E. R. BARRETT.

ADDING MACHINE.

APPLICATION FILED MAR. 8, 1907. RENEWED MAY 31, 1910.

977,582. Patented Dec. 6, 1910.

4 SHEETS—SHEET 1.

Fig. 1a

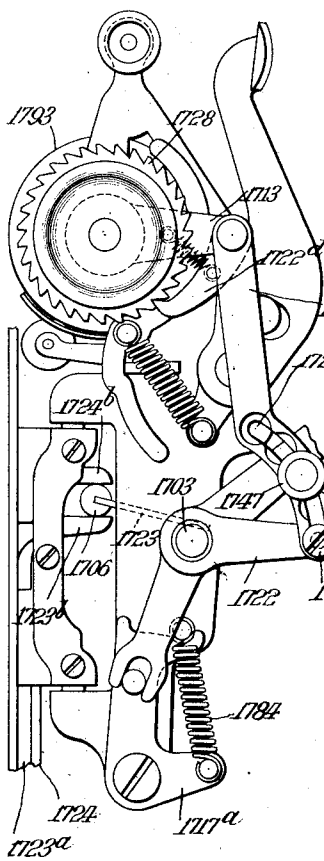

Fig. 1

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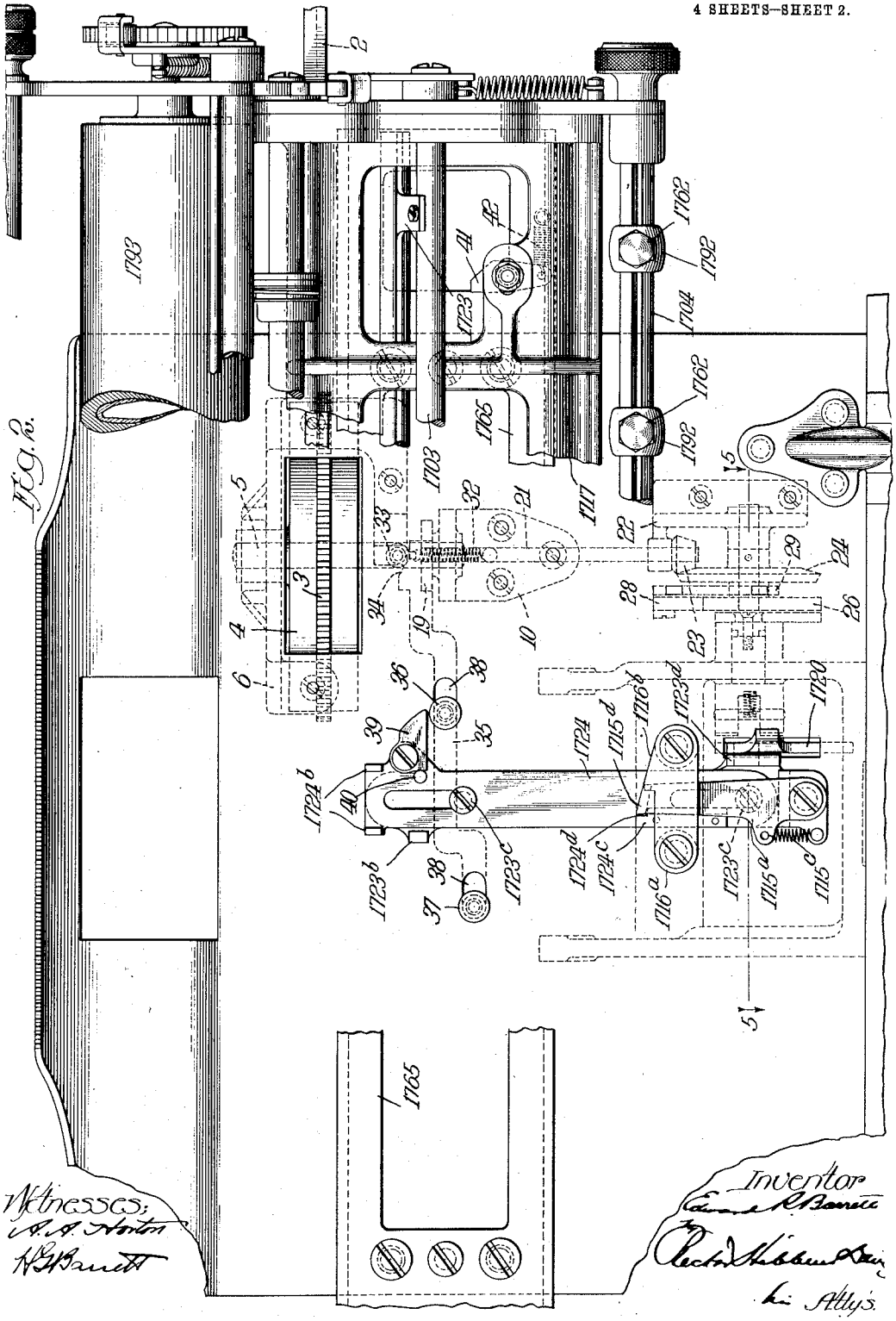
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

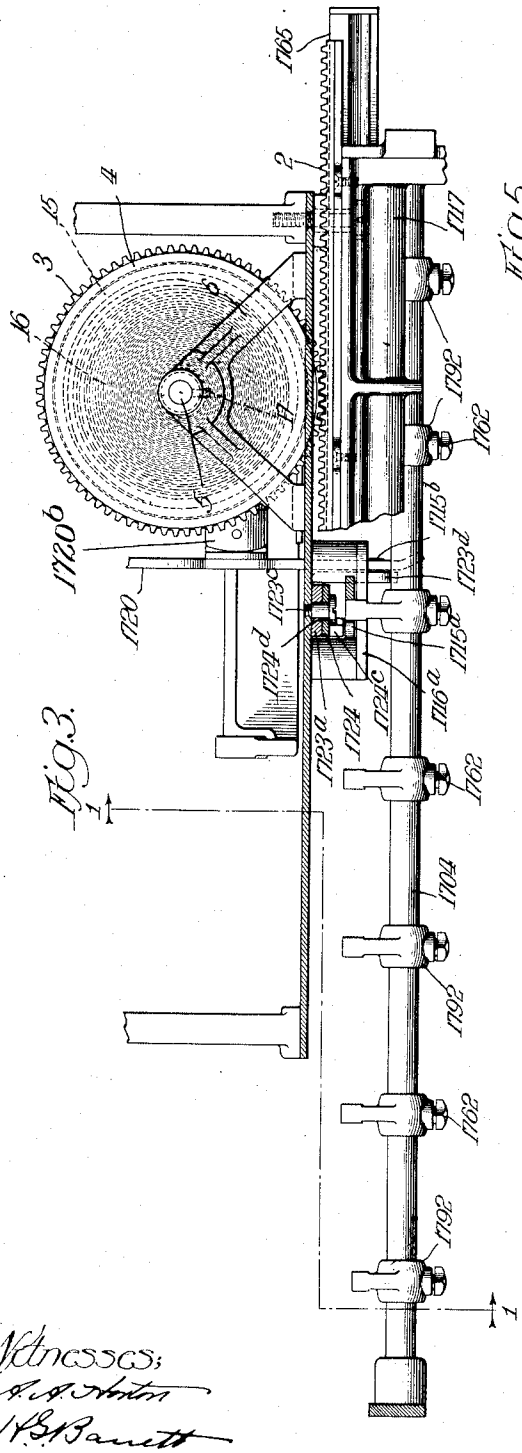

FIG. 3.

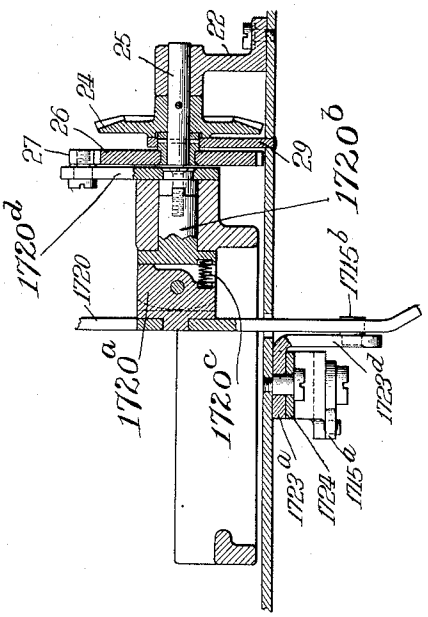

FIG. 5.

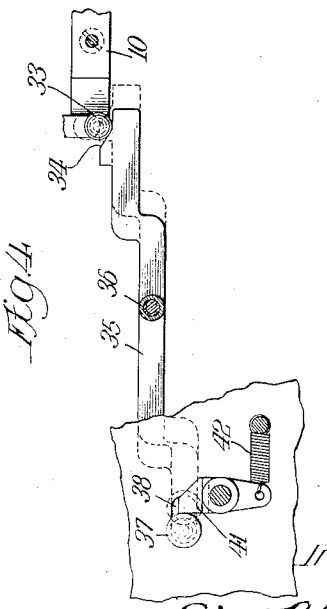

FIG. 4.

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4 SHEETS—SHEET 4.

Fig. 6.

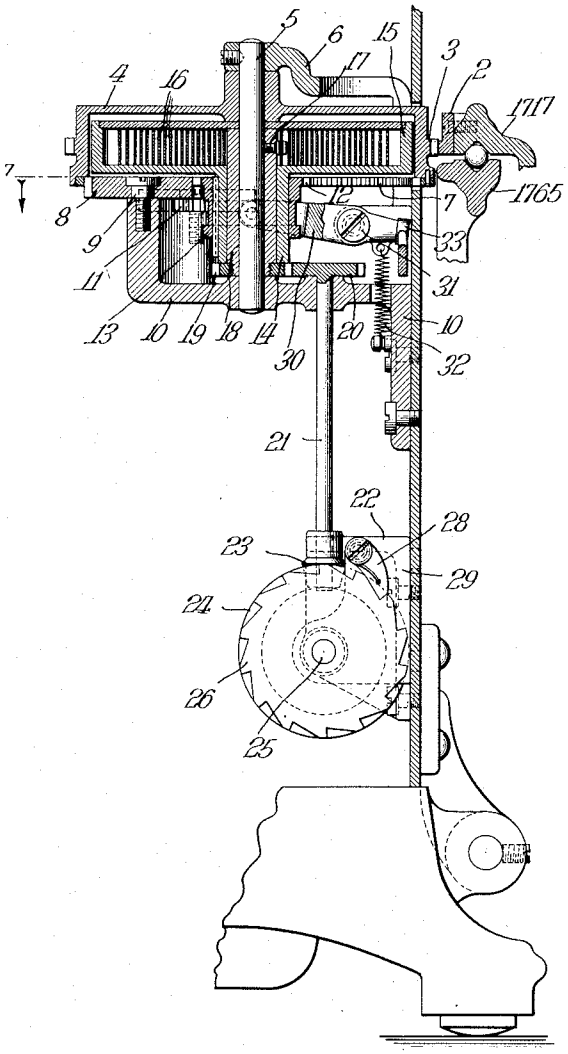


Fig. 7.

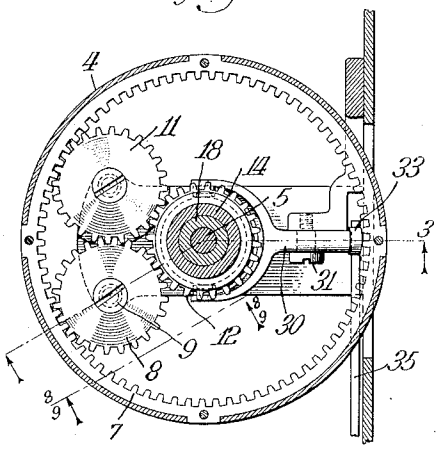


Fig. 8.

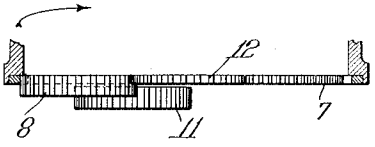
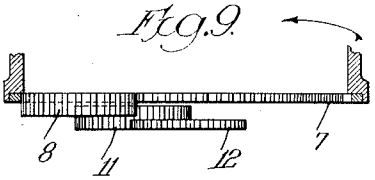


Fig. 9.



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UNITED STATES PATENT OFFICE.

EDWARD R. BARRETT, OF DETROIT, MICHIGAN, ASSIGNOR TO BURROUGHS ADDING MACHINE COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

ADDING-MACHINE.

977,582. Specification of Letters Patent. Patented Dec. 6, 1910.

Application filed March 8, 1907, Serial No. 361,292. Renewed May 31, 1910. Serial No. 564,138.

To all whom it may concern:

Be it known that I, EDWARD R. BARRETT, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Adding-Machines, of which the following is a specification.

The invention relates to adding machines wherein a laterally shifting paper carriage is employed.

The principal object of the present invention is to provide for automatically returning such paper carriage to the right when imprints have been made in a predetermined number of columns. Thus in cross-tabulating the machine will provide for numbers or amounts being printed one after another in a horizontal row with suitable spacing between and then the paper carriage will be moved all the way back, the paper being advanced to receive another horizontal row of numbers or amounts, and so on producing a series of parallel vertical columns.

In the form of embodiment of the invention herein shown and described a volute spring is employed for impelling the carriage and reversible gearing intervenes between the spring and the carriage so as to provide for shifting the latter in either direction. An escapement mechanism is arranged to bring about step-by-step movement of the carriage to the left as the cross-tabulating proceeds and paper feeding mechanism comes into play when the last number or amount of a horizontal series has been printed, the gearing between the motor spring and the carriage being reversed as an incident to the line spacing or paper feed. Thereupon the carriage is moved back to the right by the spring and upon reaching the end of such movement the gearing is again automatically reversed so as to prepare for motion of the carriage from right to left as the escapement mechanism is operated in connection with the printing of amounts.

In the drawings which accompany and form part of this specification Figure 1 represents a vertical section from front to rear of that portion of an adding machine with which the present invention is more intimately associated; Fig. 1ª shows in side elevation certain parts which the section line of Fig. 1 cuts off; Fig. 2 is a partial rear elevation of the machine with some parts broken away and others represented in dotted lines; Fig. 3 represents a partial top plan view of the machine with some parts broken away and others in horizontal section; Fig. 4 is a fragmentary rear elevation of certain parts which appear in dotted lines in Fig. 2; Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 2; Fig. 6 is a vertical section taken from front to rear farther to the left of the machine than the section on which Fig. 1 is taken; Fig. 7 is a horizontal section taken on the line 7—7 of Fig. 6; and Figs. 8 and 9 are fragmentary elevations of the reversing gears showing their two different adjustments.

The invention is here shown as applied to the well-known Burroughs adding and listing machine but it is not to be understood as necessarily so limited in its application. As usual in this type of machine when equipped with a laterally shifting carriage there is secured to the back panel of the casing a bracket 1765 on which the paper carriage 1717 is arranged to travel. The numeral 1793 designates the usual roller platen journaled in said carriage and it will be understood without illustration or detailed description that in the adding machine type will be set up opposite this platen and driven against it to print numbers upon paper which passes around the platen.

The numeral 1703 designates a rock-shaft journaled in the carriage and suitably connected with the roller platen so that by its oscillation said platen may be caused to turn step by step. There is secured to this rock-shaft a plate 1723 which is also secured to a rod or bar 1706 extending parallel with the rock-shaft 1703. A spring 1723ᵉ tends to uphold the plate and the rod or bar and means presently to be described are combined with the rod for the purpose of raising and lowering it to produce oscillations of the rock-shaft and consequent step-by-step advance of the roller platen.

A vertically extending plate or bar 1723ª is mounted to slide up and down on the back of the machine panel being held in place by screws 1723ᶜ passing through slots in the plate as shown in Fig. 2. This plate has near its upper end a rearwardly projecting finger 1723ᵇ underlying the rod 1706. Simi-

lar fingers 1724[b] overlie said rod but these latter fingers project from a plate 1724 which is separate from the plate 1723[a] though similarly slotted for the passage of the screws 1723[c] and adapted under some conditions to travel with said plate 1723[a]. When such conditions prevail the line spacing is produced by the lowering of the rod 1706 through the action thereupon of the fingers 1724[b].

The plate 1723[a] moves down and up in every operation of the machine but it will be obvious that unless accompanied by the plate 1724 in such movement no movement of the rod 1706 will take place, the spring 1723[e] holding it up. The means for causing reciprocation of the plate 1723[a] comprise a lever 1720 pivoted intermediate its length to a fixed part of the machine and carrying at its forward end a roll 1720[a] occupying a cam slot 121[d] in a plate 121 secured to the familiar Burroughs rock-shaft 100. At its rear end this lever 1720 is slotted to receive a pin 1715[b] in a lip or flange 1723[d] of the plate 1723[a]. It will be obvious that through these connections the said plate will be moved up and down by the oscillation of the rock-shaft 100, such oscillation taking place in every operation of the adding machine.

Before proceeding to describe the means whereby the two plates 1723[a] and 1724 are connected and disconnected it will be well to first describe the means employed for determining different column positions of the paper carriage. A rock-shaft 1704 is journaled in the lower part of said carriage and there are adjustably secured to it at different points throughout its length a series of stop fingers 1792, the means here shown for so securing these stop fingers to the rock-shaft consisting in set screws 1762 engaging a longitudinal groove in the shaft. Two different lengths of stop fingers are employed but all of the fingers are adapted to abut the vertical shoulder of a stop plate 1716[a] screwed to the back panel of the machine as shown in Fig. 2. Thus the position of the stop fingers on the rock-shaft determine the column positions of the carriage. Two different lengths of stop fingers are employed for the purpose of determining whether or not after the printing of a number in a certain column line spacing or paper feed shall ensue. The stop plate 1716[a] stands a distance away from the back panel of the machine casing and the plates 1723[a] and 1724 pass between the stop plate and such panel. The longer fingers 1792 project forwardly of the stop plate but the shorter fingers do not, and devices presently to be described are combined with the plates 1723[a] and 1724 so as to effect disconnection of said plates whenever one of the longer fingers is engaged with the stop plate 1716[a]. Hence under such conditions the plate 1724 will not accompany the plate 1723[a] in its reciprocations and no line spacing will take place. However, when one of the shorter fingers 1792 is engaged with the stop plate 1716[a], the two plates 1723[a] and 1724 are connected and the latter will move with the former to effect line spacing. It is further to be noted that the reciprocations of the plate 1723[a] when one of the longer fingers 1792 is engaged with the stop plate 1716[a], will cause a rocking of the shaft 1704 by action against the stop finger where it extends forward of the stop plate, all as will now be specifically described.

There is pivoted to a lower offset portion of the plate 1723[a] a dog 1715[a], the latter movable laterally and held to the right by a spring 1715[c] (Fig. 2). A strip 1724[c] secured to the plate 1724 is shouldered as shown at 1724[d] in Fig. 2 for the engagement thereover of a flange 1715[d] at the upper end of the dog 1715[a]. It will be seen that when the parts are so engaged the plate 1723[a] in moving downward will carry with it the plate 1724. It will be observed, however, that the dog 1715[a] extends between the stop plate 1716[a] and said plate 1724 and when engaged with the shoulder 1724[d] extends to the right beyond the vertical shoulder of the stop plate. The protruding end of one of the longer stop fingers 1792 before reaching the latter shoulder in the movement of the carriage to the left will encounter the vertical edge of the dog and move the latter against the stress of its spring 1715[c] thereby disengaging the flange of the dog from the shoulder 1724[d] and hence disconnecting the two plates 1724 and 1723[a]. Therefore as the plate 1723[a] descends in an operation of the machine it does not carry with it the plate 1724, the dog 1715[a] simply passing down alongside the strip 1724[c]. When the flange of the dog passes below the stop finger 1792 it snaps under the same so that when the plate 1723[a] rises as the operation of the machine continues this flange will lift the stop finger and disengage it from the shoulder of the stop plate 1716[a] whereupon the carriage will jump to the left until the next stop finger comes against said shoulder of the stop plate. Should this next succeeding stop finger be a short one, the flange of the dog which in the rise of the plate 1723[a] has returned to engagement with the shoulder 1724[d], will remain so engaged because this shorter stop finger does not act against the dog. Hence in the next ensuing operation of the machine the plate 1724 will descend with the plate 1723[a] and the paper feed will be effected. Of course no further automatic shift of the paper carriage to the left will be brought about in the manner before described since the dog does not encounter the short stop finger in rising. So far as the

mechanism already described is concerned listing of amounts in a single column would then continue indefinitely. However, the present invention provides for an automatic return of the carriage to the right at the conclusion of an operation of the machine when a short stop finger is fixing the column position of the paper carriage.

The carriage has secured to its front side above the bracket 1765 a horizontal rack 2 which is in mesh constantly with a gear 3 formed upon the periphery of a drum-like member 4 arranged to turn freely upon a vertical shaft 5 secured at its upper end in a bracket 6 on the rear panel of the machine casing (Figs. 1, 3 and 6). An internal gear 7 is secured to the inverted rim of the drum-like member 4 and this internal gear meshes with a transmission gear 8 journaled upon a screw stud 9 on a second bracket 10 secured to the back panel of the machine casing (Fig. 6), this bracket also affording a support for the lower end of the shaft 5. This transmission gear is more than double the width of the internal and an intermediate gear 11 of the same width as the transmission gear (Figs. 8 and 9) meshes with a different portion of the toothed periphery of the latter from that portion which meshes with the internal gear. This intermediate gear is mounted upon the bracket 10 in the same manner as is the transmission gear but does not engage the internal gear. A shift gear 12 of the same width as the internal gear is centrally located with reference to the latter and adapted to mesh alternately with the transmission gear 8 and the intermediate gear 11, becoming engaged with one before disengagement from the other thus always kept in register. It will be obvious that when directly in mesh with the gear 8 this shaft gear when turned will rotate the member 4 with its gear 3 in a direction opposite that in which rotation will be caused when said shift gear is in mesh with the intermediate gear 11. The shift gear 12 is part of an annularly grooved sleeve 13 splined to the hub 14 of a drum 15 incased by the member 4 all as shown in Fig. 6. Said drum contains a volute spring 16 whose outer end is in frictional engagement with the inner circumferential wall of the drum and whose inner end is secured by a screw 17 to a sleeve 18 journaled upon the shaft 5 and itself constituting a bearing for the hub of the drum 15. The sleeve 18 constitutes an anchorage for the spring and the latter tends to rotate the drum 15 and hence the shift gear 12 through the splined connection already described. It will be obvious that through the reversible gearing described the spring can be caused to impel the carriage in either direction.

Means are provided for keeping the spring properly tensioned, as follows: A spur gear 19 is secured to the lower end of the sleeve 18 and meshes with a similar gear 20 on the upper end of a vertical shaft 21 journaled in a bearing provided by the bracket 10 and in a bearing provided by a lower bracket 22 secured to the back panel of the machine casing. This shaft carries at its lower end a beveled gear 23 in mesh with a beveled gear 24 secured to a horizontal shaft 25 journaled in a bearing provided by the bracket 22 (Fig. 5). A ratchet-wheel 26 is secured to this shaft 25 and a spring-held pawl 27 vibrating with the lever 1720 engages said ratchet as shown in Fig. 1. Thus whenever the machine is operated the ratchet-wheel 26 is turned and through the described gearing the sleeve 18 is turned in a direction to wind up the spring. A retaining pawl 28 engages the ratchet to prevent retrograde movement, said pawl being spring-held and pivoted upon a bracket 29 secured to the back panel of the machine casing and embracing the hub of the ratchet as shown in Fig 5. The frictional engagement of the spring 16 with the drum prevents overwinding.

Passing now to the means for controlling the reversible gearing from the line spacing or paper feeding devices hereinbefore described, a fork 30 engages the circumferential groove of the sleeve 13, being pivoted at 31 to a lower portion of the bracket 6. A spring 32 draws down the rearward end of this fork thus elevating its forward end and holding the shift gear 12 in mesh with the transmission gear 8. Under this adjustment the spring 16 tends to impel the paper carriage toward the left. On the rear end of the fork there is mounted a roller 33 which is adapted to be acted upon by a cam 34 (Fig. 4), said cam being formed on a horizontal slide bar 35 arranged on the inner side of the back panel of the machine casing. This slide bar is suitably guided in its movements by shouldered studs 36 and 37 engaging slots 38 in said panel (Fig. 2). The stud 36 coöperates with a gravity wipe plate 39 pivoted upon the line spacing plate 1724 as shown in Fig. 2 and normally held by its weight against a stop pin 40. In the descent of said plate 1724 the wipe plate or pawl 39 simply flips idly past the stud 36 but upon the rise of said plate 1724 the cam edge of the wipe plate acts against the stud 36 and thrusts the bar 35 to the left thereby causing its cam 34 to rock the fork 30 and shift the gear 12 out of engagement with the transmission gear 8 and into engagement with the intermediate gear 11 as shown in Fig. 9. Thereupon the spring 16 acts to return the carriage to the right. Near its left-hand end the carriage is provided with a tappet-piece 41 preferably pivoted and attached to a spring 42 for cushioning pur-

poses. When the carriage is thrown to the right by the spring upon the described reversal of the gearing this tappet-piece 41 will encounter the stud 37 just as the carriage reaches the limit of its movement and by impact against said stud will thrust the bar 35 to the right withdrawing the cam 34 from engagement with the roller 33 whereupon the spring 32 restores the reversible gearing to its first adjustment so that the spring 16 again tends to impel the carriage to the left.

It will be understood that the rock-shaft 1704 is spring-actuated to enforce engagement of its stop fingers with the stop plate. As the carriage is drawn to the right the several stop fingers will slide over the inclined edge 1716^b of the stop plate and of course when the reversal thereafter takes place in the carriage shifting gear the stop finger farthest to the left will hold the carriage in position for printing in the first column. The dog 1715^a is beveled on top as shown at 1715^d in Fig. 2 so that the longer stop fingers will pass. The means here shown for yieldingly enforcing engagement between the stop fingers and the stop plate comprise an arm 1717^a (Fig. 1^a) secured to the rock-shaft 1704 and a spring 1784 connecting said arm with the carriage.

It has been hereinbefore stated that suitable connections are provided between the rock-shaft 1703 and the platen for turning the latter step by step. The connections here shown comprise an arm 1722, a stud 1722^a carried by said arm, a link 1722^b having a curved slot 1722^c receiving said stud, a stud 1747 adjustable in said slot to be acted against by the stud 1722^a, an arm 1713 pivoted concentrically with the platen and pivotally connected with the link 1722^b, a ratchet-wheel 1728 secured to the platen, and a spring-held pawl 1722^d engaging said ratchet and pivotally connected with the arm 1713 where the latter joins the link 1722^b. It will be seen that with this arrangement oscillating of the shaft 1703 will cause the stud 1722^a to retract the pawl 1722^d over the teeth of the ratchet wheel, by impact against the stud 1747, the number of teeth depending upon adjustment of the latter stud in the slot 1722^c, and that the stud 1722^a will then effect the feed by acting against the bottom of the slot.

Provision is made for disconnecting the paper feed or line-spacing mechanism when the carriage is to be taken off for inspection or other purposes, as follows: The feed lever 1720 has secured to it an ear 1720^a (Fig. 5) pivoted in the bifurcation of a stub-shaft 1720^b which is journaled in a suitable bearing on the machine frame. A spring 1720^c interposed between the ear 1720^a and the base of the said bifurcation normally holds the lever 1720 in engagement with the stud 1715^b. The lever can be readily disengaged from said stud by pressing against the rear end of the lever in opposition to the spring. The pawl hereinbefore described as vibrated by the feed lever is not mounted directly upon the same but upon an arm 1720^d secured to the shaft 1720^b which shaft of course oscillates as the lever is vibrated.

While the above-described construction is well adapted to fulfil the objects of the invention still it is susceptible of considerable modification within the scope of the invention as defined by the appended claims. For example it is not essential that the carriage be moved both ways by the spring nor is it essential that the motive power for moving the carriage be that of a spring, so far as concerns the broad idea of causing the carriage to successively occupy a series of columnar positions and then automatically return to its initial position.

What is claimed is:

1. In a machine of the character described, the combination of a laterally shiftable paper carriage, a spring connected therewith for shifting it with provisions in the connections for reversing the direction in which the spring tends to move the carriage, and means for controlling the connections by the carriage to automatically reverse the latter's movement.

2. In a machine of the character described, the combination of a laterally shiftable paper carriage, a motor spring therefor, reversing gear connecting the spring and carriage, and means for controlling the gear by the carriage to automatically reverse the latter's movement.

3. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, a gear in mesh with the latter, a motor spring for said gear, reversing gear between the first-named gear and the spring, and means for controlling the reversing gear by the carriage to automatically reverse the latter's movement.

4. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, a compound gear wheel one section of which is in mesh with said rack, a transmission gear in mesh with the other section of said compound gear, an intermediate gear in mesh with the transmission gear, a shift gear to alternately mesh with the transmission gear and the intermediate gear, a drum having a hub to which said shift gear is splined, a motor spring engaged at one end with said drum and suitably anchored at the other end, and means for shifting the last-mentioned gear to reverse the movement of the carriage.

5. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, a compound gear wheel one section of which is in mesh

with said rack, a transmission gear in mesh with the other section of said compound gear, an intermediate gear in mesh with the transmission gear, a shift gear to alternately mesh with the transmission gear and the intermediate gear, a drum having a hub to which said shift gear is splined, a motor spring engaged at one end with said drum and suitably anchored at the other end, and means for automatically shifting the last-mentioned gear to reverse the movement of the carriage.

6. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, a compound gear wheel one section of which is in mesh with said rack, a transmission gear in mesh with the other section of said compound gear, an intermediate gear in mesh with the transmission gear, a shift gear to alternately mesh with the transmission gear and the intermediate gear, a drum having a hub to which said shift gear is splined, a motor spring engaged at one end with said drum and suitably anchored at the other end, and means for controlling the last-mentioned gear by the carriage to automatically reverse the latter's movement.

7. In a machine of the character described, the combination of a laterally shiftable paper carriage, paper feeding mechanism effective or ineffective according to the lateral position of the carriage, a spring connected with the carriage for shifting it with provisions in the connections for reversing the direction in which the spring tends to move the carriage, and means for controlling the connections by the paper feeding mechanism.

8. In a machine of the character described, the combination of a laterally shiftable paper carriage, paper feeding mechanism effective or ineffective according to the lateral position of the carriage, a motor spring for the carriage, reversing gear connecting the spring and carriage, and means for controlling the gear by the paper feeding mechanism.

9. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, paper feeding mechanism effective or ineffective according to the lateral position of the carriage, a gear in mesh with the said rack, a motor spring for said gear, reversing gear between the first-named gear and the spring, and means for controlling the reversing gear by the paper feeding mechanism.

10. In a machine of the character described, the combination of a laterally shiftable paper carriage, paper feeding mechanism effective or ineffective according to the lateral position of the carriage, a spring connected with the carriage for shifting it with provisions in the connections for reversing the direction in which the spring tends to move the carriage, and means for controlling the connections by the paper feeding mechanism and the paper carriage itself.

11. In a machine of the character described, the combination of a laterally shiftable paper carriage, paper feeding mechanism effective or ineffective according to the lateral position of the carriage, a motor spring for the carriage, reversing gear connecting the spring and carriage, and means for controlling the gear by the paper feeding mechanism and the paper carriage itself.

12. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, paper feeding mechanism effective or ineffective according to the lateral position of the carriage, a gear in mesh with the said rack, a motor spring for said gear, reversing gear between the first-named gear and the spring, and means for controlling the reversing gear by the paper feeding mechanism and the paper carriage itself.

13. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, paper feeding mechanism effective or ineffective according to the lateral position of the carriage, a compound gear wheel one section of which is in mesh with said rack, a transmission gear in mesh with the other section of said compound gear, an intermediate gear in mesh with the transmission gear, a shift gear to alternately mesh with the transmission gear and the intermediate gear, a drum having a hub to which said shift gear is splined, a motor spring engaged at one end with said drum and suitably anchored at the other end, and means for controlling the last-mentioned gear by the paper feeding mechanism.

14. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, paper feeding mechanism effective or ineffective according to the lateral position of the carriage, a compound gear wheel, one section of which is in mesh with said rack, a transmission gear in mesh with the other section of said compound gear, an intermediate gear in mesh with the transmission gear, a shift gear to alternately mesh with the transmission gear and the intermediate gear, a drum having a hub to which said shift gear is splined, a motor spring engaged at one end with said drum and suitably anchored at the other end, and means for controlling the last-mentioned gear by the paper feeding mechanism and the carriage itself.

15. In a machine of the character described, the combination of a laterally shiftable paper carriage, a motor spring therefor, means for reversibly connecting said spring and carriage to move the latter in both di-

rections, and means for automatically winding the spring.

16. In a machine of the character described, the combination of a laterally shiftable paper carriage, a motor spring therefor, means for reversibly connecting said spring and carriage to move the latter in opposite directions, a vibratory member which moves in each regular operation of the machine, and means actuated by said vibratory member to wind the spring.

17. In a machine of the character described, the combination of a laterally shiftable paper carriage, a spring connected therewith for shifting it with provisions in the connections for reversing the direction in which the spring tends to move the carriage, means for controlling the connections by the carriage to automatically reverse the latter's movement, and means for automatically winding the spring.

18. In a machine of the character described, the combination of a laterally shiftable carriage, a drum reversibly geared thereto, means for reversing the gearing, a motor spring in the drum adapted to propel the carriage in both directions, and means for automatically winding said spring.

19. In a machine of the character described, the combination of a laterally shiftable carriage, a drum reversibly geared thereto, means for reversing the gearing, a motor spring in the drum frictionally engaged therewith at one end, a rotatable support for the other end of the spring, and means for automatically turning said support to wind up the spring, the latter adapted to propel the carriage in both directions.

20. In a machine of the character described, the combination of a laterally shiftable carriage, a drum reversibly geared thereto, means for reversing the gearing, a motor spring in the drum engaged at one end therewith, an arbor supporting the other end of the spring, a ratchet-wheel geared to said arbor, and a vibratory member carrying a pawl engaging said ratchet-wheel to wind the spring.

21. In a machine of the character described, the combination of a laterally shiftable carriage, a drum reversibly geared thereto, means for reversing the gearing, a motor spring in the drum frictionally engaged at one end therewith, an arbor supporting the other end of the spring, a ratchet-wheel geared to said arbor, and a vibratory member carrying a pawl engaging said ratchet wheel to wind the spring.

22. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, a compound gear wheel one section of which is in mesh with said rack, a transmission gear in mesh with the other section of said compound gear, an intermediate gear in mesh with the transmission gear, a shift gear to alternately mesh with the transmission gear and the intermediate gear, a drum having a hub to which said shift gear is splined, a motor spring engaged at one end with said drum and suitably anchored at the other end, means for shifting the last-mentioned gear to reverse the movement of the carriage and means for automatically winding the spring.

23. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, a compound gear wheel one section of which is in mesh with said rack, a transmission gear in mesh with the other section of said compound gear, an intermediate gear in mesh with the transmission gear, a shift gear to alternately mesh with the transmission gear and the intermediate gear, a drum having a hub to which said shift gear is splined, a motor spring engaged at one end with said drum, means for shifting the last-mentioned gear to reverse the spring movement of the carriage, an arbor for the inner end of the spring, a ratchet-wheel geared to said arbor, and a vibratory member carrying a pawl engaged with said ratchet-wheel to wind the spring.

24. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, a compound gear wheel one section of which is in mesh with said rack, a transmission gear in mesh with the other section of said compound gear, an intermediate gear in mesh with the transmission gear, a shift gear to alternately mesh with the transmission gear and the intermediate gear, a drum having a hub to which said shift gear is splined, a motor spring frictionally engaged at one end with said drum, means for shifting the last-mentioned gear to reverse the spring movement of the carriage, an arbor for the inner end of the spring, a ratchet-wheel geared to said arbor, and a vibratory member carrying a pawl engaged with said ratchet-wheel to wind the spring.

25. In a machine of the character described, the combination of a laterally shiftable paper carriage, means for definitely locating the carriage in a plurality of columnar positions and means for automatically moving the carriage step by step from one such position to another, with provisions for automatically reversing the direction in which such means impel the carriage whereby the latter will be returned to its original position after having successively occupied the plurality of columnar positions.

26. In a machine of the character described, the combination of a laterally shiftable paper carriage, means for definitely locating the carriage in a plurality of co-

lumnar positions and a spring connected with the carriage for shifting it with provisions in the connections for reversing the direction in which the spring tends to move the carriage.

27. In a machine of the character described, the combination of a laterally shiftable paper carriage, means for definitely locating the carriage in a plurality of columnar positions, a spring connected with the carriage for shifting it with provisions in the connections for reversing the direction in which the spring tends to move the carriage, and means for automatically effecting such reversal.

28. In a machine of the character described, the combination of a laterally shiftable paper carriage, means for definitely locating the carriage in a plurality of columnar positions, a spring connected with the carriage for shifting it with provisions in the connections for reversing the direction in which the spring tends to move the carriage, and means for controlling said connections by the carriage to automatically reverse the latter's movement.

29. In a machine of the character described, the combination of a laterally shiftable paper carriage, means for definitely locating the carriage in a plurality of columnar positions, paper feeding mechanism effective or ineffective according to the columnar position of the carriage, and means for automatically moving the carriage step by step from one such position to another, with provisions controlled by the paper feeding mechanism for automatically reversing the direction in which such means impel the carriage whereby the latter will be returned to its original position after having successively occupied the plurality of columnar positions.

30. In a machine of the character described, the combination of a laterally shiftable paper carriage, means for definitely locating the carriage in a plurality of columnar position, paper feeding mechanism effective or ineffective according to the columnar position of the carriage, a spring connected with the carriage for shifting it with provisions in the connections for reversing the direction in which the spring tends to move the carriage, and means for controlling said connection by the paper feeding mechanism.

31. In a machine of the character described, the combination of a laterally shiftable paper carriage, means for definitely locating the carriage in a plurality of columnar positions, paper feeding mechanism effective or ineffective according to the columnar position of the carriage, a spring connected with the carriage for shifting it with provisions in the connections for reversing the direction in which the spring tends to move the carriage, and means for controlling said connection by the paper feeding mechanism and by the carriage itself.

32. In a machine of the character described, the combination of a laterally shiftable carriage; line spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog; a fixed abutment for said fingers to severally encounter; a motor spring connected with the carriage with provisions in the connections for reversing the direction in which the spring impels the carriage; and means operated by the line-spacing plates when connected together whereby to reverse said connections.

33. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog and the dog adapted in turn to displace the finger; a fixed abutment for said fingers to severally encounter; a motor spring connected with the carriage with provisions in the connections for reversing the direction in which the spring impels the carriage; and means operated by the line-spacing plates when connected together whereby to reverse said connections.

34. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; and means operated by the line-spacing plates when connected together whereby to reverse said gearing.

35. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog and the dog adapted in turn to displace the finger; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; and means operated by the line-spacing plates when connected together whereby to reverse said gearing.

36. In a machine of the character described, the combination of a laterally shift-

able carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog; a fixed abutment for said fingers to severally encounter; a motor spring connected with the carriage with provisions in the connections for reversing the direction in which the spring impels the carriage; means operated by the line-spacing plates when connected together whereby to reverse said connections; and means on the carriage for restoring the connections to original adjustment.

37. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage, reversible gearing connecting the latter with the spring; means operated by the line-spacing plates when connected together whereby to reverse said gearing; and means on the carriage for restoring the gearing to original adjustment.

38. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a cam for operating said member; and means for actuating said cam by the line-spacing plates when the latter are connected together.

39. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a cam for operating said member; means for actuating said cam by the line-spacing plates when the latter are connected together; and means for actuating said cam by the carriage when the latter returns to normal as a result of the line-spacing action.

40. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a reciprocatory bar having a cam to actuate said member; and means for moving said bar by the line-spacing plates when the latter are connected together.

41. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a reciprocatory bar having a cam to actuate said member; means for moving said bar by the line-spacing plates when the latter are connected together; and means for moving said bar in the opposite direction by the carriage when the latter returns to normal position.

42. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a reciprocatory bar having a cam to actuate said member and a stud; and a wipe plate carried by one of the line-spacing plates and adapted to act upon said stud when such plate is operatively connected with the other line-spacing plate.

43. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a reciprocatory bar having a cam to actuate said member and a pair of studs; a wipe

plate carried by one of the line-spacing plates and adapted to act upon one of said studs when such plate is operatively connected with the other line-spacing plate; and a tappet on the carriage adapted to act upon the other stud.

44. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog and the dog adapted in turn to displace the finger; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a cam for operating said member; and means for actuating said cam by the line-spacing plates when the latter are connected together.

45. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog and the dog adapted in turn to displace the finger; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a cam for operating said member; means for actuating said cam by the line-spacing plates when the latter are connected together; and means for actuating said cam by the carriage when the latter returns to normal as a result of the line-spacing action.

46. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog and the dog adapted in turn to displace the finger; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a reciprocatory bar having a cam to actuate said member; and means for moving said bar by the line-spacing plates when the latter are connected together.

47. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog and the dog adapted in turn to displace the finger; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a reciprocatory bar having a cam to actuate said member; means for moving said bar by the line-spacing plates when the latter are connected together; and means for moving said bar in the opposite direction by the carriage when the latter returns to normal position.

48. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog and the dog adapted in turn to displace the finger; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a reciprocatory bar having a cam to actuate said member and a stud; and a wipe plate carried by one of the line-spacing plates and adapted to act upon said stud when such plate is operatively connected with the other line-spacing plate.

49. In a machine of the character described, the combination of a laterally shiftable carriage; line-spacing mechanism comprising sliding plates or bars and a dog or pawl for connecting them; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog and the dog adapted in turn to displace the finger; a fixed abutment for said fingers to severally encounter; a motor spring for the carriage; reversible gearing connecting the latter with the spring; a vibratory member for reversing the gearing; a reciprocatory bar having a cam to actuate said member and a pair of studs; a wipe plate carried by one of the line-spacing plates and adapted to act upon one of said studs when such plate is operatively connected with the other line-spacing plate; and a tappet on the carriage adapted to act upon the other stud.

50. In a machine of the character described, the combination of a laterally shiftable paper carriage having a rack, a compound gear wheel one section of which is in mesh with said rack, a transmission gear in mesh with the other section of said compound gear, an intermediate gear in mesh with the transmission gear, a shift gear to alternately mesh with the transmission gear and the intermediate gear, a drum having a

hub to which said shift gear is splined, a motor spring engaged at one end with said drum and suitably anchored at the other end, a vibrating member to shift the last-mentioned gear; line-spacing mechanism comprising slide-bars or plates and a dog for operatively connecting them; means for regularly reciprocating one of said plates; a rock-shaft on the carriage having stop fingers of different lengths, one of the greater length adapted to displace the dog and to be in turn displaced by the latter; a fixed abutment for the fingers to encounter; a reciprocating bar having a cam to rock the vibrating gear-shifting member and also having a pair of studs; a wipe-plate on the line-spacing slide-bar whose reciprocation depends upon connection with the regularly reciprocated line-spacing bar, said wipe-plate adapted to move the cam-bar by acting upon one of the latter's studs; and a tappet-piece on the carriage adapted to move said cam-bar in the opposite direction by acting upon the other one of its studs.

51. In a machine of the character described, the combination of a laterally-shiftable paper-carriage; line-spacing mechanism comprising slide-bars and a laterally movable spring-held dog pivoted on one of said bars and adapted to take over a shoulder on the other to operatively connect the bars; means for regularly reciprocating the dog-carrying bar; a rock-shaft on the carriage having stop fingers of different lengths, the longer ones adapted to disengage the dog from the shoulder of the other bar and to be thereafter displaced by said dog; and a fixed abutment for said fingers to encounter to determine columnar positions of the carriage; substantially as described.

52. In a machine of the character described, the combination with a laterally shiftable paper carriage, and a prime mover; of means for moving said carriage from an initial columnar position to and definitely locating it in a succession of columnar positions; and means for automatically returning said carriage to the initial columnar position by operation of the prime mover with the carriage in the final one of its several columnar positions.

53. In a machine of the character described, the combination with a laterally shiftable paper carriage, and a prime mover; of means for moving the carriage from column to column in one direction, and means for automatically returning it from a final to an initial columnar position by continuous movement past one or more intermediate columnar positions.

54. In a machine of the character described, the combination with a laterally shiftable paper carriage, and a prime mover; of means for moving said carriage from an initial columnar position to and definitely locating it in a succession of columnar positions; means for automatically returning said carriage to the initial columnar position by operation of the prime mover with the carriage in the final one of its several columnar positions, and line-spacing mechanism inactive with the carriage in its initial or intermediate positions but automatically rendered active when the prime mover is operated with the carriage in its final columnar position.

55. In a machine of the character described, the combination with a laterally shiftable paper carriage, and a prime mover; of a motor and controlling devices for moving the carriage from an initial columnar position to and definitely locating it in a succession of columnar positions; and means for automatically reversing the motor connections by operation of the prime mover with the carriage in the final columnar position.

EDWARD R. BARRETT.

Witnesses:
J. G. VINCENT,
H. H. PHELPS.