conveniently actuated, and also with a guide-arm S^{13} , which extends from the upper margin of the detent-arm downwardly over and outside of the arm R^5 , so as to hold and guide the detent-arm in a vertical plane when it is swung or moved about its pivotal support on the spindle R .

The platen-shifting devices above described are of obvious advantage, inasmuch as they enable the paper to be easily moved or shifted, by turning the platen, so as to locate the line of printing, or individual letters, (as in making correction in previously-printed matter,) exactly at the point on the paper desired. For so shifting the paper the detent-arm S^{10} is lifted with the left hand to lock the pawl S^5 in the wheel S , and the platen is then turned by the right hand applied to the knob on the right-hand end of the platen-spindle. Upon releasing the detent-arm the same falls by gravity, so as to release the pawl and restore the line-feeding devices to their normal or operative condition.

Now referring to the devices shown for actuating the sliding cam S^4 , which gives motion to the line-feed devices hereinbefore described, the devices are in some of their features like those shown in said prior patent, No. 542,275, but they contain novel features, which will be hereinafter pointed out. Said cam is attached to an endwise-movable rod S^{14} , Figs. 4, 5, 12 and 14, herein shown as mounted in guide-lugs $E^7 E^8$, which project

rearwardly from the rack-bar E^2 , and are herein shown as formed by integral, outwardly-bent lugs on the ends of the plate E^6 , Figs. 5 and 12. The rod S^{14} is held normally in its retracted position by means of a coiled spring S^{15} , located between the lug E^7 and a collar s^{14} , attached to said rod. A second spring S^{16} is also placed upon said rod between said collar s^{14} and a second sliding collar s^{15} , located on the rod S^{14} , in position to engage the inner face of the right-hand bearing-lug E^8 , said spring S^{16} and sliding collar s^{15} together forming an elastic stop or buffer for limiting the inward or backward movement of the rod S^{14} under the action of the spring S^{15} . The bar S^{14} is actuated by the contact of its rear or right-hand end with a suitable stop on the carriage-supporting frame, which stop, inasmuch as it acts to limit the rearward movement of the carriage in returning it to its starting-point, serves also as a margin-stop for the carriage, by which the width of the margin left on the sheet in printing is determined. As an improved construction in such margin-stop, by which it is made conveniently adjustable for varying the width of the margin or printed page, and by which the sliding rod S^{14} may be prevented from striking the same and the automatic feed devices thereby thrown out of action, these parts are constructed as follows:

A sliding block T is mounted on the right-hand end of the guide-bar F , as seen in Figs. 20, 21, 22 and 23. Said block is held upon the said guide-bar by means of a U-shaped clip or slide T' , which embraces the top, bottom and front sides of the guide-bar, and is pivoted to the said block T , which is located at the rear face of the bar, by means of a vertical pivot-pin t , which is inserted through the block at the left-hand side of the same, Fig. 21. At the opposite side or right-hand end of the block is located a holding-pin t' , Fig. 23, which is adapted to engage either one of a series of holes or recesses t^2 , in either one of which the pin t' may be inserted. The said pin is inserted in and released from the said recesses by swinging the block T on the pivot t , so as to carry the end of the pawl in which said pin is placed toward and from the guide-bar. A spring t^2 , secured in the block and bearing against the bottom of the groove F^7 of the guide-bar, tends to hold the pin in engagement with the recesses therein, but no positive locking device is required, because the pivot of the block and pin are so arranged that the pressure of the carriage against the block in striking the same tends to throw the free end of the block toward the guide-bar. Said block T is so located that the end of the rod S^{14} will pass freely over the same, said block being, in the particular construction illustrated, provided with a recess or concavity in its upper surface, to afford space for the passage of said rod.

Mounted in the block T is a movable de-

tent T^2 , which is arranged to be moved laterally into and out of the path of the rod S^{14} , as desired. Said detent, as shown, consists of a flat plate inserted in a slot formed transversely in the block T and mounted on a pivot-pin t^3 , inserted through the lower part of the block, the upper end of the detent standing across the recess in the top of the block and in position to engage the end of the rod unless said detent is especially moved to shift it out of the way of said rod. As a simple and convenient construction, I have provided said detent T^2 with a weighted and bent arm t^4 , which extends forwardly beneath the guide-bar T , and the weight of which tends to hold the upper end of the detent in position to engage the said rod, a suitable stop t^5 being provided to limit the inward movement of the detent under the weight of said arm t^4 . When it is desired to throw the detent out of operative position, it is merely necessary to lift the weighted arm t^4 by the hand, and the rod S may then pass the detent without striking the same, in which case the line-feeding devices will not be operated. When the said detent is thrown out of action, the stop for the carriage is provided by means of a projecting pin or stud T^3 , on the block T , which is located in position for engagement with the bearing-lug E^7 , in which the rod S^{14} is mounted.

A forwardly-projecting cam-arm E^9 on the carriage-frame serves to throw outwardly the detent T^2 out of the path of the rod S^{14} after the sliding cam has been moved to turn the platen and before the carriage reaches the extreme limit of its movement, so as to allow the said rod and the cam to be restored to its rearward position by the action of the spring S^{15} , and to permit the platen feeding-arm to also return to its rearward position or the limit of its backward stroke. It follows from this construction that the said feeding-arm and sliding cam are operated to turn the platen for the line-feed and are completely restored to their normal positions, by the act of returning the carriage to its starting-point, so that no movement of the platen-actuating devices takes place in the subsequent forward movement of the carriage under the action of the carriage-actuating spring, and the forward movement of the carriage is in no way affected by the expansion of the spring S^{15} , which would be the case if said rod were not freed from contact with the margin-stop and the spring S^{15} thereby released from compression before or at the end of the rearward movement of the carriage.

As a further improvement in the paper or line feeding devices, I propose to employ, in connection with the platen E , a feed-roll U , which is held by spring-pressure against the platen and is driven positively by gearing connecting it with the platen-spindle, so that the feed-roll will be driven positively with practically the same surface speed as that of

the platen. These devices are shown in Figs. 4, 10, 11 and 12 of the accompanying drawings.

As herein shown, the feed-roll U is mounted on a shaft or spindle U', which extends beyond the end plate of the frame and is provided with a pinion u , intermeshing with a gear-wheel U² on the platen-spindle R. Devices are provided by which the feed-roller U is held by spring-pressure in contact with the platen, and for this purpose the shaft U' is mounted in the ends of the arms $u'u'$, attached to a supporting-strip U³, which extends across the front of the carriage and is pivotally supported at its ends in the end plates E' of the carriage-frame by means of pivot-pins or projections u^2 on the ends of said strip U³. A spring or springs u^3 are applied to act upon said strip U³, so as to turn the same in a direction to carry the feed-roll toward the surface of the platen. Said spring u^3 is herein shown as made of coiled form and arranged to surround the pivots u^2 of said strip U³. The said strip U³ is shown as located in position convenient to form the scale by which to determine the position of the point at which the types strike in printing, and such scale is therefore marked thereon. The feed-roller U is so located on the carriage that the platen moves rearwardly away from the same when shifted out of its operative position, for the purpose of inserting the paper in the carriage. This arrangement of the parts enables the gear-wheel U² to become disengaged from the gear-pinion u , and reengaged therewith when the platen is restored to its operative position. Said shaft U' of the feed-roll is arranged in position to rest or bear at its ends against the end plates of the carriage when the platen is retracted, so that said end plates form stops to limit the inward or rearward movement of the feed-roll under the action of the springs u^3 ; said shaft being moved a short distance, so as to be out of contact with said end plates when the platen is brought against the feed-roll in restoring it to its working position.

With respect to the means used on the paper-carriage for guiding the paper during its insertion, and at other times, the machine shown is provided with devices as follows:

E¹⁰, Fig. 12, is the upper and E¹¹ the lower paper-guide, both made of sheet metal in the usual manner. The lower paper-guide is supported at its forward end by attachment to a longitudinal rod e^3 , located adjacent to the rear edge of the rack-bar E². Said rod e^3 also affords pivotal support for supporting-arms e^4 , which are located near opposite ends of the platen and which support, adjacent to the front surface of the platen, pressure-rollers e^5 , which are mounted on a shaft e^6 , having bearings at its ends in eyes e^7 on the guides e^4 . Said shaft e^6 engages at its end an intermediate arm e^8 , which is also mounted to turn on the rod e^3 , and a spring e^9 , coiled about the rod e^3 and engaging the said arm e^6 , operated to turn said arm in a direction to carry the

rollers e^5 toward the surface of the platen. Attached to the arms e^4 are tilting paper-guides which, when the platen is at the rearward limit of its movement the rollers e^5 and the paper-guides e^4 are moved thereon rearwardly by the action of said spring rest at their free ends in contact with the lower paper-guide E¹¹; the said paper-guides at such time being in position to guide the entering edge of around the platen, and past the adjacent parts against which it might strike in the absence of said guides.

Now referring to the inking-ribbon and the means shown for supporting and actuating the same, these parts are illustrated in Figs. 1, 3, and 25 and are constructed as follows:

V V are the ribbon-spools, which are mounted on upright shafts v , located on the type-bar-supporting frames D at the rear of the type-bars; said spools being so arranged that the ribbon extending between the spools and over the platen passes through the several loop-shaped type-bars above the pivots of the same. The inclined supports D⁴ are forked at their lower ends to afford space for the passage of the ribbon, as clearly seen in Fig. 2.

Provision is made for actuating the ribbon-spools whereby either spool may be positively driven and the ribbon wound upon one spool or the other as desired, the same being constructed as follows: Secured to each spool V, below the same, is a gear-wheel V', which is adapted for engagement with a gear-pinion v' on a shaft V². The lower end of said shaft V² is mounted in a step or bearing-recess v^{14} , Fig. 41, in the base-plate A, while its upper end is adapted for insertion in either one of two bearing-notches v^2 v^3 , formed in the plate D. The lower end of the shaft V² is made to fit loosely in the bearing-recess v^{14} , so that its upper end may be moved freely in shifting it from one to the other of the said notches; said recess, in the construction shown, Fig. 41, being made slightly larger at its upper than at its lower end, to afford the necessary freedom of movement in the upper end of the shaft. These notches are so arranged that when the upper end of the shaft is placed in one notch v^3 it will be engaged with the gear-wheel, but when placed in the other notch v^2 it will be free from said gear-wheel. Said bearing-notches are held closed by means of a spring-strip v^4 , Figs. 25 and 42, which is conveniently formed by means of a single strip of spring metal secured at one end of the plate D, and which is held or guided in its movement by means of a stud v^5 , provided with a head which forms a stop to limit the outward movement of the free end of said spring-strip; the said strip v^4 being provided with a hole for the passage of the said stud, which hole is made somewhat larger than the stud, so as to allow the free end of the strip to freely move inwardly and outwardly on the stud, as clearly seen in the drawings, Fig. 42. Both of the ribbon-spools being provided with similar driving connections it follows that the

two driving-shafts V^2 which actuate said spools may both be shifted at the same time, one into and the other out of engagement with its corresponding spool, so that the direction
 5 of the motion of the ribbon may be easily and quickly reversed as soon as one spool is filled and the other empty.

For actuating the shaft V^2 , I provide a simple pawl-and-ratchet device consisting of a
 10 ratchet-wheel V^3 , located at the lower ends of the said shaft, Figs. 3, 24, and 41, and having upwardly-facing teeth. Upon the frame-standards D' are located bell-crank levers V^4 , having depending arms connected at their
 15 lower ends with horizontally-moving pawls v^6 , the free ends of which rest on and are adapted to engage the ratchet-teeth of the ratchet-wheels V^3 . The horizontal arms of said bell-crank levers extend forward and en-
 20 gage the ends of the spacing-bar O , Fig. 1, so that upon the depression of each key-lever the said pawl will be operated through the medium of the bell-crank levers and the shafts V^2 thereby turned; a slight movement being
 25 thereby given to that one of the ribbon-spools which is at the time engaged with its actuating-shaft. The said ribbon-spools V (illustrated) contain improved features of construction as follows: Each of said spools consists
 30 of a central barrel and two heads or ends, and I propose to make the barrel part V^5 of the spool, Figs. 34, 44, and 45, of a piece of sheet metal, Fig. 34, having parallel side edges and to provide the heads or ends V^6 , Fig. 35,
 35 with annularly-arranged perforations v^8 , through which the outwardly-extending projections v^7 on the barrel part are adapted to project. When the piece of sheet metal forming the barrel is bent into cylindric form, the
 40 said prongs v^7 are inserted through said apertures and then bent down against the outer surface of the heads, to secure the latter to the barrel. In order to provide means for fastening the ends of the ribbon to a barrel,
 45 made as described, I provided the strip with a pointed or V-shaped projection v^9 , arranged to extend opposite an opening or notch v^{10} cut in the opposite end of the strip and forming a free projection or spur over which the end
 50 of the ribbon may be hooked; the end of the spur being bent down into the notch to hold the ribbon against detachment.

The gear-wheels V' as shown and preferably constructed are mounted loosely on the
 55 shaft v , above the plates D , and are adapted for detachable connection with the ribbon-spools by means of studs v^{11} in the upper surfaces of the wheels, which enter correspondingly-located holes v^{12} , Fig. 35, in the lower
 60 heads or disks of the spools. The spools rest by gravity on the gear-wheels, felt washers v^{13} , Fig. 24, being preferably placed between the gears and spools to deaden the sound. The studs v are shown as provided with milled
 65 heads, Fig. 1, and they conveniently have screw-threaded connection at their lower ends with the plates D , so that the spools may be

easily removed and replaced by unscrewing the studs from the said plates.

The type-writing machine herein shown is 70 of that class in which the inking-ribbon is provided with guides adjacent to the printing-point, which guides are movable to hold the ribbon adjacent to the paper at the time the impression is made and is adapted to be 75 moved to throw or lift the ribbon away from the paper and thus render visible the impression made after each letter is printed. As an improved ribbon throw or a device for so guiding and actuating the said ribbon I 80 propose to employ a construction shown in Figs. 24, 29, and 33, as follows: Pivoted to rigid supporting-arms W W , which are attached to the shifting carriage-frame, conveniently by means of a standard W' , at- 85 tached to the upturned forward end of the bar F^6 , and which extend to points over the platen, is a rock-shaft W^2 , arranged parallel with and above the platen and carrying two depending arms w w , to the lower ends of 90 which are attached two ribbon-guides or loops w' w' , one of which is arranged at either side of the printing-point, said loops being arranged to stand, when in working position, horizontally and beneath the pivotal axis 95 about which they swing, Fig. 33. The arms w w are rigidly connected by means of a cross-bar w^2 , which serves to rigidly connect the two arms w w , and enables both spools to be actuated by a single driving connec- 100 tion. The said cross-bar is bent downwardly or deflected so as to come below the level of the type-heads as they strike downwardly on the platen. To give motion to the said rock-shaft and the loops carried thereby, the rock- 105 shaft is provided with a rigid arm w^3 , to which is pivoted the upper end of a connecting-rod W^3 , which is connected at its lower end with a part which is actuated by all of the key-levers of the machine, in the in- 110 stance shown one of the bars O^3 , attached to the space-bar O , so that the rock-shaft is moved and the ribbon-guides oscillated each time an impression is made. The loops w' w' stand normally remote from the platen 115 and are swung into position adjacent to or over the same at the time the keys are depressed. The pivotal axis of the loops or guides is so arranged with respect to the same and to the platen that the loops stand 120 normally in a position forward of the platen or at the side of their pivotal axis adjacent to the operator, and in an inclined or oblique direction, so that the ribbon stands edgewise to the line of vision as the operator looks to- 125 ward the platen on which the paper rests. By this arrangement of the ribbon-guides the ribbon is held in such position as to avoid obstruction to the vision at all times, except when the impression is being made, while at 130 the same time a very short or slight movement of the ribbon-guides is required to bring the ribbon into its operative position.

On the rear frame-bar E^3 of the carriage is

located an adjustable left-hand-margin stop combined with a bell-actuating stop, which is constructed as follows:

X, Figs. 11 and 19, is a slide which is mounted on the said bar E^3 , and is provided with a spring-arm X' , extending longitudinally of the bar and carrying a stud x , adapted for engagement with either one of a series of holes x' , formed in the top surface of said bar E^3 . Said slide X is provided at the rear side of the bar with a stop projection X^2 , which is adapted for contact with the standard H' , by which the supporting-roller H for the rear of the carriage is supported. The said slide also carries, below the bar, a pivoted bell-actuating stop X^3 , having the form of a bell-crank lever, and provided with a depending arm which is adapted to engage the upper end of a bell-hammer lever Y, which is located in the path of said arm; the horizontal arm being arranged to bear against the under surface of the bar E^3 , so as to hold the lower arm rigid when the latter strikes the bell-hammer lever in the movement of the carriage from right to left, while permitting the said lower arm to yield backwardly and pass over the said lever in the return movement of the carriage. The bell-crank lever Y is shown as pivotally mounted on a standard Y' and as provided at its lower end with a hammer y , adapted for contact with a bell Y^2 , attached to a horizontal supporting-arm Y^3 , which is secured to a bracket F^3 on the rear part of the machine-frame.

I claim as my invention—

1. In a type-writer, looped or U-shaped type-bars of varying lengths, carrying type-heads on their closed or looped ends, which type-heads are heavier on the shorter than on the longer bars and are graduated in weight according to the lengths of the type-bars, substantially as described.

2. The combination with a carriage and a shifting frame for supporting the same, of rocking standards for supporting said frame, said standards having curved end bearing-surfaces provided with longitudinal grooves and flat sheet-metal shoes, the edges of which engage said grooves; said shoes having at their ends projecting parts which engage the opposite ends of the bearing-surfaces to hold the standards from shifting on the shoes, substantially as described.

3. The combination with a paper-carriage of spacing mechanism comprising a rack on the carriage, a shaft carrying a pinion adapted to engage said rack, and an escape mechanism embracing an escape-wheel which is mounted on the shaft at a point remote from the pinion; the end of said shaft which carries the pinion being constructed to swing toward and from the rack about an axis of oscillation adjacent to the escape-wheel, whereby the pinion may be engaged with and disengaged from the rack without disconnecting the escape-wheel from the other parts of

the escape mechanism, substantially as described.

4. The combination with a paper-carriage, of a spacing mechanism comprising a rack on the carriage, a rotating shaft provided at one end with a pinion which engages the carriage, and near its opposite end with an escape-wheel, a bearing affording oscillating movement of the shaft, which engages the end of the shaft outside of the escape-wheel, a sliding block affording a bearing for the shaft inside of the said pinion, guides on the frame engaging the side faces of the block, and a spring acting on the block to throw the pinion toward the rack, substantially as described.

5. The combination with a paper-carriage, of a spacing mechanism comprising a rack on the carriage, a revolving shaft carrying a pinion which engages the rack, and an escape mechanism embracing an escape-wheel which is mounted on the shaft at a point remote from the pinion, the end of said shaft which carries the pinion being movable toward and from the rack about an axis of oscillation adjacent to the escape-wheel, and a releasing-bar arranged parallel with the rack-bar and adapted to act on the said shaft to hold the same free from the rack, substantially as described.

6. The combination with a paper-carriage of a spacing mechanism comprising a rack on the carriage, a revolving shaft carrying a pinion which engages the rack, and an escape mechanism embracing an escape-wheel which is mounted on the shaft at a point remote from the pinion; the end of said shaft which carries the pinion being movable toward and from the rack about an axis of oscillation adjacent to the escape-wheel, a spring acting on the shaft to throw the pinion toward the rack and a releasing-bar arranged to act on the shaft to release the pinion from the rack, substantially as described.

7. The combination with a paper-carriage, of a spacing mechanism, comprising a rack on the carriage, a revolving shaft carrying a pinion which engages the rack, and an escape mechanism embracing an escape-wheel which is mounted on the shaft at a point remote from the pinion; the end of said shaft which carries the pinion being movable toward and from the rack about an axis of oscillation adjacent to the escape-wheel, and a releasing-bar arranged parallel with the rack and adapted to act on the said shaft to hold the same free from the rack, said shaft being provided with an antifriction-roller adapted to engage the releasing-bar, substantially as described.

8. The combination with a paper-carriage, of a spacing mechanism comprising a rack on the carriage, a revolving shaft carrying a pinion which engages said rack, and an escape mechanism embracing an escape-wheel which is mounted on the shaft at a point remote from the pinion, the end of the shaft which

carries said pinion being movable toward and from the rack about an axis of oscillation adjacent to the escape-wheel, a releasing-bar on the carriage, arranged to act on the shaft to
 5 hold the pinion free from the rack and an actuating device for said releasing-bar, comprising an endwise-sliding trip-rod mounted on the carriage, and a bell-crank lever mounted
 10 on the carriage for transmitting motion from the trip-rod to the said releasing-bar, substantially as described.

9. The combination with a paper-carriage, of a spacing mechanism comprising a rack attached to the carriage, an upright shaft provided at its upper end with a pinion adapted to engage the said rack, said shaft being movable at its upper end toward and from the rack, an escape-wheel at the lower end of the shaft, an escapement-lever mounted to swing
 20 in a vertical plane and provided with stiff and limber pawls engaging said escape-wheel, and a horizontally-arranged space-bar which is moved by the keys and is engaged with the said escapement-lever and communicates vertical, oscillatory movement to the same, substantially as described.

10. The combination with a paper-carriage, of a horizontal movable shifting frame for supporting said carriage, and a spacing mechanism comprising a rack on the carriage, an upright shaft mounted on the shifting frame and provided with a pinion at its upper end adapted to engage said rack, said upper end of the shaft being movable toward and from
 35 the rack, an escape-wheel on the lower end of the shaft, an escapement-lever mounted on the shifting frame so as to swing in a vertical plane and provided with stiff and limber pawls which engage the escape-wheel, and a vertically-movable spacing-bar having slotted connection with the said escapement-lever permitting the escapement-lever to retain its operative connection with the spacing-bar when moved with the shifting frame, substantially as described.

11. The combination with a paper-carriage and a horizontal movable shifting frame which supports said carriage, of a spacing mechanism comprising a rack on the carriage, an upright shaft mounted in the shifting frame and provided at its upper end with a pinion adapted for engagement with said rack, the upper end of said shaft being movable toward and from the rack, a sliding block
 55 on the shifting frame which affords a bearing for the upper end of said shaft, a spring applied to said block to throw the pinion toward the rack, an escape-wheel mounted on the lower end of said shaft, an escapement-lever
 60 mounted on the shifting frame and provided with stiff and limber pawls adapted to engage said escape-wheel a space-bar and a sliding connection between said space-bar and said escapement-lever, substantially as described.

12. The combination with a platen-shaft, of a ratchet-wheel thereon, consisting of inner and outer parts having conical contact-sur-

faces and a spring applied to hold said surfaces in contact with each other, substantially as described.

13. The combination with a platen, a ratchet-wheel and a holding-pawl engaging the ratchet-wheel, of a frictional connection between the ratchet-wheel and platen and a locking-detent adapted to engage said pawl
 75 for holding it positively in engagement with the ratchet-wheel whereby the latter is held from turning, substantially as described.

14. The combination with an endwise-movable carriage and a revolving platen thereon, of automatic line-spacing mechanism, comprising a ratchet-wheel on the platen-shaft, a sliding cam on the carriage, an oscillating feeding-arm mounted on the carriage, and a feed-pawl pivoted to the arm and adapted to
 85 engage the ratchet-wheel and also to engage the said sliding cam, substantially as described.

15. The combination with an endwise-movable paper-carriage and revolving platen, of automatic line-spacing mechanism comprising a sliding cam on the carriage, an oscillating feeding-arm, a ratchet-wheel on the platen-shaft, a feed-pawl pivoted to the feeding-arm and adapted to act on the teeth of
 95 the ratchet-wheel, said pawl being adapted also for engagement with the cam and a movable stop for determining the extent of the oscillation of the feeding-arm, substantially as described.

16. The combination with an endwise-movable paper-carriage and a revolving platen thereon, of automatic line-spacing mechanism, comprising a ratchet-wheel on the platen-shaft, a sliding cam on the carriage, an oscillating feeding-arm which is actuated by the
 105 sliding cam and carries a pawl which engages the ratchet-wheel, a stationary pawl-stop on the carriage giving a maximum line-space, and a pivoted gravity-actuated stop for giving a less extent of line-feed, substantially as described.

17. The combination with an endwise-movable paper-carriage and a guide-bar for the same, of an automatic line-spacing device, a
 115 sliding rod on the carriage for actuating the same, and a stop for actuating said rod, comprising an adjustable slide on the guide-bar, and a movable stop-plate on said slide, adapted to actuate the sliding rod, substantially as described.

18. The combination with a carriage guide-bar, of a margin-stop comprising a slide and a block pivoted to the slide and provided with a holding-pin adapted to engage one of a series of holes in the guide-bar, said pin being located in the block at a distance from the pivotal point of the same, so that it may be engaged with and disengaged from the said guide-bar by the swinging of said block on
 125 its pivot, substantially as described.

19. The combination with a guide-bar, of a margin-stop comprising a slide, a block pivoted thereto and provided with a holding-pin

adapted to engage one of a series of holes in the guide-bar, and a spring attached to said block and acting on the guide-bar, so as to swing the block toward the guide-bar, substantially as described.

20. The combination with a guide-bar of a combined margin-stop and actuating-stop for automatic spacing mechanism the same comprising a slide, a block pivoted to the slide and provided with a pin adapted to engage one of a series of holes in the guide-bar, and a stop-plate pivoted to said block and adapted to swing laterally thereon, substantially as described.

21. The combination with an endwise-movable carriage and a revolving platen thereon, of automatic line-spacing mechanism comprising an endwise-sliding rod on the carriage from which motion is given to the platen, a movable stop on the machine-frame for actuating said rod in the movement of the carriage, and a cam on the carriage constructed to move said movable stop to throw the same out of the path of said rod, substantially as described.

22. The combination with an endwise-movable carriage and a revolving platen thereon, of automatic line-spacing mechanism comprising a ratchet-wheel attached to the platen, a sliding cam on the carriage, an oscillating feeding-arm which is actuated by the sliding cam, a spring actuating the cam a stop on the carriage movable into and out of position for engagement with the said cam, and a cam-plate on the carriage adapted to actuate said stop for releasing the cam-plate after the same has been actuated to turn the platen, substantially as described.

23. The combination with a paper-carriage and a platen movable upon the carriage into and out of its operative position, of a feed-roller the shaft of which extends at its ends past the end plates of the carriage-frame, yielding arms affording bearings for the feed-roller shaft, a gear-wheel on the platen-shaft outside of the carriage-frame, and a pinion on the feed-roller shaft adapted to intermesh with said gear-wheel; the ends of said feed-roller shaft being adapted for contact with the carriage end plates so as to limit the inward movement of the feed-roller, substantially as described.

24. The combination with the platen and space-bars of a type-writing machine, of pivotal supports above the platen ribbon-guide carried by said supports and arranged to swing between the axis thereof and the center of the platen, and connections between the pivotal supports and space-bars, constructed and operating to positively move the ribbon-guides into alinement with and between the axial centers of the platen and pivotal supports upon operation of said space-bars, substantially as described.

25. In a ribbon-throw for type-writers, the combination with key-levers and a platen of a rock-shaft arranged above and parallel with

the platen guide-loops supported by said rock-shaft and arranged to be interposed between the platen and rock-shaft, and mechanism actuated by the key-levers to positively move the guide-loops into position between said rock-shaft and platen, substantially as described.

26. The combination with a platen, of ribbon-guides located above the printing-point, supporting-arms attached to the machine-frame and extending to a point above the ribbon-guides, a rock-shaft mounted in said arms and carrying the said ribbon-guides; said rock-shaft affording oscillatory movement of the guides from a horizontal to an inclined position and a connection between said rock-shaft and the space-bar of the machine by which the ribbon-guides are positively actuated upon the operation of each key-lever, substantially as described.

27. A ribbon-feeding mechanism, comprising a spool, a gear-wheel connected with the same, a driving-shaft provided with a pinion adapted to intermesh with said gear-wheel, and having lateral movement at its end which carries the pinion about an axis of oscillation located at a distance from the pinion, and a bearing for the end of the shaft adjacent to said gear-wheel provided with two open bearing-recesses at different distances from the gear-wheel, in either of which recesses the movable end of said shaft may be placed, and means for confining the said shaft in said recesses, substantially as described.

28. A ribbon-feeding mechanism comprising a spool, a gear-wheel connected with the same and a driving-shaft provided with a pinion adapted to intermesh with said gear-wheel, and having lateral movement at its end which carries the pinion about an axis of oscillation located at a distance from said pinion, a bearing for the end of the shaft adjacent to said gear-wheel, provided with two open bearing notches or recesses at different distances from the gear-wheel, in either of which recesses the movable end of said shaft may be placed, and a spring-actuated strip or bar for holding the shaft in either of the said recesses, substantially as described.

29. A ribbon-feeding mechanism, comprising a spool, a gear-wheel attached to the same, a driving-shaft provided with a pinion adapted to intermesh with said gear-wheel, a bearing for the end of the shaft adjacent to said gear-wheel provided with two bearing notches or recesses in either of which said shaft may be placed, a spring-actuated strip or bar for holding closed said notches, and a stop limiting the outward movement of said spring strip or bar, substantially as described.

30. A ribbon-feeding mechanism comprising a ribbon-spool, a gear-wheel connected with the same, a driving-shaft having a pinion adapted to intermesh with the said gear-wheel, a bearing for the end of the shaft adjacent to the gear-wheel having two open notches, a leaf-spring attached to the said bearing at one

side of the notches, and a stud attached to said bearing at the opposite side of said notches provided with a head to limit the outward movement of the adjacent end of the leaf-spring, substantially as described.

31. A ribbon-spool for type-writers consisting of two heads, and a sheet-metal barrel attached thereto and formed of a flat strip of metal provided at one end with a notch and at its opposite end with a projection, said strip being bent into cylindric form with the projection on one end of the strip occupying the notch in the other end thereof to form a ribbon-holding device, substantially as described.

32. A ribbon-spool for type-writers, consisting of two sheet-metal heads provided with annularly-arranged perforations and a barrel consisting of a flat strip of metal provided with integral projections at its edges adapted

to engage the perforations in the heads, substantially as described.

33. A ribbon-spool for type-writers consisting of two sheet-metal heads provided with annularly-arranged perforations, and a barrel formed of a flat strip of metal provided with integral perforations at its edges adapted to engage the perforations in the heads; said strip having at one end a notch and at its opposite end a projection adapted to form a ribbon-holding device, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 25th day of February, A. D. 1896.

THOMAS OLIVER.

Witnesses:

C. CLARENCE POOLE,
WILLIAM L. HALL.