Nov. 8, 1932. B. C. STICKNEY 1,886,845

TYPEWRITING MACHINE

Filed Nov. 7, 1929. 3 Sheets-Sheet 1

Fig. 1.

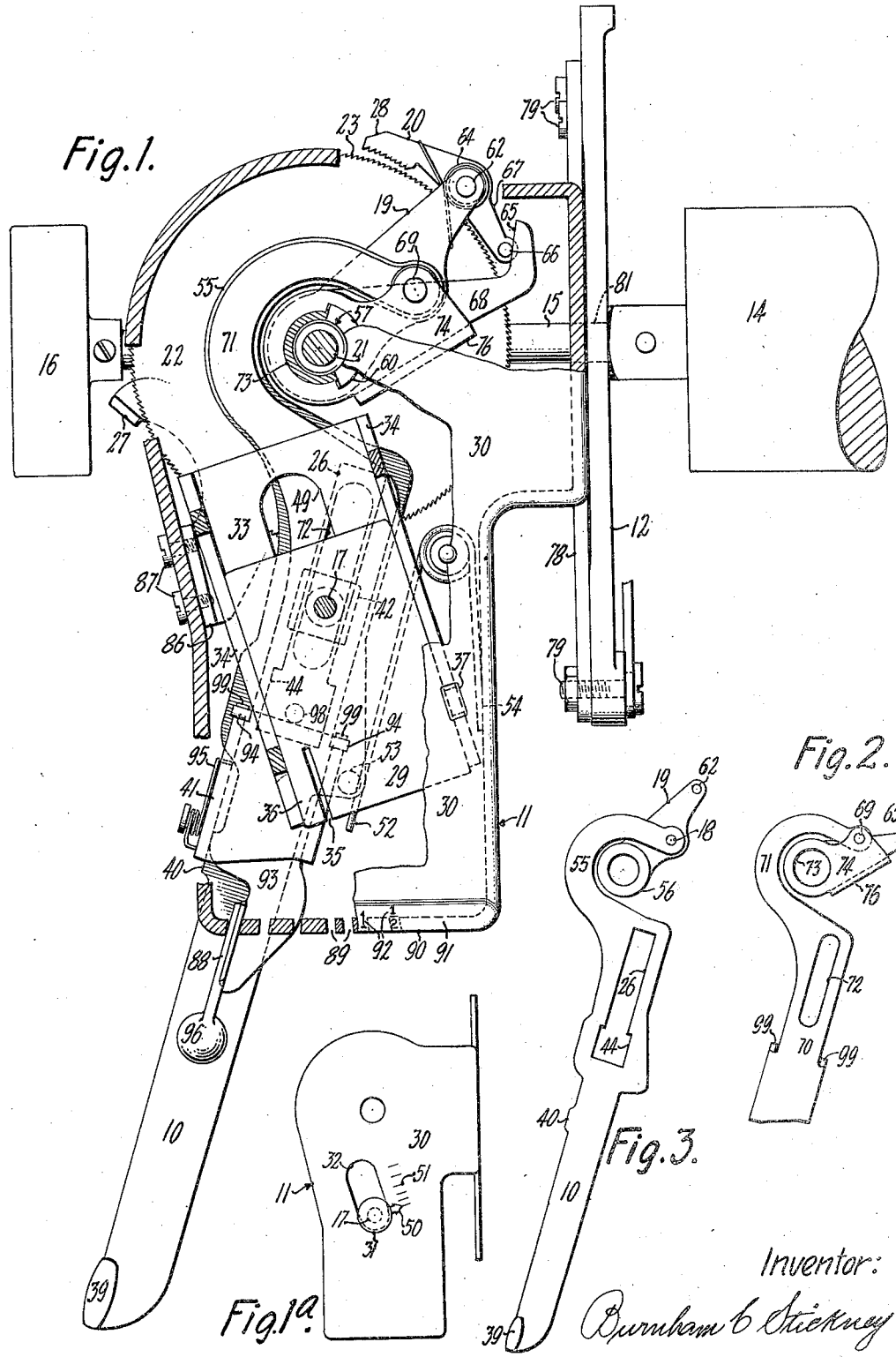


Fig. 1a.

Fig. 3.

Fig. 2.

Inventor:
Burnham & Stickney

Nov. 8, 1932. B. C. STICKNEY 1,886,845

TYPEWRITING MACHINE

Filed Nov. 7, 1929 3 Sheets-Sheet 2

Fig. 4.

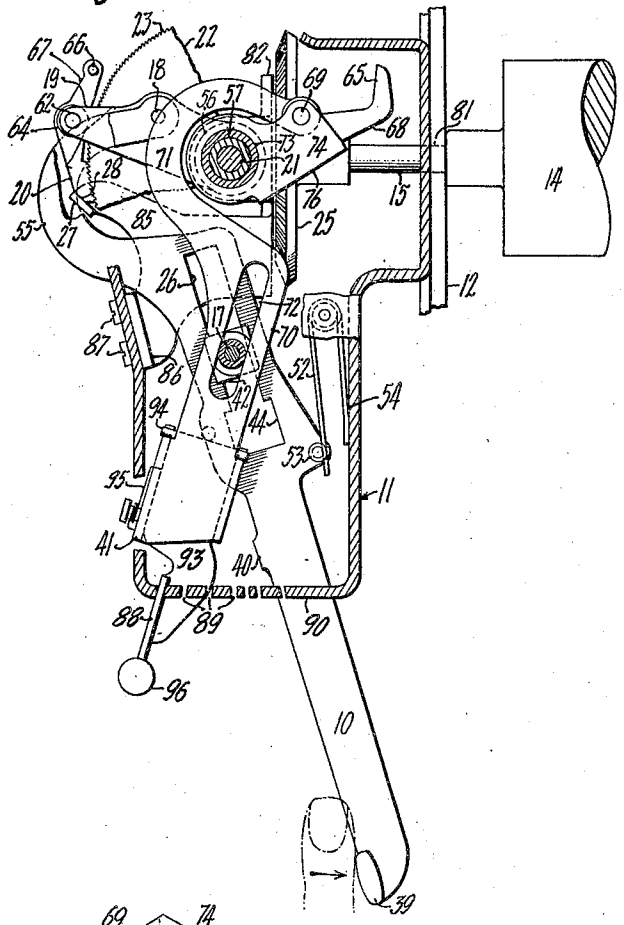
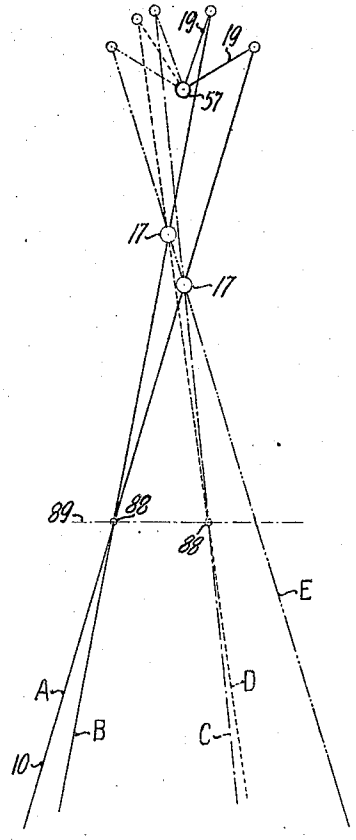


Fig. 5.



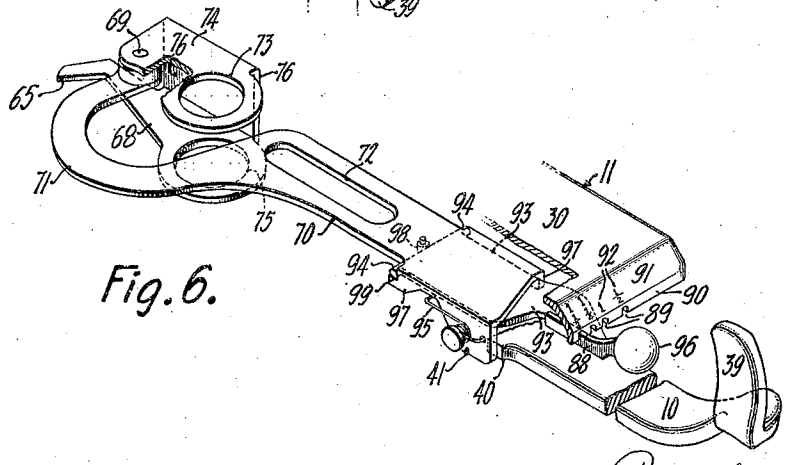


Fig. 6.

Inventor:

Burnham & Stickney

Nov. 8, 1932. B. C. STICKNEY 1,886,845

TYPEWRITING MACHINE

Filed Nov. 7, 1929 3 Sheets-Sheet 3

Fig. 7.

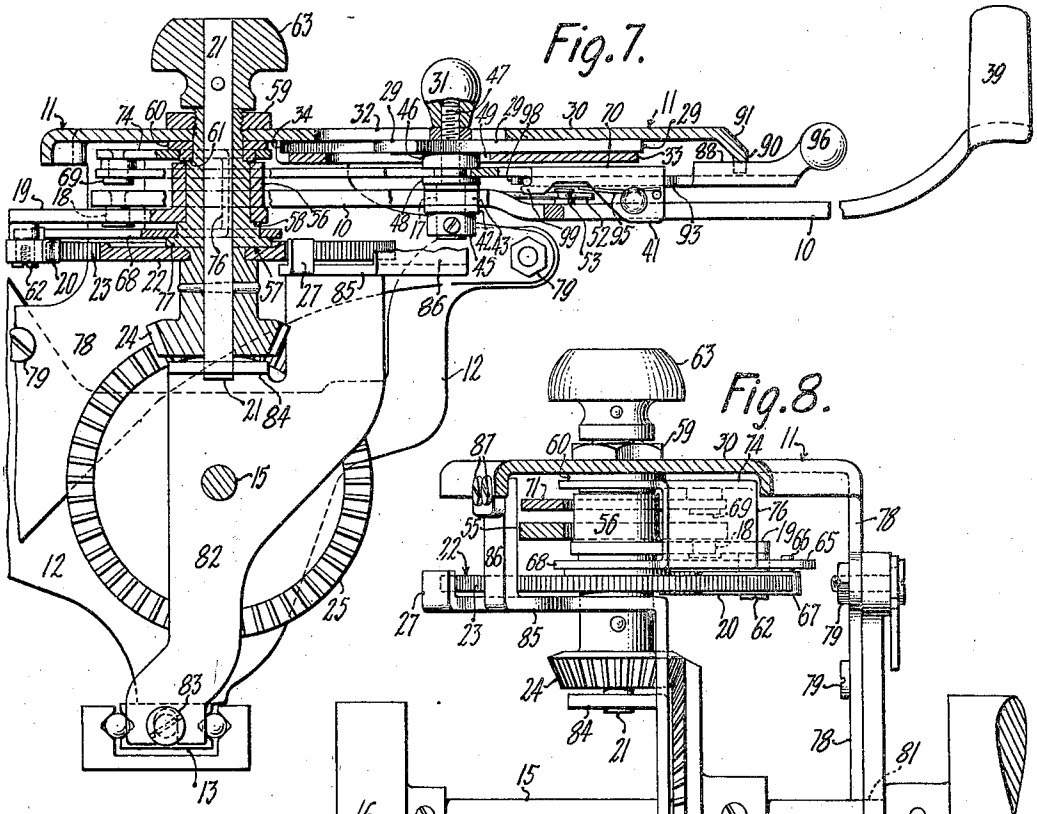
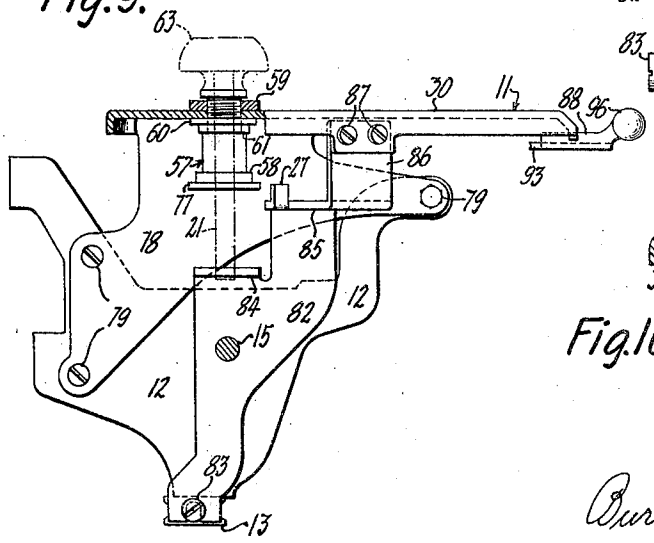


Fig. 8.

Fig. 9.



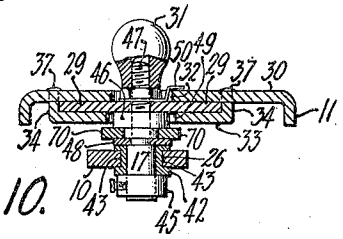


Fig. 10.

Inventor:

Burnham & Stickney

Patented Nov. 8, 1932 1,886,845

UNITED STATES PATENT OFFICE

BURNHAM C. STICKNEY, OF HILLSIDE, NEW JERSEY, ASSIGNOR TO UNDERWOOD ELLIOTT FISHER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

TYPEWRITING MACHINE

Application filed November 7, 1929. Serial No. 405,307.

This invention relates to line-spacing mechanism of typewriting machines of the class in which minute variations of the line-space movement can be produced, and in which a line-space regulator can also be adjusted for spacing the required number of line-space units at each stroke of the lever which returns the typewriter-carriage.

One of the main features of the invention is to effect the desired movements of the platen by a small number of compact, simple and inexpensive parts, and especially to avoid the necessity of employing a long train of toothed gearing for connecting the line-space lever to the revoluble platen.

The line-space mechanism is shown mounted upon a carriage which shifts up and down, as in the well-known Underwood "noiseless" typewriting machine.

Upon the platen-axle is fixed a bevel gear, and meshing therewith is a small bevel pinion that is fixed upon a vertical main arbor, the latter having a thumb-wheel at its top. Meshing with the pinion is a large gear that drives the platen. Also fixed upon the main arbor is a ratchet-wheel having a great multitude of very fine teeth. To secure a sufficient number of teeth, the ratchet-wheel may have great diameter, say 25 per cent. greater than the diameter of the platen; the proportions and connections being such that the peripheral travel of said ratchet-wheel is several times that of the platen.

Concentrically with the ratchet-wheel is mounted a pivoted driving arm, which carries a pawl to drive said ratchet-wheel. A feature of the invention resides in pivoting the line-space lever directly upon said arm. This or an equivalent connection avoids the necessity of employing several gears, and lightens the task of operating the line-space handle or lever, which extends forwardly from said arm.

Said pivoted line-space lever is moreover slidably fulcrumed between its ends upon a stationary pin or stud, which may be mounted in front of said vertical arbor. Said pawl-bearing arm is a lever of the third class, having pivoted thereto between its ends the rear end of said line-space lever. This pivotal point may be in the rear of said vertical arbor, and it is practicable to swing said arm, together with said ratchet-wheel, through about 120 degrees at a full stroke of the line-space lever.

The ratchet-wheel being of great diameter, and its teeth having minute pitch, it results that a multitude of the fine teeth are included within a stroke of 120 degrees of the ratchet-wheel, which is an advantage in that it makes it feasible to secure a practically universal variation in the measurement of the line-space unit. This adjustment of the unit is effected by setting the aforesaid line-space-lever fulcrum forward or backward; the line-space lever being longitudinally slotted to accommodate the adjustment of its fulcrum. When its fulcrum is at the forward position, the line-space lever effects a maximum stroke of the platen. When the fulcrum is at the rear position, a minimum stroke is imparted to the platen. The fulcrum-pin may be set to any intermediate position, and thus secure proportionate variation in the rotation of the platen for a given extent of stroke of the line-space lever.

An advantage is that said fulcrum-pin is stationary, being rigidly mounted upon the typewriter-carriage, and being readily adjusted upon said carriage, and affording reliability, cheapness and simplicity over prior methods of effecting universal variations in the measurement of the line-space unit.

The driving stroke of the lever is arrested by the engagement of the pawl with a fixed stop, which co-operates with the pawl to lock the ratchet-wheel and platen against overthrow.

In its return movement, the line-space lever is arrested by a novel regulator-train, which may be set for one-half, one, one and one-fourth, one and one-half, two, two and one-half or three line-space units. The length of each line-space unit is determined by the setting of said fulcrum of the line-space lever.

Said regulator possesses features of novelty, being itself in the form of a lever-train, which may be somewhat similar to and coincident with the line-space lever-train. The regulator-lever and the line-space lever have

a common adjustable fulcrum. Both levers turn upon the same fulcrum-stud, and the rear end of the regulator-lever is pivoted upon the regulating arm. The latter, like said pawl-arm, is itself pivoted upon said vertical shaft, or concentrically therewith.

This regulator-arm is formed with an interceptor-cam, which engages said pawl upon the completion of the return stroke of the line-space lever, and releases the same from the ratchet-wheel, thereby determining the length of the stroke of the ratchet-wheel and platen, and also leaving the ratchet-wheel free to be revolved idly with the platen when the latter is occasionally rotated, either by means of said vertical arbor and its thumb-wheel, or by means of the finger-wheels fixed upon projecting ends of the platen-axle.

Said regulator-lever has a movable locating tooth, to engage properly-spaced notches which form a row upon the edge of a table or plate which is mounted upon the carriage. The regulator-lever also has a lug which limits the return stroke of the line-space lever. The two levers can if desired be swung together in either direction about their fixed fulcrum, when it is desired to alter the setting of the line-space regulator-lever. This swinging movement of both levers has no tendency to rotate the ratchet-wheel and platen, since the pawl or ratchet remains disengaged at this time from the ratchet-wheel.

Owing mainly to the coincidence of the line-space regulator-lever with the line-space lever, and to the coincidence of the pivoted interceptor-arm with the pawl-carrying drive arm, like movements of the line-space-lever train and the regulator-lever train produce corresponding effects. Therefore, by swinging the regulator-lever to any desired point, and setting it there, the length of the stroke of the line-space lever may readily be predetermined. The regulator-lever is longitudinally slotted like the line-space lever; and when the fulcrum is adjusted along one slot it is adjusted to just the same extent along the other slot, so that subsequent adjustment of the regulator-lever to location for a given number of line-spaces, controls the subsequent motion of the line-space lever for driving the platen to the extent desired.

Other features and advantages will hereinafter appear.

In the accompanying drawings,

Figure 1 is a sectional plan of a line-spacing mechanism, showing the present improvements applied to the Underwood "noiseless" typwriting machine; the parts being in normal positions, and adjusted for three line-spaces, the line-space unit of measurement being adjusted at the maximum.

Figure 1ª is a plan of the table and the regulator pin.

Figure 2 is a plan of a line-space adjusting lever.

Figure 3 is a plan of the line-space lever.

Figure 4 is a sectional plan, showing the line-space lever at the terminus of its working stroke.

Figure 5 is a diagram, showing different degrees of vibration of the line-spacing train.

Figure 6 is a perspective of a line-space regulating train, showing also a fragment of the front end of the line-spacing lever.

Figure 7 is a sectional end elevation of the noiseless typewriter-carriage and the line-spacing mechanism, showing the adjustment for approximate maximum line-space-unit measurement.

Figure 8 is a sectional front elevation of the same.

Figure 9 is a sectional elevation of the carriage, showing the framing of the line-spacing mechanism, and also the forward end of the line-space regulating train.

Figure 10 is a sectional front elevation, showing the mounting of the fixed stud which is adjustable for universally varying the line-space-unit measurement.

A carriage-returning and line-spacing handle 10 projects forwardly from a table 11, forming part of a bracket, which is secured upon the left-hand end plate 12 of the carriage 13 of an Underwood noiseless typewriting machine; a platen 14 being journaled in said carriage by means of an axle 15 having at each end a hand-wheel 16.

Said handle may be in the form of a lever of the first order, which turns about a vertical stationary fulcrum-pin 17. At its rear end said lever 10 is articulated at 18 to a lever 19 that carries at its outer end a pawl 20. At its end the pawl-lever 19 is pivoted concentrically with a vertical rotary main shaft 21. Fixed upon said main shaft is a wheel 22 of great diameter, having ratchet-teeth 23. It will be seen that as the carriage-returning lever 10 is driven from left to right at Figure 1, its rear end swings about the fulcrum 17 from right to left, carrying lever 19 in the same direction, together with the pawl 20, which at this time is meshing with the ratchet-teeth 23. Thus the wheel is revolved, together with a bevel pinion 24 that is also fixed upon said vertical main shaft 21; said pinion meshing with a large bevel gear 25, which is fixed upon the platen-axle 15, thereby line-spacing the platen 14.

The pawl-lever 19 is a lever of the third order, and is employed for the purpose of multiplying the movement of the pawl 20, as compared with the movement of the driving pivot 18. The parts are so arranged that this movement-multiplying lever 19 can swing, together with the ratchet-wheel 22, through an arc of about 120 degrees, at a maximum stroke of the line-space lever 10. Since the ratchet-wheel 22 may be made of great diameter, as compared with the platen, and since its teeth may have very fine pitch,

say 50 to the inch, if desired, or even a finer pitch, substantially accurate spacing of the platen is reliably secured, since a variation of stroke to the extent of a single tooth, if it occurs in the stroke of the line-space wheel, would make only an imperceptible and insignificant variation in the line-spacing of the work-sheet.

This result is secured without the need of using movement-multiplying gearing, as heretofore, between the line-space-handle and the driving pinion-axle or arbor 21. Thus there may be secured simplicity of structure and operation, and cheapening and lightness of parts, and compactness of the entire line-space mechanism. The means for preventing overthrow of the ratchet-wheel 22 and the platen, and also the means for automatically releasing the pawl 20 from the ratchet-wheel after every stroke, will presently be described.

In order to secure universal variation in the measurement of the line-space unit, the fulcrum-pin 17 is made adjustable to different positions lengthwise of the line-space lever 10, to shorten either arm thereof while lengthening the other arm. The lever is provided with a longitudinal slot 26, to accommodate such adjustment of the fulcrum-pin 17, and a maximum variation of 100 per cent or more, in the measurement of the line-space unit, may be secured by adjusting the fulcrum-pin 17 from its extreme rearward position to its extreme forward position.

The fulcrum-pin 17 may be set either at its extreme forward position, to give a maximum measurement of line-space unit, or at its extreme rear position to give a minimum measurement, or at any position intermediate said limits; and it is always rigidly retained by the friction-tongue 36.

The direction of adjustment of the fulcrum-pin 17 is along the line-space lever slot 26 when the latter is seen at the extreme right-hand end of its working stroke. The lever at this time is arrested by means of a stop 27, which is in the path of the spacing pawl 20, see Figure 4; the head of the pawl being beveled at 28, and the stop 27 being given a corresponding inclination, for the purpose of locking the pawl into the teeth of the ratchet-wheel, so that the latter cannot be overthrown by reason of the momentum of the platen geared thereto.

There is therefore an invariable stopping position for the drive stroke of the line-space lever, i. e., its position when the locking of the pawl prevents the overthrow of the platen.

The fulcrum-pin 17 is supported for adjustment by means of a slide 29, which underlies the top 30 of the table 11, and is provided with a finger-piece 31 that extends up through a slot 32 and the table-top, for convenience in forcing the slide forwardly or backwardly. The slide may be confined against the table-top by means of a stationary supporting guide bracket or plate 33, having its side edges turned up to form opposite parallel ways or guides 34 for the slide 29. The latter may have an incision 35, providing a spring-tongue 36, bearing against a guide 34, and affording sufficient friction to retain the slide 29 firmly wherever it is adjusted. Said supporting and guiding plate 33 is staked, riveted or otherwise secured to the top of the table, as at 37.

The slide 29 and the guide 33 are arranged diagonally, extending in the same direction as the slot 26 in the line-space lever when seen at the end of its driving stroke, as at Figure 4. The fulcrum-pin 17 may therefore be adjusted forwardly or backwardly by means of the finger-piece 31 thereon, while the lever 10 remains in the Figure 4 position, and without vibrating the lever. The object in providing for the adjustment of the fulcrum-pin in this diagonal direction, is to insure that no matter what the length of driving stroke of the lever 10 may be, it will always be arrested, together with the spacing pawl, the ratchet-wheel and the platen, by means of the overthrow-stop 27, whose position remains fixed. In other words, the stroke of the line-space lever is variable in a number of ways; but in all of its strokes, of whatever length, it comes to the same stopping position, with the pawl against said stop 27.

It will thus be seen that by pivoting or connecting the driving member of the line-space lever to a movement-multiplying arm, the latter carrying the multiple-tooth line-space pawl, and by forming the ratchet-wheel with a great multiplicity of finely-pitched teeth and giving it a maximum stroke of say 120 degrees, and by having the fulcrum-pin 17 stationary and firmly supported upon a slide for universal adjustment, a very simple driving train is provided between the line-spacing finger-piece 39 and the short gear-train which forms the movement-reducing element between the line-space wheel and the platen, so that the desired result may be obtained without using more than two gears, with a simple, light, inexpensive, compact train going from the line-space finger-piece 39 to said gears.

When it is desired to effect an adjustment of the line-space lever fulcrum-pin 17 by means of the finger-piece 31, the line-space lever may, if desired, be swung to Figure 4 position, with the axis of the slot 26 coincident with the diagonal path of adjustment of the fulcrum-pin 17, Figure 1; whereby adjustment of the fulcrum-pin to any desired point may be effected without the need of stirring the line-space lever from the Figure 4 position. When, however, the line-space lever is in normal position, Figure 1, its slot 26 lies at an angle relatively to its position at Figure 4. If the fulcrum-pin

17 is forced rearwardly by means of its finger-piece or head 31, when lever 10 is in Figure 1 position, its direction of adjustment being determined by the slide 29 and the fixed guides 34, it will result that the line-space lever will be forced to vibrate idly towards the left at its rear end, together with pawl-arm 19. A shoulder 40 on the forward part of said lever normally presses against a stop 41.

The rearward adjustment of the fulcrum-pin 17 shortens the rear arm of the lever 10 and lengthens the forward arm, so that ample regulation can be secured by means of a relatively short travel of said fulcrum-pin, thus conducing to efficiency as well as compactness and lightness of mechanism.

To the lower end of the fulcrum-pin 17 may be swiveled a guide-block 42, having side grooves 43 to fit over the edges of slot 26 in the line-space lever 10, to afford stability and minimize wear. At its forward end the lever-slot 26 may have an enlargement 44, permitting the guide-block 42 to be inserted or removed, and facilitating the assemblage of the lever and fulcrum-pin. The guide-block 42 and the lever are supported by a collar 45 that is secured upon the lower end of fulcrum-pin 17. The latter at its upper end is threaded into finger-piece 31, which has the form of a nut, to draw the fulcrum-pin upwardly and thereby cause a collar 46 to press up against the bottom of the slide 29. Said collar fits over a reduced upper shank-portion 47 of the fulcrum-pin 17.

Upon the latter is placed a collar or washer 48, resting upon the shoulder of the pin 17, and drawn up thereby against the collar 46, which has also a shoulder. The finger-nut 31 it will be seen is threaded upon the shank 47 of the pin. Said finger-piece 31 extends up through diagonal slot 32 in the table-top 30. The supporting plate 33 may have a corresponding diagonal slot 49 to accommodate the travel of the collar 46. The mounting of the adjustable fulcrum-pin directly upon a stationary element, insures rigidity of the pin, and contributes to accuracy of operation, while the adjustment of the pin is simplified and improved. The table-top 30 may be provided with an index at 50 and scale 51, for use in adjusting the pin along the slot 32.

From the foregoing it will be seen that the platen may be line-spaced repeatedly by operating the carriage-returning lever 10, since the latter imparts to the line-space wheel 22 repeated rotations through a much greater angle than the vibration of the line-space-lever; the movement of said line-space wheel being transmitted through vertical arbor 21, pinion 24, gear 25 and axle 15 to the platen; the drive stroke of the line-space lever being arrested by the overthrow-stop 27, and its return stroke being arrested by the stop 41. Owing to the fineness of the pitch of the teeth 23, the possible error in the stroke of the wheel is made very slight, and this tolerance is further reduced by the co-operation of the small pinion 24 and the large gear 25, the latter being preferably of greater diameter than the platen. At any time the fulcrum-pin 17 may be set forwardly or backwardly by the finger-piece 31, thus affording a variation in the rotation of the line-space wheel and platen for the same stroke of the lever. The latter is returned to normal position by a pring 52, bearing againt a lever-pin 53, the other end of the spring 52 bearing at 54 against the flange or side of the table 11. The lever 10 at its rear portion is curved or formed into a goose-neck at 55 to clear the vertical main arbor 21, etc.

The pawl-lever 19 may be provided with a hub 56, which is pivoted upon a general shaft or bearing-post or stem 57, which is dropped from the table-top 30, and is made hollow to serve as a bearing for the vertical arbor 21, line-space wheel 22 and pinion 24. The hub of the pawl-lever 19 rests upon a shoulder 58 that may be formed upon the lower portion of said shaft, and the latter is drawn upwardly by a fastening nut 59, which is threaded upon the upper end of the post that extends up through a hole in the table-top 30. A collar 60 is confined between the table-top and a shoulder 61 on the shaft, and this collar enables the screw 59 to force the shaft firmly up to a seat, so that its rigidity during the operation of the machine is assured.

The pawl-lever 19 is confined loosely between the shoulder 58 and the collar 60. The pawl-arm 19 overlies the ratchet-wheel 22, and the pawl 20 is pivoted at 62 to the under side of said arm 19.

It will be seen that by a simple swing of the lever 10 to the right about fulcrum 17, the lever 19 is turned about the general bearing post 57, thus carrying the pawl 20 and the ratchet-wheel 22, together with vertical shaft 21 and pinion 24, whereby the gear 25 and the platen-axle are rotated. The number of parts is thus minimized, action is direct, and efficiency and accuracy are secured, as well as compactness, simplicity, cheapness, and ready applicability to existing machines; the invention not being limited to the aforesaid Underwood noiseless machine. The variability of the relative lengths of the arms of lever 10 gives ample scope of universal variation of the measurement of the line-space unit. The results are gained by means of positively moving parts, avoiding liability of erroneous action which would be apt to arise if frictional driving had to be depended upon.

It will be understood that the normal position of the pawl-arm 19 is different for

each adjustment of the fulcrum-pin 17 of the line-space lever. In all cases the shoulder 40 of said line-space lever may normally rest against said stop 41; but one of the features of the invention is the provision of novel universal means for automatically disconnecting the pawl 20 from the line-space wheel 22, thereby to permit independent rotation of the platen either forwardly or backwardly, by means of one of the hand-wheels 16 or by means of a thumb-wheel 63. The latter it will be seen is fixed upon the projecting top of the vertical line-space-wheel shaft 21; and it will be understood that the platen rotates at the same angular speed as 16 but at much less angular speed than 63, whereby fine adjusment of the work-sheet is afforded at any time by means of 63, in view of the normal disconnection of pawl 20 from line-space wheel 22.

It is desired to secure accuracy of stroke of the line-space wheel at the line-spacing operation, and for this reason the multiple-tooth pawl 20 must come accurately into automatic mesh with the ratchet-wheel at the beginning of the drive stroke of lever 10. This engagement of the pawl is effected by its returning spring 64, under the control of a cam 65, which normally restrains the pawl by means of a pin 66 that is provided upon pawl-arm 67. This cam, it will be understood, lies in the path of the pin 66, to be struck thereby at the conclusion of the return stroke of the line-spacing train, whereby the pawl is cammed out of mesh with the ratchet-wheel 22, Figure 1. One of the features of the invention is the provision of means whereby this release of the pawl, and its re-engagement with the wheel, are properly timed, throughout all of the variations in the measurement of the line-space unit which are secured by different adjustments of the fulcrum-pin 17. This is accomplished without depending upon uncertainly-operating friction devices for controlling the engaging and disengaging movements of the pawl 20. This positive action is secured by simple means, inasmuch as the adjustment of the line-space lever fulcrum-pin 17 is also made effective to adjust the position of the pawl-releasing cam 65. This result is secured by providing a cam-train, and in many respects this cam-train is coincident with the line-space lever train, see Figure 1.

The pawl-controlling cam-train includes an arm or lever 68 which is fulcrumed upon the same general shaft or bearing post as the pawl-arm 19, so that it may swing around said shaft to any desired position to intercept and release the pawl. Said arm 68 is articulated at 69 to a forwardly-extending lever 70, having a goose-neck portion 71 and a longitudinal slot 72, so that said lever mainly resembles in plan and displacement the line-space lever 10; the pivot 69 being coincident with 18, the lever bearing 73 being concentric with the shaft 57, the lever having goose-neck 71 and the slot 72 of the lever being fitted to the same fulcrum-pin 17 that is used for the line-space lever 10.

When the pin 17 is adjusted along the line-space lever, it is simultaneously adjusted along the cam-lever 70, and to the same extent. The effect is the same upon both trains. If the parts are in the Figure 1 position during such adjustment, both the line-space lever and the cam-lever will be swung to the left to the same extent; and the same will be true of the cam-lever 68 and the pawl-lever 19, as well as the pivots 18 and 69. Rearward adjustment of the pin 17 will therefore effect a reduction in the driving stroke of the pawl-lever 19, thereby to reduce the stroke of the ratchet-wheel; while the cam 65 swings to a corresponding position toward the left, so that thereafter the pawl may sooner be withdrawn automatically from the ratchet-wheel, but with exactness of timing; and it is also re-engaged to the ratchet with exact timing upon the starting of the succeeding line-spacing stroke.

It will be seen that an advantage is gained in using a line-spacing lever which is pivoted at its driving point to a movement-multiplying pawl-lever, inasmuch as the pawl-releasing device may be located by means of the same device 17 which varies the extent of stroke of the levers 10 and 19. The adjustment of cam 65 is automatic and exact, simply effected, and dependable. It is a feature of the invention that universal variation is obtainable in the extent of stroke of the pawl-arm 19, and a concomitant resetting of the pawl-controlling cam 65 to an exactly corresponding extent; and since the adjustment of 65 is mechanically effected without attention of the operator to said cam, the operator needs only to adjust the single pin 17.

The coincident levers 10 and 70 may be compactly placed facewise, one above the other, in the machine, Figure 7, the vertical fulcrum-pin 17 being common to the levers, passing through both. Coincident with 18 is pivot 69, connecting arm 68 to the bail which includes the rear end of lever 70, said bail having arm 74 which has a bearing 73 that is coincident with the bearing 75 of bail-arm 68. Said arms 74 and 68 it will be seen may be formed as a bail in one piece, with an intervening vertical web-plate 76; the arm 74 overlying 68, see Figure 6. The lower bail-arm 68 may rest upon a flange 77 that is formed upon the bottom of bearing 57; and hub or bearing 75 may be fitted upon said bearing 57 for rocking motion. The upper bail-arm 74 may be fitted at 73 upon a cylindrical portion of shoulder 61 that is formed on the collar 60. This bail-structure 74, 76, 68 may therefore be confined between 77 and 60 for pivotal motion, to permit adjustment of the cam 65.

This arrangement of arm 74 above the levers 70, 10 and 19, and arm 68 below said levers, permits compactness of the mechanism, while giving ample space and sufficient freedom of motion and accessibility, as will be understood by reference to Figure 7.

Thus a simple, compact, inexpensive, light, durable and easily-operated mechanism is provided for effecting universal variation in the measurement of the line-spacing unit, the strokes of the line-space lever being positively limited in both directions for all adjustments, and the line-space pawl being automatically released from the line-space wheel and automatically re-engaged therewith, with exactness of timing in correspondence with any adjustment. The last is effected by merely slipping the finger-piece 31 along the slot 32. The parts are firmly supported throughout, and reliability of action is secured for any desired adjustment.

The table 11 may comprise a top plate 30 and a depending flange, and may overlie the lever system and the line-space wheel. Said table may extend from the left from a vertical bracket in the form of a plate 78 that is secured by screws 79 upon the left-hand carriage-end 12 of said noiseless machine; said end having a bearing 81 for the platen-axle. An auxiliary vertical bracket 82 may be secured by screws 83 to the left-hand end of the carriage 13 in said machine, and may rise at the left of the gear 25 and have a bearing for the platen-axle 15. It may also be provided with a bent-out flange 84, to form a bearing for the lower end of the vertical main shaft 21. This bracket 82 may, at its top, be bent to the left to form a plate 85 having at its left-hand end the bent-up beveled stop 27. A brace 86 may also be extended up from 85 and secured by screws 87 to the flange at the left-hand side of the table. The improvement may be manufactured and supplied as a unit for attachment to noiseless machines.

The aforesaid arrangement of coincidently mounted line-spacing and space-measuring trains is of advantage not only for its capacity for minutely varying the measurement of the line-space unit, but also because of an added feature that the trains may be made to do further duty in regulating the gross line-spacing stroke of lever 10. It is desired in such regulation, that the platen shall be rotated at each stroke for either single, double or triple line-spacing; and preferably also for half-line-spacing and also one and a quarter, one and a half and two and a half line-spaces for each stroke. This adjustment involves simply setting the lever 70 edgewise to corresponding stations or locations. Said lever has a locating tooth 88 adapted to seat in any one of a range of notches 89 cut in the bottom edge of the front flange 90 of the table; said flange having a beveled reading face 91 having thereon designations 92 for the gross line-space regulation.

It will be seen that wherever the regulator-lever is set, its stop 41 will serve to arrest the shoulder 40 of the line-space lever 10, and determine for how many line-space units the platen shall be rotated at each stroke, regardless of the measurement of the line-space unit that is determined by the adjustment of the fulcrum-pin 17. When setting the regulator-lever 70, it will be seen that the multiple-tooth pawl 20 will be maintained out of engagement with the ratchet-wheel, because the releasing cam 65 is adjusted together with said lever 70, owing to the pivoting of the cam-arm to the lever. The lever 70 may be swung to the right as far as it is desired, from the Figure 4 position, without imparting any rotation to the platen, which is a desideratum. If desired the line-space lever 10 may be held in its Figure 4 position during the resettings of the regulator 70, although, if required, the two levers 10 and 70 may be swung together to either left or right during such adjustment, and in no case will the pawl 20 be engaged, or the platen rotated.

The tooth 88 may project forwardly from a leaf 93 that may be pivoted upon pins 94 projecting from the sides of the regulator-lever 70; and a spring 95 may hold the tooth 88 up in any notch. A finger-piece 96 may be carried by the tooth. Said leaf may be guided between flanges 97 turned down at the sides of the forward end of lever 70. A detachable stop 98 may be provided upon the lever 70 to lock the latch leaf 93 against rearward displacement; said leaf having notches 99 whereby it is detachably pivoted upon the opposite pins 94.

In the diagram at Figure 5, 89 represents the line of space-regulating notches. Full-lines A represent the normal positions of the line-spacing levers when the machine is adjusted for three line-spaces of maximum-unit measurement; this corresponding to Figure 1. Three-unit spacing may be obtained for any measurement of unit, and full-lines B represent the normal position of the line-space levers when the fulcrum-pin 17 has been adjusted backwardly to provide a minimum measurement of the line-space unit, for three units.

The regulator tooth 88 is shown in extreme left-hand position, for securing three spaces of either maximum or minimum unit-measurement. This tooth 88 may be shifted over to the right to a one-space position, at which time the lever 10 will normally occupy the position seen at C, if the fulcrum-pin 17 is at its forward maximum-unit position. But if said pin 17 is placed at its rearward extreme position, then the normal position of lever 10 is indicated at D. But from every

starting position A, B and C, the lever swings to one final position E.

Variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others; as, for examples, the gross line-space regulator-train can be employed for full and fractional line-spacing, even if no adjustment of the fulcrum-pin 17 is provided, and in some cases the return-stop 41 need not be adjustable, and may be omitted from the regulator-train.

Having thus described my invention, I claim:

1. In a line-spacing mechanism, the combination of a line-spacing wheel, a line-space lever having a fulcrum, a movement-multiplying arm to which is pivoted said line-space lever, the latter having a driving clutch for said line-space wheel, said clutch-arm being pivoted to turn about the axis of the line-space wheel, and adjustable means co-operative with said fulcrum for varying the leverage of the line-space lever upon the clutch-arm.

2. In a line-spacing mechanism, the combination of a line-spacing ratchet-wheel having a multitude of teeth of minute pitch, a line-space lever having a fulcrum which is stationary at the line-spacing operation, a movement-multiplying arm pivoted to said line-space lever and having a driving pawl for said line-space wheel, said pawl-arm being pivoted to turn about the axis of the line-space wheel and having a maximum stroke of about 120 degrees, and means for adjusting said fulcrum.

3. In a line-spacing mechanism, the combination of a line-spacing ratchet-wheel having a multitude of teeth of minute pitch, a line-space lever, a movement-multiplying arm connected to said line-space lever and having a driving pawl for said line-space wheel, said line-space lever vibrating upon an axis which is parallel with the axis of the line-space wheel, said pawl-arm being pivoted to turn about the axis of the line-space wheel, said line-space lever having a fulcrum, and means affording an adjustment of said fulcrum, the latter being stationary during the line-spacing operation.

4. In a line-spacing mechanism, the combination of a line-spacing ratchet-wheel, a line-space lever of the first order and having a fulcrum which is stationary during the line-spacing operation, a movement-multiplying arm connected to said line-space lever and having a driving clutch for said line-space wheel, said clutch-arm being directly pivoted to the end of said line-space lever, the latter vibrating upon an axis which is parallel with the axis of the line-space wheel, said clutch-arm being pivoted to turn about the axis of the line-space wheel, adjustable means for varying the leverage of the line-space lever upon the clutch-arm, and means affording an adjustment of said fulcrum, the axis of the line-space wheel being between the fulcrum of the line-space lever and the point of connection of the latter to the pawl-lever.

5. In a line-spacing mechanism, the combination of a line-spacing wheel, a line-space lever having a fulcrum, a movement-multiplying arm to which is pivoted said line-space lever, the latter having a driving clutch for said line-space wheel, said clutch-arm being pivoted to turn about the axis of the line-space wheel, adjustable means co-operative with said fulcrum for varying the leverage of the line-space lever upon the clutch-arm, an arbor upon which said line-space wheel is secured, a small bevel pinion also fixed relatively to said arbor, a large gear meshing with said pinion, and a revoluble work-sheet carrier driven by said large gear.

6. In a line-spacing mechanism, the combination of a line-spacing wheel, a line-space lever having a fulcrum, a movement-multiplying arm to which is pivoted said line-space lever, the latter having a driving clutch for said line-space wheel, said clutch-arm being pivoted to turn about the axis of the line-space wheel, adjustable means co-operative with said fulcrum for varying the leverage of the line-space lever upon the clutch-arm, an arbor upon which said line-space wheel is secured, a small bevel pinion upon said arbor, a large gear meshing with said pinion, a revoluble platen driven by said large gear, and a thumb-wheel upon said line-space-wheel arbor.

7. In a line-spacing mechanism, the combination of a line-spacing wheel, a line-space lever, a movement-multiplying arm connected to said line-space lever, and having a normally released self-closing driving clutch for said line-space wheel, said line-space lever having a fulcrum and also having two arms, means affording an adjustment of said fulcrum along the lever to change the relative length of the two lever arms, the fulcrum being stationary during the line-spacing operation, an arbor for said line-space wheel, a pinion upon said arbor, a gear meshing with said pinion, a platen driven by said large gear, and a thumb-wheel upon said arbor.

8. In a line-spacing mechanism, the combination of a line-spacing ratchet-wheel having a multitude of teeth of minute pitch, a line-space lever, a movement-multiplying arm connected to said line-space lever and having a driving pawl for said line-space wheel, said line-space lever vibrating upon an axis which is parallel with the axis of the line-space wheel, said pawl-arm being pivoted to turn about the axis of the line-space wheel, said line-space lever having a fulcrum, means affording an adjustment of said

fulcrum, the latter being stationary during the line-spacing operation, an arbor upon which said line-space wheel is secured, a small bevel pinion also fixed relatively to said arbor, a large gear meshing with said pinion, a revoluble work-sheet carrier driven by said large gear, and a vertical fixed hollow shaft in which said line-space-wheel arbor is journaled, said pawl-lever pivoted upon said shaft.

9. The combination of a line-space wheel having a multitude of teeth of minute pitch, a pawl for said wheel, a line-space lever, driving means connecting said lever to said pawl, a minutely-variable fulcrum for said lever, whereby the leverage of said lever upon said pawl may be varied to alter the measurement of the line-spacing unit, said fulcrum being stationary during the line-spacing operation, and separate independently settable means for determining the number of units of space through which said lever line-spaces the work-sheet at each operation.

10. The combination of a line-space wheel, a line-space lever having a minutely-variable fulcrum which is stationary during the line-spacing operation, a pawl for said wheel, driving means connecting said lever to said pawl, means settable independently of said fulcrum for determining the number of units of space through which said lever line-spaces the work-sheet, and a stationary stop for arresting said pawl and preventing overthrow of the line-space wheel, the adjustment of said fulcrum being in a direction such that at all adjustments thereof said line-space lever is arrested by said stationary stop.

11. The combination of a line-space wheel, a line-space lever having a minutely-variable fulcrum which is stationary during the line-spacing operation, a pawl for said wheel, driving means connecting said lever to said pawl, means settable independently of said fulcrum for determining the number of units of space through which said lever line-spaces the work-sheet, and a stationary stop for arresting said pawl and preventing overthrow of the line-space wheel, said lever having a longitudinal slot along which said fulcrum-pin is adjustable, and said slot being so formed that when the lever is arrested by said stop, the direction of its said slot is coincident with the direction of adjustment of said fulcrum-pin.

12. The combination of a line-space wheel, a line-space lever having two arms, a clutch for said wheel, means connecting said lever to said clutch, a fulcrum for said lever which is stationary during the line-spacing operation, a slide upon which said fulcrum is rigidly fixed, said slide and fulcrum being movable along the lever to change the relative length of the two lever-arms, means for guiding said slide, and a finger-piece for operating the slide.

13. The combination of a line-space wheel, a line-space lever, a clutch for said wheel, a fulcrum for said lever which is stationary during the line-spacing operation, a slide upon which said fulcrum is rigidly fixed, means for guiding said slide, a finger-piece for operating the slide, means for retaining said slide where adjusted; said fulcrum projecting from said slide to co-operate with said line-space lever, and an arm to operate said clutch, said arm directly pivoted to said lever and also mounted to swing about the axis of said line-space wheel.

14. The combination of a line-space wheel, a line-space lever, a clutch for said wheel, a fulcrum for said lever which is stationary during the line-spacing operation, a slide upon which said fulcrum is rigidly fixed, means for guiding said slide, a finger-piece for operating the slide, means for retaining said slide where adjusted; said fulcrum projecting from said slide to co-operate with said line-space lever, an arm to operate said clutch, said arm directly pivoted to said lever and also mounted to swing about the axis of said line-space wheel, and an overthrow-preventing stop engageable by said clutch, said lever having a fulcrum-slot which is parallel with said slide-guide when the lever is arrested by said stop.

15. The combination of a line-space wheel having a great multitude of teeth of minute pitch, a line-space lever having two arms, a pawl for said wheel, driving means connecting said lever to said pawl, a fulcrum for said lever which is stationary during the line-spacing of the platen, a slide upon which said fulcrum is rigidly fixed, said slide and fulcrum being movable along the lever to change the relative length of the two lever-arms, means for guiding said slide, a finger-piece for operating the same, means for retaining said slide where adjusted, separate means adjustable independently of said fulcrum for determining the number of units of space through which said lever line-spaces the work-sheet at each operation, and a stop for arresting said pawl and preventing overthrow, the direction of adjustment of said slide being such that at all adjustments thereof said line-space lever is arrested by said stop.

16. The combination of a line-space wheel, a line-spacing train including a line-space lever, a wheel-driving clutch, a driver for said clutch, said driver connected to said lever, a line-space-regulator train which is mainly a doubling of said line-spacing train and includes a regulator-lever coincidently fulcrumed with said line-space lever and having connected thereto a regulator-arm whose pivoting and lever-connection are coincident with those of said driver, said regulating arm having means for releasing said clutch from said wheel, a device common to

both levers for varying their leverage, a line-space-regulating set of stations, means to detain said regulator-lever selectively at different stations, and a clutch-locking stop to arrest said line-space lever at the same position for driving strokes of varying lengths.

17. The combination with a line-space wheel, of a line-spacing drive-train, a line-space-regulator train for said line-spacing train and including a regulator-lever having pivoted thereto a regulator-arm, the latter pivoted concentrically with said wheel and having means for controlling the connection of said drive-train with said wheel, and a device for minutely varying the leverage of said regulator-lever.

18. The combination with a line-space wheel, of a line-spacing drive-train, a line-space-regulator train for said line-spacing train and including a regulator-lever having pivoted thereto a regulator-arm, the latter pivoted concentrically with said wheel and having means for controlling the connection of said drive-train with said wheel, a device for minutely varying the leverage of said regulator-lever, means to detain said regulator-lever selectively at different set stations, and an overthrow-preventing stop to arrest said driving train at the same position for driving strokes of all extents.

19. The combination of a line-space wheel having a multitude of minute teeth, a line-spacing train including a line-space lever, a wheel-driving pawl, and a driving arm for said pawl, said driving arm pivoted to said lever and also pivoted to turn about the axis of said wheel, a line-space-regulator train which is mainly a doubling of said line-spacing train and includes a regulator-lever coincidently fulcrumed with said line-space lever and having pivoted thereto a regulator-arm which is coincidently mounted and pivoted with respect to said pawl-arm, said regulating arm having means for releasing said pawl from said wheel, a single device for adjusting the fulcrums of both levers, a rack, and means to detain said regulator-lever selectively at different points in said rack.

20. The combination of a line-space wheel having a multitude of minute teeth, a line-spacing train including a line-space lever, a wheel-driving pawl, and a driving arm for said pawl, said driving arm pivoted to said lever, and also pivoted to turn about the axis of said wheel, a line-space-regulator train which is mainly a doubling of said line-spacing train and includes a regulator-lever coincidently fulcrumed with said line-space lever and having pivoted thereto a regulator-arm which is coincidently mounted and pivoted with respect to said pawl-arm, said regulating arm having means for releasing said pawl from said wheel, a single device for adjusting the fulcrums of both levers, a rack, means to detain said regulator-lever selectively at different points in said rack, and a stop to arrest said line-space lever at the same position for driving strokes of varying extents.

21. The combination with a line-space wheel, of a driving train therefor, including a line-space lever, an arm pivoted thereto, a clutch operated by said arm for driving said line-space wheel, a stop to arrest the driving stroke of the line-space lever, a line-space-regulating train effective upon the return movement of said line-space lever, said regulating train including a lever and means pivoted thereto to release said clutch from said wheel, said releasing means forming mainly a double of said clutch-arm, the pivot which connects said line-space lever to said clutch-carrying arm being coincident with the pivot that connects the regulating lever with the clutch-releasing means, said clutch-arm being coincidently mounted with said releasing means, and means including a system of stations for selectively positioning said line-space-regulating train for various full line-spacing movements and also various fractional line-spacing movements.

22. The combination with a line-space wheel having teeth, of a driving train therefor, including a line-space lever, an arm pivoted thereto, a pawl operated by said arm for driving said line-space wheel, an overthrow-preventing stop to engage said pawl and arrest the driving stroke of the line-space lever, a line-space-regulating train effective at the return movement of said line-space lever, said regulating train having means to release said pawl from said wheel, said releasing means forming mainly a double of said pawl-arm, the pivot which connects said line-space lever to said pawl-arm being coincident with the pivot that connects the regulating lever with the pawl-releasing means, said pawl-arm being coincidently mounted with said releasing means, and means including a system of stations for selectively positioning said line-space-regulating train for various full line-spacing movements and also various fractional line-spacing movements.

23. The combination with a line-space wheel, of a driving train therefor, including a line-space lever, an arm pivoted thereto, a clutch operated by said arm for driving said line-space wheel, a stop to arrest the driving stroke of the line-space lever, a line-space-regulating train effective upon the return movement of said line-space lever, said regulating train including a lever and means pivoted thereto to release said clutch from said wheel, said releasing means forming mainly a double of said clutch-arm, the pivot which connects said line-space lever to said clutch-arm being coincident with the pivot that connects the regulating lever with the clutch-releasing means, said clutch-arm being coincidently mounted with said releasing

means, and a locating rack to co-operate with said regulator-lever to retain it selectively at predetermined full-space and fractional-space locations, said regulator-lever and said line-space lever having a common adjustable fulcrum, and said clutch-arm and said releasing means being mounted concentrically with said line-space wheel.

24. The combination with a line-space wheel, of a driving train therefor, including a line-space lever, an arm pivoted thereto, a clutch operated by said arm for driving said line-space wheel, a stop to arrest the driving stroke of the line-space lever, a line-space-regulating train effective upon the return movement of said line-space lever, said regulating train including a lever and means pivoted thereto to release said clutch from said wheel, said releasing means forming mainly a double of said clutch-arm, the pivot which connects said line-space lever to said clutch-arm being coincident with the pivot that connects the regulating lever with the clutch-releasing means, said clutch-arm being coincidently mounted with said releasing means, a locating rack to co-operate with said regulator-lever to retain it selectively at predetermined locations, said regulator-lever and said line-space lever having a common adjustable fulcrum, said clutch-arm and said releasing means being mounted concentrically with said line-space wheel, an arbor for said line-space wheel, and a fixed shaft within which said arbor is journaled, said clutch-arm and releasing means being pivoted upon said shaft.

25. In a line-spacing mechanism for a typewriting machine having a revoluble platen, the combination of a line-space lever having two arms, a movement-multiplying arm to which said line-space lever is pivoted, a pawl driven by said movement-multiplying arm, a fine-toothed line-space wheel engageable by said pawl, the connection being such that said pawl-arm, together with said line-space wheel, is vibrated through a far greater angular extent than said line-space lever, movement-reducing gearing between said line-space wheel and said revoluble platen, and means for adjusting the fulcrum of the line-space lever longitudinally of said lever, to change the relative length of the two lever-arms.

26. In a line-space mechanism for a typewriting machine, the combination of a line-space wheel, a line-spacing train including both a lever and a movement-multiplying arm pivoted thereto, the arm being mounted to rotate coaxially with said line-space wheel, a clutch operated by said arm, a line-space-regulating train forming mainly a double of said line-spacing train and including a lever and a releasing device for said clutch, and means for varying the leverage of said line-space lever upon said movement-multiplying arm and concomitantly varying the leverage of said regulating lever upon said releasing device, said regulating lever being adjustable.

27. The combination of a line-space wheel, a line-spacing train which includes both a lever and a movement-multiplying arm to which the lever is directly pivoted, said arm mounted to rotate coaxially with said line-space wheel, a clutch for connecting said arm to said wheel, a line-space-regulating train forming mainly a double of said line-spacing train and including a lever, said levers having coincident adjustable fulcrums, said regulating train including a clutch-releasing arm pivoted to said regulating lever coincidently with the pivot of said clutch-arm to the line-space lever, a system of stations, and means for detaining said regulating arm at any station.

28. The combination with a line-space wheel, of a line-space handle in the form of a lever of the first order, a support having mounted thereon for adjustment a fulcrum-pin for said lever, a movement-multiplying clutch-arm to which said lever is directly pivoted, said clutch-arm being in the form of a lever of the third order and being pivoted concentrically with said line-space wheel, and effective to drive the latter, and movement-reducing gearing for connecting said line-space wheel to an element to be line-spaced.

29. The combination with a line-space wheel, of a line-space handle in the form of a lever of the first order, a support having mounted thereon for adjustment a fulcrum-pin for said lever, a movement-multiplying clutch-arm to which said lever is directly pivoted, said clutch-arm being in the form of a lever of the third order and being pivoted concentrically with said line-space wheel, and effective to drive the latter, movement-reducing gearing for connecting said line-space wheel to an element to be line-spaced, said line-space wheel being movable by said clutch-lever through about 120 degrees at maximum stroke, and a thumb-wheel mounted on said movement-reducing gearing.

30. In a line-spacing mechanism, the combination of a line-spacing wheel, a line-space lever having a fulcrum, a movement-multiplying arm to which is pivoted said line-space lever, the latter having a driving clutch for said line-space wheel, said fulcrum-pin being made adjustable to different positions lengthwise of the line-space lever, the lever having a slot for the fulcrum-pin, a slide upon which said fulcrum-pin is fixed, and means for guiding said slide, the latter being provided with a finger-piece.

31. In a line-spacing mechanism, the combination of a line-spacing wheel, a line-space lever having a fulcrum, a movement-multiplying arm to which is pivoted said line-space lever, the latter having a driving clutch

for said line-space wheel, said fulcrum-pin being made adjustable to different positions lengthwise of the line-space lever, the lever having a slot for the fulcrum-pin, a slide upon which said fulcrum-pin is fixed, means for guiding said slide, the latter being provided with a finger-piece, and independent means, including a rack and a member adjustable along said rack, for selectively determining the length of stroke of the line-space lever without disturbing the adjustment of said fulcrum-pin.

32. The combination of a line-space wheel, a line-spacing train including a line-space lever, a wheel-driving clutch, and a driver for said clutch, said driver connected to said lever, a line-space-regulator train which is mainly a doubling of said line-spacing train and includes a regulator-lever coincidently fulcrumed with said line-space lever and having connected thereto a regulator-arm whose pivoting and lever-connection are coincident with those of said driver, said regulating arm having means for releasing said clutch from said wheel, a fulcrum-pin, common to both levers, being made adjustable to different positions lengthwise of the levers, each lever having a slot for the fulcrum-pin, and a slide upon which said fulcrum-pin is fixed, said slide being provided with a finger-piece and with guiding means, and being stationary during the line-spacing operation.

33. In a line-spacing mechanism, the combination of a line-spacing wheel, a line-space lever having a fulcrum, a movement-multiplying arm to which is pivoted said line-space lever, the latter having a driving clutch for said line-space wheel, a stop for arresting the line-space lever and wheel, and constructed to maintain engagement of the clutch with the wheel, a table above said wheel and lever, a slide having a fulcrum-pin for said lever, a guide being provided upon said table for said fulcrum-pin slide, and means to maintain said slide where it is adjusted, said lever having a fulcrum-pin slot and said guide extending in the same direction as the slot in the line-space lever when it is at the end of its driving stroke.

34. In a line-spacing mechanism, the combination of a line-spacing wheel, a line-space lever having a fulcrum, a movement-multiplying arm to which is pivoted said line-space lever, the latter having a driving clutch for said line-space wheel, a stop for arresting the line-space lever and wheel, and constructed to maintain engagement of the clutch with the wheel, a table overlying said wheel and lever, a slide having a fulcrum-pin for said lever, a support and guide for said slide fastened upon said table, said lever having a slot, guiding means for said slide extending in the same direction as the slot in the line-space lever when at the end of its driving stroke, a guide-block provided upon said fulcrum-pin and fitted to the slot in said lever, said slot having an enlargement to permit assembling and separation of the block and lever, and a finger-piece projecting above said table, the latter having a slot to accommodate the travel of said finger-piece, and said support having a corresponding slot.

35. The combination with a line-space wheel, of a driving train therefor, including a line-space lever, an arm pivoted thereto, a clutch operated by said arm for driving said line-space wheel, a stop to arrest the driving stroke of the line-space lever, a line-space-regulating train effective upon the return movement of said line-space lever, said regulating train including a lever and means pivoted thereto to release said clutch from said wheel, said releasing means forming mainly a double of said clutch-arm, the pivot which connects said line-space lever to said clutch-arm being coincident with the pivot that connects the regulating lever with the clutch-releasing means, said clutch-arm being coincidently mounted with said releasing means, a fulcrum-pin common to said levers, a slide from which said fulcrum-pin projects, and a guide for said fulcrum-pin slide, each of the levers being longitudinally slotted for said pin, said guide extending in the same direction as the slot in the line-space lever when the latter is at the end of its driving stroke.

36. In a line-spacing mechanism, the combination of a line-spacing wheel, a train of driving devices therefor, including a lever, said lever having a supporting member which is fixed relatively to the framework during the line-spacing operation, said supporting member being adjustable relatively to said lever, to afford variation in the measurement in the line-spacing unit, and independently-adjustable means for use in determining the number of units to be included in the line-space operation.

37. The combination of a line-space wheel, a line-space lever, an adjustable fulcrum for said lever, a movement-multiplying and clutching device for connecting said lever to the line-space wheel, a clutch-locking stop for arresting the drive-stroke of the lever, an adjustable stop for the return stroke of the lever, and clutch-releasing means adjustable simultaneously with said stop and to a corresponding extent.

38. The combination of a line-spacing wheel, a train of driving devices therefor, including a lever, said train having a supporting member which is fixed relatively to the framework during the line-spacing operation, said supporting member being adjustable to afford variation in the measurement in the line-spacing unit, and said supporting member having a fulcrum for said lever, a movement-multiplying and clutching device being provided for connecting said lever to the line-space wheel, a clutch-locking stop for arrest-

ing the drive-stroke of the lever, an adjustable stop for the return stroke of the lever, adjustable clutch-releasing means, and independently-adjustable means for use in determining the number of units to be included in the line-space operation.

39. The combination of a member to be line-spaced, a line-space wheel, a pawl, a pawl-arm, a driver, a table, an arbor upon which said line-space wheel is fixed, a fixed shaft or bearing-post through which said arbor extends, said pawl-arm having a hub whereby it is pivoted to said shaft, means securing said shaft to the bottom of said table, a pinion fixed upon said arbor, a gear meshing with said pinion and driving said member, said shaft having a shoulder upon which rests the hub of said pawl-arm, a fastening nut threaded upon the upper end of said shaft to draw it up against said table, and a collar confined between the table-top and the shaft to enable the nut to force the shaft firmly up to its seat, said arbor extending up through the table and provided thereover with a thumb-wheel.

40. In a line-spacing mechanism, the combination with a line-space wheel, of a driving train therefor including a lever, a movement-multiplying arm driven thereby, a clutch actuated by said arm, said clutch being normally disengaged from said wheel and provided with means for automatically clutching the arm to the wheel upon the starting of said lever in motion, a clutch-locking stop to limit the line-spacing stroke of the lever, an adjustable arm having a clutch-releaser, and a regulating lever connected to said clutch-releasing arm, said clutch-releaser effective to keep the clutch released throughout all adjustments of said adjustable arm, whereby the arm may be selectively set without disturbing said line-space wheel.

41. In a line-spacing mechanism, the combination with a line-space wheel having fine teeth, of a driving train therefor including a lever, a movement-multiplying arm driven thereby, a pawl actuated by said arm, said pawl being normally disengaged from said wheel and provided with means for automatically clutching the arm to the wheel upon the starting of said lever in motion, a pawl-locking stop to limit the line-spacing stroke of the lever, an adjustable arm having a pawl-releaser, and a regulating lever connected to said pawl-releasing arm, said regulating lever having a stop for said line-space lever to arrest its return stroke, said pawl-releaser connected to move together with said stop to keep the pawl released throughout all adjustments of said regulating train, whereby the regulating train may be selectively set without operating said line-space wheel.

42. In a line-spacing mechanism, the combination of a line-spacing wheel, a line-space lever having a fulcrum, a movement-multiplying arm to which is pivoted said line-space lever, said arm having a driving clutch for said line-space wheel, said clutch-arm being pivoted to turn about the axis of the line-space wheel, and adjustable means co-operative with said fulcrum for varying the leverage of the line-space lever upon the clutch-arm, said clutch having a projection, and a releasing cam in the path thereof, said cam being settable to regulate the length of the line-spacing movement.

43. The combination of a line-space wheel, a line-spacing train including a line-space lever, a wheel-driving clutch, and a driver for said clutch, said driver connected to said lever, a line-space-regulator train which is mainly a doubling of said line-spacing train and includes a regulator-lever coincidently fulcrumed with said line-space lever and having connected thereto a regulator-arm whose pivoting and lever-connection are coincident with those of said driver, said regulating arm having means for releasing said clutch from said wheel, said line-space lever having an adjustable fulcrum, means whereby the adjustment of said line-space-lever fulcrum is made effective to adjust the position of the clutch-releaser, said regulator-train being adjustable to different set stations, and means whereby the selective setting of said regulator-train is also made effective to adjust the position of said clutch-releasing means.

44. In a line-spacing mechanism, the combination with a line-space wheel and a driving train having a normally-released clutch for engaging the wheel, of a regulating train having an adjustable stop for the line-spacing train and having a clutch-releasing cam adjustable simultaneously with said stop, a system of set stations, means for detaining said stop at any one of the set stations, and adjustable means effective alike upon said driving train and said regulating train for effecting minute variations in the measurement of the line-spacing unit, said line-spacing train and said regulating train being substantially coincident and superposed one upon the other to operate upon a common adjustable fulcrum-pin, and also including members mounted upon a common fixed shaft which is coincident with the axis of the line-space wheel.

45. In a line-spacing mechanism, the combination with a line-space wheel and a driving train having a normally-released clutch for engaging the wheel, of a regulating train having an adjustable stop for the line-spacing train and having a clutch-releasing cam adjustable simultaneously with said stop, a system of set stations, means for detaining said stop at any one of the set sta-

tions, and adjustable means effective alike upon said driving train and said regulating train for effecting minute variations in the measurement of the line-spacing unit, said line-spacing train and said regulating train being substantially coincident and superposed one upon the other to operate upon a common adjustable fulcrum-pin, and also including members mounted upon a common fixed shaft which is coincident with the axis of the line-space wheel, the line-spacing train including a lever operating upon said fulcrum-pin and also including a clutch-arm mounted upon said fixed shaft and pivoted to said line-space lever, said regulating train also including a lever also mounted upon said fulcrum and also including a releasing arm pivoted to said regulating lever coincidently with the pivoting of said clutch-arm to the line-space lever.

46. In a line-spacing mechanism, the combination with a line-space wheel, of a driving train having a clutch to cooperate with said wheel, a regulating train for variably limiting the extent of line-space movement, said regulating train including an adjustable clutch-releaser, and adjustable means effective upon both trains for varying the extent of both the wheel-movement and the movement of the power-end of the driving train, and simultaneously and automatically effective to vary to corresponding extent the adjustment of the clutch-releaser, and means for selectively positioning the regulating train at any one of a series of permanently located stations.

47. The combination of a line-space wheel, a line-spacing train including a line-space lever, a wheel-driving clutch, a driver for said clutch, said driver connected to said lever, a line-space-regulator train which is mainly a doubling of said line-spacing train and includes a regulator-lever coincidently fulcrumed with said line-space lever and having connected thereto a regulator-arm whose pivoting and lever-connection are coincident with those of said driver, said regulating arm having means for releasing said clutch from said wheel, a fulcrum-pin, common to both levers, being made adjustable to different positions lengthwise of the levers, each lever having a slot for the fulcrum-pin, and a slide upon which said fulcrum-pin is fixed, said slide being provided with a finger-piece and with guiding means, and being stationary during the line-spacing operation, the line-space lever and the regulating lever being placed facewise one over the other, the common fulcrum-pin for said slotted levers being vertical and passing through both slots, said releasing arm in the form of a bail-member, a fixed shaft, said line-space wheel having an arbor in said shaft, said bail having upper and lower bearings upon said shaft, the upper member of said bail being pivoted to said regulating lever, and the lower member of said bail being the clutch-releasing element, said levers being disposed between the upper and lower members of said bail, said bail resting upon a flange that is formed upon the lower part of the fixed shaft, and a shoulder provided upon said fixed shaft upon which said upper bail-arm is fitted.

48. The combination of a line-space wheel, a pawl-arm, a driver, a table, an arbor upon which said line-space wheel is fixed, a fixed shaft or bearing-post through which said arbor extends, said pawl-arm having a hub whereby it is pivoted to said shaft, means securing said shaft to the bottom of said table, a pinion fixed upon said arbor, a gear meshing with said pinion and driving the line-spacing element of the machine, said shaft having a shoulder upon which rests the hub of said pawl-arm, a fastening nut threaded upon the upper end of said shaft to draw it up against said table, a collar confined between the table-top and the shaft to enable the nut to force the shaft firmly up to its seat, said arbor extending up through the table and provided thereover with a thumb-wheel, said table overlying the line-spacing lever system and line-space wheel, a bracket for supporting said plate upon the carriage of a typewriting machine, said bracket having a bearing for the platen-axle, and an auxiliary bracket also secured to the end of the typewriter-carriage and having a bearing in proximity to said gear for the platen-axle, and also having a portion to form a bearing for the lower ends of the vertical wheel-arbor, said bracket bent to form a clutch-locking stop, said bracket also having a brace attached to the left-hand border of the table.

49. The combination of a line-space wheel, a pawl, a pawl-arm, a driver, a table, an arbor upon which said line-space wheel is fixed, a fixed shaft or bearing-post through which said arbor extends, said pawl-arm having a hub whereby it is pivoted to said shaft, a pinion fixed upon said arbor, a gear meshing with said pinion and driving the line-spacing element of the machine, said shaft having a shoulder upon which rests the hub of said pawl-arm, a fastening nut threaded upon the upper end of said shaft to draw it up against said table, a collar confined between the table-top and the shaft to enable the nut to force the shaft firmly up to its seat, said arbor extending up through the table and provided thereover with a thumb-wheel, and means for affording regulation of the gross line-space stroke of the driver for either single, double or triple line-spacing, and also for fractional line-spacing, including a regulator-lever and means for setting the same selectively to different locations, said regulator having a locating tooth, and said machine provided with a range of notches to be selectively engaged by said tooth, said

notches cut in the border of said table, said regulator-lever having a stop to terminate the return stroke of the line-space driver, said regulating means including a clutch-releaser which is adjusted together with the regulating stop-lever, said regulating stop-lever being movable to any position while maintaining the clutch in released position, and being swingable together with said driver to either left or right during the setting of the regulator, without rotating the line-space wheel.

50. The combination of a line-space wheel, a pawl, a pawl-arm, a driver, a table, an arbor upon which said line-space wheel is fixed, a fixed shaft or bearing-post through which said arbor extends, said pawl-arm having a hub whereby it is pivoted to said shaft, means securing said shaft to the bottom of said table, a pinion fixed upon said arbor, a gear meshing with said pinion and driving the line-spacing element of the machine, a lever for regulating said pawl-arm and having a leaf mounted thereon, and provided with a tooth to engage notches in said table, a spring for said leaf and tooth, and a finger-piece for said regulating lever.

51. The combination of a typewriter-element to be line-spaced, a line-space wheel having minute teeth, movement-reducing gearing to enable said line-space wheel to drive said element, a normally released pawl for driving said line-space wheel, an overthrow-preventing stop for said pawl, a line-space regulator connected to control said pawl and adjustable to different set stations to predetermine the number of line-spacing units composing each stroke, and independently adjustable means co-operating with said pawl for varying the measurement of the line-spacing unit.

52. The combination of a line-space driver, a line-space wheel, a pawl for said wheel, a line-space regulator including a lever having a minutely-variable fulcrum, means enabling said regulator-lever to control said pawl, means independently settable for determining the number of units of space through which said driver line-spaces the work-sheet, and a stationary stop for arresting said pawl and preventing overthrow of the line-space wheel, said line-space pawl being arrested by said stationary stop at all adjustments of said fulcrum.

53. The combination of a line-space driver, a line-space wheel, a pawl for said wheel, a line-space regulator including a lever having a minutely-variable fulcrum, means enabling said regulator-lever to control said pawl, means independently settable for determining the number of units of space through which said driver line-spaces the work-sheet, and a stationary stop for arresting said pawl and preventing overthrow of the line-space wheel, said line-space pawl, being arrested by said stationary stop at all adjustments of said fulcrum, said lever having a longitudinal slot along which said fulcrum is adjustable, and said slot being so formed that when the lever is arrested by said stop, the direction of its said slot is coincident with the direction of adjustment of said fulcrum.

54. The combination of a line-space wheel having minute teeth, a line-space-regulator lever, a normally released driving clutch for said wheel, a fulcrum for said regulator-lever, a slide upon which said fulcrum is fixed, means for guiding said slide, adjustable means for rendering said fulcrum variably co-operative with said regulator-lever to control said clutch, and adjustable means for releasing the driving clutch from said wheel.

55. The combination with a line-space wheel having minute teeth, of a line-spacing drive-train, a line-space-regulator lever for said line-spacing train, a regulator-arm connected thereto, said arm pivoted concentrically with said wheel and having means for controlling the connection of said drive-train with said wheel, a device for minutely varying the leverage of said regulator-lever, and means to detain said regulator-lever selectively at different set stations.

56. The combination with a line-space wheel having minute teeth, of a line-spacing drive-train, a line-space-regulator lever for said line-spacing train, a regulator-arm connected thereto, said arm pivoted concentrically with said wheel and having means for controlling the connection of said drive-train with said wheel, a device for minutely varying the leverage of said regulator-lever, means to detain said regulator-lever selectively at different set stations, and an overthrow-preventing stop to arrest said driving train at the same position for driving strokes of all extents.

57. In a line-spacing mechanism, the combination of a line-spacing wheel having minute teeth, a lever, a movement-multiplying arm for said lever, the latter having a driving clutch for said line-space wheel, a line-space-regulator lever having a fulcrum, means for adjusting said fulcrum to different positions lengthwise of the regulator-lever, the latter having a slot for the fulcrum, a slide carrying said fulcrum, means for guiding said slide, and adjustable means for releasing the clutch from said wheel.

58. In a line-spacing mechanism, the combination of a line-spacing wheel having minute teeth, a line-space lever, a movement-multiplying arm for said line-space lever, the latter having a driving clutch for said line-space wheel, a line-space-regulator lever having a fulcrum, said fulcrum being made adjustable to different positions lengthwise of the lever, the lever having a slot for the fulcrum, a slide carrying said fulcrum, means for guiding said slide, and independent means, including a rack and a member ad-

justable along said rack, for selectively determining the length of stroke of the line-space lever.

59. The combination of a line-space wheel, a line-space lever, a wheel-driving clutch, and a driver for said clutch, said driver operated by said lever, a regulator-lever, having connected thereto an arm, the latter having means for releasing said clutch from said wheel, said regulating lever having an adjustable fulcrum, means whereby the adjustment of said fulcrum is made effective to vary the effective point of the clutch-releaser, said regulator-train being also adjustable to different set stations independently of the adjustment of said fulcrum, and means whereby the selective setting of said regulator train is also made effective to regulate the effective point of said clutch-releasing means.

60. In a line-spacing mechanism for a typewriting machine having a revoluble platen, the combination of a line-space lever, a movement-multiplying arm to which said line-space lever is connected, a pawl driven by said movement-multiplying arm, a line-space wheel having teeth of minute pitch engageable by said pawl, the connection being such that said pawl, together with said line-space wheel, is vibrated through a far greater angular extent than said line-space lever, movement-reducing gearing between said line-space wheel and said revoluble platen, an adjustable regulating train having means for controlling the engagement of said pawl with said line-space wheel, said regulating train including a lever and means for adjusting its leverage for effecting minute variations in the length of the line-spacing unit, and a device having a set of stations to which said lever may also be set according to the number of units to be included in the line-spacing stroke of the platen.

61. Machine according to claim 60, in which an overthrow stop is co-operative with said pawl at the conclusion of every drive-stroke of the line-space lever.

62. In a line-spacing mechanism for a typewriting machine having a revoluble platen, the combination of a line-space lever, a movement-multiplying arm to which said line-space lever is connected, a pawl driven by said movement-multiplying arm, a line-space wheel having teeth of minute pitch engageable by said pawl, the connection being such that said pawl, together with said line-space wheel, is vibrated through a far greater angular extent than said line-space lever, movement-reducing gearing between said line-space wheel, and said revoluble platen, an adjustable regulating train having means for controlling the engagement of said pawl with said line-space wheel, said regulating train including a lever, adjustable means co-operative with said regulating lever for varying its leverage, said pawl having a projection, and a releasing cam in the path of said projection, said cam being settable by said regulating lever to vary the length of the line-spacing movement.

63. In a line-spacing mechanism for a typewriting machine having a revoluble platen, the combination of a line-space lever, a movement-multiplying arm to which said line-space lever is connected, a pawl driven by said movement-multiplying arm, a line-space wheel having teeth of minute pitch engageable by said pawl, the connection being such that said pawl, together with said line-space wheel, is vibrated through a far greater angular extent than said line-space lever, movement-reducing gearing between said line-space wheel and said revoluble platen, an adjustable regulating train having means for controlling the engagement of said pawl with said line-space wheel, said regulating train including a lever, adjustable means co-operative with said regulating lever for varying its leverage, said pawl having a projection, and a releasing cam in the path of said projection, said cam being settable by said regulating lever to vary the length of the line-spacing movement, by a leverage-changing movement of said regulating lever to vary the extent of the line-spacing unit, and being also settable by a swing of said lever to regulate the number of units included in the line-spacing movement of the platen.

64. The combination of a line-space wheel provided with an arbor and having a multitude of minute teeth, a line-spacing train including a line-space lever and a wheel-driving pawl, a line-space-regulator train which includes a regulator-lever fulcrumed eccentrically of said arbor and having pivoted thereto a regulator-arm, the latter having means for releasing said pawl from said wheel, a device for minutely adjusting the fulcrum of said regulator-lever, a rack, and means to detain said regulator-lever selectively at different points in said rack.

65. The combination of a line-space wheel having a multitude of minute teeth, a line-spacing train including a line-space lever and a wheel-driving pawl, a line-space-regulator train which includes a regulator-lever fulcrumed eccentrically of said line-space wheel and having pivoted thereto a regulator-arm, the latter having means for releasing said pawl from said wheel upon the return stroke of the line-space lever, a device for varying the leverage of said regulator-lever, a rack, means to detain said regulator-lever selectively at different points in said rack, and a single stop to arrest said line-space lever at the same position for driving strokes of all extents, said stop effective to prevent overthrow of said line-space wheel.

66. The combination with a line-space wheel having an arbor, of a line-space lever,

a clutch for enabling it to drive said line-space wheel, a stop to arrest the driving stroke of the line-space lever, a line-space-regulator train including a lever fulcrumed eccentrically of the line-space wheel, and means pivoted to said regulator-lever to release said clutch from said wheel, said releasing means being mounted concentrically with said line-space wheel, a fixed shaft upon which said arbor is journaled, said releasing means being pivoted upon said shaft, a pivot connecting the regulator-lever with said releasing means, and a locating rack to co-operate with said regulator-lever to retain it selectively at predetermined locations, said regulator-lever having an adjustable fulcrum.

67. In a line-space mechanism for a typewriting machine, the combination of a line-space wheel, a line-spacing train including both a lever and a movement-multiplying arm driven thereby, the arm being mounted to rotate coaxially with said line-space wheel, a clutch operated by said arm, a line-space-regulating train including a lever and a releasing device for said clutch, said releasing device pivoted coaxially with said wheel, and pivoted to said regulating lever, and means for varying the leverage of said regulating lever upon said releasing device, by adjusting the fulcrum of said regulating lever.

BURNHAM C. STICKNEY.