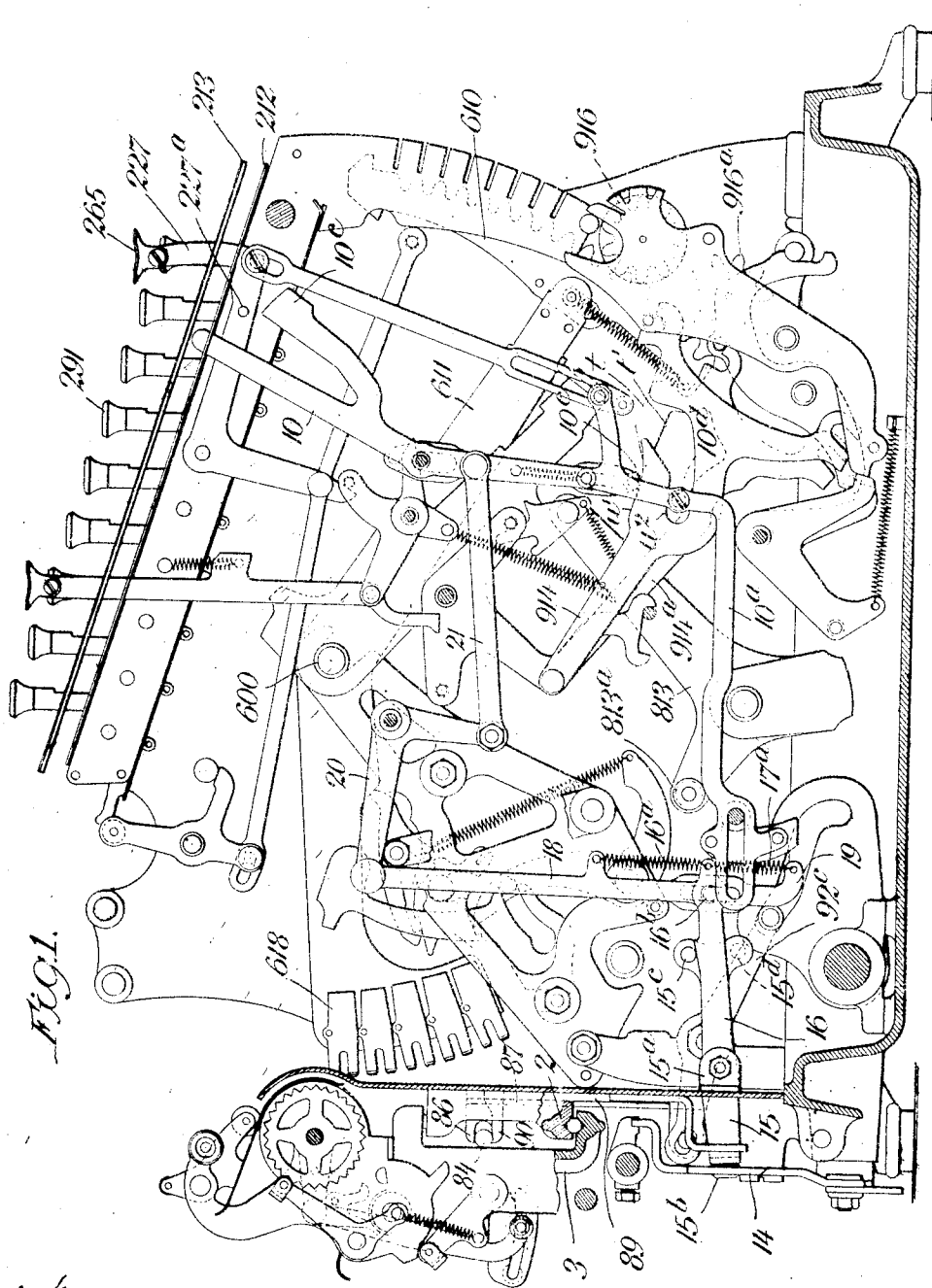


1,084,591.

5 SHEETS--SHEET 1.



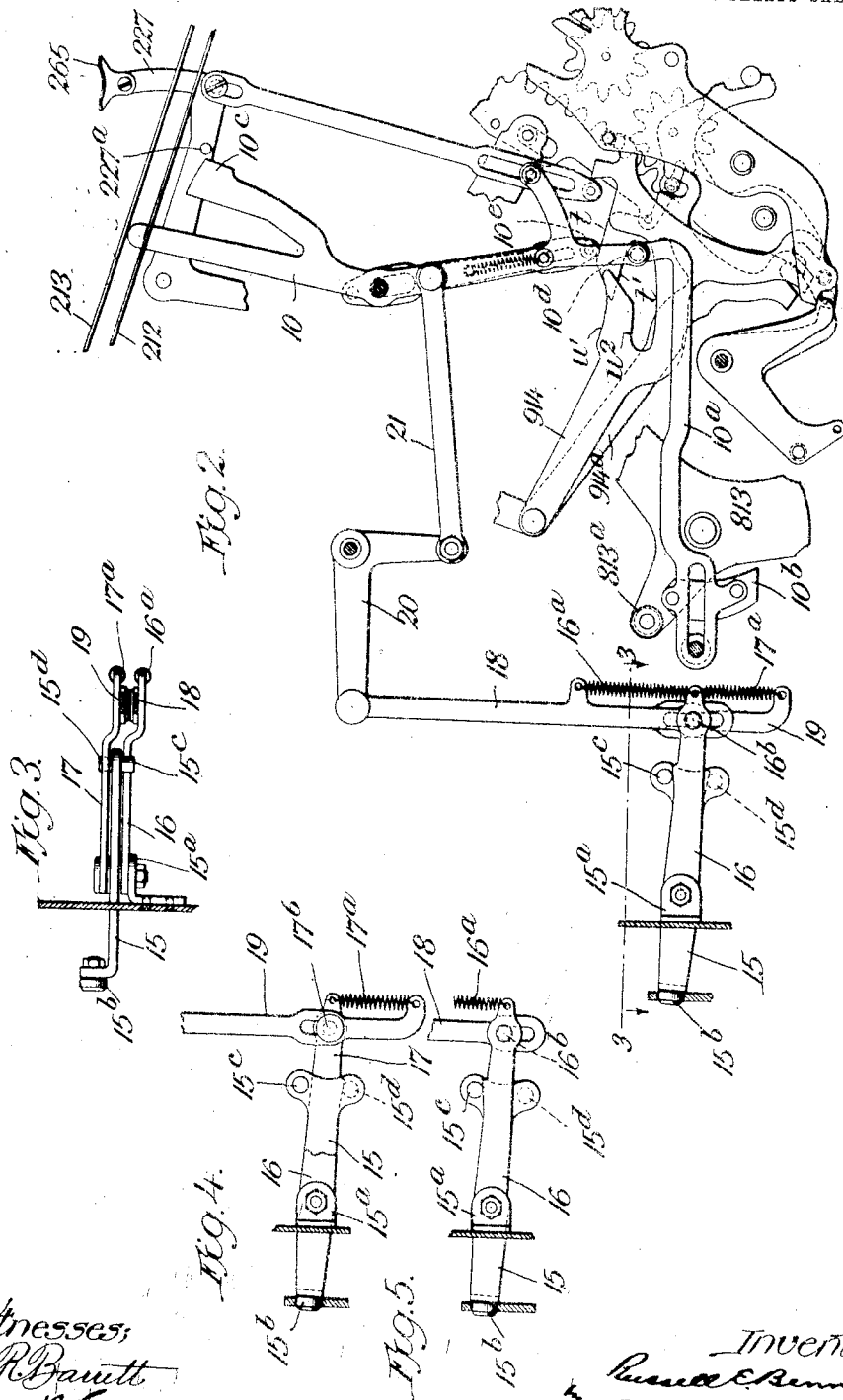
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R. E. BENNER.
 ADDING AND LISTING MACHINE.
 APPLICATION FILED FEB. 21, 1910.

1,084,591.

Patented Jan. 13, 1914.

5 SHEETS-SHEET 2.



Witnesses:
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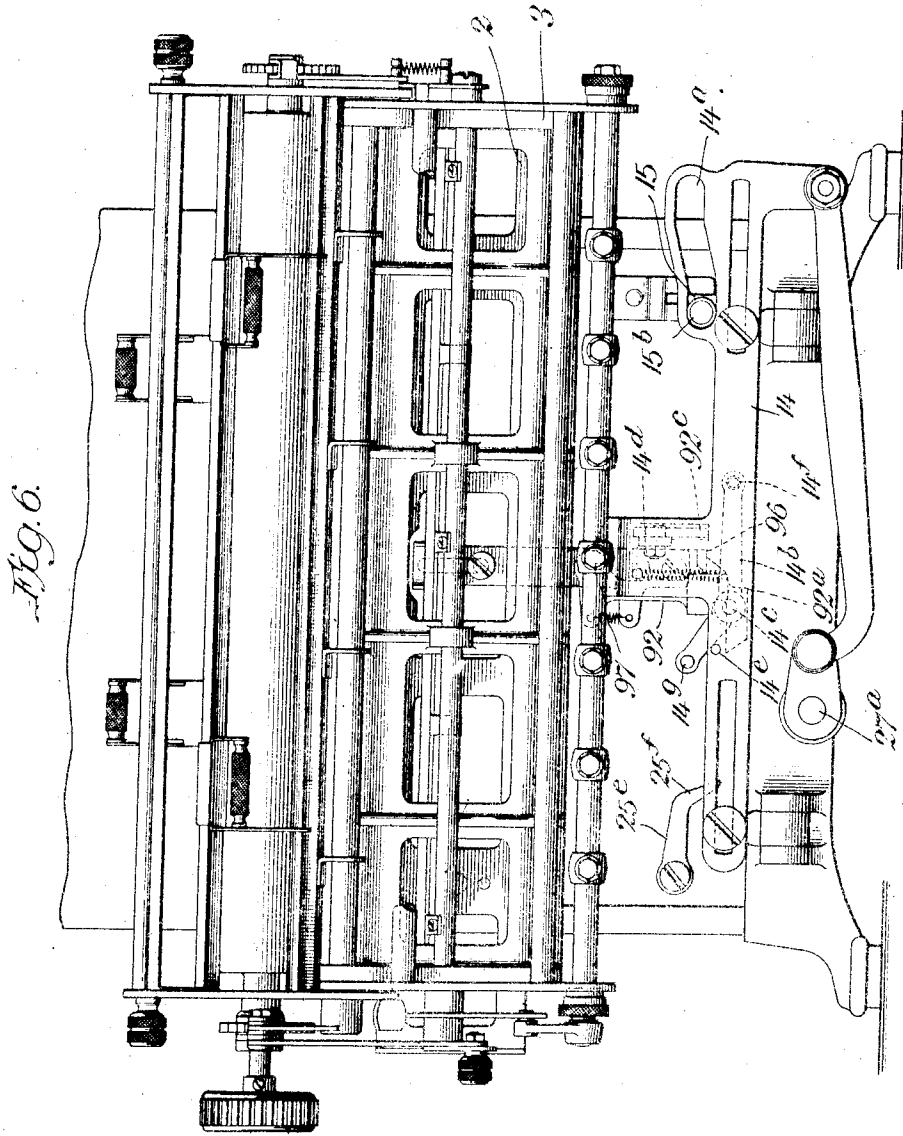
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R. E. BENNER.
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5 SHEETS-SHEET 3.



Witnesses;
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5 SHEETS-SHEET 4.

Fig. 7.

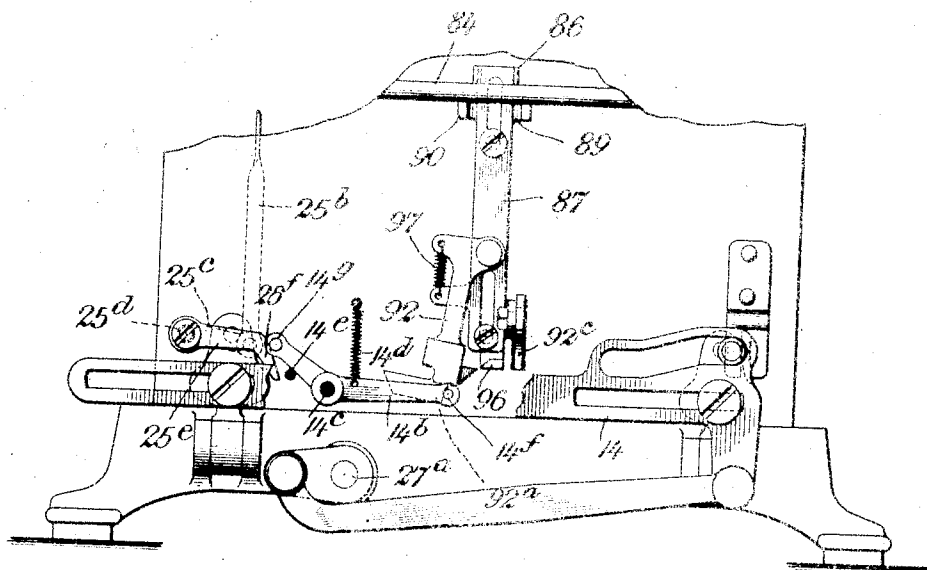
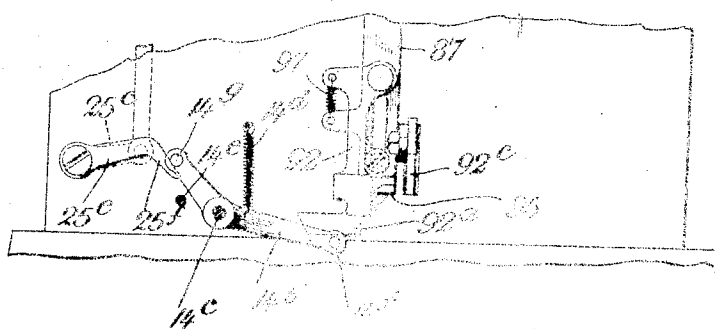


Fig. 8.



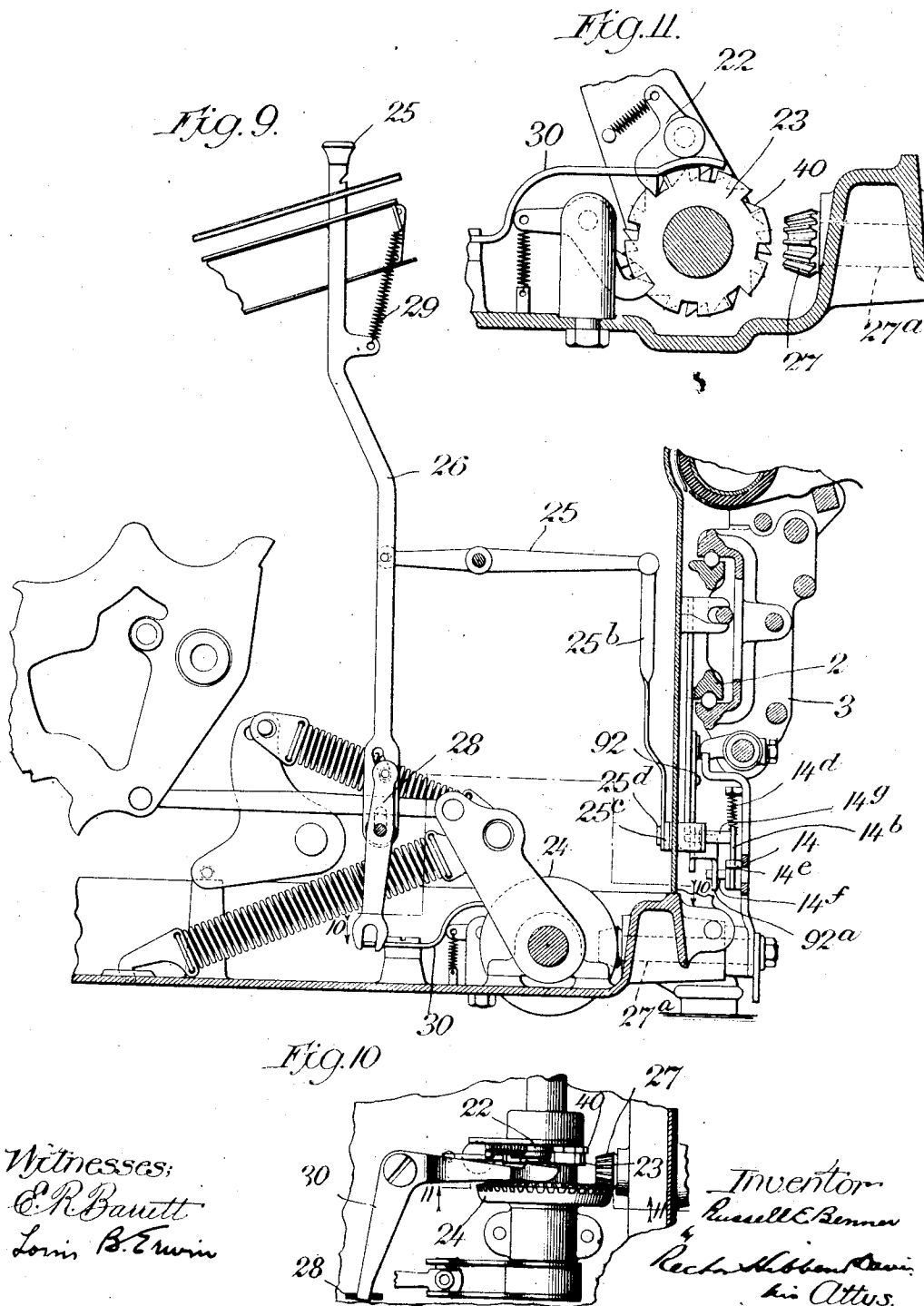
Witnesses:
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 Louis B. Erwin

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1,084,591.

R. E. BENNER.
 ADDING AND LISTING MACHINE.
 APPLICATION FILED FEB. 21, 1910.

Patented Jan. 13, 1914.
 5 SHEETS-SHEET 5.



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UNITED STATES PATENT OFFICE.

RUSSELL E. BENNER, OF DETROIT, MICHIGAN, ASSIGNOR TO BURROUGHS ADDING MACHINE COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

ADDING AND LISTING MACHINE.

1,084,591.

Specification of Letters Patent.

Patented Jan. 13, 1914.

Application filed February 21, 1910. Serial No. 545,037.

To all whom it may concern:

Be it known that I, RUSSELL E. BENNER, 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 and Listing Machines, of which the following is a specification.

My invention relates to adding and listing machines employing two counters or accumulators and a paper carriage laterally shiftable back and forth between two columnar positions automatically.

In Patent No. 910,749, issued January 26, 1909, to Burroughs Adding Machine Company on the invention of Jesse G. Vincent, there is disclosed an adding and listing machine having two sets of accumulating wheels together with means whereby the particular set of wheels to come into play may be determined by the lateral position of the paper carriage though in that machine the paper carriage is not automatically shifted back and forth between two columnar positions but is merely shifted at will by hand. In Patent No. 919,656, issued April 27, 1909, to Burroughs Adding Machine Company on the joint invention of said Vincent and one Nelson White, there is disclosed an adding and listing machine of the same general type as that shown in the before-mentioned Vincent patent but with a two-counter or duplex accumulator arrangement differing considerably from that disclosed in said Vincent patent and not under control of the laterally shiftable paper-carriage. In Patent No. 924,118, issued June 8, 1909, to Burroughs Adding Machine Company on the joint invention of said Vincent and myself, there is disclosed an adding and listing machine of the same general type as shown in the before-mentioned Vincent and Vincent-White patents, but having incorporated in it mechanism whereby the paper carriage is shifted back and forth between two columnar positions automatically, that is to say first one way as an incident to operation of the machine and then the other way as an incident to a following operation of the machine. The machine of this Vincent-Benner patent has, however, a single counter or accumulator only.

Now by my present invention I propose to combine in one machine automatic paper car-

riage reciprocating means such for example as that disclosed in the above-mentioned Vincent-Benner patent, and a double counter or duplex accumulator arrangement such as shown in the above-mentioned Vincent-White patent, thereby producing a machine in which a single set of actuators and type carriers will be caused to cooperate alternately with two independently operable sets of adding wheels and the amounts alternately accumulated will be alternately printed in two parallel columns, all of this taking place automatically as the machine is successively operated, *c. g.* by depressing amount keys and pulling an operating handle.

While as stated I aim to combine in one machine the so-called "shuttle" paper carriage and the so-called "duplex" accumulating mechanism, the feature of automatically alternating cooperative relationship between the two counters or accumulators and the common set of actuators is not necessarily dependent upon the automatic reciprocation of the paper carriage though the invention may find its chief utility in the combination including the latter feature.

In the form of embodiment of my invention herein detailed the double counter or duplex accumulator arrangement follows quite closely that disclosed in the before-mentioned Vincent-White patent, and the carriage reciprocating mechanism follows quite closely that disclosed in said Vincent-Benner patent and it is therefore not necessary for the present specification to extend to all of the particulars of construction and modes of operation of these mechanisms but reference may be had to said prior patents in this regard.

Of the drawings which constitute a part of this specification Figure 1 represents in left side elevation a complete adding and listing machine which embodies my present invention in the form above mentioned, the usual inclosing casing of the machine being omitted and the base casting and rear panel shown in cross section as well as a number of cross shafts, supporting rods and pivot studs, and portions of the paper carriage and its track being broken away and sectionalized. The condition of the machine as here represented is that which obtains when an amount has just been accumulated on the upper one of the two sets of adding wheels

and the next ensuing operation is to accumulate an amount on the lower set of adding wheels. Fig. 2 is a view similar to Fig. 1 though not embracing as much of the machine, and here the condition is changed to represent that which obtains when an amount has just been accumulated in the lower set of adding wheels and in the next ensuing operation an amount is to be accumulated in the upper set of adding wheels; Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 2; Fig. 4 is a left side elevation of parts which appear in plan view in Fig. 3 with certain parts broken away to disclose the relation of other parts shown as such relation would exist with the machine in the condition illustrated in Fig. 2; Fig. 5 is a view similar to Fig. 4 but with the omitted parts of the latter retained and certain parts of Fig. 4 omitted; Fig. 6 shows the machine in rear elevation in a condition corresponding with the illustration in Fig. 1; Fig. 7 is a partial rear elevation with some parts broken away and sectionalized, this view illustrating a condition of the machine corresponding with that illustrated in Fig. 2; Fig. 8 is a view somewhat similar to Fig. 7 though not including as many parts and differing further in showing a changed relationship of part, due to manipulation of a certain special key; Fig. 9 is a partial vertical section and partial right side elevation of the rear lower portion of the machine extending fragmentarily to the top of the machine so as to embrace the before-mentioned special key; Fig. 10 is a horizontal section taken substantially on the line 10—10 of Fig. 9; and Fig. 11 is a vertical section taken substantially on the line 11—11 of Fig. 10.

The reference numeral 610 designates segmental racks mounted in the usual way on the forward ends of levers 611, the latter pivoted on shaft 600 and carrying at their rear ends type plates 618.

The reference numeral 916 designates the upper set of adding pinions and 916^a the lower set of adding pinions arranged as in the Vincent-White patent to cooperate with the racks 610 for (1) accumulating amounts independently of each other, (2) being independently turned to zero for sub-total and total printing operations; and (3) transferring accumulations from one to the other set of pinions. These results are accomplished as in the Vincent-White construction through control of pitmen 914 and 914^a by the shifting of a lever 10 though the latter does not as in the Vincent-White construction project up through the upper keyboard plate 213 but terminates below the same guided by a slot in the lower keyboard plate 212. As in the Vincent-White construction the forward position of this lever

as to its upper end (Fig. 1) means adjustment of the pitmen to provide for cooperation between the racks 610 and the lower pinions 916^a, whereas rearward position of said lever as to its upper end (Fig. 2) means adjustment of the pitmen to provide for cooperation between the said racks and the upper set of pinions 916. The shifting of the said lever from one position to the other is done automatically, according to the present invention, and, in the form of embodiment of that invention here detailed, through connection with paper carriage reciprocating means of the character shown in the aforesaid Vincent-Benner patent. Thus a reciprocating bar 14 at the back of the machine (see Fig. 6) similar to the bar correspondingly designated in said Vincent-Benner patent, is, for the purposes of the present invention, formed in a widened end portion with a cam-slot 14^a, and a lever 15, pivoted intermediate its ends to a bracket 15^a on the back panel of the machine, carries at its rear end a roller 15^b occupying said cam-slot so that in reciprocations of the bar 14 said lever will be vibrated. As will be understood by reference to the Vincent-Benner patent the bar 14 is shifted during the back stroke of the operating handle of the machine, and consequently said lever 15 will be rocked one way or the other during such back stroke of the operating handle. It is through connection with this lever that the lever 10 is shifted but the connection is not a positive and direct one inasmuch as the lever 10 is locked forward or back as in the Vincent-White construction while the operating handle is out of normal position. Thus a rearwardly-extending branch 10^a of the lever 10 carries a locking block 10^b and the familiar vibrating arm 813 a roller 813^a adapted to pass down in front or in rear of the block 10^b according to whether the lever 10 is forward or rearward as to its upper end. In the present instance the said block is shown as rounded at its upper end instead of square as in the Vincent-White construction, such rounding being for the purpose of easing the operation of shifting the lever 10, *i. e.*, permitting it to start to shift before the roller 813^a entirely clears the upper end of the block.

The lever 15 extends between a pair of arms 16 and 17 also pivotally mounted independently of each other on the bracket 15^a (see particularly Fig. 3) and said lever has a widened forward end in which at points above and below each other are fixed oppositely projecting studs 15^c and 15^d, the former projecting over the arm 16 and the latter projecting under the arm 17 and these arms being formed with raised edges as shown for the studs to act upon respectively. The arms 16 and 17 are connected respectively

by spiral springs 16^a and 17^a to pendent links 18 and 19, the spring 16^a being connected to an upper portion of the link 18 and the spring 17^a to a lower portion of the link 19 so that these springs act oppositely. The link 18 is slotted longitudinally at its lower end to receive a stud 16^b on the arm 16 and the link 19 is slotted at an intermediate point to receive a stud 17^b on the arm 17, as most clearly shown in Figs. 4 and 5. The links 18 and 19 are both pivotally connected to one arm of a bell crank lever 20 and the other arm of that lever is connected by a link 21 with the lever 10 as clearly shown in Figs. 1 and 2.

With the bar 14 in the position shown in Fig. 6, which corresponds of course with a position of the paper carriage moved to the left for printing in a right-hand column as the parts would be viewed from the front, the rear end of the lever 15 would be lowered inasmuch as the lower end of the cam-slot 14^a is engaged with the roller 15^b. This is the condition illustrated in Fig. 1, whereas Figs. 2, 4 and 5 show the rear end of the lever 15 elevated as when the bar 14 has been shifted the other way or to the left as the parts are seen in Fig. 6. The first effect of the shifting of the lever 15 is to stretch either the spring 16^a or the spring 17^a according to the direction in which the bar 14 is moving in accompaniment with the backward swing of the operating handle, for during the greater portion of such movement of the operating handle the roller 813^a is engaged with the locking block 10^b so that the lever 10 cannot shift. However, just as the operating handle arrives home the roller 813^a clears the block 10^b whereupon the stretched spring acts to shift the lever 10 through the link 18 or the link 19 as the case may be, and the bell crank lever 20 and link 21. When the lever 15 shifts from the position shown in Fig. 1 to that shown in Figs. 2, 4 and 5 its stud 15^c acts upon the arm 16 to depress the latter and put the spring 16^a under tension, the stud 15^d in such case simply moving down away from the arm 16. Then when the roller 813^a passes from in front of the block 10^b the spring 16^a pulls the link 18 down the length of the slot therein, thereby shifting the lever 10 rearward as to its upper end. Of course the rocking of the bell crank lever 20 in such case results in the other link 19 being lowered and the arm 17 brought into engagement with the stud 15^d. Then when the lever 15 is shifted the other way its stud 15^d elevates the arm 17, stretching the spring 17^a, and the stud 15^c simply moves away from the arm 16. When the roller 813^a passes from behind the block 10^b the spring 17^a pulls up the link 18 thereby rocking the bell crank 20 and through the link 21 throwing the

lever 10 forward as to its upper end. Such rocking of the bell crank elevates the link 19 thereby bringing the arm 16 again in engagement with the stud 15^c.

It will be seen that with the above-described construction in the shifting of the bar 14 first one way and then the other in successive operations of the machine, first one set of pinions and then the other will be brought into coöperative relationship with the racks 610, so that amounts set up by depression of the regular keys 291 will be alternately accumulated on the two sets of pinions and alternately printed in two parallel columns, it being understood that a paper carriage 3 is mounted at the rear to shift laterally upon a track 2 and that said carriage is suitably engaged with said bar 14. As the machine is here shown organized amounts printed in the left-hand column of the two parallel columns will be accumulated in the upper counter and amounts printed in the right-hand column will be accumulated in the lower counter.

To prevent depression of the total key 265 while the lever 10 is being shifted and to prevent shifting of said lever when the total key is depressed or being depressed, the lever is formed with a branch 10^c (Fig. 1) having a widened upper end portion with straight front and rear edges and a curved top edge, and the total key bell crank lever 227 has a stud 227^a. When the total key is depressed with the upper end of the lever 10 forward as in Fig. 1 said stud passes down along the rear straight edge of the branch 10^c, locking said lever in such position, and when the total key is depressed with the upper end of the lever in the rearward position, as in Fig. 2, said stud passes down along the front straight edge of the branch 10^c. As the lever is swung from either position to the other the curved top edge of the branch 10^c passes under the stud 227^a, preventing depression of the total key.

In order to steady the pitmen 914 and 914^a in the changing of adjustments thereof, the shape of the same is changed somewhat as compared with that of the pitmen shown in the Vincent-White patent and the lever 10 carries a stud 10^d to coöperate with the pitmen. The pitman 914 instead of merely having a raised edge such as that designated *u'* in the Vincent-White patent is formed with an undercut portion *u''* below which said stud 10^d passes when the lever 10 is shifted to throw its upper arm forward and its lower arm rearward as in Fig. 1. The pitman 914^a is formed with a similar undercut portion *t'* below which said stud passes when the lever is thrown the other way or to the position shown in Fig. 2. The pitmen are further modified in shape to provide for easy passage of the roller 10^e from one to

the other. Thus that portion of the pitman 914 whose upper edge u' corresponds with the edge similarly designated in the Vincent-White patent is extended forward to overlap that portion of the pitman 914^a whose upper edge t corresponds with the similarly designated edge in the Vincent-White patent, and the edge u' of the pitman 914 extends on an upward curve where its transverse plane bisects that of the beveled termination of the edge t . The pitman 914 is preferably beveled from the outer terminal of the edge u' down to the undercut edge v' in order to avoid the possibility of the stud 10^a being obstructed by any contact with the pitman 914. It will be noted that the undercut edge t' of the pitman 914^a is of such extent and extends at such an angle as to preclude the possibility of the stud 10^a being obstructed by any contact with this pitman 914^a.

In order to produce double column printing with successively recorded amounts in horizontal alinement it is essential that there shall be line spacing only in every other operation of the machine and the Vincent-Benner patent shows an arrangement for suspending the line spacing when the carriage moves to the right-hand position so that an amount having been printed in the left-hand column no line spacing ensues as the handle returns to normal. Similar mechanism is shown in the accompanying drawings, the same comprising slide bars or strips 87 and 89 mounted on the back panel of the machine, the former having jaws 86 embracing the line spacing bail 84 and the strip or bar 89 having jaws 90 extending under the bail rod. The feed lever 92^a (Fig. 1) engages an ear of the slide bar or strip 89 as usual and the latter has a beveled lug 96 (Fig. 7) for engagement with the similar lug of a coupler piece or dog 92 pivoted to the slide strip or bar 87 and actuated by a spring 97. As in the case of the corresponding coupler piece or dog in the Vincent-Benner construction there is an undercut or shouldered downward extension 92^a of the coupler piece against which a stud carried by the reciprocating bar 14 is adapted to act so as to disconnect the slides 87 and 89 when the carriage shifts to the right, which means a shift to the left of the bar 14 as viewed from the rear. However, according to the present invention such stud is not in fixed position on the bar 14 as in the Vincent-Benner construction but is otherwise arranged in the manner and for the purpose presently to be described.

Provision is made in the Vincent-Benner construction for discontinuing at will the automatic reciprocation of the paper carriage when it is desired to list only in a sin-

gle column and for such work the carriage is required to be in the left-hand one of the two positions it is capable of occupying when the reciprocating mechanism is active. Now by the present invention provision is made for doing single column work with the carriage in the other or right-hand position also and to this end the means for disconnecting the paper feed slide bars or strips 87 and 89 by the shifting of the bar 14 which accompanies movement of the carriage to the right-hand position, may be disabled at will. This is the occasion for adopting a different arrangement than that of a stud such as that designated 14^a in the Vincent-Benner construction fixed in position on the bar 14. According to the present construction the stud 14^a, which performs the function of the similarly designated stud in the Vincent-Benner construction, is carried at one end of a lever 14^b pivoted upon the bar 14 at 14^c and drawn upward as to its arm carrying said stud 14^a, by a spiral spring 14^d connecting it to an upper portion of the said bar 14, which spring normally holds the other arm of said lever against a stop stud 14^e on the bar 14 as shown in Fig. 7. Thus the stud 14^a is normally in a position corresponding to that of the similarly designated stud in the Vincent-Benner construction, that is to say a position adapting it to operate upon the coupler piece or dog 92 to disable the line spacing mechanism in the manner described in said Vincent-Benner patent and as illustrated in Fig. 7. However, by rocking the lever 14^b against the stress of the spring 14^d the stud 14^a can be disengaged from the vertical shoulder of the coupler piece so as to permit the latter to reengage the lug 96 of the slide bar or strip 89 as shown in Fig. 8. The lower portion of the coupler piece is elongated to provide an extended under edge so that in such case the stud 14^a will, upon movement of the reciprocating bar 14 to the right as viewed from the rear, resume its normal position in line with the vertical shoulder of the coupler piece. The means for rocking the said lever 14^b are of the following description: A key 25, similar to that correspondingly designated in the Vincent-Benner patent, is similarly located and surmounts a stem 26 sliding through the keyboard plates and upheld by a spring 29. This key stem is jointed to the forwardly-extending arm of a lever 25^a whose rearwardly-extending arm is jointed to a downwardly-extending bent link 25^b. The latter at its lower end is jointed to a crank arm 25^c secured to a short rock shaft 25^d journaled in a bearing on the back panel of the machine and carrying at its rear end an arm 25^e which terminates in a downwardly-inclined finger 25^f as shown in Figs. 6, 7 and 8. When the reciprocating bar 14 is over to the left as

viewed from the rear of the machine, a stud 14^a, at the end of the lever 14^b opposite that where the stud 14^c is located, lies over the said finger 25^c as shown in Fig. 7. It follows that upon depression of the key 25 and consequent upward rocking of the arm 25^a said finger 25^c will wipe under said stud 14^a and rock the lever 14^b to the position shown in Fig. 8 thereby disengaging the stud 14^c from the vertical shoulder of the coupler piece 92 and permitting the latter to resume engagement with the slide bar or strip 89. Line spacing can then take place with the carriage in the right-hand position.

15 The key 25, besides performing the function above described, serves in the same way that the correspondingly designated key in the Vincent-Benner construction does, to disable the carriage reciprocating mechanism, 20 the key stem 26 being slotted at its lower end to embrace a stud on which is pivoted a lever 28 having at its upper end a stud occupying an oblique slot in the key stem 26 so that upon depression of the latter the said lever 25 28 will be rocked. As in the Vincent-Benner construction the lever 28 engages one arm of a bell crank lever 30 whose other arm is formed as a shield to move into the path of the pawl 22 and prevent said pawl from 30 actuating the ratchet wheel 40 and notched disk 23, the latter being secured to the sleeve or hub of the beveled gear wheel 24 which is in mesh with the beveled pinion 27 on the crank shaft 27^a for reciprocating the bar 14. 35 Inasmuch, however, as the intention is, as before stated, to provide for single column work with the carriage in the righthand position as well as in the lefthand position, the connections from the said key 25, unlike 40 those disclosed in the aforesaid Vincent-Benner patent, provide for disablement of the carriage reciprocating mechanism when the carriage is in its righthand position. Thus, the bell crank lever 30 does not have 45 the branch which appears in said Vincent-Benner patent (there designated 33) and which in this former construction strikes against the web of the beveled gear 19, thereby preventing effective depression of the key 50 when the carriage is in the righthand position. The omission of this branch of said lever obviously provides for the same action in disablement of the carriage reciprocating mechanism when the carriage is in the right-hand position as when it is in the lefthand 55 position.

In so far as concerns carriage control *per se* and line-spacing control *per se*, a divisional application has been filed (Serial No. 60 735,153, December 5, 1912).

What I claim is:

1. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the

same, two sets of wheels independently operable by the racks, and means for automatically alternating coöperative relationship between the racks and the two sets of wheels.

2. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of wheels independently operable by the racks, type carriers common to said sets of wheels, printing mechanism, a laterally shiftable paper carriage, and means for automatically shifting the same back and forth between two columnar positions and coincidentally automatically alternating coöperative relationship between the racks and 80 the two sets of wheels.

3. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable 85 with and disengageable from said racks, and means for automatically alternating coöperative relationship between the racks and the two sets of wheels.

4. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable 90 with and disengageable from said racks, type carriers common to said sets of pinions, printing mechanism, a laterally shiftable paper carriage, and means for automatically shifting the same back and forth between two columnar positions and coincidentally automatically alternating coöperative re- 100 lationship between the racks and the two sets of pinions.

5. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, 105 two sets of pinions independently engageable with and disengageable from said racks, controlling devices for causing both sets of pinions to be out of engagement with the racks during movement of the latter in one 110 direction, and means for automatically alternating engagement of the two sets of pinions with the racks throughout movement of the latter in the opposite direction.

6. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable 115 with and disengageable from said racks, controlling devices for causing both sets of pinions to be out of engagement with the racks during movement of the latter in one direction, means for automatically alternating engagement of the two sets of pinions 120 with the racks throughout movement of the latter in the opposite direction, type carriers common to the two sets of pinions, printing mechanism, a laterally shiftable paper car- 125

riage, and means for reciprocating the same by the means for alternating engagement of the two sets of pinions with the racks.

7. In a machine of the character described, 5 the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable with and disengageable from said racks, a shifter for each set of pinions, a controlling 10 member for the shifters, a prime mover, a lock for preventing operation of said controlling member during operation of the prime mover, and means of a yielding nature for automatically changing the adjustment 15 of the controlling member as a result of an operation of said prime mover.

8. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two 20 sets of pinions independently engageable with and disengageable from said racks, a shifter for each set of pinions, a controlling member for the shifters, a prime mover, a lock for preventing operation of said controlling member during operation of the 25 prime mover, a reciprocatory element adapted to be moved one way and then the other in successive operations of the prime mover, and connections of a yielding nature between 30 said element and the controlling member.

9. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two 35 sets of pinions independently engageable with and disengageable from said racks, a shifter for each set of pinions, a controlling member for the shifters, a prime mover, a lock for preventing operation of said controlling member during operation of the 40 prime mover, a reciprocatory element adapted to be moved one way and then the other in successive operations of the prime mover, and duplex connections of a yielding nature between said element and the controlling 45 member.

10. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently 50 engageable with and disengageable from said racks, a shifter for each set of pinions, a controlling lever for the shifters, a prime mover, a lock for preventing operation of said controlling lever during operation of 55 the prime mover, a reciprocatory element adapted to be moved one way and then the other in successive operations of the prime mover, arms engaged with said element for independent movement thereby in opposite 60 directions, oppositely arranged springs connected to said arms respectively, and connections between said springs and the afore-said controlling lever.

11. In a machine of the character de-

scribed, the combination of a set of racks, 65 means for differentially reciprocating the same, two sets of pinions independently engageable with and disengageable from said racks, a shifter for each set of pinions, a controlling lever for the shifters, a prime 70 mover, a lock for preventing operation of said controlling lever during operation of the prime mover, a lever adapted to be moved one way and then the other in successive operations of the prime mover and 75 having oppositely projecting studs, independently pivoted arms engaged by said studs respectively, links having slot-and-pin connection with said arms respectively, oppositely arranged springs connecting said 80 links with said arms respectively, and operating connections between said links and the controlling lever.

12. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable with and disengageable from said 85 racks, a shifter for each set of pinions, a controlling lever for the shifters, a prime mover, a lock for preventing operation of said controlling lever during operation of the prime mover, a lever adapted to be moved one way and then the other in successive operations of the prime mover and 90 having oppositely projecting studs, independently pivoted arms engaged by said studs respectively, links having slot-and-pin connection with said arms respectively, oppositely arranged springs connecting said 95 links with said arms respectively, a bell crank lever connected to said links, and a link connecting said bell crank lever and the controlling lever.

13. In a machine of the character de- 100 scribed, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable with and disengageable from said racks, a shifter for each set of pinions, a 110 controlling member for the shifters, a prime mover, a cam-slotted bar and connections between the same and said prime mover for shifting the bar first one way and then the other in successive operations of the prime 115 mover, and controlling member-shifting means operated through engagement with the cam-slot of said bar.

14. In a machine of the character described, the combination of a set of racks, 120 means for differentially reciprocating the same, two sets of pinions independently engageable with and disengageable from said racks, a shifter for each set of pinions, a controlling member for the shifters, a prime 125 mover, a cam-slotted bar and connections between the same and said prime mover for shifting the bar first one way and then the

other in successive operations of the prime mover, a lever engaged with the cam-slot of the said bar, and operating connections between said lever and the controlling member.

15. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable with and disengageable from said racks, a shifter for each set of pinions, a controlling lever for the shifters, a prime mover, a cam-slotted bar and connections between the same and said prime mover for shifting the bar first one way and then the other in successive operations of the prime mover, a lever engaged with the cam-slot of the said bar and having oppositely projecting studs, independently pivoted arms engaged by said studs respectively, links having slot-and-pin connection with said arms respectively, oppositely arranged springs connecting said links with said arms respectively, operating connections between said links and the controlling lever, and a lock for preventing operation of the controlling lever during operation of the prime mover.

16. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable with and disengageable from said racks, a shifter for each set of pinions, a controlling lever for the shifters, a prime mover, a cam-slotted bar and connections between the same and said prime mover for shifting the bar first one way and then the other in successive operations of the prime mover, a lever engaged with the cam-slot of the said bar and having oppositely projecting studs, independently pivoted arms engaged by said studs respectively, links having slot-and-pin connection with said arms respectively, oppositely arranged springs connecting said links with said arms respectively, a bell crank lever connected to said links, a link connecting said bell crank lever and the controlling lever, and a lock for preventing operation of the controlling lever during operation of the prime mover.

17. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of wheels independently operable by the racks, type carriers common to said sets of wheels, printing mechanism, a laterally shiftable paper carriage, line spacing mechanism, and means for automatically shifting the same back and forth between two columnar positions and coincidentally automatically alternating coöperative relationship between the racks and the two sets of wheels, and alternating effectiveness

and ineffectiveness of the line spacing mechanism.

18. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable with and disengageable from said racks, type carriers common to said sets of pinions, printing mechanism, a laterally shiftable paper carriage, line spacing mechanism, and means for automatically shifting the same back and forth between two columnar positions and coincidentally automatically alternating coöperative relationship between the racks and the two sets of pinions, and alternating effectiveness and ineffectiveness of the line spacing mechanism.

19. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable with and disengageable from said racks, controlling device for causing both sets of pinions to be out of engagement with the racks during movement of the latter in one direction, means for automatically alternating engagement of the two sets of pinions with the racks throughout movement of the latter in the opposite direction, type carriers common to the two sets of pinions, printing mechanism, a laterally shiftable paper carriage, means for reciprocating the same by the means for alternating engagement of the two sets of pinions with the racks, line-spacing mechanism, and means for alternating effectiveness and ineffectiveness thereof.

20. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of wheels independently operable by the racks, type-carriers common to said sets of wheels, printing mechanism, a laterally shiftable paper carriage, line spacing mechanism, and means for automatically shifting said carriage back and forth between two columnar positions and coincidentally automatically alternating coöperative relationship between the racks and the two sets of wheels, and alternating effectiveness and ineffectiveness of the line spacing mechanism, with provisions for disabling said carriage-shifting means at will to permit single column printing.

21. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same two sets of wheels independently operable by the racks, type carriers common to said sets of wheels, printing mechanism, a laterally shiftable paper carriage, line spacing mechanism, and means for automatically shifting said carriage back and forth between two columnar positions and coin-

cidentally automatically alternating coöperative relationship between the racks and the two sets of wheels, and alternating effectiveness and ineffectiveness of the line spacing mechanism, with provisions for disabling said carriage shifting means at will to permit single column printing with the carriage in either of its two positions and for maintaining the line spacing mechanism effective under either condition.

22. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of wheels independently operable by the racks, type carriers common to said sets of wheels, printing mechanism, a laterally shiftable paper carriage, and means for automatically shifting the same back and forth between two columnar positions and coincidentally automatically alternating coöperative relationship between the racks and the two sets of wheels, with provision for disabling the carriage shifting means at will to permit single column printing and registering on one set of wheels only.

23. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of wheels independently operable by the racks, type carriers common to said sets of wheels, printing mechanism, a laterally shiftable paper carriage, and means for automatically shifting the same back and forth between two columnar positions and coincidentally automatically alternating coöperative relationship between the racks and the two sets of wheels with provision for disabling the carriage shifting means when the carriage is in either of its two positions and for correspondingly permitting operations of either set of wheels alone.

24. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of wheels independently operable by the racks, and means for automatically alternating coöperative relationship between the racks and the two sets of wheels with provisions for disabling said latter means at will.

25. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable with and disengageable from said racks, a shifter for each set of pinions, and a controlling member for the shifters engaged therewith to change their adjustment and having provisions for limiting vibration of the shifters.

26. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the

same, two sets of pinions independently engageable with and disengageable from said racks, a shifter for each set of pinions, the shifters having upper acting edges and undercut portions; and a controlling member engaging with the said upper edges of the shifters to change the adjustment thereof and having a projection to engage the undercut portions.

27. In a machine of the class described, the combination of differentially reciprocating racks; two sets of accumulating pinions independently engageable with and disengageable from said racks, rocking supports for the sets of pinions respectively; a pitman for each support adapted to engage the same on either side of its pivot and having an upper acting edge and an undercut portion; and a lever engaging the upper edges of the pitman to change their adjustment, said lever having a stud to engage the undercut portions.

28. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, two sets of pinions independently engageable with and disengageable from said racks, a shifter for each set of pinions, the shifters having upper acting edges on portions overlapping each other, and a controlling member engaging such edges to change the adjustment of the shifters.

29. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, type-carriers common to said sets of wheels, printing mechanism, a laterally shiftable paper carriage, and means for automatically alternating coöperative relationship between the racks and the two sets of wheels with provisions for disabling said latter means at will when the carriage is in either of two columnar positions between which it reciprocates.

30. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, type-carriers common to said sets of wheels, printing mechanism, a laterally shiftable paper carriage, means for automatically reciprocating the same, and means for automatically alternating coöperative relationship between the racks and the two sets of wheels with provisions for disabling said latter means at will when the carriage is in either of the two positions between which it is automatically reciprocated.

31. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, type-carriers common to said set of wheels, printing mechanism, a laterally shiftable paper carriage, means for automatically alternating coöperative relationship

between the racks and the two sets of wheels, and a key and connections for disabling said latter means at will when the carriage is in either of two columnar positions between 5 which it reciprocates.

32. In a machine of the character described, the combination of a set of racks, means for differentially reciprocating the same, type-carriers common to said sets of 10 wheels, printing mechanism, a laterally shiftable paper carriage, means for automati-

cally reciprocating the same, means for automatically alternating coöperative relationship between the racks and the two sets of wheels, and a key and connections for disabling said latter means at will when the carriage is in either of the two positions between which it is automatically reciprocated. 15

RUSSELL E. BENNER.

Witnesses:

J. G. VINCENT,
R. S. MIELERT.