

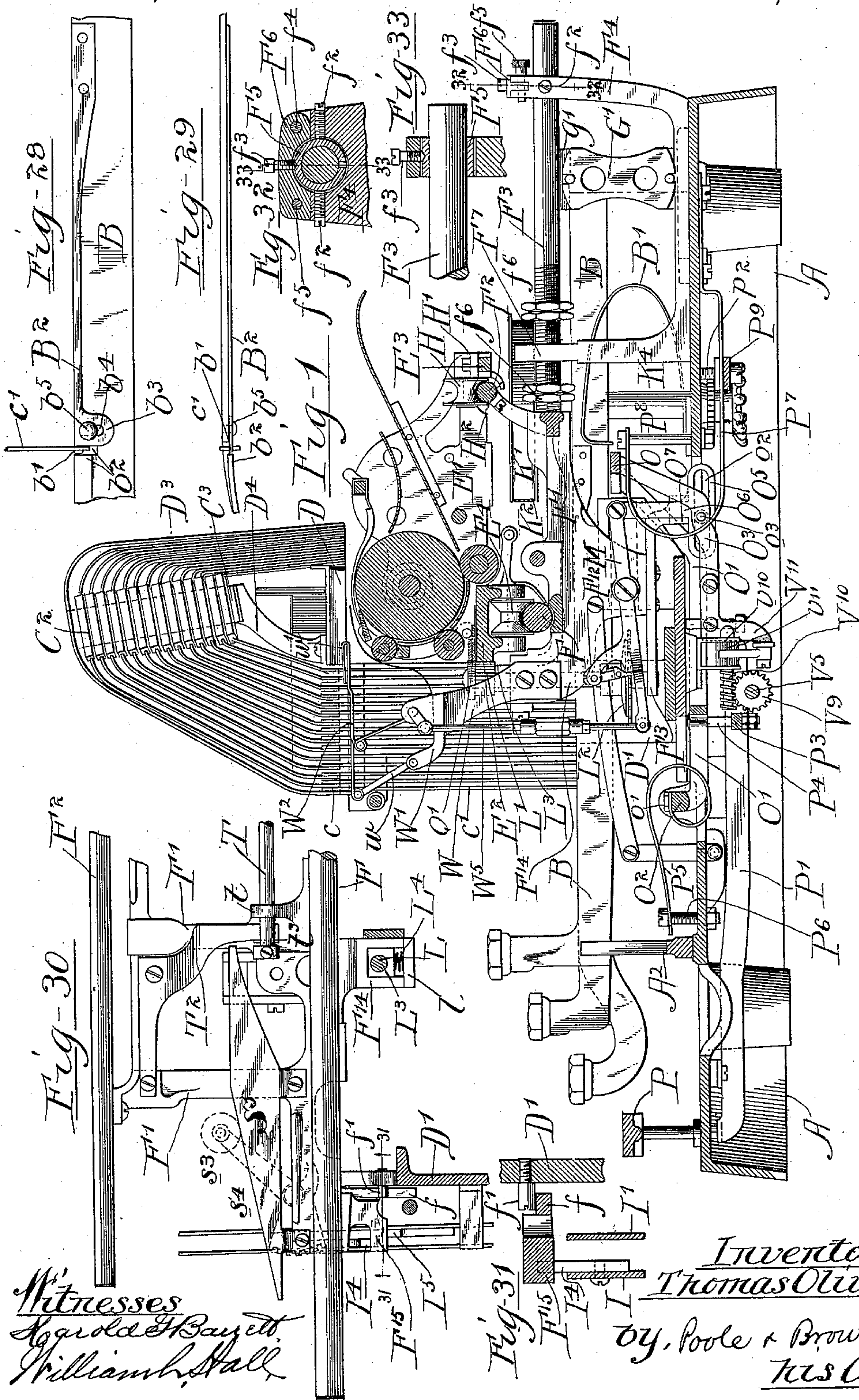
(No Model.)

8 Sheets—Sheet 1.

T. OLIVER.
TYPE WRITING MACHINE.

No. 599,863.

Patented Mar. 1, 1898.



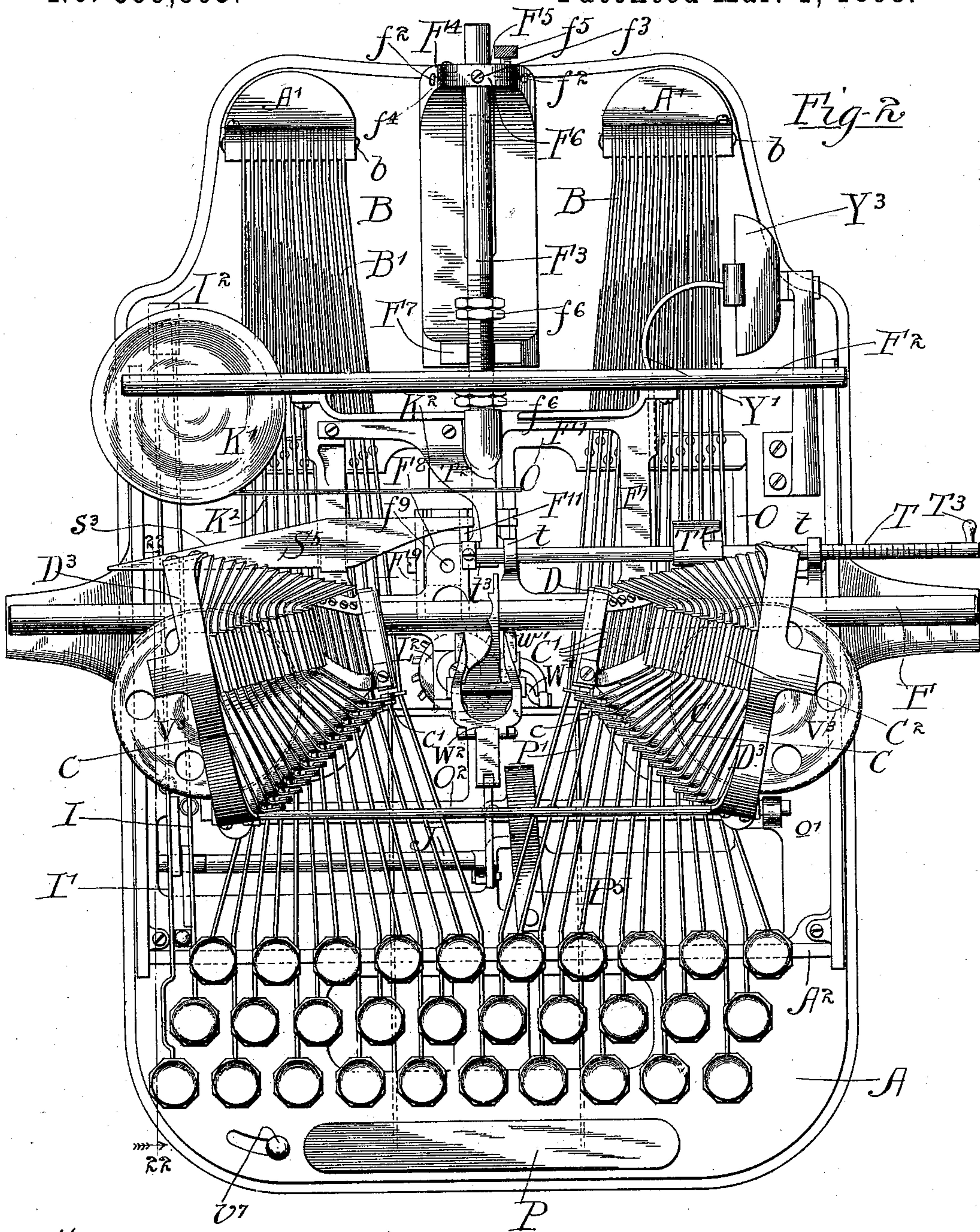
(No Model.)

8 Sheets—Sheet 2.

T. OLIVER.
TYPE WRITING MACHINE.

No. 599,863.

Patented Mar. 1, 1898.



Witnesses

Harold G. Barrett

William L. Hall

Inventor

Thomas Oliver

by Pooler & Brown

his Attys.

(No Model.)

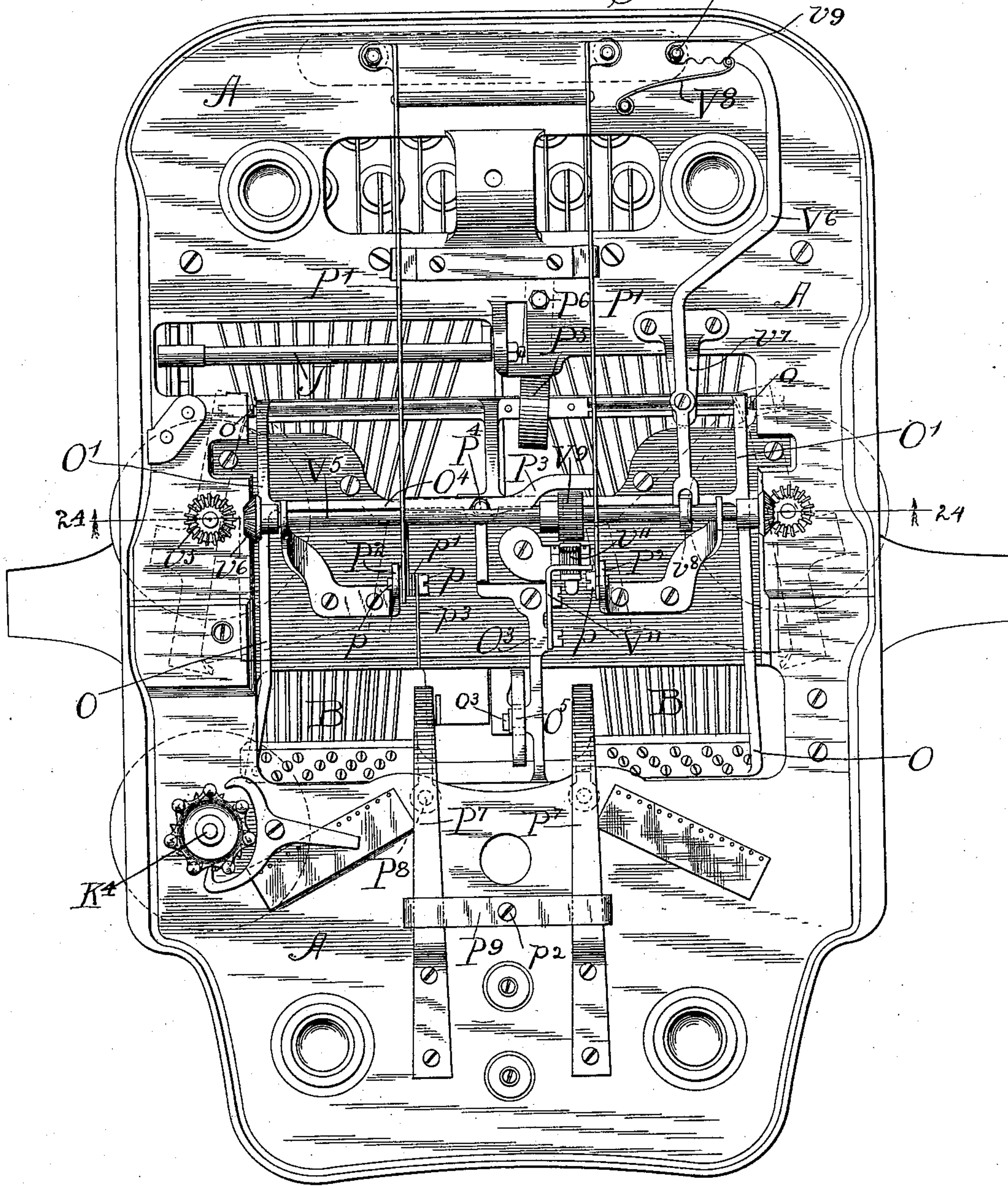
8 Sheets—Sheet 3.

T. OLIVER.
TYPE WRITING MACHINE.

No. 599,863.

Patented Mar. 1, 1898.

Fig-3 *V⁷*



Witnesses

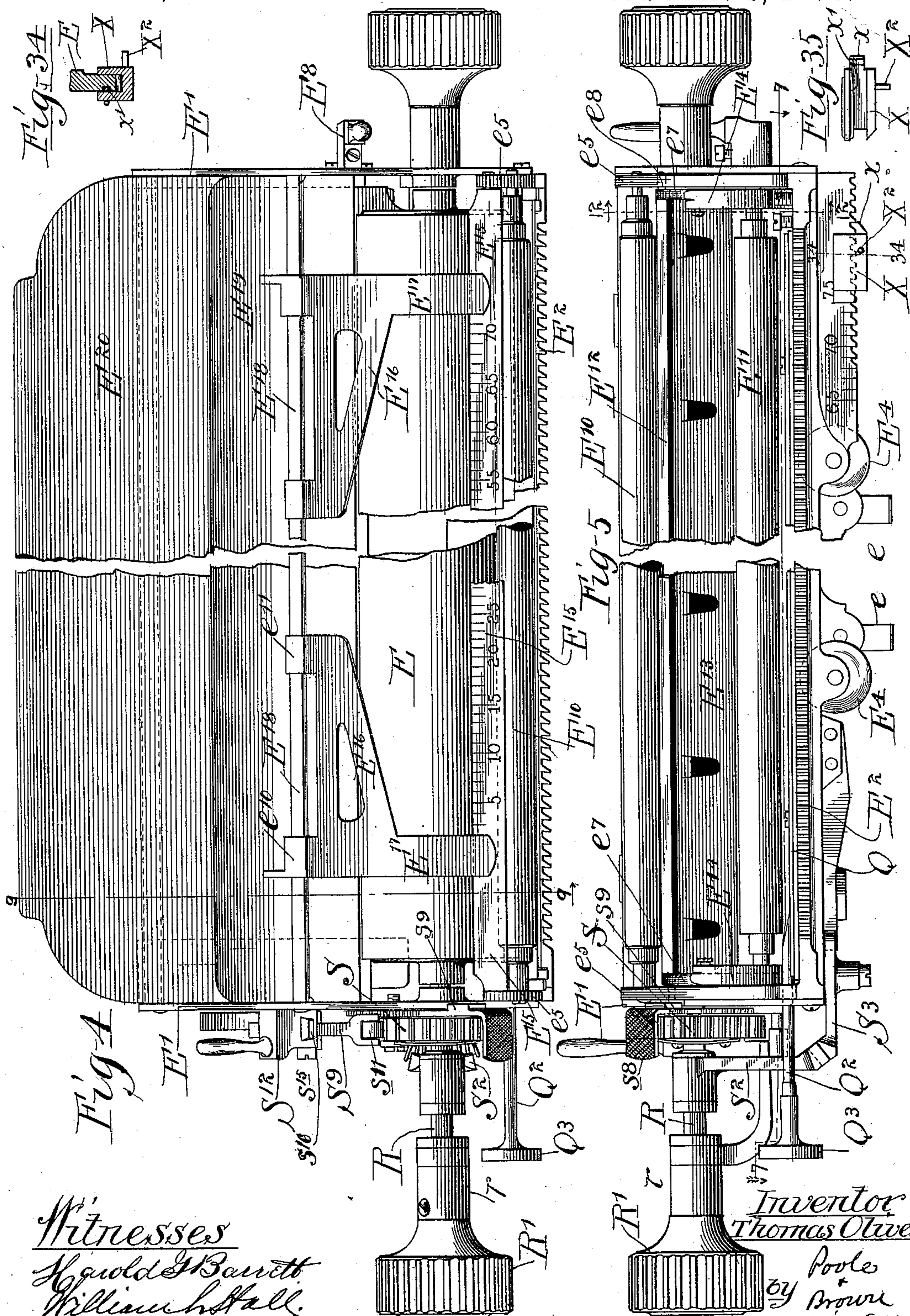
Harold G. Barrett.
William H. Hall.

Inventor
Thomas Oliver


by Poole & Brown
his Attys.

8 Sheets—Sheet 4.

No. 599,863.

Patented Mar. 1, 1898.

Witnesses
 Harold P. Barrett
 William Hall.

Inventor
Thomas Oliver
 *by Poole*
+ Brown
his Attys

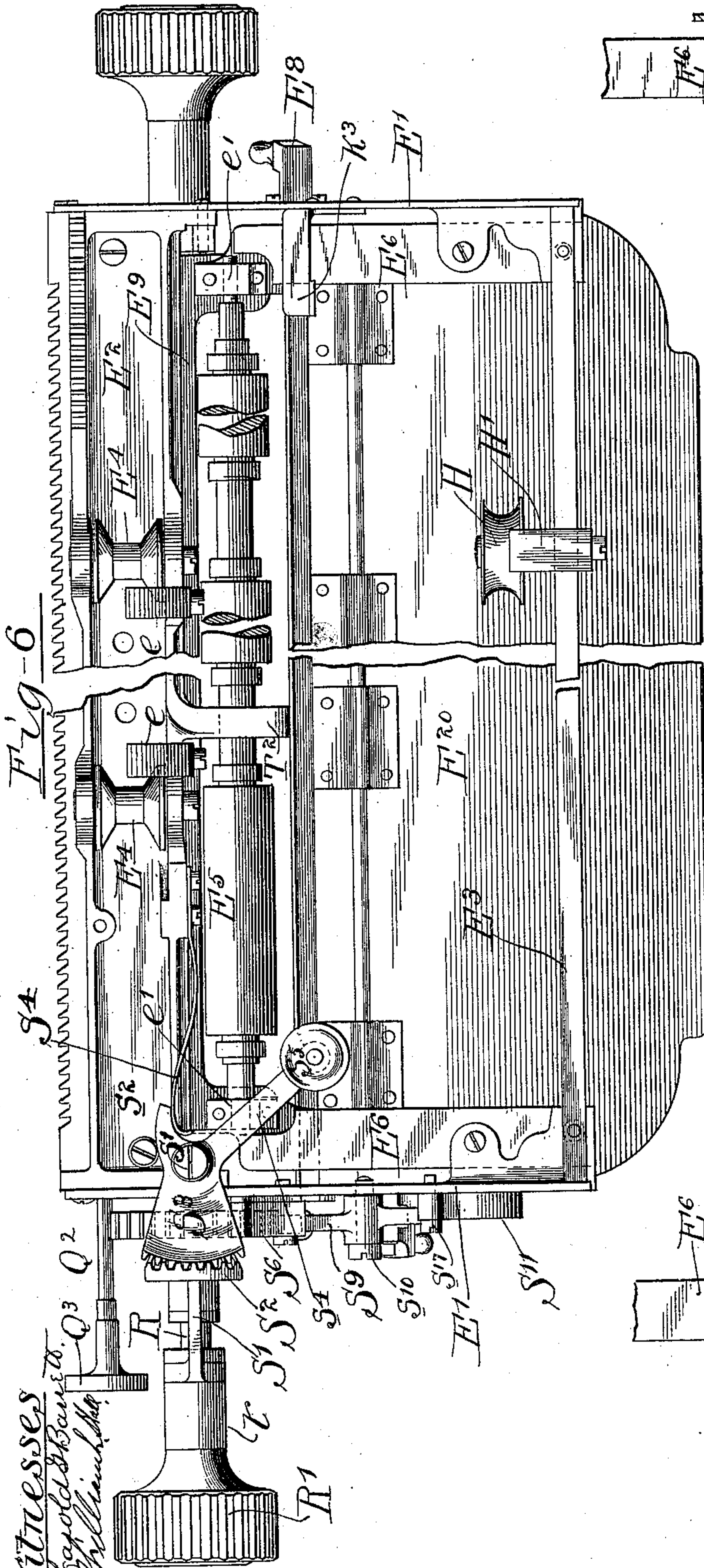
(No Model.)

8 Sheets—Sheet 5.

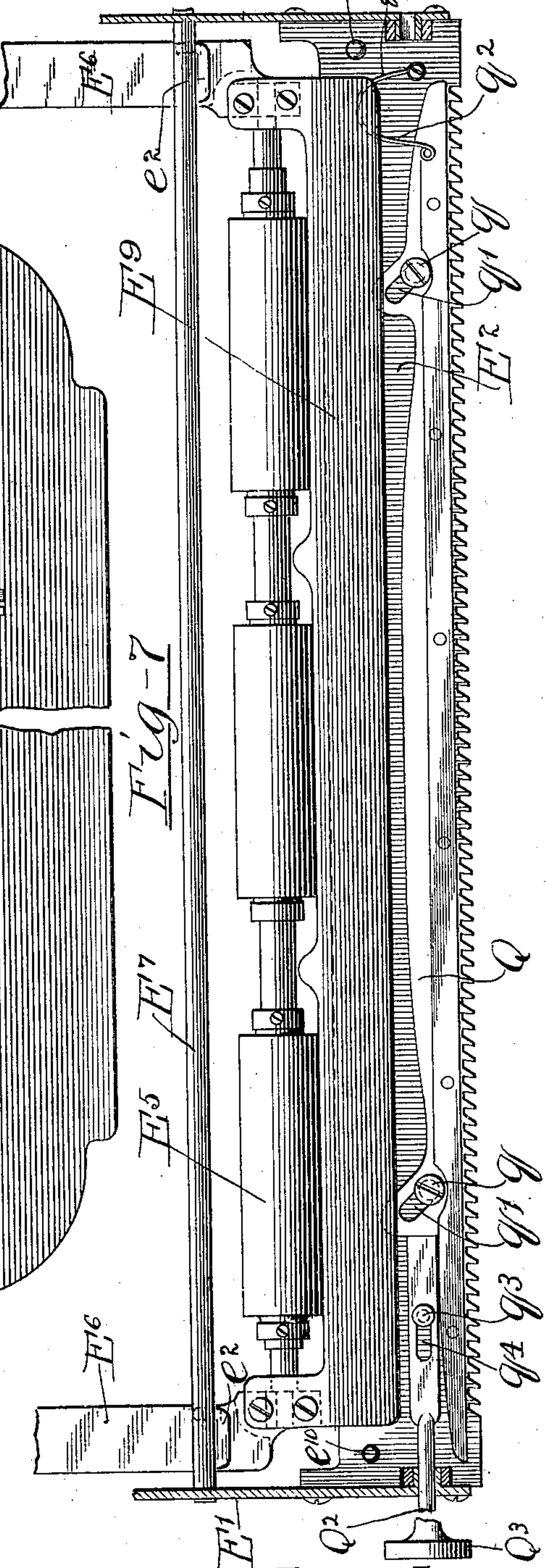
T. OLIVER.
TYPE WRITING MACHINE.

No. 599,863.

Patented Mar. 1st 1898.



Witnesses
H. J. Gold & B. J. B. & Co.
Millwaukee, Wis.



Inventor
Thomas Oliver
by Poole & Brown
his Attorneys

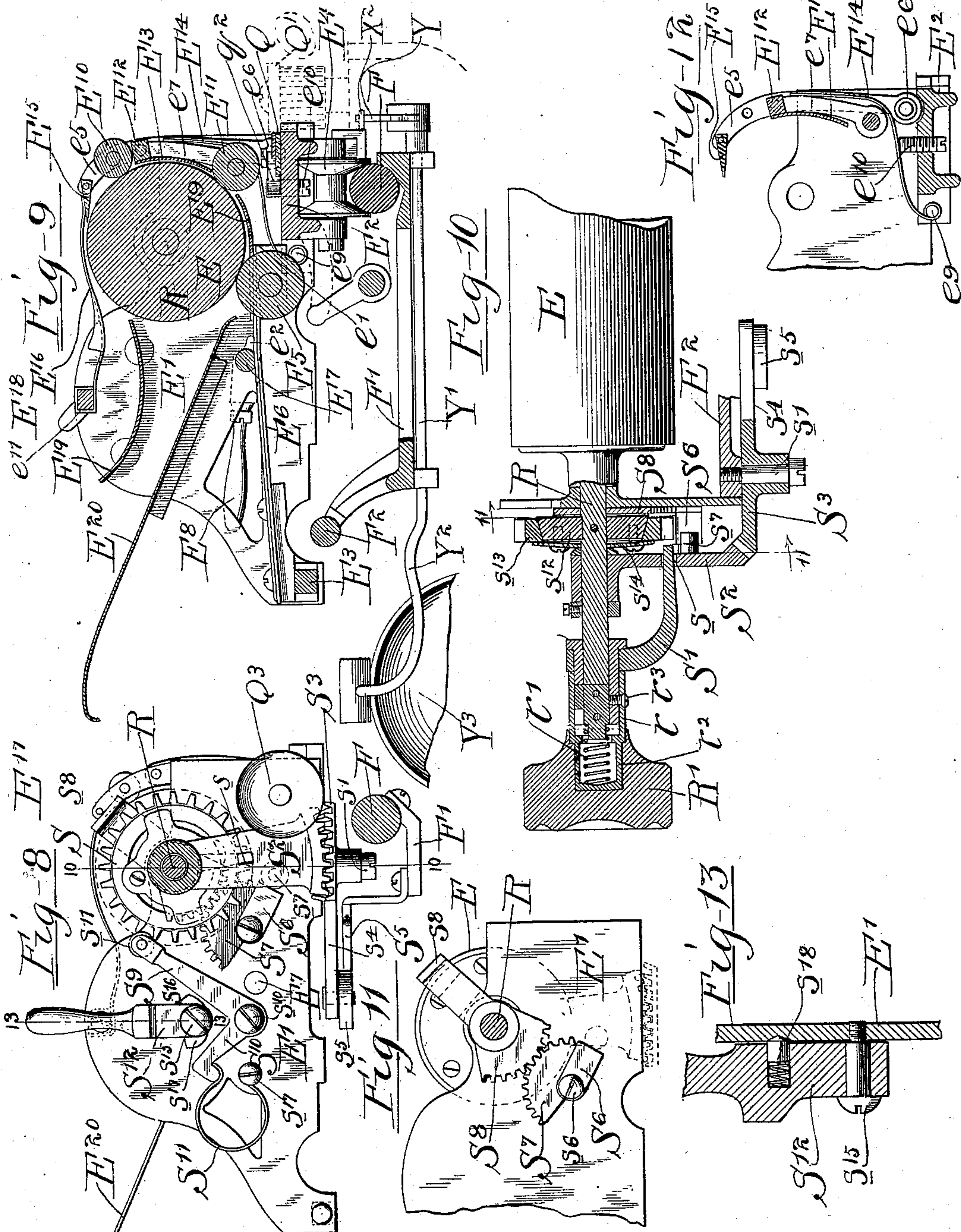
(No Model.)

8 Sheets—Sheet 6.

T. OLIVER.
TYPE WRITING MACHINE.

No. 599,863.

Patented Mar. 1 1898.



Witnesses
H. Gold & Barrett,
William H. Hall.

Inventor
Thomas Oliver
by Poole & Brown
his Attys.

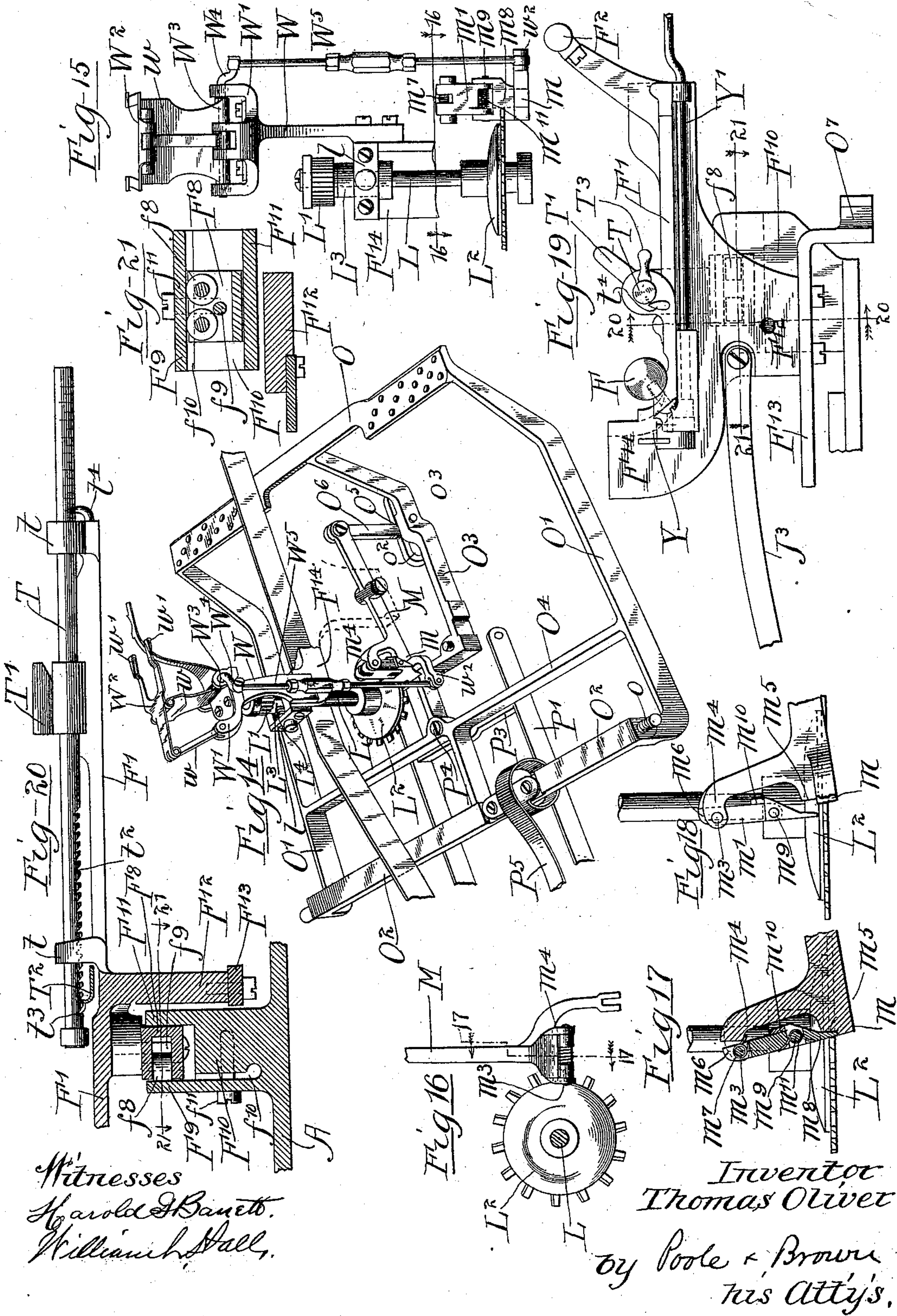
(No Model.)

8 Sheets—Sheet 7.

T. OLIVER.
TYPE WRITING MACHINE.

No. 599,863.

Patented Mar. 1, 1898.



Witnesses
Harold B. Bantlett.
William H. Hall.

Inventor
Thomas Oliver
by Poole & Brown
his Attys.

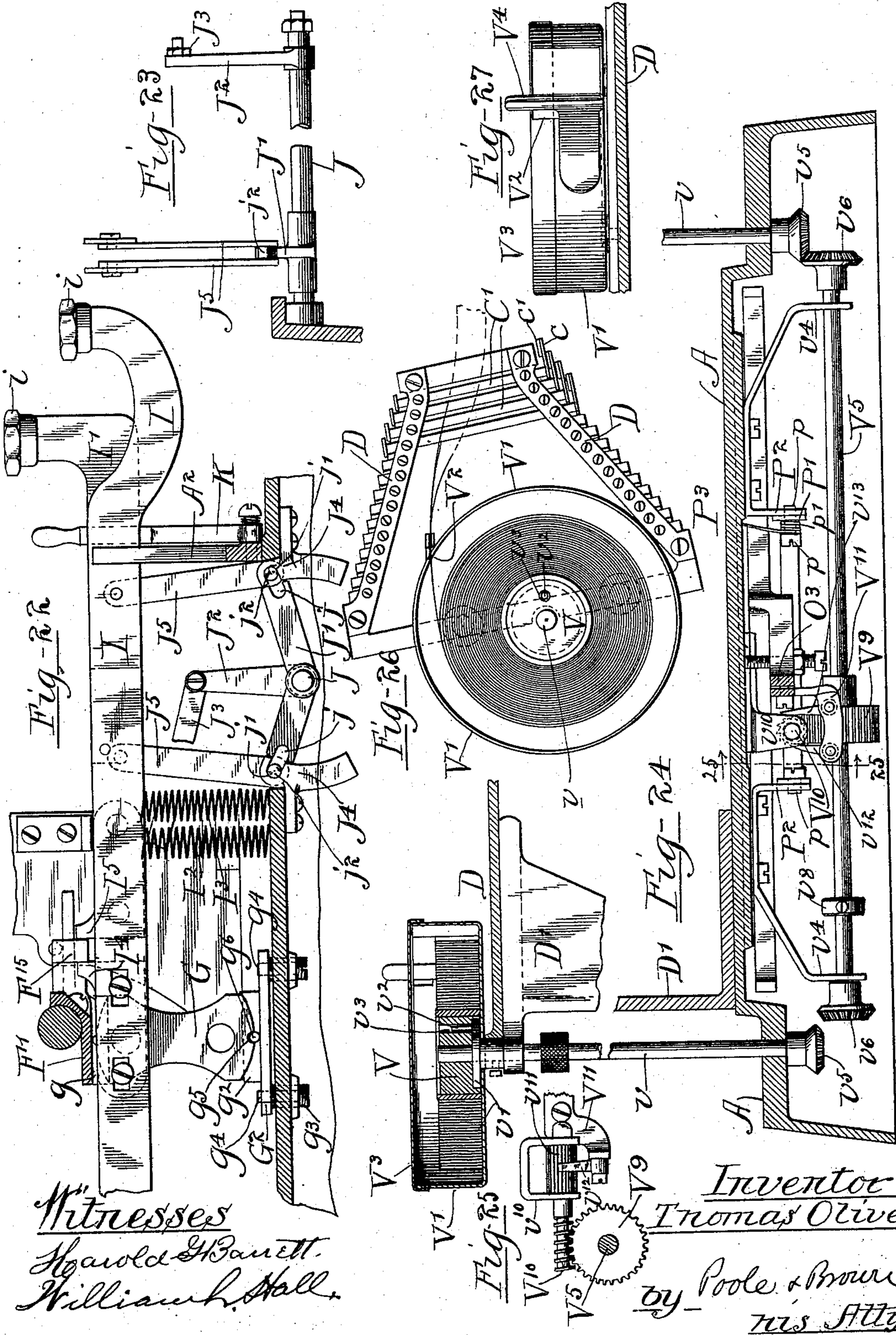
(No Model.)

8 Sheets—Sheet 8.

T. OLIVER.
TYPE WRITING MACHINE.

No. 599,863.

Patented Mar. 1, 1898.



UNITED STATES PATENT OFFICE.

THOMAS OLIVER, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-FOURTH TO
FREDERICK A. EASTMAN, OF WOODSTOCK, ILLINOIS.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 599,863, dated March 1, 1898.

Application filed August 28, 1897. Serial No. 649,831. (No model.)

To all whom it may concern:

Be it known that I, THOMAS OLIVER, 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 type-writing machines of that kind shown in my prior patent, No. 562,337, dated June 16, 1896, and having a revolving platen or cylinder against which the paper is held during the act of printing, which platen is mounted in an endwise-movable carriage and wherein the types are mounted on swinging type-bats located above the platen and arranged to swing on horizontal axes arranged transversely to the platen, so that the types will strike downwardly upon the platen and the letters printed will be constantly in view of the operator. Several of the improvements herein described and claimed may, however, be applied to type-writing machines of other kinds.

In the accompanying drawings, Figure 1 is a view in central vertical section of a type-writing machine embodying my invention. 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 view of the machine from beneath, showing the base-plate and the parts immediately adjacent thereto. Fig. 4 is a plan view, on an enlarged scale, of the paper-carriage removed from the machine. Fig. 5 is a view in front elevation of the paper-carriage. Fig. 6 is a view of the paper-carriage as seen from beneath. Fig. 7 is a plan section of the carriage, taken on line 7 7 of Fig. 5. 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 an enlarged sectional view of the said carriage, taken on line 9 9 of Fig. 4. Fig. 10 is a longitudinal section taken on line 10 10 of Fig. 8, illustrating more in detail the devices for shifting the platen. Fig. 11 is a detail section taken on line 11 11 of Fig. 10,

illustrating the devices for varying the extent of line-feed. Fig. 12 is a detail section of the carriage, taken on line 12 12 of Fig. 5, showing the arms which support the paper-feeding rollers. Fig. 13 is a detail section of the carriage end plate, taken on line 13 13 of Fig. 8, showing the actuating-lever for the platen-holding pawl. Fig. 14 is a view in perspective of the universal bar, the letter-spacing devices, and the ribbon-throw. Fig. 15 is a front elevation of the ribbon-throw and letter-spacing devices. Fig. 16 is a plan section of the escape mechanism, taken on the line 16 16 of Fig. 15. Fig. 17 is an elevation with parts in section of the escape-wheel and stiff and limber pawls, taken on line 17 17 of Fig. 16. Fig. 18 is a view in side elevation of the same parts, showing a changed position of the limber pawl. Fig. 19 is a detail end elevation of the shifting frame which supports the carriage. Fig. 20 is a detail sectional view taken on line 20 20 of Fig. 19, showing the roller-bearing which takes the end thrust of the shifting frame and the adjustable margin-stop. Fig. 21 is a sectional plan view of the parts shown in Figs. 19 and 20, taken on line 21 21 of the same figures. Fig. 22 is a detail cross-section taken on line 22 22 of Fig. 2, showing the carriage-shift keys in side elevation. Fig. 23 is a detail view of the rock-shaft which forms part of the carriage-shifting devices. Fig. 24 is a detail sectional elevation taken on line 24 24 of Fig. 3, showing the ribbon-spool and ribbon-feeding devices. Fig. 25 is a detail section taken on line 25 25 of Fig. 24, showing in side view the worm-gear of the ribbon-feeding devices. Fig. 26 is a detail plan view of one of the type-bar frames and the ribbon-spool case thereon, with the cover of said case removed. Fig. 27 is a view in side elevation of one of the ribbon-spool cases with the cover thereon. Fig. 28 is a detail side view of a part of one of the key-levers, showing the spring-arm by which the type-bar link is connected with said lever. Fig. 29 is a detail plan view of the parts shown in Fig. 28. Fig. 30 is a detail plan view of the parts below the carriage at the left-hand side of the machine. Fig. 31 is a detail section taken on line 31 31 of Fig. 30. Fig. 32 is a detail section of the rear support of the

shifting frame, taken on line 32 32 of Fig. 1. Fig. 33 is a detail vertical section taken on line 33 33 of Fig. 32. Fig. 34 is a detail section taken through the line stop-block on line 34 34 of Fig. 5. Fig. 35 is a plan view of the line stop-block removed from the machine.

As shown in said drawings, A designates the base-plate of the machine, consisting of a flat horizontal flanged metal casting, and B B the key-levers, which extend from the front to the rear of the machine, above and generally parallel with the base-plate, and are pivotally supported at their rear ends by means of transverse pivots *b*, supported in standards A' on 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 to one of the standards, as clearly seen in the plan view, Fig. 2. At their front ends the key-levers engage a vertically-slotted guide-bar A², attached to the base-plate, Figs. 1 and 2.

The several key-levers are lifted and held normally in an elevated position by means of springs B', Fig. 1, herein shown as made of U form and located between the base-plate and the key-levers.

C C indicate the type-bars, which are of loop or U form and are attached to such shafts C' C', which are mounted in supporting-frames D D. The type-bars are arranged in two groups at opposite sides of the center of the machine, so as to swing on horizontal axes and act on a platen or paper-supporting roller E, which is located in position for the action thereon of the type-bars of both groups and is 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. The supporting-frames D overhang the platen E, Fig. 1, and are attached to posts or uprights D' on the base. Said type-bars are provided at their central parts with type-heads C² and are actuated from the key-levers by means of upright links *c'*, which are pivoted to crank-arms *c* on the type-bars. The supporting-frames D are provided with yokes D³, to which are attached inclined supports or rests D⁴, 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 type-bar heads carry each a plurality of type-faces or types, preferably three, whereby 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 types on the type-heads may be printed from at will.

As an improvement in the arrangement of the type-bars of a machine of the character described I purpose to arrange the same with their pivotal axes at an angle with respect to the central axis of the platen and with the axes of type-bars in the two groups at oppo-

site angles, so that the axes belonging to the two groups diverge from each other from front to rear. This construction is plainly seen in the drawings, Fig. 2, wherein the supporting-frames D D are angularly arranged with respect to the posts or uprights D', and the rock-shafts or spindles C' are correspondingly inclined.

The oblique arrangement of the type-bars described results in bringing the printing or contact point at which the types strike the platen rearwardly of the points at which the types rest when retracted. This construction affords a wider space or opening at which the paper is exposed to the eye of the operator and enables more of the writing to be seen at one time. The construction described, moreover, by bringing the contact-point to the rear of the center of the type-bars affords more space for the carriage and the platen at the rear of the standards which support the bearings for the type-bars and thereby permits the use of a larger platen while making the machine more compact and stronger than in the case in which the type-bar axes are arranged at right angles with respect to the platen.

As an improvement in the means for transmitting motion from the key-levers to the type-bars I have provided an elastic or resilient connection between said parts of a sufficiently yielding character to soften or cushion the blow when the fingers strike the keys, but not so yielding as to interfere with the prompt and positive action of the type-arms. As a preferred form of such elastic connection I interpose a spring between the key-lever and the connecting rod or link *c'*, and I make this spring in the form of a spring-arm B², Figs. 28 and 29, which spring-arm is arranged in a vertical plane and secured against the side of the key-lever, the spring-arm being rigidly attached at one end to the type-lever and having its opposite or free end engaged with the link. The yielding or resilient connection in this instance is afforded by the yielding of the spring-arm edgewise in a vertical plane. The said spring-arm B² is shown as attached to the key-lever at the rear of the links *c'* and adjacent to the upper edges of the type-levers by means of rivets inserted through the rear end of the arm. Said arm is also shown as having at its free end a tooth or projection *b'*, which projects through an eye in the lower end of the link, the upper type-lever being notched or cut away adjacent to the end of the spring-arm to afford room for the said eye. As a means for holding the link in engagement with the said tooth *b'* the metal of the key-lever is slit on a line with the bottom of the notch, so as to form a tongue *b²*, the end of which stands opposite the end of the spring-arm and thereby holds the link from outward movement. Said tongue *b²* may obviously be bent laterally to permit the disconnection of the link from or its connection with the spring-arm. To hold the spring-arm

from lateral movement or displacement, the same is shown as provided with a depending part or arm b^3 , in which is formed a vertical slot b^4 and through which is inserted a stud b^5 , which is secured in the key-lever, the said stud being loosely inserted in said slot to permit the end of the spring-arm to move freely in a vertical direction.

The employment of a spring or resilient connection between the key-lever and the type-arm has the effect in all cases of making the action of the keys easier and more agreeable to the operator, but these advantages are especially marked in the case of metal key-levers, which, by reason of their inelastic quality, tend to give a harsh and unpleasant action if no such elastic connection be employed.

The paper-carriage frame in the preferred construction illustrated consists of two end plates E' E' , a longitudinal bar E^2 at the lower front part of the frame which constitutes the rack-bar of the spacing mechanism, and a rear frame-bar E^3 , Fig. 6. The said carriage is mounted to slide endwise on a shifting frame, which consists of a transverse guide-bar F , Figs. 1, 2, and 19, a horizontal yoke-piece F' , extending rearwardly therefrom, a horizontal rear guide-bar F^2 , and a horizontal rearwardly-extending guide-rod F^3 , which is attached to the rear end of the yoke-piece F' and slides in a bracket F^4 , attached to the rear part of the base-plate.

The devices illustrated for sustaining the shifting carriage-frame consist of two rocking standards G G , which are located beneath the outer ends of the frame-yoke F' , and a similar standard G' , located beneath the guide-rod F^3 , Figs. 1 and 22. Each of said rocking standards consists of a flat plate curved at both its upper and lower ends to form circular arcs which are segments of the same circle, so that when the shifting frame is moved backward or forward it will remain in the same horizontal plane. The upper and lower ends of the standards are longitudinally grooved and engage at their upper ends with depending flanges g g on the ends of the yoke-piece F' and a similar flange g' on the guide-rod F^3 . At their lower ends the several standards are engaged with vertical flanges g^2 , which rise from plates G^2 , Fig. 22, which are adjustably attached to the machine base-plate. For adjustably connecting the said plates G^2 with the base-plate tubular screw-plugs g^3 are inserted through the base-plate and bear against the plates G^2 , and holding-screws g^4 are inserted through the said plugs and are engaged at their upper ends with screw-threaded holes in the plates. The said standards are also provided at their ends with central notches g^5 , which are engaged by pins g^6 , which are inserted through the flanges g^2 and serve to loosely confine the rockers and hold them from backward or forward movement. To hold the forward end of the shifting frame from rising, the yoke F' is provided with horizontal arms f f , which extend out-

side of the standards D' D' , beneath studs f' f' thereon, Figs. 30 and 31.

To hold the rear end of the shifting frame from being lifted from its place, the rod F^3 is engaged with a guide-standard F^4 , located at the rear end of the base-plate, said standard being provided with a separate bearing-ring F^5 , Figs. 32 and 33, which is removably confined in a recess in the standard in such manner that the said ring will be held from upward or lateral movement, while at the same time the weight of the rear part of the shifting frame will be carried entirely by the rocking standard G' . For so supporting the bearing-ring F^5 the opening or recess in the standard is made somewhat larger than the ring, and the ring is held or confined in position by means of two horizontal set-screws f^2 f^2 , which pass through the sides of the standard and engage the outer face of the ring, and a third set-screw f^3 , which is inserted vertically through a removable cap-piece F^6 and engages a holding-recess in the top face of the ring. The cap-piece F^6 is connected with the standard at one side of the recess by a pivot f^4 , and is held at the opposite side thereof by a removable pivot-pin f^5 , so that said cap-piece with set-screw thereon may be easily swung back or lifted for the purpose of disengaging the holding-recess in the ring, and thus permit the ring to be removed endwise out of the recess, so that the rod may be lifted therefrom in taking the shifting frame out of the machine. The lateral set-screws obviously afford lateral adjustment of said bearing-ring, while the top set-screw enables the ring to be adjusted vertically.

The backward-and-forward movement of the shifting frame is limited by means of adjustable stops or nuts f^6 f^6 , placed on a screw-threaded part of the stem F^3 at either side of a standard F^7 , which rises from the base-plate and is provided at its upper end with a notch through which the stem freely passes.

In order to resist the tendency to endwise movement in the shifting frame due to the pull of the carriage-actuating spring upon the carriage, devices are provided as follows: Attached to the yoke F' of the shifting frame, at a point near the center of the machine and at the rear of the guide-rod F , is a metal block F^8 , Figs. 2, 20, 21, and 30, said block being provided with a horizontal groove or recess in its side face and having mounted in said groove or recess two antifrictional rollers f^8 , which project beyond the sides of the block and are adapted to bear against a vertical guide flange or plate F^9 , which extends from front to rear of the machine and is herein shown as forming part of a block or standard F^{10} , which rises from the base-plate of the machine. The block F^8 is herein shown as attached to the yoke-piece F' by means of a holding-screw f^9 , which passes vertically through the block into the said yoke-piece. The upper end of the standard F^{10} is shown as provided with a flange F^{11} , arranged par-

allel with the guide-flange F^9 and forming a groove or recess in which the block F^8 rests and moves. The said flange F^{11} serves to hold the shifting frame from movement to the right, but is normally free from contact with the block F^8 , so as to avoid frictional resistance to the backward-and-forward movement of the shifting frame. In order to afford a means for adjustment of the guide plate or flange F^9 to the right or left, said guide-plate is separated from the body of the standard F^{10} by a vertical slot f^{10} , Figs. 20 and 21, which reaches nearly to the base-plate, and a set-screw f^{11} is inserted through the guide-plate and into the body of the standard, the said slot giving sufficient elasticity to the lower part of the plate to enable the upper part of the same to be swung or moved to the slight extent needed by tightening or loosening said set-screw f^{11} .

The paper-carriage is sustained at its front edge upon the guide-bar F by means of grooved supporting-rollers E^4 , Fig. 9, which are preferably two in number, Fig. 6, and are mounted on pivot-pins inserted through depending lugs on the bar E^2 of the carriage, and the carriage is held from rising or being lifted from its place at its front edge by means of two lugs $e e$ on the carriage-frame, which extend downwardly and beneath the guide-bar F . The rear part of the carriage is sustained by means of a supporting-roller H , Figs. 1 and 6, which is mounted on an arm H' , attached to the rear frame-bar E^3 of the carriage-frame and which rests and travels on the rear guide-rod F^2 of the shifting frame in the endwise traverse of the carriage. To hold the carriage from rising at its rear part, a stop-arm H^2 is secured to the rear frame-bar E in such manner as to extend beneath the said rod F^2 .

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 immovable 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:

$I I'$, Figs. 2 and 22, represent shifting levers having their keys $i i'$ 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 , Fig. 2, said levers being guided in a vertical slot formed in the left-hand end of the guide-bar A^2 . Mounted on the frame-base at the rear of the guide-plate A^3 is a rock-shaft J , Figs. 1, 2, 22, and 23, which extends from a point beneath the shifting levers to the center of the machine and is provided with two laterally-extending crank-arms $J' J'$ and an upwardly-extending crank-arm J^2 . The crank-arm J^2 ,

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^3 , Figs. 19 and 22, the rear end of which is pivoted to a depending arm F^{12} on the central part of the yoke F' of the shifting frame, Figs. 19, 20, and 21.

The two crank-arms $J' J'$ extend one forwardly and the other rearwardly from the rock-shaft at an upward inclination and are provided at their ends with notches $j j$, Fig. 22, located in the end faces of the arms. On the base-plate of the machine adjacent to the ends of said arms are two stationary plates $J^4 J^4$, provided with notches $j' j'$, which are opposite the notches in the crank-arms when the shifting frame is in its normal position.

Pivoted to the shifting levers $I I'$ are two depending links $J^5 J^5$, carrying at their lower ends lateral studs $j^2 j^2$, which are adapted for engagement with either the notches j or j' . Said notches are inclined or oblique, and lifting-springs $I^2 I^3$, applied to the shifting levers, normally retain the said studs in the outer or stationary notches j' . When one of the shifting levers is depressed, the stud j^2 , carried thereby, first slides inwardly from the notch j' into the notch j in the end of the crank-arm, and after becoming engaged with said crank-arm acts on the latter to depress the same and thereby give movement to the rock-shaft and shifting frame. Provision is made for confining the stud within the notch of the crank-arm during the time said crank-arm is moving downwardly from its normal position, that herein shown consisting of a curved guide surface or arm on the stationary plates J^4 , the same being curved concentrically with the rock-shaft and arranged to keep closed the open end of the notch throughout the swing of the crank-arm. Obviously the crank-shaft will always be free to be turned in either direction upon the depression of either key, the shifting of the studs into the stationary notches leaving the crank-arms entirely disconnected from the shifting keys except when one of the same is being operated.

The shifting levers are provided with stop projections $j^4 j^5$, adapted for contact with a laterally-projecting arm F^{15} on the shifting frame, Figs. 22, 30, and 31, so as to limit the movement of the same and hold the carriage immovable when in its central position. To hold the carriage for some length of time in its shifted position, a hand-lever K , Fig. 22, is arranged vertically between the levers l and l' and is pivoted at its lower end to the guide-bar A^2 , said lever K being provided with outwardly-facing stop-shoulders located in such position as to hold either one of the spacing-keys depressed.

A spring-actuated mechanism is provided for giving motion to the 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 a key is depressed for printing a letter, these parts being made as follows:

5 K', Fig. 1, indicates a drum which contains a carriage-actuating spring and has wrapped about it a strap K², the free end of which is attached to a hook k³, Figs. 5 and 6, on the carriage-frame. Said drum is attached to the vertical shaft K⁴, which extends downwardly through the base of the machine and is provided below the base with a ratchet-wheel and escapement-lever, (shown in Fig. 3,) by which the tension of the spring may be regulated.

15 The spacing device for effecting the letter-spacing operates in connection with the carriage rack-bar E², hereinbefore referred to, and is constructed as follows:

20 L, Figs. 1 and 14, indicates an upright escape-wheel shaft mounted on the front of the shifting frame near the center of the machine. Said shaft carries at its upper end a gear-pinion L', adapted to engage the rack-bar E² of the carriage-frame, Fig. 1, and at its lower end an escape-wheel L². The upper end of the shaft L is adapted to move toward and from the rack-bar about an axis of oscillation located adjacent to the escape-wheel. The said shaft engages at its lower end a bearing-aperture in a horizontal bar F¹³, which is attached to the lower end of the arm F¹² on the shifting frame, Figs. 1, 19, and 20, the bearing-aperture being made of slightly-elongated shape to afford the necessary freedom of movement in the upper end of the shaft. The said upper end of the shaft L passes through a sliding block L³, which is mounted in a guide-slot in an arm or bracket F¹⁴ on the shifting frame. The bearing-block L³ is held normally in its rearward position, and the said pinion is retained in mesh with the rack-bar by means of a coiled spring L⁴, which is inserted in the slot of the bracket F¹⁴, between the plate, which closes the front end of the slot, and the said block L³.

45 To now describe the escape device by which the escape-wheel L² is allowed to turn step by step and the carriage allowed to advance under the action of the carriage-actuating spring when the several keys are operated, the same is constructed as follows:

50 M is an oscillatory escapement-lever, Figs. 14, 15, 16, 17, and 18, which extends from front to rear of the machine and is pivoted on the depending arm F¹² of the shifting frame, so as to swing in a vertical plane, with its forward end at one side of and adjacent to the escape-wheel L². Said lever 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 lever is oscillated. 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 upper end by means of a transverse pivot m³ upon the upper end of a standard m⁴ 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 lever M, the said stiff pawl being adapted for engagement with the teeth of the wheel when the lever is elevated. The limber pawl is also adapted for engagement with and disengagement from the teeth of the escape-wheel by the vertical movement of said lever M, said pawl for this purpose being arranged above the stiff pawl m, Fig. 15.

The parts are so arranged that when the escapement-lever is depressed the lower part of the limber pawl m' will engage the teeth of the escape-wheel, 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 m⁵ for the limber pawl is formed by means of an upward projection on the lever M, and a front stop for said limber pawl is formed by projection m⁶ on the upper end of the limber pawl, which is adapted for contact with the upper end of the standard m³, Fig. 17. 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 m⁷, Figs. 16 and 17, placed around the pivot m³ of the limber pawl. The escape-wheel turns in a direction to carry the limber pawl toward the back stop m⁵ when engaged with said pawl against the action of the spring m⁷, as clearly seen in Fig. 17, 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. When the escape-lever is 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 m⁷ will return to its forward position, as seen in Fig. 18. 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 back stop, thus permitting the turning of the escape-wheel a distance of one tooth at each oscillation of the escape-lever. The said limber pawl is provided with a separate yielding lower part or section m⁸, which immediately engages the teeth of the ratchet-wheel and is connected by a pivot m⁹ with the main part of the limber pawl in such manner that it will swing forward from its operative position under the pressure of the escape-

wheel teeth, but will be held from any backward movement from such operative position by a suitably-arranged stop-arm m^{10} , which extends rearwardly from the lower part m^8 and bears against the rear surface of the upper part adjacent to the pivot connecting the same, as clearly seen in the drawings, Figs. 17 and 18. The said yielding section m^8 is held normally in its operative position by a suitably-applied spring, herein shown as having the form of a coiled spring m^{11} , placed around the pivot m^9 and bearing at its ends against the two parts of the pawl. The said yielding part or section m^8 being free to swing forward allows the escape-wheel teeth to move freely past the limber pawl if the escape-wheel be turning rearwardly or in the reverse direction from that in which it turns during the usual operation of the spacing mechanism. The construction of the limber pawl with the separate yielding section therefore enables the carriage to be thrust backwardly or returned to its starting-point for a new line without disengaging the escape-wheel shaft from the rack-bar, thereby rendering the employment of the devices provided for this purpose unnecessary, except when it is desired to release the carriage and allow it to move backwardly for inserting a letter at a desired place in the line, which is done in making corrections or under like circumstances.

Now referring to the means illustrated for giving motion to the escape-lever, these parts are constructed as follows:

O, Figs. 1, 2, 3, and 14, indicates a transversely-arranged vertically-movable space-bar located beneath and adapted for actuation by all of the key-levers. Said space-bar is attached to the rear ends of two arms O' , Fig. 14, the forward ends of which are rigidly attached to a rock-shaft O^2 , having bearings at its ends o in lugs o' on the base-plate, as seen in Fig. 1. The said space-bar O is connected with the said rock-shaft O^2 not only by the arm O' , located at the ends of said bars, but also by means of an intermediate bar O^3 , Fig. 14, which is intersected by a transverse frame-bar O^4 , these parts constituting a rigid space-bar frame. The escape-lever M is operated directly from the bar O by means of a slotted yoke O^5 , Figs. 3 and 14, which is pivoted to the rear end of the lever M and is provided in its lower part with a horizontal slot o^2 , adapted to receive a stud o^3 , which is secured in the rear end of said lever. Said yoke O^5 has a vertical shank or stem O^6 , which has vertically-sliding engagement with a stationary guide-block O^7 , Figs. 1 and 19, which, as herein shown, is formed on the rear end of the bar F^{13} , Fig. 19. Through the medium of the slotted yoke O^5 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^2 without affecting the action of the escape devices.

The intermediate arm O^3 , which connects the space-bar O with the rock-shaft O^2 , as above described, affords means for connecting a space-key P , Figs. 1, 2, and 3, located in front of the keyboard, with the said escape devices. The said space-key P is attached to two parallel levers P' , which are pivoted at their rear ends to depending lugs P^2 P^2 on the base-plate (shown in Figs. 3 and 24) by means of pivots p p , around one of which is placed a coiled spring p' , which acts to hold the space-key normally in its elevated position. At a point forward of the pivot-lugs P^2 a cross-bar P^3 , Figs. 1 and 3, rigidly connects the levers P' , and said cross-bar is connected with the space-bar frame by means of a vertical bolt P^4 , having a nut at its lower end, which forms an adjustable stop against which the cross-bar acts.

The space-bar frame is thrown upwardly and the space-bar held in contact with the key-levers by means of a volute spring P^5 , the inner end of which is attached to the rock-shaft O^2 and the outer end of which is connected with the base-plate by means of a screw P^6 , by which the tension of the spring may be adjusted. Two upwardly-pressing springs P^7 P^7 are arranged beneath the space-bar O in position to be struck by said bar when the same is depressed, said springs serving to gradually arrest the downward movement of the space-bar when the keys are struck. The springs P^7 P^7 are shown as made of U form, with their lower horizontal arms secured to the base-plate beneath the same and their upper arms apertured and engaged with vertical guide-posts P^8 P^8 on the base-plate. Adjustment of the tension of said springs is afforded by a cross-bar P^9 , which extends beneath and in contact with the lower parts of the springs and which is connected with the base-plate by means of an adjusting-screw p^2 .

Devices are provided for moving the upper end of the shaft L and the pinion L' thereon away from the rack-bar of the carriage for the purpose of releasing said carriage from the spacing devices when it is desired to shift or move the carriage backward to insert a letter in making corrections or at other times, as follows: Above the rack-bar E^2 , Figs. 1, 7, and 9, is a longitudinally-arranged horizontally-movable releasing-bar Q , arranged to slide obliquely on the rack-bar and held in place thereon by studs q q , which engage oblique slots q' q' in the said bar. The outer or working edge of the bar is adapted to engage an antifriction-roller Q' , Fig. 1, mounted on the upper end of the shaft L , above the said pinion L' , when the said bar is advanced. A suitably-applied spring, in this instance having the form of a U -spring q^2 , is engaged at one end with a stud on the rack-bar and at its other end with the releasing-bar and serves to throw the latter endwise and rearwardly, and thereby tends to hold it in its retracted position. For actuating said releas-

ing-bar an endwise-sliding trip-rod Q^2 , Fig. 7, is arranged longitudinally above said releasing-bar, said trip-rod extending beyond the end of the carriage at the left-hand side of the machine and having on its end a finger-piece or button Q^3 . The trip-rod is held in place by a stud q^3 in the rack-bar, which engages a slot q^4 in the trip-rod, and the inner end of the trip-rod abuts against a shoulder on the releasing-bar, so that the latter will be moved endwise and outward against the action of the spring q^2 when the trip-rod is thrust inwardly.

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, and the carriage may be moved freely so long as such pressure is maintained.

As an improved construction in automatic line-spacing devices for the platens of machines of that class in which the platen is turned automatically a line-space at a time at each movement of the carriage backward to a starting-point I have provided devices which are more clearly shown in Figs. 8 to 13 and are constructed as follows: Mounted on the platen-spindle R is a ratchet or gear wheel S , through which the platen is turned for line-spacing and by which it is held from turning as the line is being printed, said gear-wheel being located outside of the end of the plate of the carriage-frame at the left-hand side of the machine. An oscillating platen-actuated arm S' is mounted on the carriage concentrically with the axis of the platen, said arm preferably being mounted on the said spindle. In connection with said arm is employed an oscillating gear-segment S^2 , which is also mounted concentrically with the axis of the platen, preferably by being also mounted upon the said spindle R . Said gear-segment S^2 has a bearing-aperture s , through which the outer portion of the arm S' passes, said outer portion being parallel with the said spindle-arm, Fig. 10. The gear-segment S^2 is arranged concentrically with the platen-shaft and intermeshes with another gear-segment S^3 , which is mounted to swing horizontally on the lower part of the carriage-frame, the same being herein shown as supported upon a pivot-stud s' , which is secured in the rack-bar E^2 adjacent to the end plate of the carriage-frame. The platen-actuating arm S' , together with the gear-pinions S^2 S^3 , is moved in one direction by a spring, herein shown as having the form of a leaf-spring S^4 , secured to the bar E^2 and bearing at its free end against a rigid arm s^2 on the segment S^3 . Said parts are moved in opposition to the said spring by means of a cam-plate S^5 , Figs. 2 and 30, which is mounted on the carriage-supporting frame and is provided with an oblique edge s^3 , adapted for engagement with

the free end of an arm s^4 on the segment S^3 , said arm being provided with an antifriction-roller s^5 , which acts against the cam-plate. The parts referred to are so arranged that the gear-segment S^3 will be swung or moved on its pivot when the roller s^5 engages the oblique surface s^3 in the backward movement of the carriage, and said swinging movement of the gear-segment S^3 will be transmitted to the gear-segment S^2 and from the same to the actuating-arm S' , which engages said gear-segment. Said actuating-arm S' is movable endwise with respect to the gear-segment S^2 , and the free end of said arm is so arranged that when the arm is thrust inwardly it will engage one of the notches of the ratchet-wheel S , but when retracted, which is its normal position, will be free from said ratchet-wheel. The said actuating-arm is moved or shifted through the medium of a knob or handle R' , which is mounted on the platen-spindle at the left-hand side of the machine and which has sliding engagement with the said spindle. The said knob R' is secured to a sleeve r , which slides endwise on the spindle, and is held at the outer limit of its movement by a spring r' , herein shown as made of coiled form and inserted between the outer end of the spindle and the outer closed end of the sleeve r . Said sleeve r is shown as provided with a separate inner tubular section r^2 , which is secured in the same by a screw r^3 and which is provided at its outer end with a flange, between which and the end of the sleeve r is formed an annular groove, in which is inserted an integral sleeve on the actuating-arm S' , it being understood that said arm is adapted to swing or turn loosely on the sleeve, but is moved endwise therewith, when pressure is applied to the knob for the purpose of moving the carriage. Said spring r' is weaker than the carriage-actuating spring, so that the knob will be moved before the carriage is moved when pressure is applied to the knob. The platen-actuating arm is held normally disengaged from the ratchet-wheel by the said spring, which holds the knob or handle at the outer limit of its movement; but said arm is thrust inwardly in the act of moving the carriage backward to its starting-point, and this engagement will continue while the carriage is being moved toward the right and until the gear-segment S^2 , through the action of the second gear-segment and cam-plate, has been moved or swung laterally, as above described. As the actuating-arm is thus swung or moved it will carry with it the ratchet-wheel, and the platen will be thereby turned the desired distance for effecting the line-spacing. As soon as the carriage reaches the point for beginning a new line it will of course be held from returning by the action of the letter-spacing devices, and upon relieving the knob or handle from the pressure of the hand the said knob and the actuating-arm will be thrown outwardly by the knob-actuating

spring, thereby disengaging the arm from the ratchet-wheel and leaving the said arm free to swing backwardly to its original position in the subsequent forward movement of the carriage.

The construction described not only affords a simple means for automatically turning the platen or line-spacing, but it has the advantage also of leaving the platen free to be rotated by hand for adjusting the paper with respect to the striking-point of the types at the time the carriage stands at the extreme limit of its movement to the right and while the actuating devices are still engaged with the cam-plate S^5 , it being obvious that as soon as the actuating-arm has been released from the ratchet-wheel the automatic line-spacing devices will be entirely disconnected from the said ratchet-wheel, and the same and the platen may be freely turned.

The extent to which the platen is turned for line-spacing is determined by the extent of oscillatory movement of the actuating-arm, and provision is made for giving a variable line-spacing by varying the distance through which the actuating-arm is allowed to swing backward under the action of its actuating-spring S^4 , the same consisting of a movable stop which limits the rearward swing of the actuating-arm after it has been advanced to turn the platen. Such movable stop consists of a pivot-block S^6 , Figs. 8 and 11, which is mounted on the pivot-stud s^6 , secured in the end plate of the carriage, said block S^6 being adapted for contact with a pin or lug s^7 on the inner face of the gear-segment S^2 and having lateral and end contact-surfaces, either of which may be brought into position for engagement with said pin, so that the block forms a stop which when in one position affords a much greater swing to the actuating-arm than when in another position. As a means of actuating said block S^6 a gear-segment S^7 is attached thereto, said gear-segment intermeshing with a second gear-segment S^8 , which is mounted concentrically with the platen-shaft in position to intermesh with the first gear-segment. Conveniently the two gear-segments referred to are located in a space between the ratchet-wheel S^1 and the adjacent end plate of the machine, and the gear-segment S^8 is mounted directly on the platen-spindle. The second gear-segment is provided with a hand-lever s^8 , which projects outwardly beyond and above the ratchet-wheel in a position convenient for the finger of the operator. Suitable means are provided for limiting the movement of the hand-lever, the same consisting, as herein shown, of a projection s^9 on the inner face of said lever, which projection is adapted for contact with the edge of the end plate E' at either side of the same. (See Figs. 4 and 11.) These parts are so arranged that when said lever s^8 is at one limit of its movement the block will present its side surface, giving to the actuating-arm a movement sufficient for a full-line space, and when

at the other limit of its movement the block will present its end surface and give a shorter stroke for a half-line space.

In connection with the line-spacing device described a holding-pawl S^9 , held by spring-pressure in contact with the ratchet-wheel S^1 , is employed to retain the platen from turning while the printing is being accomplished, said holding-pawl being shown as consisting of an L-shaped lever, pivoted on a stud s^{10} and provided with an arm S^{10} , on which a spring S^{11} acts in a direction to hold the free end of the pawl, which carries an antifriction-roller s^{11} , against the teeth of the ratchet-wheel. In order to enable the platen to be turned or adjusted independently of the line-feeding devices, the ratchet-wheel is connected with a spindle by a friction device of the kind shown in a prior patent, No. 562,337, granted to me June 16, 1896, and consisting of an inner part s^{12} , which is rigidly attached to the spindle R , an outer annular part s^{13} , having a conical contact-surface engaging the periphery of the inner part, and a flat spring s^{14} , secured to the inner part and having spring-arms which bear against the outer part. In connection with such frictional device and the holding-pawl S^9 a device is provided for holding the said pawl so firmly against the ratchet-teeth as to prevent said ratchet-wheel from turning, so that by the application of suitable force to the platen-shaft through the hand of the operator applied to the knob R^2 at the right-hand end of the platen-spindle the platen may be turned while the ratchet-wheel remains stationary. Such holding device for the pawl consists of a hand-lever S^{12} , which is mounted on a pivot-stud s^{15} , and to which is attached a cam arm or projection s^{16} , arranged to act upon the pawl in such manner as to hold the same in engagement with the ratchet-wheel so long as pressure is maintained upon the hand-lever in a direction to hold the cam-arm against the pawl. Said cam-arm is so disposed with relation to the holding-pawl that no permanent engagement or interlocking of the cam-arm with the pawl will take place, so that the holding-pawl will be free to move and permit the turning of the ratchet-wheel so soon as the hand is removed from the lever, thereby insuring that the parts will be restored to condition for operation as soon as the hand-lever is relieved from pressure.

The spring S^{11} is shown as made in the form of a C-spring, which is connected at one end with a stud s^{17} on the end plate of the carriage and is engaged at its other end with the arm S^{10} of said pawl, said spring serving to retain the holding-pawl against the ratchet-wheel with sufficient force to prevent accidental turning of the platen, as has heretofore been common. In order, however, to enable the holding-pawl to be entirely disengaged from the ratchet-wheel when it is desired to rotate the platen in making corrections, filling blanks, &c., the lever S^{12} is pro-

vided with a second cam-arm S^{17} , which is adapted to bear against the arm S^{10} by a backward movement of the hand-lever, this cam projection being so arranged that it will be locked in engagement with the said arm S^{10} when the hand-lever is thrown backward, so that a constant pressure on the hand-lever will not be required to retain the locking-lever away from the ratchet-wheel.

As a means of holding the hand-lever S^{12} in an intermediate position and thereby leaving the holding-pawl free to move as the ratchet-wheel is turned I have provided said hand-lever with a spring-plug s^{18} , Fig. 13, which spring-plug is adapted to engage a conical recess in the outer face of the carriage end plate at the time when the hand-lever is in an intermediate position or free from both arms of the holding-pawl.

As an improved construction in the margin stop or device for limiting the rearward movement of the carriage in returning it to its starting-point, by which the width of the margin left on the sheet in printing is determined, devices are provided as follows:

T is a horizontally-arranged rod, which is mounted on the shifting or carriage-supporting frame at the rear of and parallel with the carriage-supporting guide-bar F , said rod T being mounted in guide-lugs tt , formed upon the said frame and being adapted to move endwise in said guide-lug and to also turn or rotate therein. Said rod T carries a stop-arm T' , which is adapted for contact with the arm or projection T^2 on the bottom of the carriage-frame, said arm or projection being herein shown as being cast integral with the lower frame-bar E^2 of the carriage. The shifting of said rod endwise in its bearings affords a means for changing the length of the line of the width of the margin at the left-hand side of the sheet. As a means of adjustably holding the rod in place it is provided at one side with a series of teeth or notches t^2 , adapted for engagement with a spring-actuated pawl T^2 , which bears against the notched side of the rod when the stop-arm is in operative position, but rests in contact with the smooth part of the rod and leaves the same free to be moved endwise when the rod is turned to carry the said arm out of its operative position. Said spring-detent T^2 is herein shown as consisting of a plate-spring secured by screws at its rear end to the top of the shifting frame and extending at its front end beneath the rod T , the said front end of the spring having a turned-up edge t^3 , Fig. 20, which is adapted for engagement with the notches of the rod T when the rod is turned to bring the notches downwardly. For convenience in adjusting the said rod T the same is shown as provided with a handle T^3 at its outer end and as being provided with a scale or index corresponding with the letter-space intervals of the machine, said scale or index acting in connection with a pointer t^4 on the right hand end of the shifting frame.

My invention also embraces an improved construction in the paper-carriage, intended for facilitating the insertion and adjustment of the paper and the holding of the same in contact with the platen, so that the paper will move with the platen as the same is turned to accomplish the line-spacing.

The parts above referred to are shown more fully in Figs. 4 to 12 and are constructed as follows: To hold or grip the paper against the lower surface of the platen where the advance edge of the paper first comes in contact with the platen in the act of inserting the sheet, I employ a presser-roller E^5 , which is mounted at its ends in bearing-blocks e' , attached to the forward and free extremities of the horizontally-arranged spring-arms E^6 , which are located at opposite ends of the carriage-frame and are rigidly attached to said frame at their rear ends. Said spring-arms serve to hold the lower presser-roller against the paper and to press the same firmly into contact with the platen. To release the said lower presser-roller from contact with the platen, as necessary for adjusting the paper after insertion and sometimes for convenience for inserting the advanced edge of the paper, a rock-shaft E^7 is mounted in the end frame-plates of the carriage and extends longitudinally thereof above the spring-arms. Said rock-shaft is provided near its ends with cam arms or projections e^2 , which are located over and adapted to act upon the spring-arm in a manner to depress the same when the rock-shaft is turned in a direction to carry the cam-arms against the spring-arms. Said rock-shaft is provided at one end with a hand-lever E^8 , by which it may be conveniently turned when desired. A guide-plate E^9 , Figs. 7 and 9, for the paper is also attached to said spring-arms, said guide-plate extending forwardly and upwardly from the said presser-roller for guiding the paper after it leaves the said roller. As a means for holding the paper in contact with the platen as it passes upwardly at the front surface of the same toward the striking-point of the type two other pressure-rollers E^{10} and E^{11} are located at the front of the platen above and below the center line of the same. The uppermost of said front rollers E^{10} is mounted at its ends in two upright supporting-arms e^5 , Fig. 12, the lower ends of which are pivoted to the machine-frame near the bottom of the same in such manner as to permit the said upper roller to move inwardly and outwardly or toward and from the platen. As shown in the drawings, the said arms e^5 are mounted on pivot-studs e^6 on the inner faces of the end plates of the carriage, the stud on the left-hand end plate being tubular for the passage of the trip-rod Q^2 , as seen in Fig. 7. The lowermost of the said two front rollers is journaled at its ends in two supporting-arms e^7 , which arms are pivoted at their upper ends to the inner faces of the supporting-arms e^5 below the pivots of the upper front roller, the pivotal connection being formed

by means of bearing-pivots e^8 on the ends of a horizontal rod E^{12} , which extends across the carriage below the roller E^{10} . Said bearing-pivots pass through the upper ends of the said arms e^7 and engage the arms e^5 . Said rod E^{12} affords a support for the upper edge of a guide-plate E^{13} , which guide-plate extends between the rollers E^{10} and E^{11} and serves to guide the advance edge of the paper after it passes the lower roller E^{11} , so that it shall properly pass around the front surface of the platen and beneath the upper roller E^{10} . For holding both of said rollers E^{10} and E^{11} against the platen with a spring or yielding pressure two leaf-springs E^{14} are employed, said springs being attached to the carriage and their lower ends with their upper free ends bearing inwardly upon the supporting-arms e^7 of the lowermost of the rollers at points between the ends of said arms. The springs E^{14} thus arranged operate to throw both sets of arms inwardly toward the platen by reason of the fact that they bear against the supporting-arms of the upper roller, below the pivots of the latter, as stated. Adjustable connection of said leaf-springs with the carriage is formed by means as follows: The lower parts of said springs are bent or carried inwardly over the rack-bar E^2 to points inside of the same and are there engaged with pivot-studs e^9 , Fig. 12, which are secured to the ends of the rack-bar E^2 . The portions of said springs which extend over the rack-bar are engaged by set-screws e^{10} , which pass through said bar and bear against the lower surfaces of the said springs, the screws thus arranged serving to hold the upper ends of the springs against the roller-supporting arms e^7 . By raising or lowering the set-screws the pressure of the free ends of the springs may be increased or diminished, it being obvious that the said springs will swing upon the studs e^9 when the set-screws are thus moved and thereby effect a movement of the free ends of the springs inwardly or outwardly, according to the direction in which the set-screws are moved.

A strip E^{15} , marked with a scale, is mounted on the free ends of the supporting-arms e^5 of the upper front roller, said arms being extended past the bearings of the said upper roller a sufficient distance to afford a proper support for the said strip. The strip is pivotally connected at its ends with the arms, so that its free edge may adjust itself with respect to the surface of the platen. Above the platen are located two paper-guides E^{16} , which are arranged obliquely and extend from points at or near the top of the roller rearwardly and inwardly, the outer ends of said inclined guides being attached to transverse guide-arms E^{17} , which extend to and bear at their front ends upon the scale-bar E^{15} . The inclined guides E^{16} and guide-arms E^{17} are mounted upon a supporting-rod E^{18} , which is attached to and extends between the carriage end plates at the rear of the platen, the said

guides being provided with two sockets e^{10} e^{11} , which embrace said supporting-rod and which have endwise-sliding but non-rotative connection with the rod, so as to retain the guide-arms in place over the platen, the rod and sockets preferably being made of square form for this purpose. The guide-arms E^{17} serve to guide the side edges of the paper as it advances over the top of the platen. The oblique guides E^{16} serve as guides for the forward edge of the sheet, the same, owing to their oblique arrangement and the attachment of their outer ends to the guide-arms, serving to insure that the front edge of the paper shall advance without catching or being retarded should it bend or buckle at its central part.

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

E^{19} , Fig. 9, is the upper and E^{20} the lower paper-guide, both made of sheet metal in the usual manner. The lower paper-guide is supported by the attachment of its ends to the end plates of the carriage-frame and is located in an inclined position, with its lower and forward edge near the lower presser-roller E^5 . The upper paper-guide is conveniently made of curved form and attached at its ends to the carriage and plates, with its front edge near the platen.

V V are the ribbon-spools, which are removably secured to the upper ends of upright shafts v , Figs. 25, 26, and 27, which shafts are located outside of the standards D' , said spools being so arranged that the ribbons extend over the top of the platen and through the several type-bars, Fig. 26. For securing the spools to the shaft v each shaft is provided with a collar v' , carrying an upright eccentric-stud v^2 , which is adapted to enter a vertical hole v^3 in the spool to afford driving connection between the shaft and the spool. The ribbon is wrapped around the spool V, and the said ribbon and spool are inclosed in a stationary cylindric casing V' , which is provided with an exit-slot V^2 for the ribbon. Said casing is preferably provided with a removable top or cover V^3 and is secured to the frame D of the type-bars by means of screws, Figs. 26 and 27, or other suitable securing means. The ribbon is guided after its exit from the casing V' by means of a slotted guide V^4 , the same consisting of a strip of metal bent into U form and provided with a shank by which it is attached to said casing V' .

The lower ends of the shafts v extend below the base-plate of the machine and are there engaged by driving connections arranged to operate upon either one or the other of the shafts, so that the direction of movement of the ribbon may be reversed whenever the ribbon has become entirely unwound from one of the spools. Such ribbon-spool-actuat-

ing mechanism is shown more clearly in Figs. 3 and 25 and is constructed as follows:

V^5 is a horizontal shaft arranged transversely of the machine and mounted in bearings v^4 , so as to rotate and also slide endwise thereon. The upright shafts V are provided on their lower ends with bevel gear-wheels v^5 , adapted to intermesh with similar gear-wheels v^6 on the ends of the shaft V^5 . Said shaft is made, however, of such length that only one pair of the gear-wheels $v^5 v^6$ can be engaged with each other at one time, the engagement of one bearing or the other being accomplished by endwise shifting of the shaft. To provide means for shifting said shaft endwise, a lever V^6 , Fig. 3, is pivoted beneath the base-plate A on a bracket v^7 , said lever v^6 being provided with a forked end which engages a collar v^8 on the shaft V^5 . The front end of said lever is provided with a knob v^7 , which rises through a slot in the base-plate, near the front thereof, so that the lever can be easily moved by the operator. A detent-spring V^8 is attached to the base-plate and engages at its end with one of a series of notches v^9 in the end portion of the lever v^6 , so as to hold said lever from movement except when intentionally shifted by the hand of the operator.

Rotary motion is given to the shaft V^5 from the intermediate bar O^3 of the space-bar frame by means as follows, Figs. 24 and 25: Mounted on the shaft V^5 is a toothed wheel V^9 , which forms part of a worm-gear and is engaged with a worm-shaft V^{10} , located above the said gear-wheel and at right angles with the shaft V^5 . Said worm-shaft is mounted in depending arms v^{10} , attached to the base-plate, and is provided between said arms with a ratchet-wheel v^{11} . Attached to said bar O^3 is an arm V^{11} , which carries two spring-pawls v^{12} and v^{13} . Said pawls rise from the arms V^{11} at opposite sides of the ratchet-wheel v^{11} , one of said pawls, v^{12} , having a plain end and the other, v^{13} , a hooked end, so that one pawl will engage and turn the ratchet in the upward movement of the spacing-bar frame and the other pawl will actuate or turn the ratchet in the descent of said frame.

It follows from the above-described construction that the shaft V^5 and one of the spool-shafts will be continuously turned as the space-bar is moved through the actuation of the keys, motion being transmitted to the space-bar from the worm-shaft and the worm-gear through the shaft V^5 in obvious manner. The worm gear-wheel V^9 is made of sufficient thickness to permit endwise movement of the shaft V^5 without disengaging said wheel from the worm-shaft.

The inking-ribbon is provided with guides adjacent to the printing-point, which guides are adapted to hold the ribbon over the point of impression at the time the impression is made, but serve to hold the ribbon normally away from the printing-point, so that the writing will be always in sight, except at the moment when the impression is being made.

As an improved construction in the ribbon-throw or device for actuating said guides I employ the construction which is illustrated in Figs. 1, 14, and 15 and is as follows: A rigid supporting-arm W is attached to the shifting carriage-frame and extends to a point in front of the platen. The upper part of said supporting-arm is provided with a horizontally-extending portion W' , to which are pivoted two links $w w$, which are of equal length and are arranged one behind the other and parallel with each other. To the upper ends of said links are pivoted a horizontally-arranged guide-plate W^2 , which extends toward the platen and is provided with two ribbon-guides or guide-loops $w' w'$, located at opposite sides of the printing-point. The pivoted links described afford movement of the guide-plate horizontally toward and from the printing-point, while maintaining the said plate constantly in its horizontal position. In actuating the guide-plate one of said links is provided at its lower end with a rigidly-attached rock-shaft W^3 , which is mounted in the standard W and is provided with a rigid crank-arm W^4 , to which oscillatory movement is communicated through suitable connections with the universal or spacing bar of the machine, the connection device herein shown consisting of a connecting-rod W^5 , which extends downwardly to and has pivotal engagement with an arm w^2 on the escape-lever N . The parts are so arranged that when any key is depressed and the escape-lever thereby moved the upper ends of the links and the guide-plate thereon will be swung toward the platen, and the inking-ribbon will be carried thereby over the printing-point, and when the keys are released and the type-bars rise said guide-plate and ribbon will be drawn backwardly away from the platen.

On the front frame-bar E^2 of the carriage is located an adjustable line-stop, combined with a bell-actuating stop, which is constructed as follows: X , Figs. 5, 34, and 35, is a sliding line-stop block, which is mounted on a depending longitudinal flange E^{21} , located on the right-hand end of the said bar E^2 , and is provided with a tooth x at one end adapted for engagement with either one of a series of notches in the lower edge of the flange E^{21} and also with a spring-arm x' , which engages a groove in the rear surface of said flange and acts to hold the tooth x yieldingly in engagement with the notches in the flange. The slide-block is preferably made of inverted- U form, so as to embrace the lower edge of the flange E^{21} , and the spring-arm x' is arranged on the inner face of the rear part of the block, with its rear end free and capable of movement in a vertical plane, so that the tooth x may be pushed down free from the notches in the flange against the tension of the spring-arm, which remains constantly in engagement with the said groove. Said slide-block X projects below the flange E^{21} and at its left-hand end is adapted for contact with the arm or

bracket F^{14} on the front edge of the shifting frame. The said slide-block also carries at its front side a bell-actuating stop X^2 , which is adapted to engage the upper end of a bell-hammer lever Y , Figs. 9 and 19, which is located in the path of said arm. The bell-hammer lever Y is shown as attached to a rock-shaft Y' , mounted in the shifting frame and provided at its rear end with an arm Y^2 , carrying a hammer y , adapted for contact with a bell Y^3 , which is secured to a bracket on the rear part of the machine-frame.

I claim as my invention—

1. In a type-writer, the combination with key-levers and a platen of U-shaped type-bars of graduated lengths, whose closed or looped ends carry type-heads, said type-bars being arranged in two groups with the axes of the type-bars in each group parallel with each other but with the axes of the type-bars in the two groups rearwardly divergent.

2. The combination, with a shifting frame and a carriage mounted thereon, of a rock-shaft operatively connected with the shifting frame and provided with two crank-arms, stationary guide-arms having curved guide-surfaces concentric with the crank-arms and independently-movable shifting-levers provided with pivoted actuating-links, said crank-arms and guides being provided with notches, and the said actuating-links having studs adapted to engage said notches.

3. The combination of a shifting frame provided with a rearward extension or stem, of rocking supports sustaining the carriage and a guide for the said stem, comprising a stationary standard, a guide-ring for the stem which is confined from lateral movement in the standard, and adjustable means limiting the upward movement of said ring.

4. The combination with the shifting-frame stem, and standard on the frame, of a rocking standard which supports the said stem, a guide-ring engaging the stem, a standard supporting the ring, means on the standard affording lateral adjustment of the said ring in the standard, and a set-screw acting on the ring to limit its upward movement.

5. The combination with the shifting-frame stem, and standard on the frame, of a rocking standard which supports the said stem, a guide-ring engaging the stem, a stationary standard on the frame, a guide-ring engaging the stem, said ring being held from lateral movement by the standard, and a removable cap on the standard, by which the ring is removably confined in engagement with the standard.

6. The combination with a paper-carriage, of a horizontally-movable shifting frame supporting said carriage, an upright shaft on the shifting frame provided with a pinion on its upper end adapted to engage said rack; said upper end of the shaft being movable toward and from the rack, an escape-wheel on the lower end of the shaft, an escapement-lever mounted on the shifting frame and provided

with stiff and limber pawls, a vertically-movable spacing-bar, and a yoke-piece, pivoted to the escapement-lever, and having vertically-sliding connection with the shifting frame, said yoke-piece having slotted connection with the spacing-bar.

7. The combination with a platen, a ratchet-wheel and a frictional connection between the ratchet-wheel and platen, of a spring-actuated holding-pawl engaging the ratchet-wheel, and a pivoted holding-detent provided with a hand-lever and adapted to engage the holding-pawl to throw it into contact with the ratchet-wheel, said detent being so disposed with respect to the said pawl as to prevent the parts from having locking engagement with each other.

8. The combination with a platen, a ratchet-wheel, and a frictional connection between the ratchet-wheel and platen, of a spring-actuated holding-pawl engaging the ratchet-wheel and a holding-detent provided with a hand-lever and two opposite arms or projections one of which is adapted to engage the holding-pawl to force it against the ratchet-wheel and the other of which engages an arm on the holding-pawl to hold the latter away from said wheel.

9. The combination with a platen, a ratchet-wheel and a frictional connection between the ratchet-wheel and platen, of a spring-actuated holding-pawl engaging the ratchet-wheel, a holding-detent provided with a hand-lever and two opposite arms or projections adapted for engagement with the holding-pawl and an arm on the same, and a spring-detent applied to retain the holding-detent normally in its central position.

10. The combination with an endwise-movable carriage and a rotating platen thereon, of automatic line-spacing mechanism, comprising a ratchet-wheel on the platen-shaft, an oscillatory, endwise-movable, spring-actuated, platen-actuating arm, a sliding knob on the platen-shaft by which the actuating-arm is given endwise movement, an oscillatory gear-segment mounted concentrically with the platen-shaft and with which the actuating-arm has endwise-sliding engagement, a second oscillatory gear-segment, mounted on the carriage and intermeshing with the first-mentioned gear-segment, and means on said second gear-segment operating to give movement thereto when the carriage is moved endwise.

11. The combination with an endwise-movable carriage and a rotating platen thereon, of automatic line-spacing mechanism, comprising a ratchet-wheel on the platen-shaft, an oscillatory, endwise-movable, spring-actuated platen-actuating arm, a sliding knob on the platen-shaft by which the actuating-arm is given endwise movement, an oscillatory gear-segment, mounted concentrically with the platen-shaft and with which the actuating-arm has endwise sliding engagement, a second oscillatory gear-segment, mounted on

the carriage-frame and intermeshing with the first-mentioned gear-segment, and a cam on the machine-frame, acting on the said second segment to turn the same in the endwise movement of the carriage.

12. The combination with an endwise-movable carriage and a rotating platen thereon, of automatic line-spacing mechanism, comprising a ratchet-wheel on the platen-shaft, an oscillatory, endwise-movable, spring-actuated, platen-actuating arm, a sliding knob on the platen-shaft, by which the actuating-arm is given endwise movement, an oscillatory gear-segment mounted concentrically with the platen-shaft and with which said actuating-arm has endwise sliding engagement, a second oscillatory gear-segment, intermeshing with the gear-segment first mentioned and provided with a rigid arm, a spring applied to turn said gear-segments in one direction, and a cam-plate provided with an oblique cam edge, adapted to act on said rigid arm in the endwise movement of the carriage.

13. The combination with an endwise-movable carriage and a rotating platen thereon, of automatic line-spacing mechanism, comprising a ratchet-wheel on the platen-shaft, an oscillatory, endwise-movable, platen-actuating arm, a sliding knob on the said shaft having rotative engagement with the said arm, a spring applied between the knob and shaft holding the knob normally at the outward limit of its movement, an oscillatory gear-segment mounted concentrically with the platen-shaft, with which the actuating-arm has endwise sliding engagement, a second oscillatory gear-segment mounted on the carriage and intermeshing with the first-named gear-segment, and means acting on said second gear-segment to give movement thereto when the carriage is moved endwise.

14. 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, an oscillatory, endwise-movable, platen-actuating arm, a sliding knob on said shaft by which the actuating-arm is given endwise movement, an oscillatory gear-segment mounted concentrically with the platen-shaft and with which said actuating-arm has endwise sliding engagement, a second oscillatory gear-segment mounted on the carriage and intermeshing with the gear-segment first mentioned, means acting on said second gear-segment in the endwise movement of the carriage, operating to turn said gear-segments, and a pivoted stop for one of said segments, having a plurality of stop-surfaces at different distances from the pivot thereof.

15. 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, an oscillatory, endwise-movable, platen-actuating arm, a sliding knob on said shaft by which the actuating-arm is given end-

wise movement, an oscillatory gear-segment mounted concentrically with the platen-shaft and with which said platen-actuating arm has endwise-sliding engagement, a second, oscillatory gear-segment mounted on the carriage and intermeshing with the gear-segment first mentioned, means acting on the second gear-segment in the endwise movement of the carriage, operating to turn said gear-segments, a pivoted stop, provided with stop-surfaces at different distances from its pivot, a gear-segment attached to said stop, and a pivoted stop-actuating arm, provided with a gear-segment which intermeshes with that on the stop.

16. The combination with an endwise-movable paper-carriage and a frame supporting the same provided with guides for the carriage, of a margin-stop consisting of a rod mounted to rotate and slide endwise in the frame, said rod being provided at one side with notches and having an arm for contact with the carriage, and a spring-pawl consisting of a flat, metal spring attached at one end to the frame and bent at its free end to form a tooth which bears against the said rod.

17. The combination, with a paper-carriage, a platen mounted therein, and type-bars which strike downwardly in the platen, of a presser-roller located beneath and pressing upwardly against the platen, spring-arms attached to the carriage and provided at their free ends with bearings for said presser-roller, and a rock-shaft mounted in the carriage above said spring-arms and provided with cam-arms which act upon the spring-arms to depress the roller away from the platen, and provided also with a hand-lever for turning the same.

18. The combination with a paper-carriage and a platen mounted therein, of a presser-roller located beneath and pressing upwardly against the platen, spring-arms attached to the carriage and provided at their free ends with bearings for said presser-roller, a rock-shaft mounted in the carriage above said spring-arms and provided with cam-arms which act upon the spring-arms to depress the roller away from the platen, and a guide-plate attached to the ends of said spring-arms and arranged to guide the edge of the paper after it has passed said roller.

19. The combination, with a paper-carriage and a platen mounted therein, of two presser-rollers for holding the paper against the platen as it approaches the striking-point of the type, a pair of arms pivoted to the ends of the carriage and carrying one of said rollers, a second pair of arms pivoted to the first-named arms between the ends of the latter, and carrying the other of said rollers, and springs acting on said second pair of arms, between the ends of the same, and acting to throw both rollers toward the platen.

20. The combination, with a paper-carriage and a platen mounted therein, of two presser-rollers for holding the paper against

the platen, a pair of arms pivoted to the carriage and carrying one of said rollers, a second pair of arms, pivoted to the first-named pair between the ends of the same, and carrying the other of said rollers, leaf-springs, each connected at one end with the carriage-frame and bearing at its opposite end against the second pair of springs between the ends thereof, and set-screws bearing against said springs for adjusting the tension thereof.

21. The combination, with a paper-carriage and a platen mounted therein, of two presser-rollers for holding the paper against the platen, a pair of arms, pivoted to the carriage-frame and carrying one pair of said rollers, a second pair of arms, pivoted to the first-named pair between the ends of the same and carrying the other of said rollers, springs acting against the second pair of arms to hold both rollers against the platen, and a guide-plate supported by said second pair of arms between the rollers.

22. The combination, with a carriage, a platen, and type-bars which strike downwardly on the platen, of a presser-roller located below the platen and held by spring-pressure in contact therewith, means for throwing the said roller away from the platen, two rollers located at the front of the platen, and held against the same by spring-pressure, upper and lower paper-guides located at the rear of the platen and lower presser-roller, a guide-plate located between the lower roller and the front rollers, and a guide-plate located between the front rollers.

23. The combination, with a paper-carriage, a platen mounted thereon and type-bars which strike downwardly upon the paper, of a presser-roller located at the front of the platen, arms pivoted to the carriage and carrying said roller at their upper ends, springs applied to said arms for holding the roller against the platen, a scale-bar mounted on said arms above the said roller, a supporting-bar attached to the carriage at the rear of the striking-point, and oblique guides having sliding engagement with said supporting-bar and bearing at their forward ends upon said scale-bar.

24. The combination with a paper-carriage, a platen mounted therein, type-bars which strike downwardly upon the platen, and a shifting frame carrying the platen and the space-bar, of ribbon-spools mounted on the machine-frame and supporting a ribbon lengthwise of the platen, a ribbon-guide engaging the central part of the ribbon and having a horizontal movement toward and from the striking-point of the type-bars, a supporting-standard mounted on the shifting frame, two links pivoted to the said standard at their lower ends, an escape mechanism for the carriage comprising an escape-wheel and an escapement-lever which is mounted on the shifting frame, and moves in a vertical plane and has operative connection with the space-bar, and a connection between the said escape-

ment-lever and the ribbon-guide consisting of a crank-arm attachment to one of said links, and a connecting-rod uniting said crank-arm with the escapement-lever.

25. The combination with the machine-frame and space-bar, of a ribbon-feeding mechanism comprising two ribbon-spool shafts, an endwise-movable driving-shaft provided with beveled gears on the ribbon-spool shafts, a hand-actuating shift-lever engaging the driving-shaft to give endwise movement thereto, a worm-shaft arranged transversely with respect to the driving-shaft, a worm-wheel on the worm-shaft engaging the driving-shaft, a ratchet-wheel on the worm-shaft and a pawl which is connected and moves with the space-bar and acts on said ratchet-wheel to turn the worm-shaft.

26. A ribbon-feeding mechanism comprising two ribbon-spool shafts, stationary ribbon-cases into which the shafts extend, said cases being provided with removable covers and with exit-slots for the ribbon, and means on the spool-shafts for detachably securing the ribbon-spools thereto.

27. A ribbon-feeding mechanism comprising two ribbon-spool shafts, stationary ribbon-cases into which the shafts extend, said cases being provided with removable covers and exit-slots for the ribbon, ribbon-guides located outside of the said cases, and means on the shafts for securing the ribbon-spools thereto.

28. The combination, with the key-levers and space-bar, of a rock-shaft to which the space-bar is rigidly attached, and a lifting-spring for the space-bar, said spring being of volute form and attached at its inner end to said rock-shaft and having at its outer end adjustable connection with the machine-frame.

29. The combination, with the key-levers and space-bar, of a spring for controlling the downward movement of the bar, said spring being of "U" form and having its lower end secured to the machine-frame and its upper end extending horizontally beneath the space-bar.

30. The combination, with a key-lever, type-bar, and connecting-rod, of a spring-arm attached to the side of the key-lever and engaged with the connecting-rod at its free end, said spring-arm having a transverse slot near its free end, and the key-lever having a stud which engages the said slot to confine the spring-arm from lateral movement.

31. The combination, with a key-lever, type-bar, and connecting-rod, of a spring-arm attached to the key-lever and provided at its free end with a prong for engagement with the connecting-rod, said key-lever being provided with a notch to receive the end of the connecting-rod, and with a tongue which may be bent laterally to retain the connecting-rod in engagement with the said prong on the spring-arm.

32. The combination, with the paper-carriage, shifting frame, and carriage-actuating

spring of means for holding the shifting frame from movement under the action of the said spring, comprising a transverse, vertical, guide-flange on the machine-frame, a grooved block secured to the lower surface of the shifting frame and provided with an antifriction-roller adapted to bear against said guide-flange, and means for adjusting said guide-flange laterally.

33. The combination, with the paper-carriage, shifting frame and carriage-actuating spring, of means for holding the shifting frame from lateral movement comprising a standard on the machine-frame, provided with two parallel guide-flanges, and a block attached to the shifting frame and extending downwardly between said flanges, said block being provided with an antifriction-roller which bears against the left-hand guide-flange, said left-hand guide-flange being separated from the body of the standard by a slot, and having an adjusting-screw by which its upper end may be adjusted laterally.

34. The combination, with a paper-carriage of a line-stop comprising a depending laterally-grooved, notched flange on the carriage, and a stop-block having sliding engagement with said flange and provided with a tooth adapted for engagement with the notches in said flange; said block being provided with a spring-arm which engages the groove in the flange and acts to retain the tooth with one of the notches of the flange.

35. The combination, with a paper-carriage, of a line-stop and alarm mechanism, comprising a depending, laterally-grooved, notched flange on the carriage, a stop-block having sliding engagement with said flange and provided with a tooth adapted for engagement with the notches of the flange, said block being provided also with a spring-arm which engages the groove in the flange and with a bell-actuating stop, an alarm-bell, and a bell-hammer lever located in position for actuation by said bell-actuating stop.

36. The combination, with a shifting frame and carriage mounted thereon, of a rock-shaft operatively connected with the shifting frame, and provided with a crank-arm having a holding-notch, a stationary part having a notch which is opposite the notch in the crank-arm when the latter is at one limit of its movement, a shifting lever, a stud movable with the shifting lever and adapted for engagement with either of said notches, and means for confining the said stud in the notch in the crank-arm when the notch in the latter is moved away from the notch in the stationary part.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 23d day of August, A. D. 1897.

THOMAS OLIVER.

Witnesses:

C. CLARENCE POOLE,
TAYLOR E. BROWN.