

July 12, 1932.

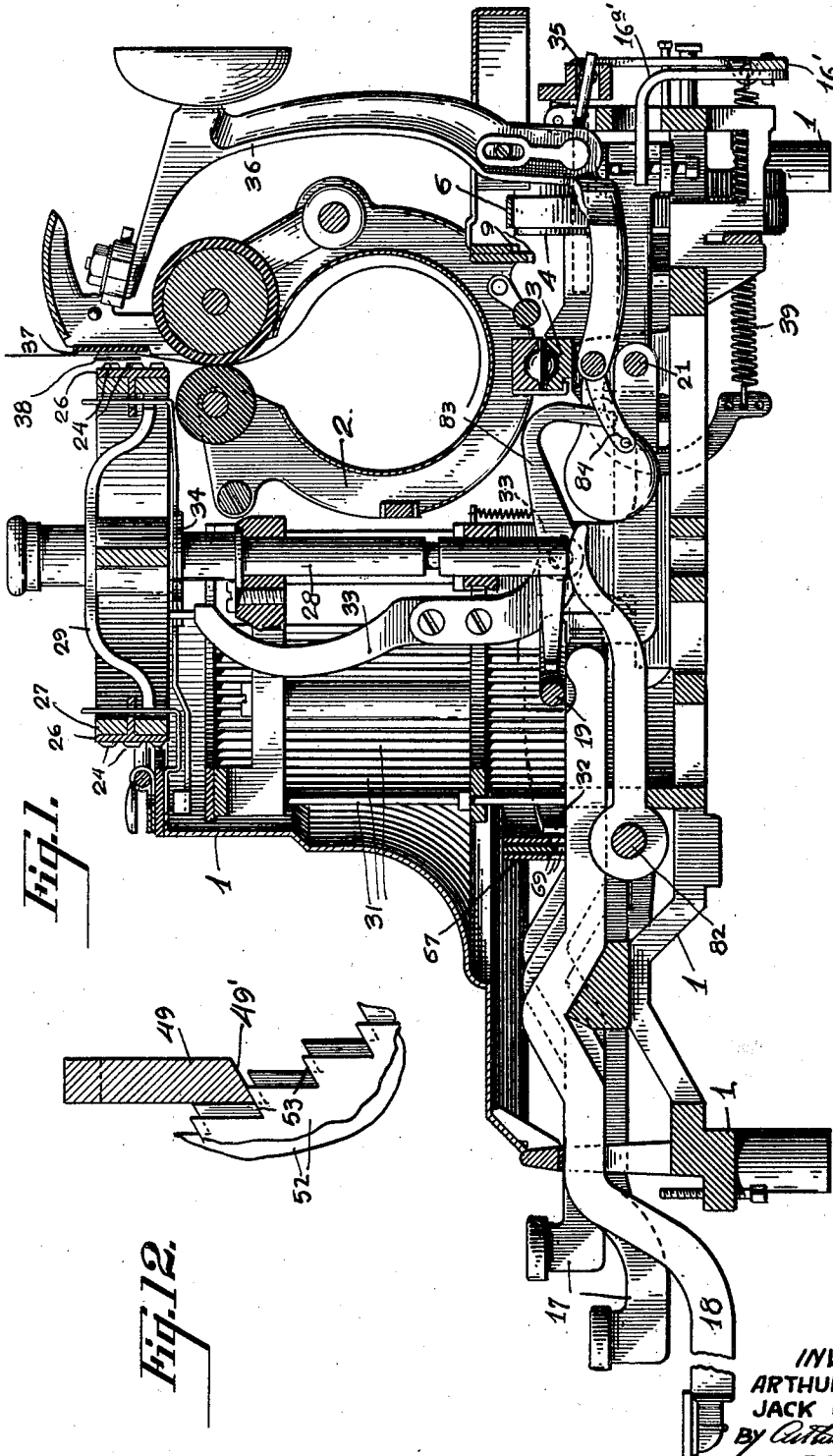
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1,867,155

VARIABLE SPACING MECHANISM FOR TYPEWRITERS

Filed Aug. 5, 1929

5 Sheets-Sheet 1



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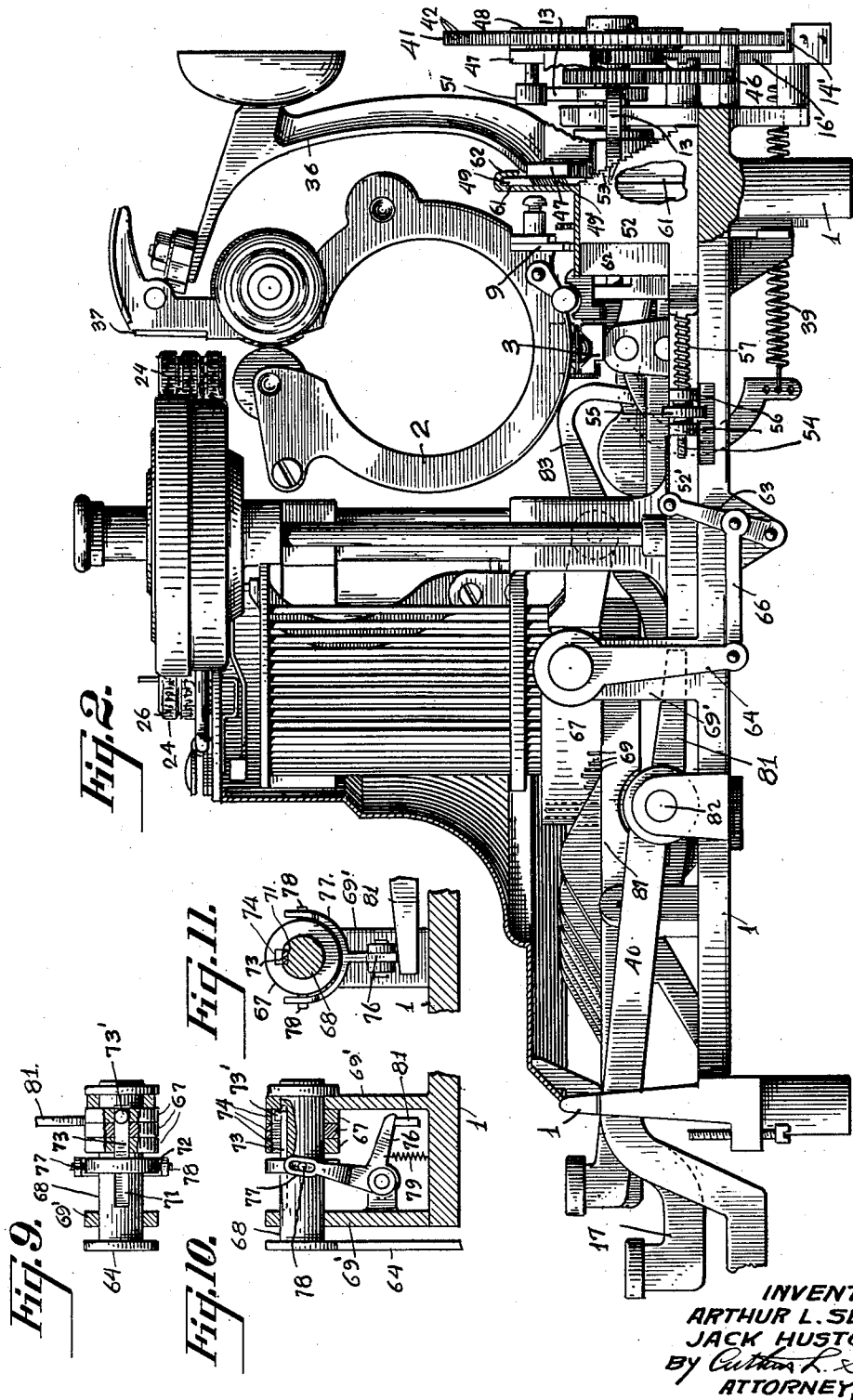
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VARIABLE SPACING MECHANISM FOR TYPEWRITERS

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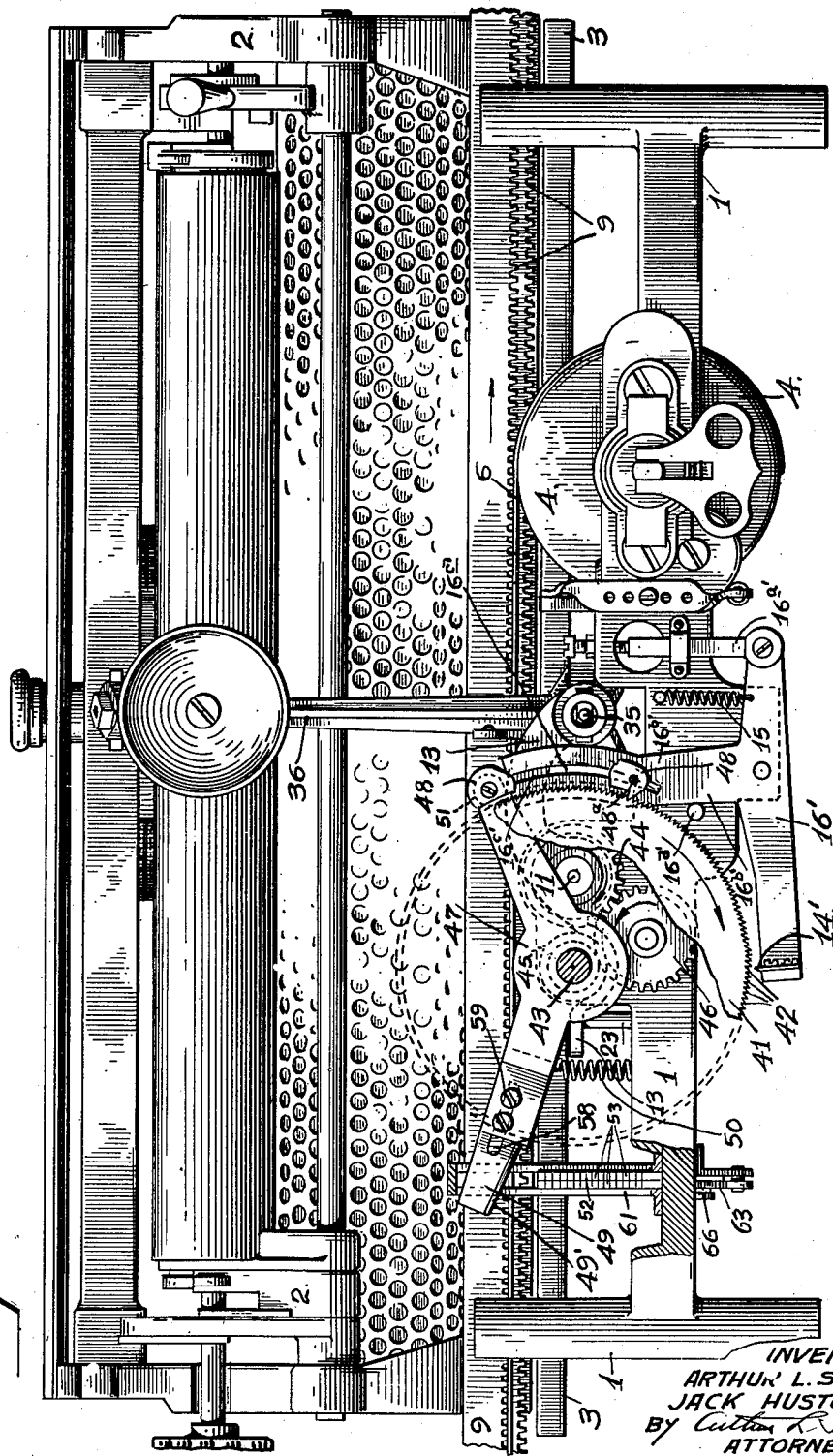
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VARIABLE SPACING MECHANISM FOR TYPEWRITERS

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5 Sheets-Sheet 3

Fig. 3.



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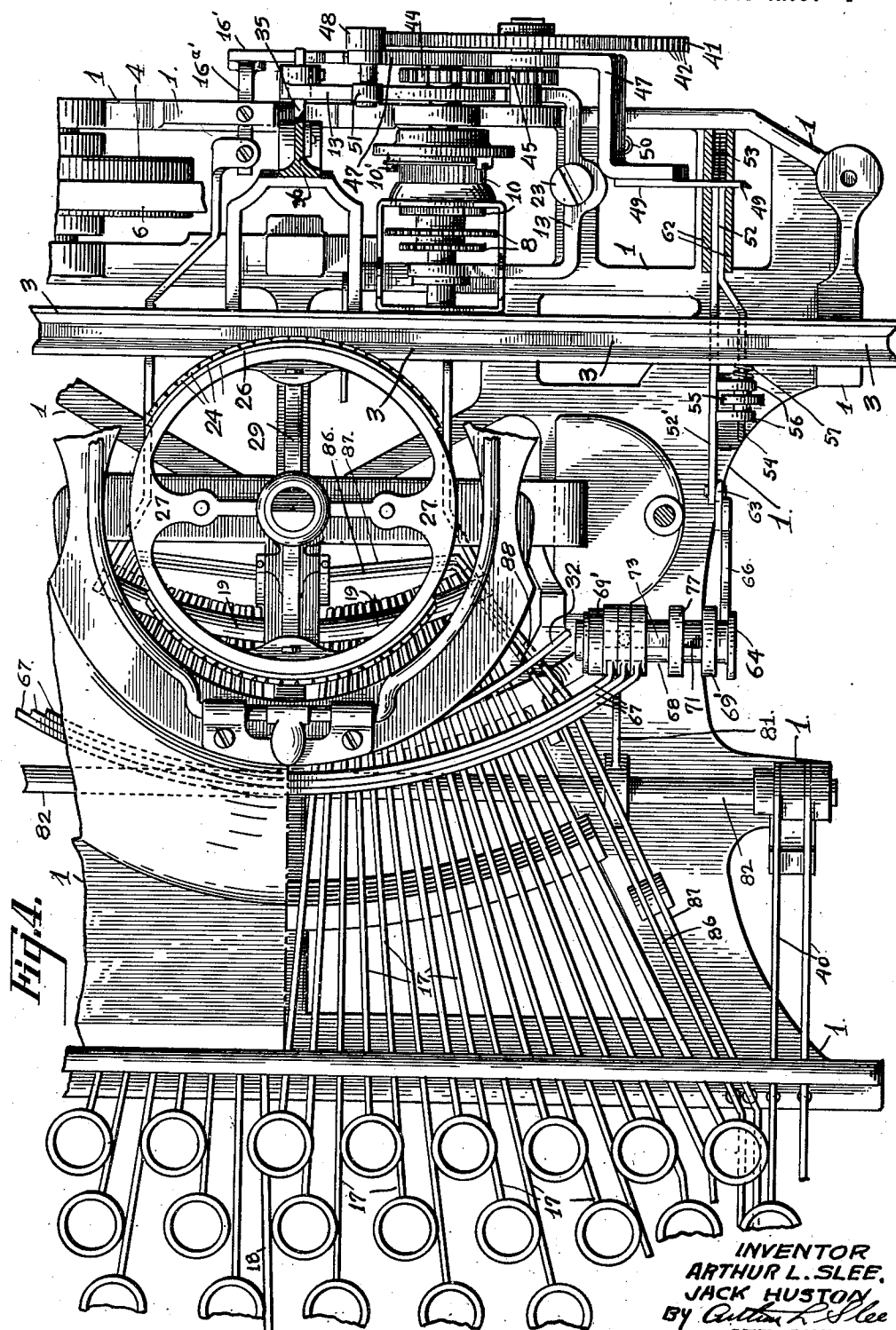
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VARIABLE SPACING MECHANISM FOR TYPEWRITERS

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5 Sheets-Sheet 4



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VARIABLE SPACING MECHANISM FOR TYPEWRITERS

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5 Sheets-Sheet 5

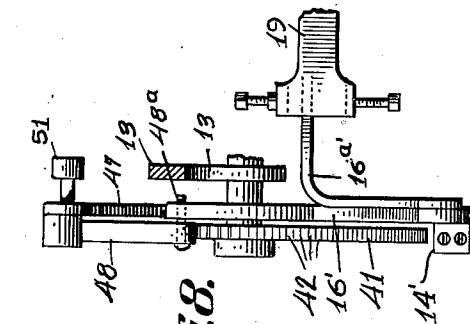


Fig. 8.

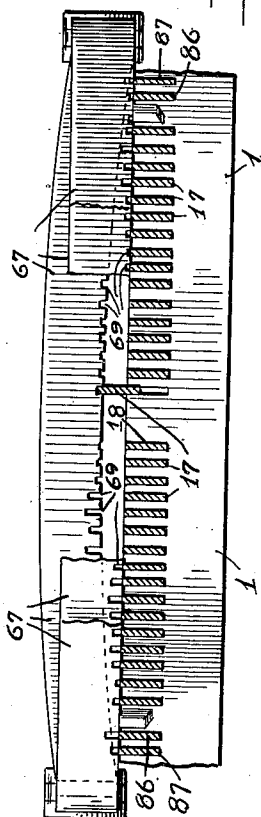


Fig. 5.

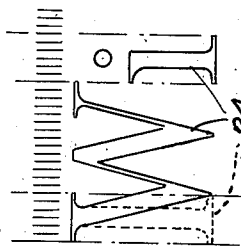


Fig. 13.

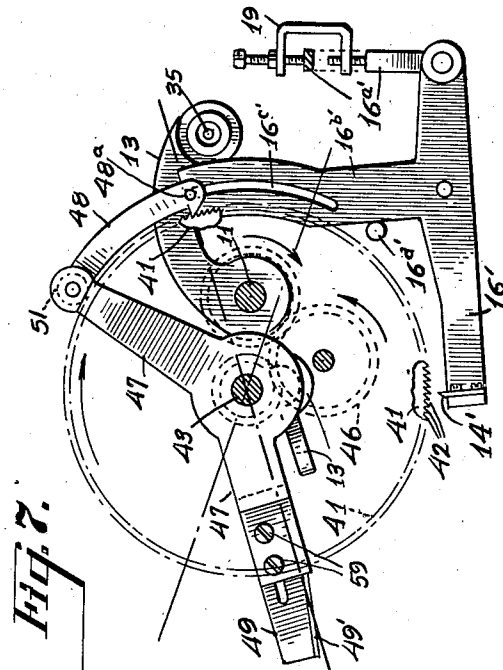


Fig. 7.

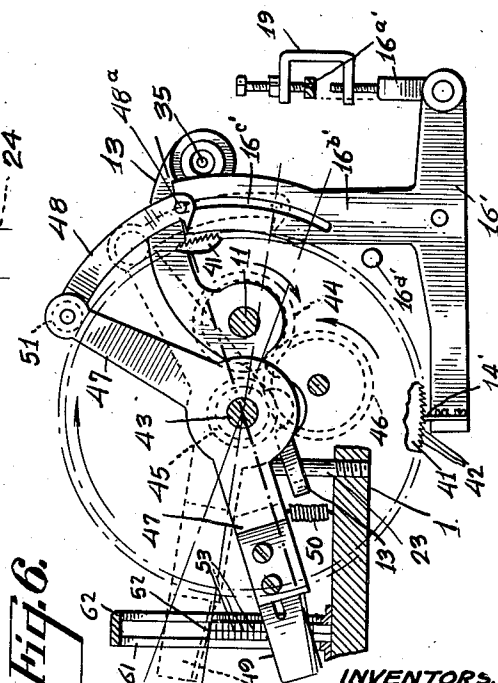


Fig. 6.

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UNITED STATES PATENT OFFICE

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VARIABLE SPACING MECHANISM FOR TYPEWRITERS

Application filed August 5, 1929. Serial No. 383,729.

Our invention relates to improvements in mechanism for automatically varying the space moved by the carriage of a typewriter when each letter or character is printed to conform to the different widths of the various letters and characters to correspond to the respective widths of letters and characters of a font of printer's type, and to provide for variable spacing between words or characters whereby the true appearance of printer's type may be obtained and the ends of successive lines may be alined as in printing.

Typewriting machines, as heretofore commonly constructed, are provided with a carriage escapement operating to permit the carriage to be advanced by regular steps as each successive letter is printed, the distance moved being equal for all letters, characters, and spaces. This necessitates that each letter and character occupy the same space and the result is that the large letters must be condensed and will appear closely crowded together in a typewritten line, while the narrow letters will appear relatively widely spaced apart, thereby causing an appearance of irregular spacing and disproportioned letters and characters. Furthermore, the uniform spacing provided renders it substantially impossible to aline the ends of successive lines, a variation of several letters in the relative lengths of the lines being usual.

In printer's type, each letter and character is designed to be in proportion with the sizes of the other letters and characters of a font so that each piece of type will be made of a width corresponding to the width of its letter or character, whereby the letters and characters of a printed line will appear in correct proportion and regularly spaced. The lines are, of course, made to occupy exactly the same length by supplying additional spaces between the words of the line to give a uniform spacing between words.

The present invention is, therefore, directed to an improved mechanism whereby the letters and characters of a typewriter may be designed in correct proportion, as in printer's type, and providing means whereby by the carriage may be advanced variable

amounts corresponding to the width of each letter or character as printed and whereby the typewritten line may be made to present the same appearance as a printed line, and also providing means whereby the spacing between words may be varied to provide a regular margin line along the right-hand side of a typewritten sheet, the primary object being to provide an improved mechanism whereby typewriting may have the same appearance as printed matter.

An important object of the invention is to provide a typewriting mechanism whereby copy may be written and cuts made directly from the typewritten sheets for printing without the time and expense of setting or casting type and without altering the accustomed appearance of such printed copy.

Another object is to provide an improved mechanism whereby the carriage may be moved a distance conforming to the width of each letter or character as the same is printed.

A further object is to provide an improved variable spacing means which is actuated automatically by the operation of the keys of a typewriter to vary the spacing proportionately to the widths of successive letters.

Another object is to provide an improved variable spacing mechanism having selective means automatically operating to vary the spacing proportionately to the widths of any of a plurality of letters or characters printed by a single key through the usual shifting mechanism.

Another object is to provide an improved mechanism whereby variable spaces may be provided between words and in which the spaces between the several words of a line may be made substantially equal.

A further object is to provide an improved mechanism of the character described which is positive and efficient in its operation and which can be incorporated with typewriting machines without otherwise altering the mechanism and operation thereof.

A further object is to provide an improved variable stop which may be adjusted to obtain accuracy and to compensate for wear.

Another object is to provide an improved

mechanism of the character described which is compact and which will provide a wide range of variable spacing.

A still further object is to provide an improved mechanism which will extend the field of utility of typewriters and produce printing of a more uniform and attractive appearance.

We accomplish these and other objects by means of the improved device disclosed in the drawings forming a part of the present application wherein like characters of reference are used to designate similar parts throughout the specification and drawings, and in which—

Fig. 1 is a broken vertical mid-sectional view of a typewriter showing parts of our improved variable spacing mechanism as applied thereto;

Fig. 2 is a broken side elevation, partly in vertical section, of the typewriter as shown in Fig. 1 with our variable spacing mechanism applied thereto;

Fig. 3 is a broken rear elevation of the typewriter and variable spacing mechanism;

Fig. 4 is a broken plan view of a portion of the typewriter and the spacing mechanism;

Fig. 5 is a front elevation of the variable actuating lever mechanism;

Figs. 6 and 7 are rear elevations of the pawl and ratchet mechanism illustrating in detail the arrangement and operation thereof;

Fig. 8 is a side view of the parts shown in Fig. 7;

Figs. 9, 10, and 11 are broken detail views of the selective means for connecting desired actuating levers to the spacing mechanism, the views showing a plan, side elevation, and end elevation of said selective means, respectively;

Fig. 12 is a broken sectional detail of a portion of the variable stop showing the manner in which the pawl arm is engaged and disclosing the manner in which the stop may be adjusted; and

Fig. 13 is a view disclosing the manner in which letters and characters of various widths are aligned along the left-hand margin.

Referring to the drawings, we have illustrated our invention as applied upon a typewriter of the "varityper" type, designated in general by the numeral 1. In order that the operation of our variable spacing mechanism as applied to typewriters of this type may be clearly understood, the structure and operation of the typewriter is briefly described as follows:

The typewriter is provided with a carriage 2 slidably movable along a suitable track 3 and actuated by a suitable actuating mechanism 4 connected to the carriage by a flexible band 6 to normally urge the carriage forwardly in one direction, usually toward the left as viewed from the front.

In the machine illustrated, the printing is accomplished as follows:

Type letters and characters 24 are formed upon a matrix 26 slidably mounted upon the member 27 mounted upon the upper end of a vertically disposed column 28. The matrix is actuated by a yoke 29 mounted upon the column 28 and arranged to be rotatably moved to shift the matrix to desired printing positions. As any particular key 17 is struck, the movement of the key lever portion raises a stop 31 corresponding to said key and defining the position to which the yoke 29 and matrix 26 are to be moved to print the letter or character actuated by said key. At the same time, an arm 32 is turned upon a pivot to actuate an arm 33 movable to engage a cam 34 connected to the yoke 29 and operating to turn said yoke until the raised stop 31 is engaged, the movement of the stop and of the yoke taking place during the first portion of the movement of the key. The further movement of the key 17 causes the lever 19 to be engaged and moved to actuate an escapement, as hereinafter described.

A hammer 36 is pivotally mounted upon the back of the machine and arranged to be moved by any key 17 to strike a blow against a desired type letter or character 24 through an impression band 37 arranged opposite the matrix 26, a suitable inked ribbon 38 being disposed between the band 37 and the matrix 26 and a sheet of paper being threaded between the ribbon 28 and band 37 whereby the blow imparted by the hammer 36 will cause the character to be printed upon the paper. The paper is carried with the carriage 2 in the well known manner. The hammer 36 is moved rearwardly against the tension of a hammer spring 39 by the operation of any key 17, and is released when a key 17 is fully depressed to strike and print the desired letter or character. The matrix 26 is provided with a plurality of rows of letters and characters and is arranged to be shifted by the well known shifting keys 40 whereby the operation of any particular key 17 may operate to permit any of a plurality of letters or characters corresponding to the shifted positions of the matrix.

The present invention consists of spacing mechanism whereby the movement of the carriage may be made to correspond to the width of each particular letter or character printed and consists of a relatively large escapement ratchet 41 having a relatively large number of closely spaced teeth 42 representing units of width of type and corresponding units of carriage movement. The ratchet 41 is secured upon a shaft 43 journaled upon the back of the machine. A gear 44 is mounted upon the shaft 11, said gear 44 operating to drive the ratchet 41 by means of a gear 45 secured upon the shaft 43 and an idler gear 46 meshing with both gears 44 and 45 whereby the gears 44

and 45 may be rotated in the same direction at a desired speed ratio. The shaft 11 is actuated by the normal tension of the carriage 2 through the usual gears 8 and ratchet 10. The usual hammer lever 13 is mounted for pivotal movement upon the shaft 11 and connected to the hammer 36 in the ordinary manner. In machines not employing applicants' variable spacing means the ordinary ratchet mechanism is carried on the shaft 11 in place of gear 44.

The pawl actuating arm 47 is pivotally mounted upon the shaft 43 immediately in back of the escapement ratchet 41, said arm being provided with a pawl 48 pivotally mounted upon one end thereof, and provided with a stop engaging member 49 adjustably secured upon the opposite end thereof. An escapement lever 16' is pivotally mounted upon the back of the machine adjacent the ratchet 41. The lever 16' is provided with extensions 16^a' and 16^b' similar to the ordinary escapement lever structure but of relatively greater length to correspond to the larger ratchet 41. A detent or escapement flange 14' is carried by the lever 16' to engage the ratchet in a manner similar to the usual detent. A slot 16^c' is formed in the extension 16^b' to receive and slidably engage a pin 48^a carried by the pawl 48, said slot being normally positioned concentric with the ratchet 41 and just clear of the teeth thereof when the lever 16' is in its normal position against a stop 16^d'. A stop roller 51 is mounted upon the arm 47 adjacent the pivot of the pawl 48, said stop extending across the hammer lever 13 and being movable to engage the upper edge of said lever.

A variable stop member 52 is slidably mounted in a position to be engaged by the stop engaging member 49. The stop 52 is provided with an inclined edge having a plurality of tooth like stops 53 formed thereon to represent units of type width and the corresponding units of carriage movement. The member 52 is preferably made from two identical portions mounted in matching proximate relation, one of said plates being adjustable relative to the other whereby, by advancing the adjustable member slightly with respect to the other member, the effective level of each stop tooth 53 may be slightly varied. This is accomplished by means of an adjusting screw 54 mounted in offset relation to one side portion of the member 52, said screw extending through mounting lugs 56 carried by the opposite side portion of the member 52 and having a follower 55 mounted upon the screw between said lugs whereby the screw and the side portion to which it is connected can be moved relative to the opposite side portion. A spring 57 mounted around the stem takes up any lost motion which may occur between the follower and the lugs 56 to insure accurate adjustment.

The stop engaging member 49 is preferably provided with a beveled edge 49' adapted to seat upon the inclined bottoms of any tooth 53 of the member 52. The beveled edge 49' is preferably inclined slightly relative to a longitudinally disposed slot 58 formed in the body of the member 49 and engaged by screws 59 securing said member to the arm 47 permitting the member 49 to be adjusted longitudinally of the arm to vary the point along said beveled edge which will seat upon the teeth 53 of the stop 52, whereby the degree of movement of the arm 47, to seat the member 49 upon a particular stop tooth 53, may be slightly adjusted. The member 49 is movable between suitable guide slots 61 formed in a guide 62 for accurately defining the path of movement of said member.

The stop member 52 is slidably moved through the guide 62 at right angles to the member 49 by means of an arm 63 pivoted at one end upon the frame of the machine and at its other end to an extension 52' of said stop member. The arm 63 is actuated by means of a crank 64 pivotally mounted upon the machine and connected to said arm 63 by a link 66. A plurality of actuating levers 67 are pivotally mounted in proximate relation upon suitable shafts 68 at opposite sides of the machine, said levers 67 extending across the machine and being supported immediately above the lever portions of the type keys 17. The levers 67 are each provided with a plurality of slots 69 formed in the lower edge thereof and matching with the lever portions of the several type keys 17 of the typewriter and arranged to permit movement of the respective keys into said slots to engage the levers at the tops of the slots. The slots 69 are made of various depths proportional to the width of each letter or character and to the amount of carriage movement necessary for the respective letters or characters. A lever 67 is provided for each of the shifted positions of the typewriter whereby each key is made to actuate and print any of a plurality of characters, which, in the machine herein illustrated and described, numbers three.

The levers 67 are selectively connected to the crank 64 by suitable selective means actuated by the usual shift keys 40 of the typewriter to operatively connect a corresponding lever 67 to the crank 64 when the machine is shifted to cause each key to print the desired one of its plurality of letters and characters. In Figs. 9, 10, and 11, I have illustrated in detail one suitable selective means by which the levers 67 may be thus connected, wherein one of the shafts 68 is mounted upon suitable bearings 69' and is provided with a key way 71 formed thereon. The crank 64 is secured upon one end of the shaft 68 and the levers 67 are pivotally supported at one end upon said shaft 68. A collar 72

is slidably mounted upon the shaft 68 and provided with a key 73 movable within the key-way 71, said key being provided with a key extension 73' movable to engage matching key-ways 74 formed in the ends of the levers 67 to normally match with the key-way 71. The key extension 73' is of a width to engage the key-way of any lever 67 and key the same to the shaft 68 independently of the other levers 67. The collar 72 is actuated by means of a bell crank 76 pivotally mounted upon one of the bearing members 69' and having a sliding and pivotal connection with the collar by means of a slotted yoke 77 engaging pins 78 carried upon the collar. The crank 76 is moved from a normal position connecting the lever 67 corresponding to the normal operation of the keys 17, and, against the tension of a light spring 79 normally holding said lever in said normal position, by means of an arm 81 secured upon the shift shaft 82 of the typewriter and engaging the crank 76. The shift shaft, in the typewriter illustrated, is operated by the shift keys 40 which are moved variable distances to impart a corresponding variable degree of rotation to the shaft 82, said variable rotation causing the arm 81 to be swung through corresponding distances whereby the crank 76 is moved to shift the collar 72 and cause the key extension 73' to operatively connect the proper lever 67.

In carrying our invention into effect, the type letters and characters 24 are designed in accordance with the standard widths of the several letters and characters of a font of printer's type. These widths of course vary according to the size and face of type, but the variation in width between the large letters and small letters and characters is substantially proportional, and this variation in size between the letters and characters of a particular face of type may be represented, therefore, by conventional units of width. In Fig. 13 of the drawings, we have illustrated upon a much enlarged scale letters illustrating the difference in relative widths of certain letters 24 and indicating the manner in which said widths are measured in such conventional units. Thus, a capital letter "W" is represented as occupying a width of twenty units, whereas the capital letter "I" occupies only a space of six units, and the lower case letter "i" occupies a space of only six units. The several letters and characters are arranged to be printed with their relative positions fixed with respect to the left hand edge of each letter or character, as opposed to the positioning with respect to a center line through the center of the letter or character as typewriter type has heretofore been arranged. In the type of machine herein illustrated, this is accomplished by designing the matrix to carry letters and characters of the various standard printer's

widths, and operating the yoke 29 to turn the matrix 26 to a position such that the left-hand edge of each letter or character to be printed is always moved to the same relative position.

In operation, the printing of each letter or character is accomplished in the ordinary manner, as hereinbefore explained, the matrix 26 being shifted to the desired position during the initial movement of a lever key, and the hammer 36 released to strike and make the impression at the end of said movement.

Our improved variable spacing mechanism operates as follows:

The tension by which the carriage 2 is normally urged toward one side of the machine is transmitted through the gear 8, shaft 11, gears 44, 45, and 46 to the shaft 43 and escapement ratchet 41. The pawl 48, engaging the teeth of the ratchet 41 causes the pawl arm 47 to be carried to its normal position, as shown in Fig. 3 of the drawings, the stop member 51 being thereby moved to engage the upper edge of the hammer lever 13 and move the same downwardly to its extreme position as defined, by the fixed stop 23, and moving the hammer 36 to its retracted position. The movement of the ratchet 41 and the pawl arm 47 in the carriage advancing direction as indicated by the arrows in Figs. 3, 6, and 7, is thus limited by the hammer lever 13 which in turn is limited by the fixed stop 23 accurately limiting the movement of the several parts in this direction.

When a key 17 is operated to cause the printing of a letter or character, the final movement of the key lever causes the extension 16' to be engaged and the escapement lever 16' to be moved from its normal position, as shown in Fig. 3 of the drawings, to a ratchet retaining position, as indicated in Fig. 6. This movement of the escapement lever causes the escapement detent 14' to engage a tooth 42 of the ratchet 41, and immediately after the ratchet is thus engaged, the slot 16'' causes the pawl 48 to be swung out of engagement with the ratchet teeth 42. At the instant the pawl 48 disengages the ratchet, a spring 50 moves the pawl arm 47 opposite to the normal movement of the ratchet 41, and as the stop 51 is thus moved away from the hammer lever 13, the hammer is released to make the usual impression.

The movement of the arm 47 by the spring 50 is limited by the variable stop member 52, which is moved by the operation of each key lever 17 operating through the selective mechanism above described, to shift the stop 52 to a position corresponding to each particular letter or character. The teeth 53 of the member 52 form successive steps representing successive units of type width, and each operating to limit the movement of the pawl arm 47 at points corresponding to the various widths of letter or character. Thus, if the key

selected operates to print a small letter or character, the stop will be moved to cause one of the upper teeth thereof to be engaged by the stop engaging member 49, and the arm 47 and pawl will be checked after a relatively short movement. If one of the large letters is operated, the stop will be moved to permit a greater movement of the pawl arm 47 proportional to the relatively greater size of the letter.

As the pawl arm 47 is thus moved, the pawl 48 will be carried past a variable number of the teeth 42 of the ratchet 41, the pawl being held out of engagement with the teeth by the extension 16^b and its slot 16^c. If it be assumed that the minimum width of letter or character be represented by six units of width, the pawl arm 47 will be released to carry the pawl 48 past six of the teeth of the ratchet to a position such as indicated in dotted lines in Fig. 6 of the drawings, when a key is operated to print a letter or character of this minimum. If a letter or character of greater width is to be printed, the arm 47 will be permitted to move a correspondingly greater distance, and the pawl 48 will be carried past a correspondingly greater number of teeth 42, to a position such as indicated in full lines in Fig. 6, said teeth 42 being designed to represent units of type width as above explained. The minimum movement of the pawl arm is made sufficient to clear the hammer lever 13 and permit normal operation of said lever and the hammer when a letter or character of minimum width is to be printed. The movement of the hammer lever 13 is, of course, limited by the action of the hammer itself, so that said lever 13 will not move beyond its normal limit regardless of the additional movement which the pawl arm 47 may make.

When a key is released after causing the printing of a desired character, the escapement lever 16' is returned to its normal position by a suitable spring 15. The first portion of the return movement of the lever 16' causes the slot 16^c to swing the pawl 48 into engagement with the adjacent tooth 42 of the ratchet 41, and during the remaining portion of said return movement, the detent 14' is moved out of engagement with the ratchet to positions such as indicated in Fig. 7 of the drawings. As the ratchet is released by the detent 14', the tension of the carriage, imparted to the ratchet through the intermediate gear connections above described, causes the carriage to be advanced and the ratchet 41 turned in the carriage advancing direction, thereby actuating the pawl 48 and arm 47 and moving the stop 51 against the hammer lever 13 and moving said lever 13 downwardly until further movement is checked by the stop 23. The stop 23 is fixed, thereby checking the movement of the ratchet 41 and carriage 2 at a fixed limit of movement. The

degree of movement of the ratchet and carriage is therefore limited by the number of teeth past which the pawl 48 has been moved during the period while released from engagement with the ratchet, and said movement will be equal to the width of letter or character printed. Thus, if the letter printed is a capital letter "W", the carriage will be permitted to move a distance of twenty units of type width, as indicated in Fig. 13, where, as, if the letter had been a capital letter "I", as indicated in dotted lines, the carriage would have been checked after moving a distance of six units, the distance of movement being measured in each case from the left hand edge of the letter. When the next succeeding letter or character is printed, the carriage will be moved a distance corresponding to the width of said letter, as for instance, a movement of six units when a letter "i" is struck, as illustrated in Fig. 13.

To provide spaces between words, the usual spacing bar 18 operates to release the escapement in the same manner as a type key 17, except that in operating the spacer bar, a hook member 83 is adapted to be swung into the path of an extension 84 formed upon the hammer 36 in the ordinary and well known manner whereby said hammer will be stopped before striking an impression. The ordinary spacing bar lever 18 engages the levers 67 and operates the same to move the adjustable stop member 52 to a position providing the average space required, the exact degree of movement being determined by the depth of a notch 69 provided in the levers 67 in the same manner as for the type keys 17.

In addition to the normal spacing bar, we provide additional spacing keys 86 and 87 mounted at one end of the ordinary key board and movable to actuate the levers 67 to move the stop to positions providing spaces of different length when the escapement is released. The additional spacing keys 86 and 87 are designed to provide short intervals of movement whereby a succession of operations of said levers either alone or after an operation of the normal spacing bar will permit any desired space to be provided. The lever portions of the keys 86 and 87 engage and actuate the levers 67 and 19 but are notched as at 88 to avoid actuating the arm 32.

From the above explanation, it will be seen that type letters and characters may be made of variable type widths and the carriage will be automatically released to move variable amounts corresponding to the width of each letter and character printed whereby the appearance of type printed matter may be produced by typewriting. The variable spacing means provided will permit the lines to be laid out to give regular alinement at both margins of a sheet.

In addition to the improved appearance obtained by the use of our improved variable

spacing means, the invention is of particular value in preparing copy for printing. In the initial drafting of copy, successive lines will ordinarily end with a somewhat irregular right hand margin. The number of units of movement difference can be readily noted, and, by rewriting the copy, allowance can be made by increasing or decreasing the space between words to distribute the difference evenly between the several words of a line, and thereby bring the right hand ends of the lines into alinement to give a regular margin line at the right as well as the left hand side of a page. The copy thus prepared may be photographed and cuts made in the ordinary manner without the labor and expense of setting or casting type or forming matrices as in the ordinary practice. Material printed from cuts formed in this manner will have the accustomed appearance of type printed matter, and an enormous saving can be effected in the cost of labor, materials, and costly machines and equipment heretofore necessary.

While we have illustrated and described only one embodiment of our invention and have illustrated it only in connection with a single type of typewriter, the device is, of course, subject to modification in a great number of specific details of construction and arrangement, and may be adapted to typewriters of other types having a rotatable ratchet wheel escapement. We, therefore, do not wish to restrict ourselves to the specific structure illustrated and described, or to its use with the specific type of typewriter to which we have shown it adapted, and we desire to avail ourselves of all modifications which may fall within the scope of the appended claims.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. A variable spacing mechanism for typewriters comprising the combination with a typewriter having type keys operable to print letters and characters corresponding in relative size to the letters and characters of a font of printer's type, and a carriage arranged to be advanced after the operation of each key, of an escapement limiting the movement of the carriage after each operation and comprising a toothed ratchet actuated by the carriage, an arm pivotally mounted adjacent the ratchet, and a pawl movable by the arm to engage and disengage teeth of the ratchet to limit the movement of the ratchet and carriage; a fixed stop limiting the movement of the arm and pawl in one direction; and a variable stop actuated by the operation of any type key for regulating the movement of the pawl in the opposite direction to conform to the width of letters to be printed whereby the movement of the ratchet and carriage may be correspondingly limited.

2. A variable spacing mechanism for typewriters comprising the combination with a typewriter having type keys operable to print letters and characters corresponding in relative size to the letters and characters of a font of printer's type, and a carriage arranged to be advanced after the operation of each key, of an escapement limiting the movement of the carriage after each operation and comprising a toothed ratchet actuated by the carriage, an arm pivotally mounted adjacent the ratchet, and a pawl movable by the arm to engage and disengage teeth of the ratchet to limit the movement of the ratchet and carriage; a fixed stop limiting the movement of the arm and pawl in one direction; a variable stop actuated by the operation of any type key for regulating the movement of the pawl in the opposite direction to conform to the width of letter to be printed whereby the movement of the ratchet and carriage may be correspondingly limited; and means for moving the pawl independently of any type key whereby the carriage may be moved to provide spacing between desired letters or characters.

3. A variable spacing mechanism for typewriters comprising the combination with a typewriter having type keys operable to print letters and characters corresponding in relative size to the letters and characters of a font of printer's type, and a carriage arranged to be advanced after the operation of each key, of an escapement limiting the movement of the carriage after each operation and comprising a ratchet actuated by the carriage, an arm pivotally mounted adjacent the ratchet, and a pawl movable by the arm to engage and disengage teeth of the ratchet to limit the movement of the ratchet and carriage; a fixed stop limiting the movement of the arm and pawl in one direction; a variable stop actuated by the operation of any type key for regulating the movement of the pawl in the opposite direction to conform to the width of letter to be printed whereby the movement of the ratchet and carriage may be correspondingly limited; a plurality of spacing members operable independently of any type key for moving the arm and pawl; and means connecting the spacing members to the variable stop member to move said stop to various positions whereby the carriage may be moved to provide a desired spacing between desired letters or characters.

4. A variable spacing mechanism for typewriters comprising the combination with a typewriter having type keys operable to print letters and characters corresponding in relative size to the letters and characters of a font of printer's type, and a carriage arranged to be advanced after the operation of each key, of an escapement limiting the movement of the carriage after each operation and comprising a toothed ratchet actuated by the

- carriage, an arm pivotally mounted adjacent the ratchet, and a pawl movable by the arm to engage and disengage teeth of the ratchet to limit the movement of the ratchet and carriage; a fixed stop limiting the movement of the arm and pawl in the carriage advancing direction to check the movement of the carriage; a variable stop mounted adjacent the arm and movable to limit the movement of the arm and pawl in the opposite direction to any of a plurality of positions proportional to the widths of various sizes of letters and characters; and means actuated by the movement of the type keys for moving the variable stop to a position corresponding to any particular letter or character to be printed whereby the movement of the ratchet and carriage may be correspondingly limited.
5. A variable spacing mechanism for typewriters comprising the combination with a typewriter having keys operable to print letters and characters corresponding in size to the letters and characters of a font of printer's type, and a carriage arranged to be advanced after the operation of each key, and also provided with shifting means whereby each key may operate to print any of a plurality of letters or characters, of an escapement limiting the movement of the carriage after each operation and comprising a toothed ratchet actuated by the carriage, an arm pivotally mounted adjacent the ratchet, and a pawl movable by the arm to engage and disengage teeth of the ratchet to limit the movement of the ratchet and carriage; a fixed stop limiting the movement of the arm and pawl in the carriage advancing direction to check the movement of the carriage; a variable stop mounted adjacent the arm and movable to limit the movement of the arm and pawl in the opposite direction to any of a plurality of positions proportional to the widths of various sizes of letters and characters; a plurality of actuating members operable by the movement of the type keys; and selective means actuated by the type shifting means for selectively connecting a proper actuating lever to the variable stop to move said stop to a position corresponding to any particular letter or character of any particular key whereby the movement of the ratchet and carriage may be correspondingly limited; and a plurality of spacing members operable independently of any type key and having actuating connections to the variable stop for moving the arm and pawl variable amounts whereby the carriage may be moved to provide a desired spacing between desired letters or characters.
7. In a variable spacing mechanism for typewriters, an escapement comprising a ratchet actuated by the carriage of a typewriter and provided with a plurality of closely spaced teeth; an arm pivotally mounted adjacent the ratchet; a pawl carried by the arm and movable to engage and disengage the teeth; a member pivotally mounted adjacent the ratchet and actuated by the movement of any type key of the typewriter, said member being provided with a detent movable to engage a tooth of the ratchet to hold said ratchet and the carriage against forward movement when a key is struck, said member being also provided with means engaging the pawl to move the pawl out of engagement with the ratchet; means for normally moving the arm in a direction opposite to the normal direction of movement of the ratchet when the pawl is disengaged; a variable stop mounted adjacent the arm and actuated by the movement of the type keys to limit said normal movement of the arm to variable distances proportional to the width of a letter or character being printed whereby the pawl may be moved past a variable number of teeth corresponding to the width of each letter or character; and a fixed stop limiting the movement of the arm in the opposite direction, the pawl engaging and checking the forward movement of the ratchet and carriage when said carriage has moved a distance equal to the width of a letter or character printed.
8. In a variable spacing mechanism for

typewriters, a variable stop comprising a member having a plurality of teeth forming stops adapted to be engaged by a pawl arm to limit the movement thereof to different amounts; and means actuated by the movement of the type keys of a typewriter for moving said stop member to a position corresponding to the size of each particular letter or character.

9. In a variable spacing mechanism for typewriters, a variable stop comprising a member having a plurality of teeth forming stops adapted to be engaged by a pawl arm to limit the movement thereof to different amounts, means actuated by the movement of the type keys of a typewriter for moving said stop member to a position corresponding to the size of each particular letter or character; and means for adjusting the teeth of said stop member to vary the effective point at which each tooth operates to stop the arm.

10. In a variable spacing mechanism for typewriters, a variable stop to limit the movement of a carriage control pawl to regulate the amount of forward movement of the carriage of a typewriter when a letter or character is printed; and a pivoted lever mounted adjacent the type keys of the typewriter and connected to the stop, said lever being actuated to different positions by different keys, each position corresponding to the width of the letter or character printed.

11. In a variable spacing mechanism for typewriters, a variable stop to limit the movement of a carriage control pawl to regulate the amount of forward movement of the carriage of a typewriter when a letter or character is printed; and a pivoted lever mounted adjacent the type keys of the typewriter and connected to the stop, said lever having a plurality of slots of various depths to be engaged by the respective keys of the typewriter whereby the lever may be engaged and moved variable amounts to actuate the stop to positions corresponding to each particular letter and character as the keys are operated.

12. In a variable spacing mechanism for typewriters, a variable stop to limit the movement of a carriage control pawl to regulate the amount of forward movement of the carriage of a typewriter when a letter or character is printed; a plurality of pivoted stop actuating levers mounted adjacent the type keys of the typewriter, each lever having a plurality of slots of various depths proportional to the width of letters and characters printed by type keys matching therewith whereby the levers may be moved variable amounts by the movement of said type keys; and selective means for connecting the levers to the stop for actuating said stop to positions corresponding to each particular letter and character as the keys are operated, said selective means operating to automati-

cally connect a proper lever to the stop when the keys are operated in conjunction with shifting means for printing any of a plurality of letters or characters actuated by each key.

In witness whereof, we hereunto set our signatures.

JACK HUSTON.
ARTHUR L. SLEE.