

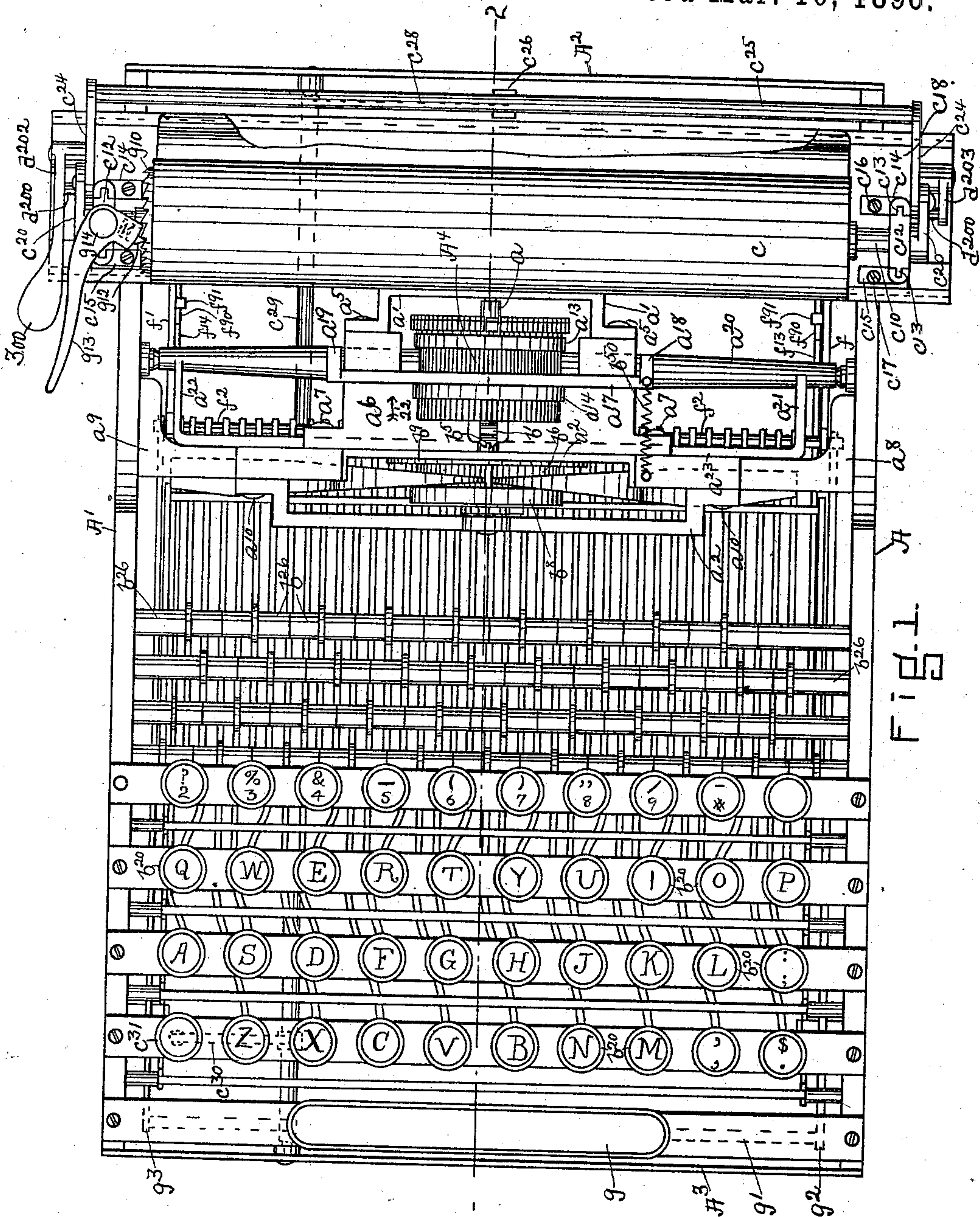
(No Model.)

3 Sheets—Sheet 1.

A. E. AYER.
TYPE WRITING MACHINE.

No. 555,917.

Patented Mar. 10, 1896.



WITNESSES.

Matthew M. Blunt.
J. Murphy.

INVENTOR.

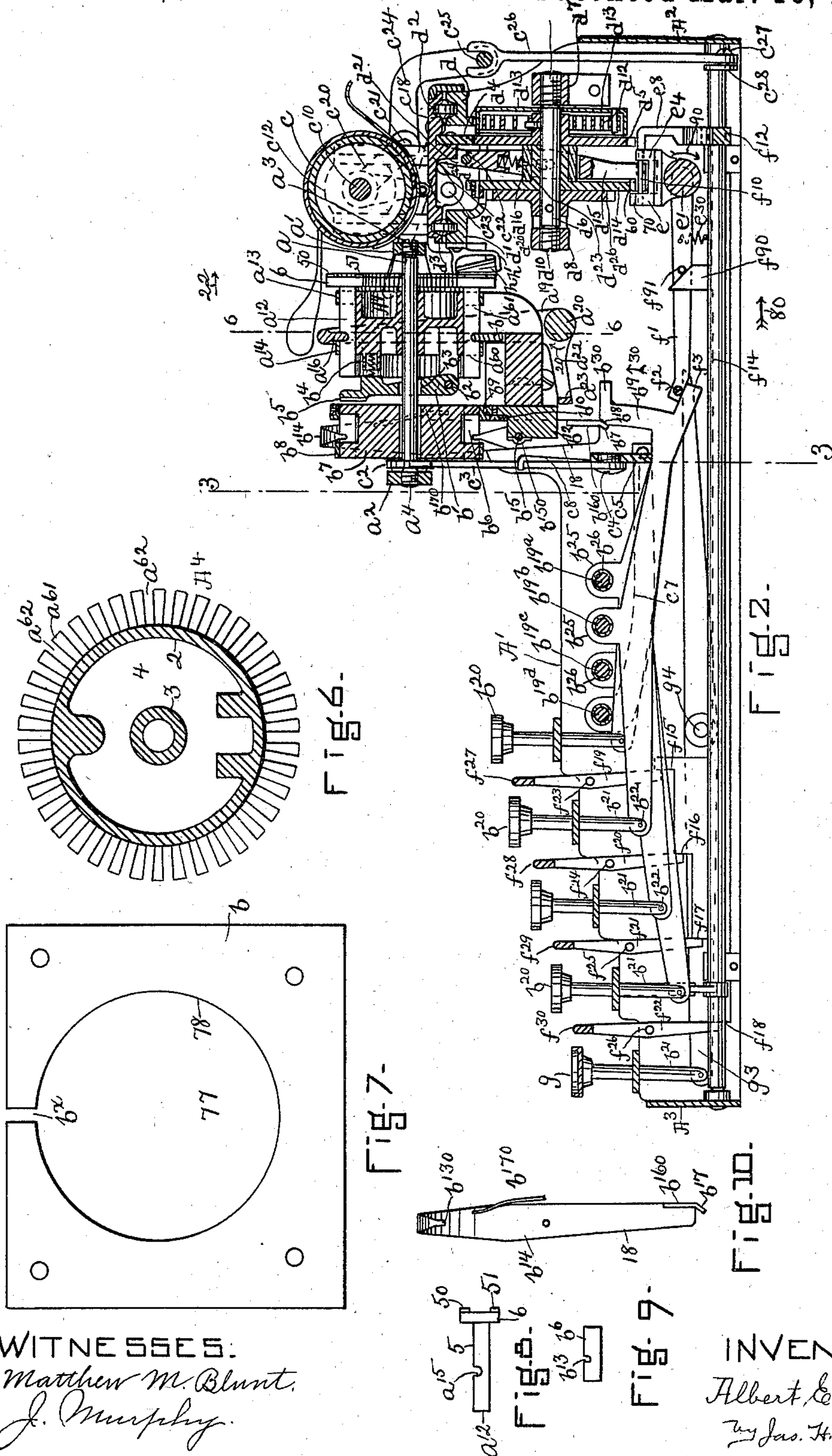
Albert E. Ayer
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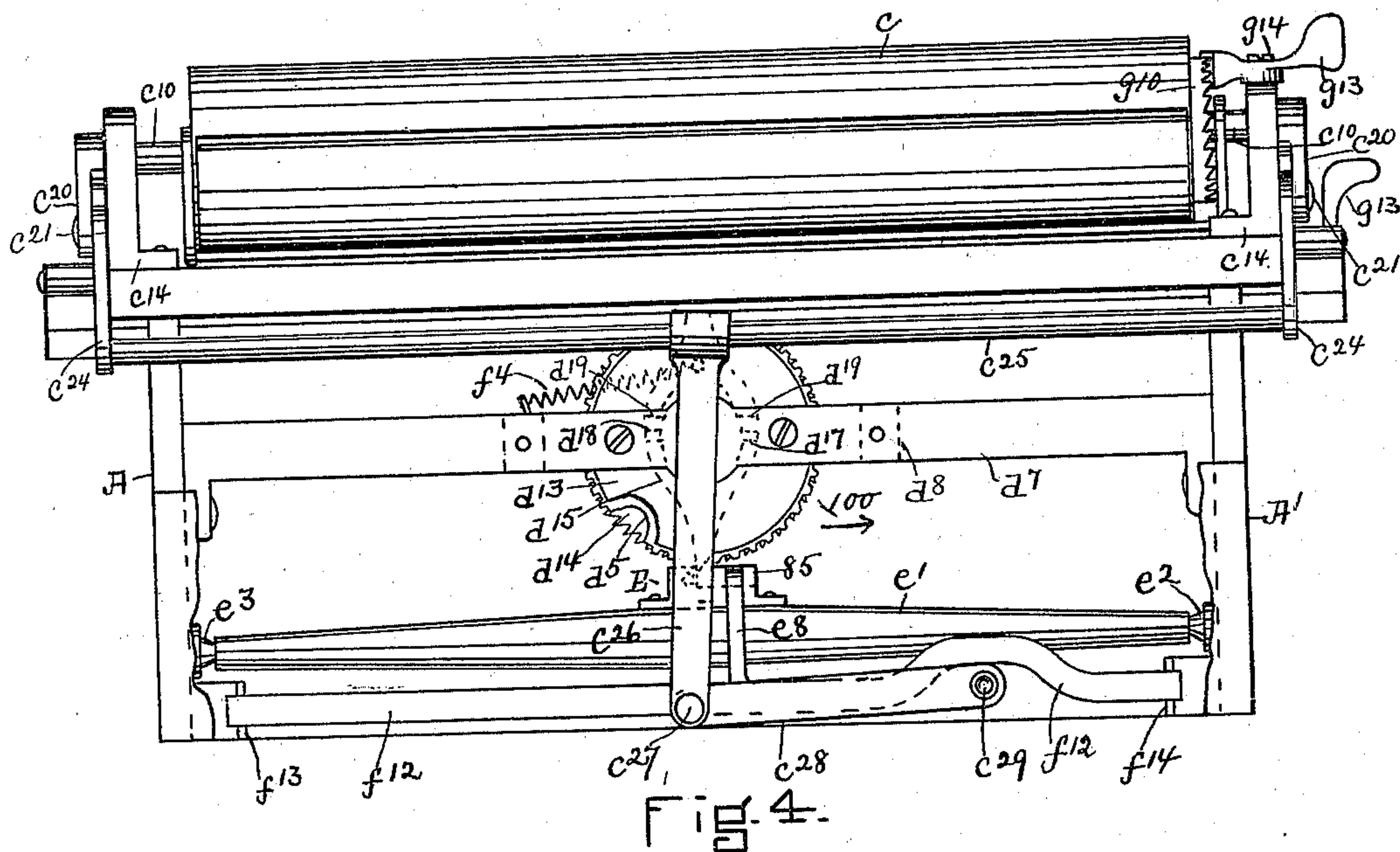
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3 Sheets—Sheet 3.

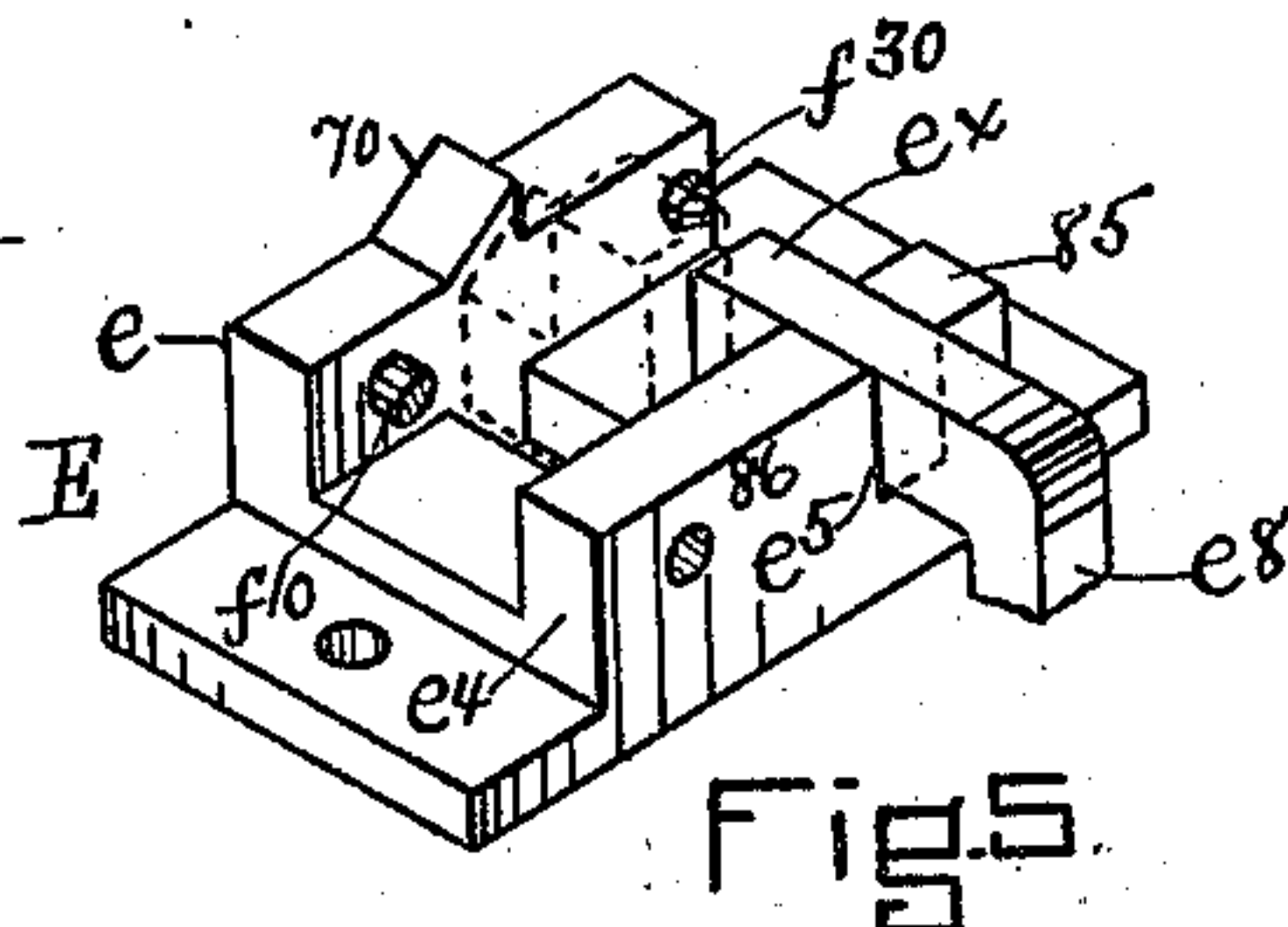
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INVENTOR -
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ATT'Y -



UNITED STATES PATENT OFFICE.

ALBERT E. AYER, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF TWO-THIRDS TO AMBROSE S. VOSE, CHESTER M. SPRAGUE, AND HENRY C. ADAMS, OF SAME PLACE.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 555,917, dated March 10, 1896.

Application filed March 8, 1895. Serial No. 540,940. (No model.)

To all whom it may concern:

Be it known that I, ALBERT E. AYER, residing in Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Type-Writing Instruments, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to type-writing instruments, and has for its object to improve the construction of the same, whereby a simple, efficient and easily-operated instrument is obtained.

In accordance with this invention the instrument is provided with a rotary type-carrier having a plurality of independently-movable type-bars, which, for the best results, are provided at their ends with a plurality of type. The rotary type-carrier has co-operating with it a plurality of movable stops, by which the rotation of the type-carrier may be arrested at any predetermined point to effect the proper positioning of a selected character.

The instrument is also preferably provided with a paper-carrying roll, bodily movable, as will be described, so as to co-operate with a plurality of type on each type-bar. The bodily movement of the paper-carrying roll may and preferably will be accomplished in a manner as will be described.

The instrument is further provided with a keyboard comprising an individual key for each character carried by the type-carrier, and with the usual spacer mechanism and preferably with an auxiliary spacer mechanism for each character-key, for a purpose as will be described.

The instrument is further provided with a carriage-feed mechanism of a novel construction, as will be described.

These and other features of this invention will be pointed out in the claims at the end of this specification.

Figure 1 is a top or plan view, with the parts broken away, of a sufficient portion of a type-writing instrument embodying this invention to enable it to be understood. Fig. 2 is a longitudinal section of the instrument shown in Fig. 1 on the line 2 2; Fig. 3, a transverse section on the irregular line 3 3, Fig.

2, looking toward the right; Fig. 4, a rear elevation of the instrument shown in Fig. 1, the back plate of the framework of the machine being broken away; Fig. 5, a detail to be referred to; Fig. 6 a transverse section, on an enlarged scale, of the type-carrier shown in Fig. 1, the section being taken on the line 6 6, Fig. 2; Fig. 7, a detail, on an enlarged scale, of the type-bar-locking device to be referred to; Fig. 8, a detail of one of the type-bars shown in Figs. 1 and 2; Fig. 9, a detail of one of the stop bars or pins, and Fig. 10 a detail of one of the stop-pin-operating levers.

The framework of the machine, which supports the operating parts, comprises essentially the side frames or bars $A A'$, the end bars or pieces $A^2 A^3$, and intermediate cross-bars, which will be more specifically referred to hereinafter, the said framework being of any usual, suitable or desired material.

The framework of the machine supports in a suitable manner, as will be described, a revoluble type-carrier A^4 , preferably made as herein shown, and consisting of a cylindrical drum, having its rim 2 connected to the hub 3 by a web or plate 4, (see Fig. 6,) the said rim being constructed, as will be described, to support a plurality of movable type-bars a^{12} . The cylindrical drum is fast on a shaft or arbor a , mounted to revolve in two yoke-shaped pieces $a' a^2$, (see Figs. 1 and 2,) the said shaft or arbor being herein represented as supported by centering-screws $a^3 a^4$. The yoke-shaped piece a' , in the present instance, is shown in Fig. 1 as secured by screws a^5 to one end of an open or substantially U-shaped plate a^6 , fastened, as by screws a^7 , to arms $a^8 a^9$, secured to the side pieces, $A A'$, respectively. The arms $a^8 a^9$ and the center piece a^6 practically form one of the transverse supporting-bars of the framework above referred to. The yoke-shaped piece a^2 is also secured to the arms $a^8 a^9$, as by screws a^{10} .

The type-carrier A^4 supports a plurality of independently-movable type-bars a^{12} , which are preferably made as herein shown, and each comprises a shank 5 and a head 6.

In the present instance the rim 2 of the revoluble type-carrier, for sake of lightness, is provided on its outer surface with annular flanges $a^{60} a^{61}$, having a plurality of axially-

extended slots a^{62} , into which the shanks 5 of the type-bars are fitted, the heads 6 of the type-bars projecting beyond one end or side of the type-carrier.

5 In the present instance the type-bars are retained in slots a^{62} on the outer side or periphery of the carrier A^4 by means of two annular bands or rings $a^{13} a^{14}$, (see Figs. 1 and 2,) which prevent the type-bars a^{13} from lifting out of
10 their slots and which leave an open space between them on the outside of the cylinder or drum, as clearly shown in Fig. 1. Each type-bar has its shank 5 provided with a notch, groove, or depression a^{15} , and in the normal
15 or retracted positions of the independently-movable type-bars the notches or depressions a^{15} of the various type-bars supported by the carrier A^4 register with one another, so as to form an annular groove about the outer cir-
20 cumference of the rotatable type-carrier A^4 and into which annular groove extends a finger or projection a^{16} on a cross-bar a^{17} forming part of a rocking frame, it being secured to or forming part of the upright cranks or
25 arms $a^{18} a^{19}$ on a rock-shaft a^{20} , suitably supported at its ends at the sides $A A'$ of the framework.

The rock-shaft a^{20} is adapted to be rocked in the direction indicated by the arrow 20,
30 Fig. 2, so as to move the cross-bar a^{17} in the direction indicated by arrow 22, Figs. 1 and 2, when each individual character-bar is actuated, and this result may be effected after the manner herein shown, the rock-shaft a^{20}
35 having secured to it cranks or arms $a^{21} a^{22}$, which are connected by a bar a^{23} extended transversely across the machine, as clearly shown in Fig. 1. As the rock-shaft a^{20} is moved in the direction indicated by arrow 20,
40 the particular type-bar with which the finger or projection a^{16} is in engagement will be moved in the direction indicated by arrow 22, and in order that only the particular type-bar with which the finger or projection a^{16} is
45 engaged may be moved in the direction indicated by arrow 22, as described, I have provided the rotary type-carrier with a locking device for the remaining type-bars carried by it.

50 The locking device referred to may and preferably will be made as herein shown, it consisting of a plate b , (see Fig. 7,) having an annular opening 77 to enable it to fit over the type-carrier A^4 and provided with the slot or
55 opening b^x , for a purpose as will be described, the said plate being suitably secured to the framework of the machine substantially at right angles to the type-carrier.

The plate b is preferably of substantially
60 the same thickness as the width of the groove a^{15} , and for the best results the edge or wall 78 of the opening 77 is made rounding, as shown in Fig. 2, to fit the annular groove formed by the depressions a^{15} in the type-bars.
65 The slot b^x is made substantially equal to the width of the type-bar and the finger a^{16} , so that the finger a^{16} in its normal position may

project into the slot b^x and into the groove or depression a^{15} in line with the said slot, the
said finger or projection, in the normal posi- 70
tion of the rocking frame carried by the shaft a^{20} , being in a substantially vertical line with the plate b , as represented in Fig. 2. It will thus be seen that the wall or edge 78 of the
opening 77 enters into the groove a^{15} of all the 75
type-bars carried by the carrier A^4 , with the exception of the particular bar which is in line with the finger or projection a^{16} , and that all the type-bars, except the particular type-bar
in engagement with the finger a^{16} , are pre- 80
vented from longitudinal or axial movement, so that when the rock-shaft a^{20} is moved in the direction indicated by arrow 20, Fig. 2, all the type-bars are locked against move-
ment, except the type-bar having the char- 85
acter it is desired to print.

The type-carrier A^4 has co-operating with it an arresting or stopping mechanism, by which the said type-carrier may be arrested at any predetermined position in its revolu- 90
tion to bring a predetermined or selected type-bar in line with the finger a^{16} and into position to effect the printing of the character selected.

The stopping mechanism referred to con- 95
sists essentially of a stop-arm b' , revoluble with the type-carrier and herein represented as pivoted thereto, as at b^2 , the said arm being provided with a slot or opening b^3 through
which the shaft a is extended loosely, the said 100
slot or opening being of sufficient diameter or size to permit of a pivotal movement of the stop-arm b' without engagement of the said arm with the said shaft. The stop-arm b' is
normally pressed outward away from the 105
type-carrier by a spring b^4 , and at its upper end the said stop-arm is provided with a slotted nose-piece b^5 , the opposite sides of which are rounded or beveled, as clearly shown in Fig. 1, for a purpose as will be described. The 110
spring b^4 permits the stop-arm b' to be moved on its pivot toward the type-carrier, but normally acts to hold the upper portion of the stop-arm outward and into position to be en-
gaged by one of a plurality of sliding stop 115
bars or pins b^6 , fitted into axial slots or openings in the flanges of a stationary wheel b^7 , suitably secured to or supported by a cross-bar of the frame.

In the present instance the stop pins or 120
bars b^6 are shown as secured on the periphery of the stationary disk or wheel b^7 by an annular band b^8 and by a plate b^9 , the latter being shown in Fig. 2 as secured to the cross
bar or plate b^{12} of the framework, as by screws 125
 b^{10} , only one of which is shown in Fig. 2. Each stop-pin b^6 is provided with a notch or depression b^{13} , (see Fig. 9,) into which projects a finger b^{130} , on the end of a pin-operating
lever b^{14} , (see Fig. 10,) it being understood 130
that there is a separate lever for each stop-pin, all of the said levers in the present construction of machine being mounted in a substantially vertical plane to swing on a rod

b^{15} (see Figs. 2 and 3) extended across the machine and suitably supported by boxes or bearings b^{150} , attached to the plate or bar b^{12} , forming part of the framework and best shown in Figs. 2 and 3.

The lower end or arm 18 of each pin-operating lever b^{14} (see Fig. 2) is brought down into a substantially vertical plane extending transversely of the machine, and for the best results I prefer to provide the lower arm of each pin-operating lever with a bar b^{160} , (see Figs. 2, 3, and 10,) having an inclined finger or projection b^{17} , with which co-operates an inclined or cam-shaped surface b^{18} of a lever b^{19} , which is operated by a finger-key b^{20} , the said key having its stem b^{21} pivotally connected to the lever b^{19} , as at b^{22} . (See Fig. 2.)

In practice there will be as many levers b^{19} as there are type-bars carried by the type-carrier A^4 , and for convenience in arrangement I have shown the finger-keys b^{20} as arranged in four rows or banks, comprising ten keys to a row, the levers b^{19} for the various rows being pivotally mounted upon transverse rods or bars b^{19a} b^{19b} b^{19c} b^{19d} . To facilitate construction, each lever b^{19} is provided with an ear b^{25} , having a suitable hole, through which its supporting or pivotal rod is extended, and in order to obtain perfect alignment of the levers b^{19} they are separated on their respective rods by short tubes or collars b^{26} , extended through the ears b^{25} . (See Figs. 1 and 2.)

The operation of the stopping mechanism for the type-carrier may be briefly described as follows: When a finger-key—as, for instance, a finger-key in the second row—is depressed, the lever b^{19} connected therewith is turned on its pivot b^{19b} , and the front end of the lever is moved upward in the direction indicated by arrow 30, Fig. 2, which upward movement, by reason of the cam or inclined surface b^{18} , produces a rocking movement of the pin-actuating lever b^{14} in engagement with this particular lever b^{19} , the lever b^{14} moving on its pivot b^{15} , so as to cause its upper portion or end in engagement with the particular stop bar or pin corresponding to the particular finger-key depressed to be moved in the direction indicated by arrow 22, Fig. 2, and to project the end of the stop pin or bar b^6 beyond what may be termed the “front face” of the disk or wheel b^7 , so that the said projecting pin will be engaged by the slotted nose of the stop-arm b' when in the revolution of the type-carrier A^4 the said arm strikes the projecting stop-pin.

In order to facilitate the engagement or entrance of the stop-pin into the slot in the nose-piece b^5 of the stop-arm, the sides of the said nose-piece are preferably made rounding or inclined, as represented in Fig. 1, so that as an inclined side engages the stop-pin the stop-arm b' will be moved backward with a minimum amount of friction and without imparting a severe blow to the machine, until the slot in the nose-piece has been brought in line

with the projecting stop-pin, and when in this latter position the spring b^4 will throw the stop-arm b' outward, so that its slotted nose will embrace or clutch the projecting stop-pin, and the revoluble type-carrier will be arrested in its movement in the predetermined or selected position—that is, when a particular stop-pin corresponding to a particular character-key b^{20} is engaged with the stop-arm the type-bar having the character corresponding to the key b^{20} which has been operated will be in engagement with the finger a^{16} .

The apparatus is now in condition to effect the printing of the selected character, which is accomplished by the further upward movement of the front end of the lever b^{19} , which lever, as herein shown, is provided with a finger b^{30} , (see Figs. 2 and 3,) which engages the cross-bar a^{23} and rocks the shaft a^{20} in the direction indicated by arrow 20 to project the selected type-bar a^{12} forward or toward the paper-carrying roll c , and thereby effect the printing of a selected character upon the paper carried by the said roll, which paper is not herein shown. When the character has been printed, the operator releases the finger-key b^{20} , and the latter may be restored to its normal position by a suitable spring b^{50} , (shown in Fig. 1 as secured to the crank or arm 18 and to the frame of the machine,) and on the upward movement of the finger-key b^{20} the lever b^{19} is brought back into its normal position, (represented in Fig. 2,) which leaves the pin-operating lever free to be returned to its normal position, preferably by a suitable spring b^{170} , the rock-shaft b^{20} being restored to its normal position by the spring b^{50} . The rock-shaft b^{20} , on its return movement, carries the type-bar which has been operated to effect the printing of the selected character back into its normal position. (Represented in Fig. 2.) The type-carrier A^4 is rotated by the operation of each finger-key b^{20} , and this may be effected after the manner herein shown, and which will now be described.

The type-carrier shaft a has fast on it at one end, which may be designated the “front” end, a star-wheel c^2 , with which engages a push pawl or lever c^3 , pivoted, as at c^4 , to a cross-bar c^5 , which is extended transversely across the machine and which may normally rest upon the levers b^{19} , the said cross-bar having secured to or forming part of it side bars c^6 c^7 , (see Figs. 1 and 3,) which are pivotally mounted in any suitable or desired manner—as, for instance, upon one of the pivotal rods for the levers b^{19} . In the present instance the arms c^6 c^7 are represented as curved (see Fig. 2) and as mounted upon the pivot-rod b^{19a} . The pivoted pawl c^3 is normally held in engagement with the star-wheel c^2 by suitable means, (herein shown as a spring) fastened at its lower end to the cross-bar c^5 and having its upper end bent to engage the push-pawl c^3 , so as to keep the said pawl in engagement with the star-wheel c^2 .

In this construction it will be seen that when a finger-key b^{20} is depressed and the lever b^{19} connected therewith has its front end elevated or moved in the direction indicated by arrow 30 the cross-bar c^5 will be lifted and the pawl c^3 will be carried upward until its end has passed out of engagement with the star-wheel. This upward movement of the push-pawl c^3 will impart to the type-carrier shaft a sufficient force to cause it to revolve until stopped by the engagement of the stop-arm b' with a stop-pin. When the pressure upon the finger-key b^{20} has been relieved and the lever b^{19} has returned to its normal position, the cross-bar c^5 may be returned to its normal position, either by gravity or positively by means of a spring, (not shown,) and on its return movement the push-pawl c^3 will again engage the star-wheel when the cross-bar c^5 has reached its normal position and is at rest, and at such time the spring c^8 will hold the pawl c^3 in engagement with the star-wheel c^2 and thereby hold the type-carrying shaft stationary until again operated by the depression of a finger-key.

In order to enable the type-carrier A^4 to be made of a minimum size in a machine having a maximum number of characters, each type-bar a^{13} is preferably provided with two independent characters located at or near the opposite ends of the head 6, the said characters being herein marked 50 51. (See Figs. 2 and 8.) For the purpose of explanation the character 51 may be supposed to be of the lower case, and the character 50 of the upper case. In the normal position of the apparatus the lower-case character 51 is in position to engage the paper-carrying roll c , and in order that the upper-case character 50 may be printed, the paper-carrying roll is made movable bodily, so as to elevate the roll and bring a line upon which the characters are printed in a horizontal plane with the upper-case character 50. This result may be accomplished after the manner herein shown and which will now be described. The paper-carrying roll c has its shaft c^{10} mounted in vertically-movable bearings c^{12} , and inasmuch as the bearings for both ends of the roll are alike I will specifically describe but one. Each bearing c^{12} (see Figs. 1 and 2) is shown as provided with side ribs c^{13} , extended into suitable guide ways or slots in a vertical frame, composed of the two bars c^{14} c^{15} , secured, as by screws c^{16} c^{17} , to a plate c^{18} , which latter constitutes the carriage proper for the paper roll. The shaft c^{10} for the rolls c is extended through the bearings c^{12} , and has secured to its opposite ends links or levers c^{20} , pivoted, as at c^{21} , to elbow-levers c^{22} , pivotally secured to the under side of the carriage c^{18} , as at c^{23} . (See Fig. 2.) The levers c^{22} at the opposite ends of the roll are provided with arms c^{24} , which are shown as bent downwardly beyond and at the back of the carriage c^{18} and which have their lower ends tied together by a bar or rod c^{25} . The links or levers c^{20} c^{22}

constitute what I prefer to designate as a "toggle-joint mechanism," by which the paper-carrying roll may be moved bodily upward. 70

The bar or rod c^{25} is engaged by the forked arms of an upright rod or link c^{26} , loosely pivoted at its lower end, as at c^{27} , (see Figs. 2 and 4,) to a crank or arm c^{28} on a rock-shaft c^{29} , having suitable bearings in the frame-work of the machine and extended longitudinally the length thereof, the said rock-shaft at the front end of the machine having a crank or arm c^{30} , (represented by dotted lines in Fig. 1,) to which is pivotally connected the stem of a finger-key c^{31} , which may be designated as the "upper-case key." The crank or arm c^{30} extends in an opposite direction from the crank or arm c^{28} , so that when the upper-case key is depressed the shaft c^{29} will be rocked so as to elevate the crank or arm c^{28} , thereby lifting the link c^{26} , and the upward movement of the link c^{26} carries upward the rod c^{25} and the arms c^{24} attached thereto, the upward movement of the arms c^{24} causing the levers c^{20} c^{22} to assume a position substantially in the same vertical plane, which causes the journal-bearings c^{12} to slide upward in their guideways until the roll c has been brought opposite to the upper-case character 50. The loose connection of the link c^{26} with the crank c^{28} permits its upper forked end to move away from and then toward the carriage, so as to permit the levers c^{20} c^{22} to assume their substantially vertical position. The forked arms of the links c^{26} permit the rod c^{25} to rock or turn on the inward movement of the arms c^{24} to bring the levers c^{20} c^{22} into substantially the same vertical plane. 90

When the paper-carrying roll has been elevated as described, it may be locked permanently in its elevated position in any suitable or desired manner, or it may be permitted to descend by gravity or otherwise as soon as the pressure upon the upper-case key c^{31} has been released. The paper-carriage, which is herein shown as a flat plate or table, may and preferably will be movable upon suitable transverse guide-bars d d' , (see Fig. 2,) and to enable the carriage to move with the least possible friction I prefer to provide the said carriage and its guide-bars with suitable grooves and to interpose between the said carriage and guide-bars in said grooves anti-friction rollers or balls d^2 d^3 . The paper-carriage c^{18} is provided with a feed mechanism by which the carriage and its paper roll are progressively advanced from one side of the machine to the other in its operation, and this feed mechanism may and preferably will be made as herein shown and which will now be described. 105

Referring to Fig. 2, the carriage c^{18} has secured to its under side a rack-gear d^4 of any suitable or usual construction, with which meshes a toothed wheel or gear d^5 , fast on a shaft d^6 having suitable bearings in cross-bars d^7 d^8 , the said shaft in the present instance being represented as having its ends 115

supported upon centering-screws d^9 d^{10} . The shaft d^6 is adapted to be rotated by means of a normally-wound-up spring d^{12} , located within a suitable box or case d^{13} , the said spring having one end secured to the said case, which is stationary, and is fastened in any suitable manner to the framework of the machine, and having its other end made fast to the shaft d^6 so as to revolve the same. The shaft d^6 has loose on it a ratchet-wheel d^{14} with which engages a tooth 60 at the lower end of a bar d^{15} , the said bar being hereinafter designated by me as the "feed-pawl."

The bar d^{15} is made substantially wide at or near its center, as represented by dotted lines, Fig. 4, and is provided with a central opening through which extends the hub of the ratchet-wheel d^{14} and a collar or thimble d^{16} encircling the said hub. The collar d^{16} has extended from it pins d^{17} d^{18} , (indicated by dotted lines in Figs. 2 and 4,) which pins enter substantially long slots d^{19} in the feed-pawl d^{15} , whereby the said pawl is permitted to have a sliding vertical movement for a purpose, as will be described. The feed-pawl d^{15} at its upper end is provided with a cup-shaped socket d^{20} , which co-operates with a rod d^{200} (see Fig. 1) extended across the machine and supported in ears d^{201} on levers d^{202} d^{203} suitably pivoted to the carriage c^{18} , the said levers and rod forming a release mechanism for the feed-pawl, as will be described.

The pawl d^{15} is normally held up into engagement with the rod d^{200} by a suitable spring d^{23} interposed between the pawl and the collar d^{16} , as shown in Fig. 2. The feed-pawl d^{15} is normally held upward with its tooth 60 in engagement with a tooth of the ratchet-wheel d^{14} by the spring d^{23} . The ratchet-wheel d^{14} , while normally loose on the shaft d^6 , may be rendered fast thereon, by means of a suitable pawl d^{25} (shown in section, Fig. 2,) which engages a ratchet wheel or disk d^{26} , fast on the shaft d^6 . This construction permits the ratchet-wheel d^{14} to be rotated in one direction and effects a movement of the carriage and remains substantially stationary while the carriage is being moved in an opposite direction.

The tooth 60 of the feed-pawl d^{15} is normally in engagement with a tooth of the ratchet-bar d^{14} , but it is adapted to be disengaged therefrom by a tooth 70 on a side bar e of a block, box or trough-shaped structure E, (see Figs. 2 and 5,) which is secured to a rock-shaft e' , the latter being extended transversely of the machine and supported on suitable bearings e^2 e^3 at its opposite ends. (See Fig. 4.)

The box or trough-shaped structure E may and preferably will be made substantially as shown in Fig. 5, the opposite side wall e^4 being provided with a vertical slot e^5 , which divides said side wall into two upright portions 85 86. (See Figs. 2 and 4.)

The vertical slot e^5 has extended into it a finger e^x on an upright arm e^8 for a purpose,

as will be described, the said finger in its normal position, Fig. 5, being projected into the path of side movement of the feed-pawl d^{15} but separated therefrom a distance substantially equal to one tooth of the ratchet-wheel d^{14} , so that the feed-pawl d^{15} , when disengaged from the ratchet-wheel d^{14} , may be moved sidewise in the trough or box or guideway E the distance of one tooth of the ratchet-wheel.

The disengagement of the feed-pawl d^{15} from the ratchet-bar d^{14} is effected by rocking the shaft e' , and in order that the said shaft may be rocked each time a character-key is depressed the rock-shaft e' has extended from it cranks or arms f f' , projecting toward the front of the machine and connected together by a tie bar or rod f^2 , (see Figs. 1 and 2,) which is engaged by a finger f^3 on each co-operating lever b^{19} , so that when any one of the levers b^{19} is operated by the depression of a character-key the rod f^2 will be elevated and the rock-shaft e' rotated in the direction indicated by arrow 90, Fig. 2, which movement of the rock-shaft carries the tooth 70 into engagement with the tooth 60 of the feed-pawl d^{15} and forces the latter back out of engagement with the ratchet-disk d^{14} , the tooth 70 remaining in engagement with that tooth of the ratchet-bar from which the feed-pawl has been disengaged.

As soon as the feed-pawl has been disengaged from its ratchet-wheel, it is swung or moved by means of a spring f^4 , (see Fig. 4,) so that its lower or toothed end is carried sidewise in the box or guideway E or in the direction indicated by arrow 100, Fig. 4, until it meets with the finger e^x on the upright arm e^8 , which prevents its further movement in the direction indicated by arrow 100, and at such time the pawl d^{15} is in line with the next tooth of the ratchet-wheel d^{14} . The tooth 70 constitutes the holding-pawl and holds the ratchet-wheel d^{14} and the carriage stationary while the character is being printed; but as soon as the character has been printed and the lever b^{19} has returned to its normal position the rock-shaft e' is rotated back into its normal position, as by a suitable spring or springs e^{30} , (see Fig. 2,) which may be fastened to the arms f f' and to the framework of the machine, and the holding-pawl 70 is disengaged from the ratchet-wheel d^{14} by the rocking movement of the shaft e' in the direction opposite to that indicated by arrow 90, Fig. 2, and on this return movement of the rock-shaft the portion 86 of the wall e^4 carries the lower end of the feed-pawl d^{15} with it and engages the tooth 60 of the feed-pawl with the next tooth of the ratchet-wheel d^{14} , so that as soon as the holding-pawl 70 is disengaged from the ratchet-wheel d^{14} the latter is placed under the influence of the spring d^{12} , which moves it the distance of one tooth toward the left, viewing Fig. 4—that is, in the direction opposite to that indicated by arrow 100—until the feed-pawl meets with a suitable stop (shown as a pin f^{10} , see Fig. 5) connecting the

wall e^4 with the wall e of the push-pawl-guiding frame E.

In some instances it is desirable after printing a letter to give the paper-carriage an additional feed of one or more teeth, and this result is accomplished, as herein shown, by means of a mechanism, as will now be described. The upright bar e^8 , above referred to, is connected to a cross bar or rod f^{12} , (see Figs. 2 and 4,) suitably connected at its opposite ends to side bars $f^{13} f^{14}$. (Shown by full lines in Fig. 4 and dotted lines in Fig. 2.) The side bars $f^{13} f^{14}$ at the front of the machine are constructed in the present instance so as to form a series of steps $f^{15} f^{16} f^{17} f^{18}$, with which co-operate, respectively, fingers or levers $f^{19} f^{20} f^{21} f^{22}$, pivoted upon rods $f^{23} f^{24} f^{25} f^{26}$, respectively, located preferably behind the various rows of character-keys, the rods or levers at the opposite end of each row of character-keys being connected by tie-bars $f^{27} f^{28} f^{29} f^{30}$, which, in the present instance, are arranged behind and preferably a little below the character-keys in their normal position. This construction enables one of the cross or tie bars $f^{27} f^{28} f^{29} f^{30}$ to be struck by the finger of the operator on its backward movement in the withdrawal of the finger from contact with the character-key—that is, the operator when desiring to effect an additional space, after a particular letter or character, would depress the character-key to effect a printing of the character, and instead of lifting the said finger from the said key after the manner now practiced he may move the finger backward so as to strike the particular cross-bar located behind the particular key operated. The movement of any one of the cross-bars $f^{27} f^{28} f^{29} f^{30}$ causes the levers to which it is connected to push or slide the side bars $f^{13} f^{14}$ forward—that is, in the direction indicated by the arrow 80, Fig. 2—and this movement withdraws the finger e^x on the upright bar e^8 away from or out of line with the feed-pawl d^{15} , so that an additional space for side movement of the feed-pawl in the direction indicated by arrow 100, Fig. 4, is afforded the said pawl—that is, when the feed-pawl is disengaged from its ratchet-wheel by the holding-pawl 70, which is effected in this instance by means of inclined uprights f^{90} on the side bars $f^{13} f^{14}$ engaging projections f^{91} on the arms $f f'$, and is moved in the direction indicated by the arrow 100, Fig. 4, by its spring f^4 , it is not stopped or arrested in its movement by the finger e^x on the upright e^8 , but is permitted to move until it brings up against a suitable stop, which may be the end of the frame E or it may be a pin f^{30} similar to f^{10} , which connects the wall e with the portion 85 of the wall e^4 , and this additional distance may be one or more teeth on the ratchet-wheel as desired, preferably one, so that when the feed-pawl d^{15} is engaged with its ratchet-wheel d^{14} , and the holding-pawl 70 disengaged therefrom, the ratchet-wheel d^{14} will be moved the distance of two teeth by the spring d^{12} ,

and consequently the carriage will be moved the distance of two teeth, and an additional or extra spacing is effected.

Referring to Fig. 2, it will be seen that when the side bars $f^{13} f^{14}$ are moved in the direction indicated by arrow 80 the inclined uprights will move in the same direction and will lift the side arms $f f'$ upward and rock the shaft e' in the direction indicated by arrow 90 to bring the holding-pawl 70 into engagement with the ratchet-wheel d^{14} and at the same time disengage the tooth 60 of the feed-pawl d^{15} from said ratchet-wheel.

The feed-pawl-guiding frame or box E will preferably be made deep enough to permit the feed-pawl to be moved downward, so as to disengage it from its ratchet-wheel d^{14} , to thereby leave the carriage free to be moved in either direction.

The release of the feed-pawl d^{15} is accomplished by depressing the finger-piece 300 on the lever d^{202} , so as to move the rod d^{200} downward against the action of the spring d^{23} , the feed-pawl being guided in its downward movement by the pins $d^{17} d^{18}$, and when the pressure is relieved from the release-lever the spring d^{23} restores the pawl d^{15} into its normal position with its tooth 60 in engagement with the ratchet-wheel without any movement of the carriage.

The auxiliary spacing mechanism described, while desirable, is not essential for the operation of the machine, and it merely serves as an auxiliary to the spacer-key g , which is connected by the cross-bar g' to one end of levers $g^2 g^3$, pivoted, as at g^4 , (see Fig. 2,) to the framework of the machine, and having their front ends extended under the rod f^2 . The paper roll c is provided with a ratchet disk or ring g^{10} , with which co-operates a pawl g^{12} , carried by a lever g^{13} , pivoted, as at g^{14} , to the journal-bearings c^{12} , the said lever moving in a substantially horizontal plane to effect the engagement and disengagement of the pawl g^{12} with the ratchet-disk g^{10} to thereby effect the line-spacing of the paper.

The instrument may be provided with the usual ink-ribbon, (not shown;) but I prefer to employ ink-rolls h , (see Fig. 2,) which are carried by a frame h' , (shown as secured to the guide-bar d' ;) the said rolls being in contact with the type on the type-bars, and the said type are constantly reinked as the type-carrier is revolved.

I claim—

1. In a type-writing instrument, the combination of the following instrumentalities, viz: a revoluble type-carrier, a plurality of independently-movable type-bars carried thereby and provided with registering depressions forming an annular groove, a locking-plate having an annular opening and a slot b^x communicating therewith, the edge of the said opening fitting into the said annular groove, a stop-arm revoluble with the type-carrier, a plurality of stoppins or bars co-operating with said stop-arm, operating-levers co-operating

with said stop pins or bars, a type-moving device provided with a finger extended through the slot b^x to engage a selected type, and means to operate said device, substantially as described.

2. In a type-writing instrument, the combination of the following instrumentalities, viz: a revoluble type-carrier, a plurality of independently-movable type-bars carried thereby, a stop-arm revoluble with the type-carrier, a plurality of stop pins or bars co-operating with said stop-arm, operating-levers co-operating with said stop pins or bars, a type-bar-moving device co-operating with a selected type-bar, and means to operate the said device, for the purpose specified.

3. In a type-writing instrument, the combination of the following instrumentalities, viz: a revoluble type-carrier provided with a plurality of independently-movable type-bars provided with a plurality of type, a paper-carrying roll having its shaft journaled in vertically-movable bearings, vertical guides erected upon the carriage for the paper-carrying roll and in which said bearings slide, and a toggle-lever mechanism to effect the bodily movement of the sliding bearings and the roll above the paper-carriage, substantially as described.

4. In a type-writing instrument, the combination of the following instrumentalities, viz: a movable carriage consisting of a plate supported on antifriction-bearings movable in guideways, a rack-gear firmly attached to said carriage, a gear in mesh with said rack-gear, a shaft on which said gear is fastened, a ratchet-wheel loose on said shaft, a push-pawl normally in engagement with the under side of said ratchet-wheel, means to connect the ratchet-wheel to the said shaft when the said ratchet-wheel is moved in one direction, a holding-pawl co-operating with the said ratchet-wheel, and with the said feed-pawl to disengage the latter from the ratchet-wheel, a rock-shaft actuating said holding-pawl, and means to operate said rock-shaft, substantially as and for the purpose specified.

5. In a type-writing instrument, the combination of the following instrumentalities, viz: a revoluble type-carrier, a plurality of movable type-bars carried thereby and each provided with a notch or depression a^{15} , a locking device for said type-bars co-operating with said notches or depressions to permit of movement of a selected type-bar and to prevent movement of the remaining type-bars, and means to move a selected one of the type-bars, substantially as described.

6. In a type-writing instrument, the combination of the following instrumentalities, viz: a revoluble type-carrier, a plurality of independently-movable type-bars, a stop-arm movable with the type-carrier, a stationary support provided with a plurality of independently-movable stop pins or bars, a plurality of pin-operating levers, one for each pin or bar and operatively connected to its

co-operating pin or bar to move it axially on the stationary support, means to lock the stop-arm to the selected pin or bar, and a type-bar-operating frame co-operating with a selected one of the plurality of type-bars, for the purpose specified.

7. In a type-writing instrument, the combination of the following instrumentalities, viz: a revoluble type-carrier, a plurality of movable type-bars carried thereby, a plurality of movable stop pins or bars corresponding to the said type-bars, a stopping device movable with a type-carrier and co-operating with the said stop pins or bars, to arrest the type-carrier in a selected position, mechanism to move a selected type-bar, a plurality of stop-pin-operating levers, and a plurality of key-levers b^{19} to operate the pin-operating levers and the type-bar-actuating mechanism in sequence, substantially as described.

8. In a type-writing instrument, the combination of the following instrumentalities, viz: a revoluble type-carrier, a plurality of movable type-bars carried thereby, a plurality of movable stop pins or bars corresponding to the said type-bars, a stopping device movable with the type-carrier and co-operating with the said stop pins or bars to arrest the type-carrier in a selected position, mechanism to move a selected type-bar, a plurality of stop-pin-operating levers, a paper-carriage, a feed mechanism to effect the movement of the carriage in one direction, a rock-shaft e' to operate said feed mechanism, and a plurality of key-levers b^{19} to operate the pin-operating levers, the type-bar-actuating mechanism and the rock-shaft e' , substantially as described.

9. In a type-writing instrument, the combination of the following instrumentalities, viz: a ratchet-wheel, a feed-pawl normally in engagement with the under side thereof, a holding-pawl, a rock-shaft to operate it, arms on the said rock-shaft, a bar e^8 normally in the path of movement of the said feed-pawl, a sliding frame to which the bar e^8 is secured to move therewith, means on the sliding frame to engage the arms on the rock-shaft, vertically-pivoted levers having their lower ends adapted to engage the sliding frame and move it bodily toward the rear of the machine and thereby remove the bar e^8 out of the path of movement of the feed-pawl, substantially as described.

10. In a type-writing instrument, the combination of the following instrumentalities, viz: a paper-carriage provided with a rack-gear, a gear in mesh with said rack-gear, a shaft on which said gear is mounted, a ratchet-wheel normally loose on said shaft, means to render the said ratchet-wheel movable with the shaft in one direction, a feed-pawl co-operating with the under side of the ratchet-wheel, and movable bodily away from the said ratchet-wheel, and pivotally with relation thereto, a holding-pawl co-operating with the said ratchet-wheel and with the feed-pawl to disengage it from a tooth of the ratchet-wheel,

and means to operate the holding-pawl, substantially as described.

11. In a type-writing instrument, the combination of the following instrumentalities, viz:
 5 a paper-carriage provided with a rack-gear, a gear-wheel in mesh with said rack-gear, a shaft on which said gear-wheel is mounted, a ratchet-wheel normally loose on said shaft, means to connect the ratchet-wheel to the
 10 shaft to revolve therewith in one direction, a feed-pawl consisting of a vertically-movable bar having a tooth at its lower end normally in mesh with the under side of the said ratchet-wheel, and a release mechanism to act on said
 15 bar to move it downward out of engagement with the ratchet-wheel, substantially as described.

12. In a type-writing instrument, the combination of the following instrumentalities viz:
 20 a carriage-feed mechanism provided with a ratchet-wheel, a feed-pawl consisting of a vertically-movable bar provided at its lower end with a tooth normally in engagement with the under side of the ratchet-wheel, and a re-
 25 lease mechanism consisting of a rod extended in the direction of the length of the carriage and adapted to engage the upper end of the said bar to move the said bar downward and disengage its tooth from the ratchet-wheel,
 30 substantially as described.

13. In a type-writing instrument, the combination of the following instrumentalities, viz:
 a reciprocating carriage, uprights erected upon the same at its opposite ends and forming guideways, a paper roll having its shaft
 35 journaled in bearings movable between said uprights in said guideways, a ratchet-ring on the said roll, a pawl in engagement with said ratchet-ring, and a lever pivoted to one of
 40 the movable journal-bearings in a substantially horizontal plane and carrying the said pawl, substantially as described.

14. In a type-writing instrument, the combination of the following instrumentalities, viz:
 45 a revoluble type-carrier, a plurality of independently-movable type-bars carried thereby and each provided with a depression or notch a^{15} , a locking-plate provided with the slot b^x , a rocking frame provided with a finger
 50 extended into said slot to engage a type-bar in line therewith, a yielding stop-arm movable with the type-carrier, movable stop pins or bars, one for each type-bar, pin-operating levers engaging said stop pins or bars,
 55 means to rotate said type-carrier, a carriage-

feed mechanism, and key-levers b^{19} to operate the pin-operating levers, the rocking frame, and the feed mechanism, substantially as described.

15. In a type-writing instrument, the combination of the following instrumentalities, viz:
 a revoluble type-carrier provided with a plurality of movable type-bars, and an inking-roll co-operating with the type on said bars, and a stationary support for said inking-roll,
 65 substantially as described.

16. In a type-writing instrument, the combination of the following instrumentalities, viz:
 a carriage-feed mechanism provided with a rotating ratchet-wheel, a feed-pawl normally in engagement with a tooth on the under side of the said ratchet-wheel, a holding-pawl independent of and disconnected from the feed-pawl and normally in line with the feed-pawl on opposite sides of the said ratchet-wheel, means to move said holding-pawl into engagement with the tooth of the ratchet-wheel with which the feed-pawl is normally engaged and thereby disengage the said feed-pawl from said tooth, means to move the
 80 feed-pawl out of line with the holding-pawl and into position to engage another tooth of the ratchet-wheel, means to again engage the feed-pawl with the ratchet-wheel, and a rock-shaft to operate said means, substantially as described.
 85

17. In a type-writing instrument, the combination of the following instrumentalities, viz:
 a carriage-feed mechanism provided with a feed-pawl, a rock-shaft provided with arms, a frame having a bodily movement toward and away from said rock-shaft and provided at its front end with a series of steps, and at its rear end with an arm e^8 provided with a finger normally in the path of movement of the
 95 said feed-pawl, and a plurality of vertically-pivoted levers having their lower ends in engagement with the steps in the said frame to engage the said frame and move it toward the rear of the machine while the upper end
 100 of its operating-lever is moved toward the front of the machine, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALBERT E. AYER.

Witnesses:

JAS. H. CHURCHILL,
 J. MURPHY.