Oct. 6, 1942. L. P. CROSMAN 2,298,202

LISTING CALCULATOR

Filed Oct. 24, 1939 6 Sheets-Sheet 1

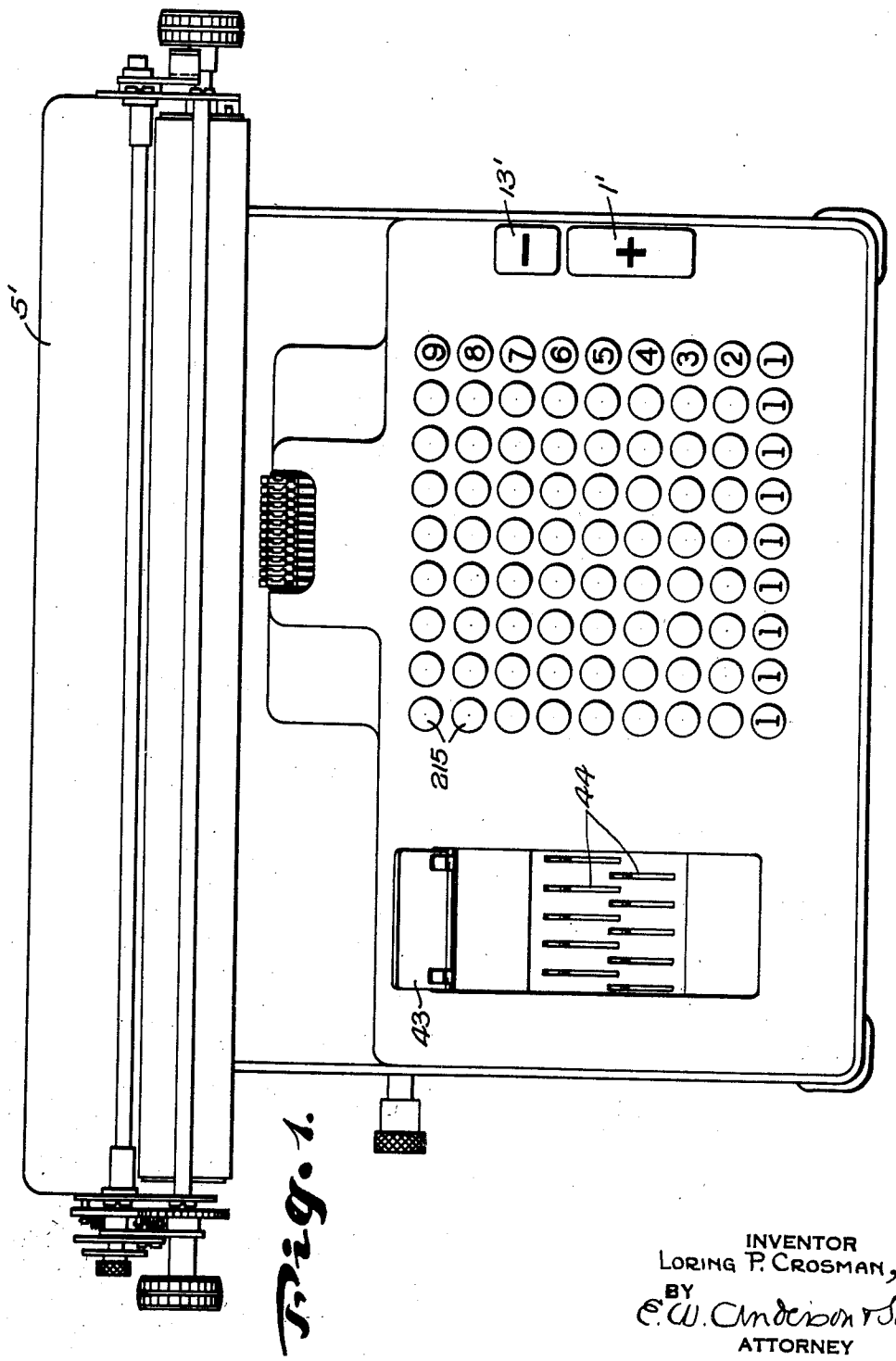



Fig. 1.

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LISTING CALCULATOR

Filed Oct. 24, 1939 6 Sheets-Sheet 2

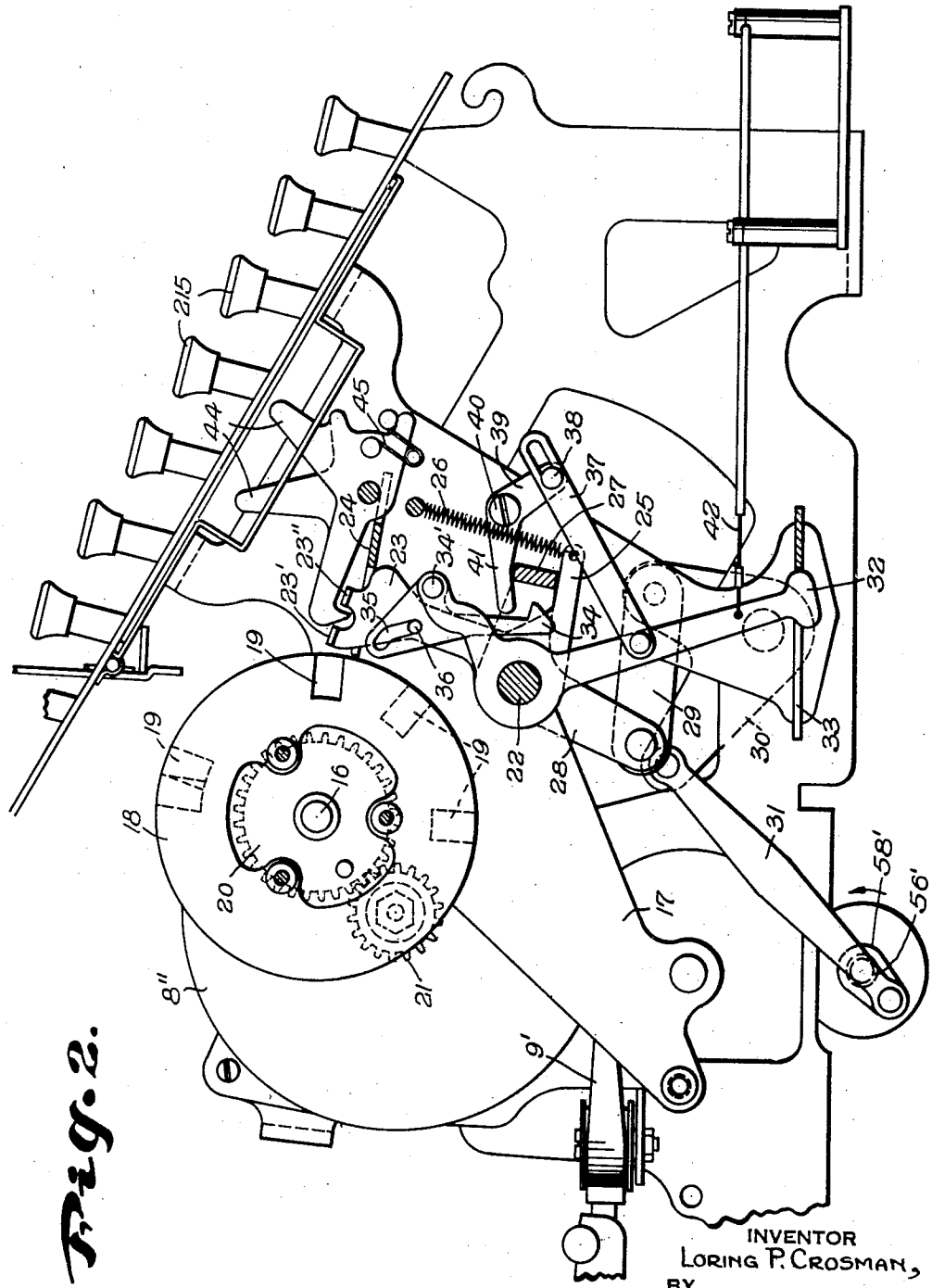



Fig. 2.

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LISTING CALCULATOR

Filed Oct. 24, 1939 6 Sheets-Sheet 3

Fig. 3a.

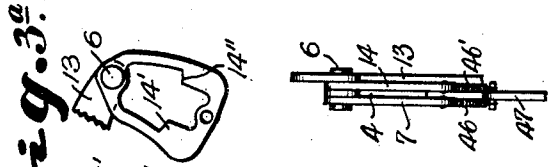


Fig. 3b.



Fig. 3.

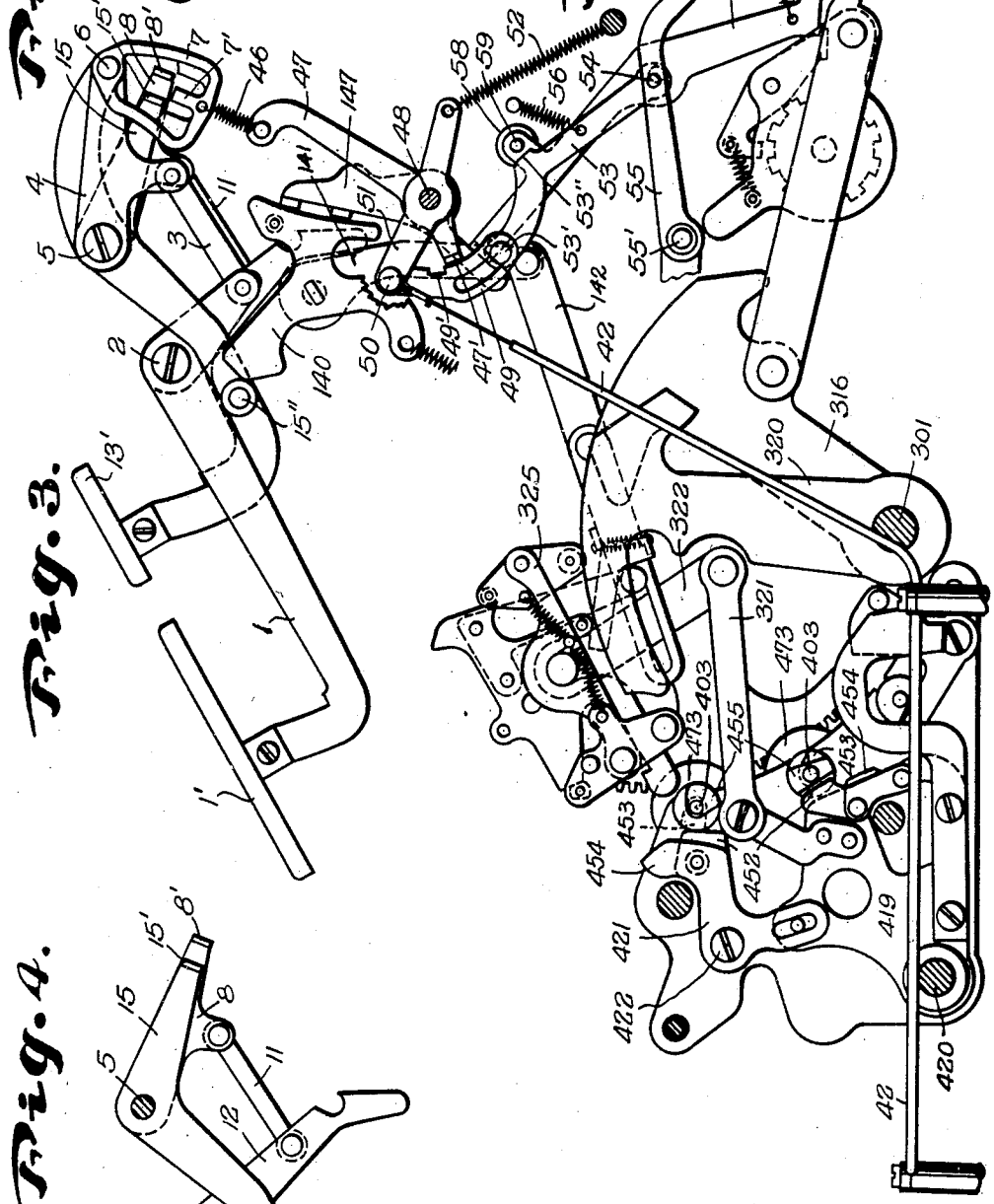


Fig. 4.



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Oct. 6, 1942. L. P. CROSMAN 2,298,202

LISTING CALCULATOR

Filed Oct. 24, 1939 6 Sheets-Sheet 4

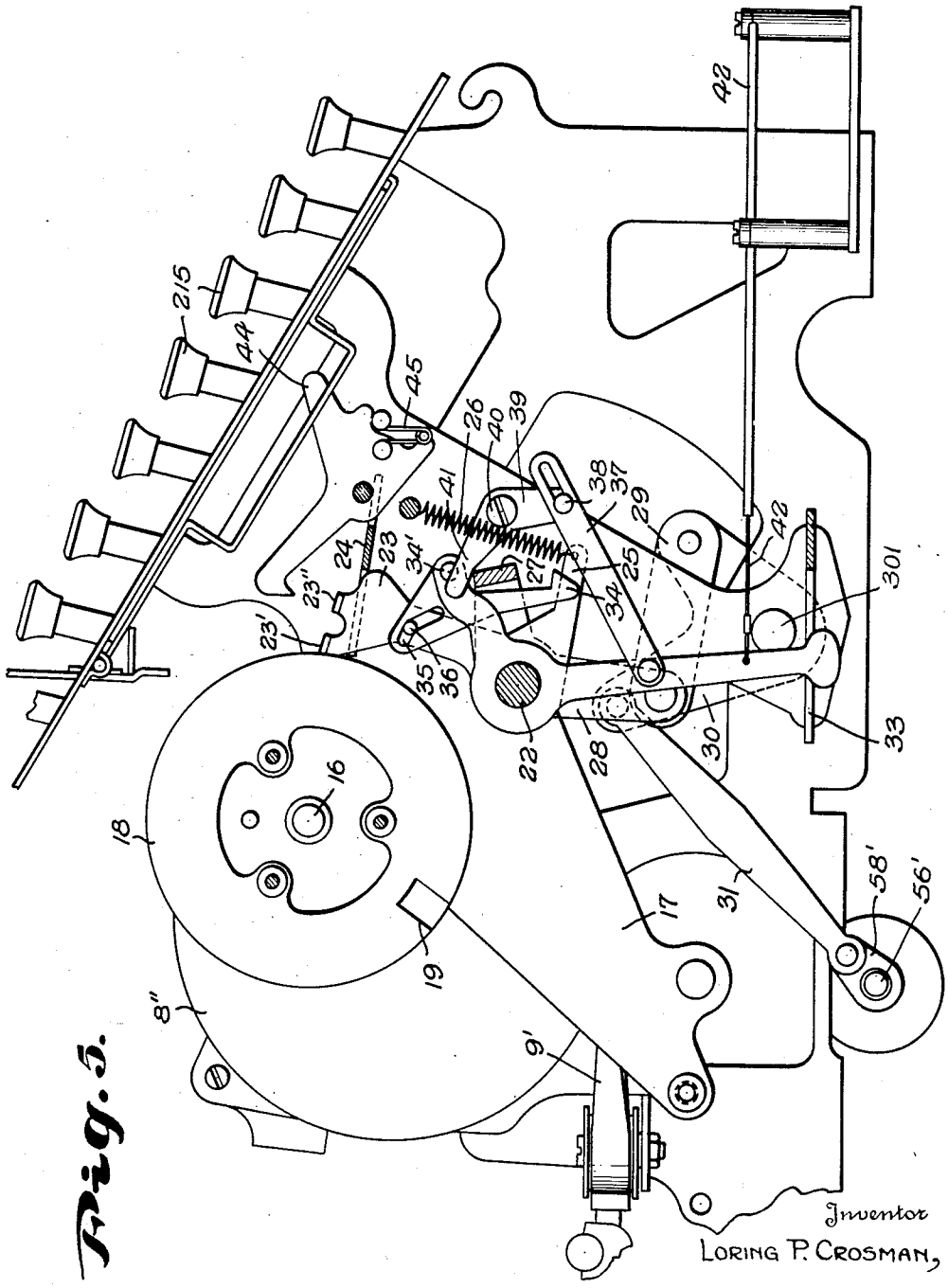



Fig. 5.

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Oct. 6, 1942. L. P. CROSMAN 2,298,202

LISTING CALCULATOR

Filed Oct. 24, 1939 6 Sheets-Sheet 5

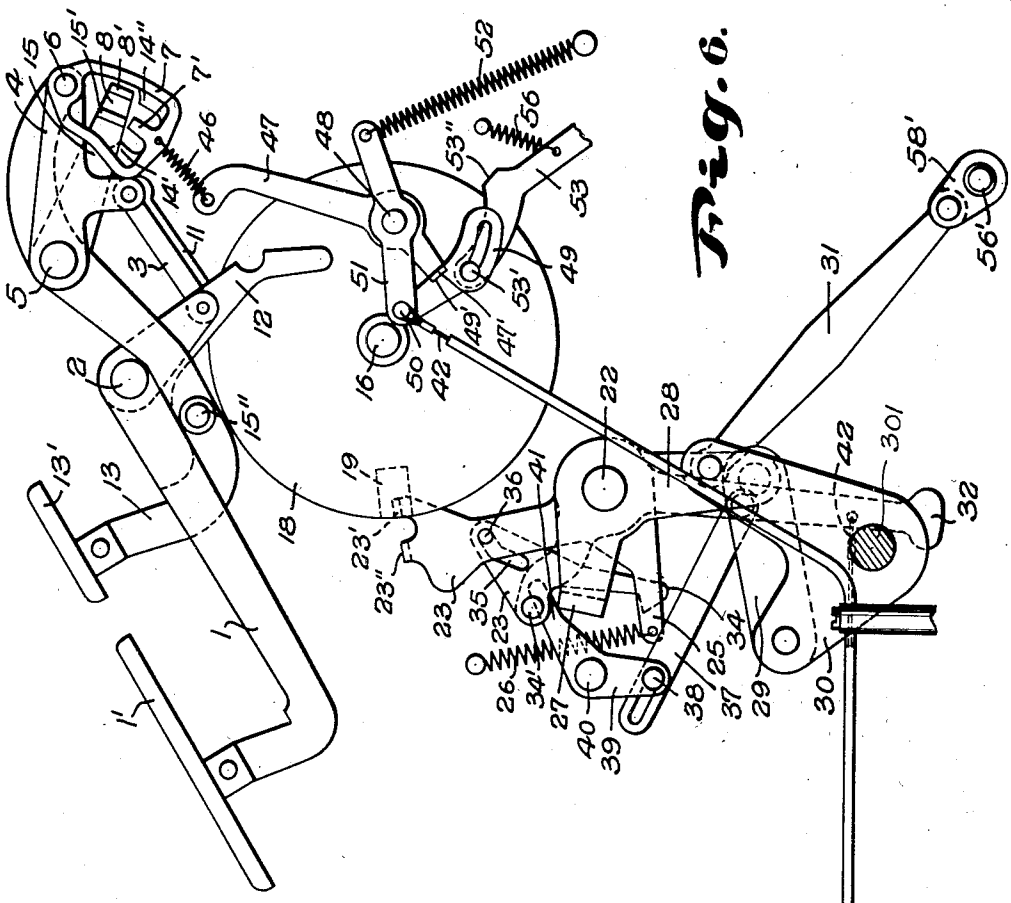


Fig. 6.

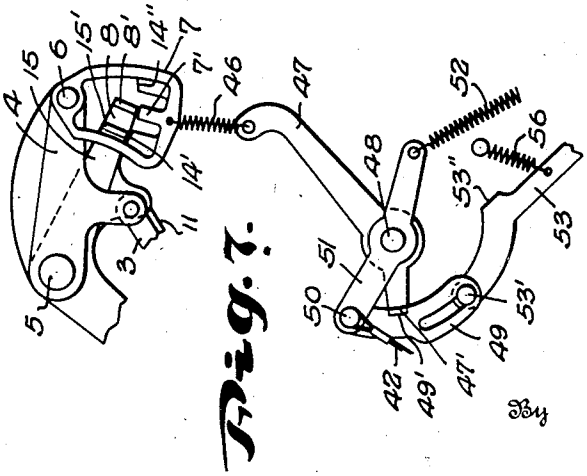


Fig. 7.

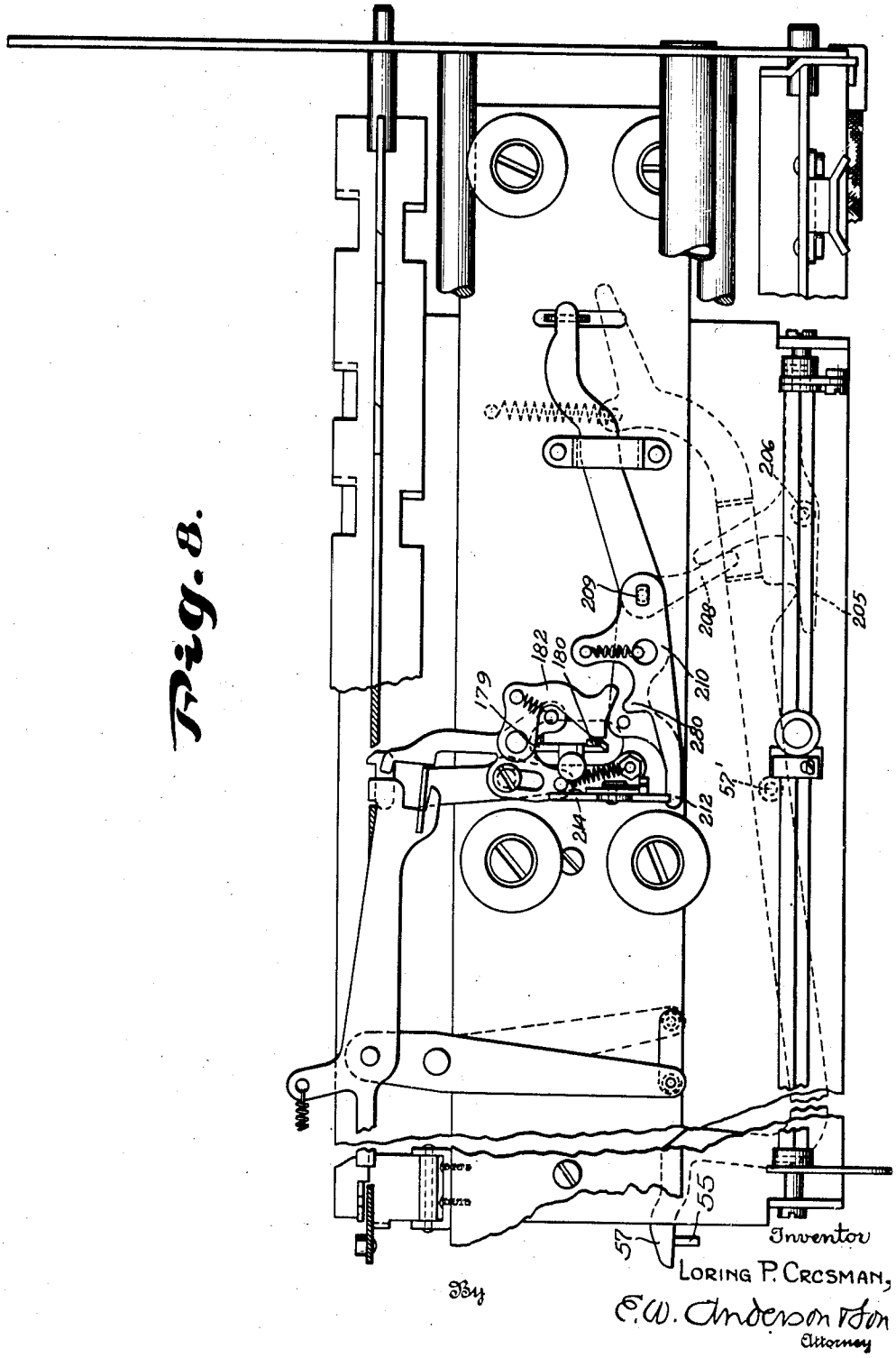
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LISTING CALCULATOR

Filed Oct. 24, 1939 6 Sheets-Sheet 6

Fig. 8.




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Patented Oct. 6, 1942

2,298,202

# UNITED STATES PATENT OFFICE

2,298,202

## LISTING CALCULATOR

Loring Pickering Crosman, Maplewood, N. J., assignor to Monroe Calculating Machine Company, Orange, N. J., a corporation of Delaware

Application October 24, 1939, Serial No. 301,053

16 Claims. (Cl. 235—60)

The invention relates to listing calculators, such for instance as the well known Monroe lister, an object of the invention being to provide improved means to so reverse the functioning of the opposite sign key devices that the plus bar may be used in entering or registering both credit and debit items and the minus bar may be used in registering corrections of both credit and debit items. Another object is to provide improved means embodying carriage-controlled means for effecting this reversal. Another object is to provide improved means embodying carriage-controlled means cooperable with means for carrying out a predetermined sequence or program series of operations for effecting this reversal. Another object is to render depression of the plus bar or the minus bar ineffective to initiate a succeeding machine cycle after the depression of either to initiate a machine cycle until the machine has performed its proper functions and is ready for the performance of another calculation. Other objects and advantages will appear hereinafter.

The invention consists in the novel construction and combinations of parts as hereinafter set forth in the claims.

In the accompanying drawings,

Figure 1 is a plan view of the machine.

Figure 2 is a left side elevation of the machine showing that portion of the reversible plus, minus bar mechanism located at that side of the machine, the parts being in plus position, namely in the positions assumed preliminary to normal operation of the machine, the latch for the feeler lever being shown as engaged therewith.

Figure 3 is a right side elevation of the machine showing that portion of the reversible plus, minus bar mechanism located at that side of the machine, the parts being in the positions assumed preliminary to normal operation of the machine with exception of the switch members and the lever having spring connection therewith, which are shown in neutral position.

Figure 3a is a detail side view of the switch member in rear of that shown in Figure 3, parts being shown as broken away.

Figure 3b is a detail edge view of the switch members and the lever having spring connection therewith, parts being broken away.

Figure 4 is a detail side view of the secondary portions of the normal and reverse operation key devices.

Figure 5 is a view similar to Figure 2, the parts being in the positions assumed at the end of the first half revolution of the actuating crank in case the lug of the feeler lever strikes upon the periphery of the related disk, the latch being shown as disengaged from the feeler lever.

Figure 6 is a combined view of the reversible plus, minus bar mechanism shown in Figures 2 and 3, the parts being in the positions assumed at the end of the first half revolution of the actuating crank in case the feeler lever lug enters the notch of the related disk, the switch members being shown in minus position, namely in the position assumed preliminary to reverse operation of the machine.

Figure 7 is a detail view of certain parts shown in Figure 6, the switch members being shown in plus position, namely in the positions assumed preliminary to normal operation of the machine.

Figure 8 is a detail rear elevation of the machine, corresponding to Figure 2 of the patent to Crosman, No. 1,946,572, showing the line spacing lever and the lever with which it contacts to cause the platen of the record carriage to be given a line spacing movement.

In these drawings, the invention is shown as applied to a machine designed to be equipped with carriage-controlled program mechanism for carrying out a predetermined sequence of operations, such for instance as disclosed in the Crosman Patent No. 1,946,572, as modified by the disclosure of the Crosman Patent No. 2,147,692, the Crosman Patent No. 1,932,013 being referred to for certain features of the mechanism.

### *General operation*

Amounts set up on the digit keys 215 (Fig. 1), are accumulated in one or more accumulators 473 (Fig. 3), either additively by engagement of an accumulator during the upward stroke or subtractively by engagement thereof during the downward stroke of segmental racks forming part of actuator levers (not shown). The extent of movement of each segmental rack is limited by engagement of a toothed member or stop bar, carried by the related actuator lever, with the lower end of a depressed key 215, whereby such movement will correspond with the value of the key depressed. Type bars are also carried by said actuator levers and are raised thereby to bring the appropriate type to the printing line. Before the return of the adjusted actuator levers, and their segmental racks and type bars, spring type hammers are released by suitable triggers to print the item on a record sheet passing around the platen of the shiftable carriage.

*Plus, minus and non-add setting*

The accumulators 473 are set to give the desired registration by means of two cam plates 419, 421 (Fig. 3), pivoted to the stationary framing at 420 and 422 respectively, these cam plates cooperating with cams carried by the shafts 403 of the accumulators. From the position illustrated in Fig. 3, these cam plates are rocked towards each other by means of a rocker device 325, connected with the cam plates by the members 322, 321 and operated by cam arms 320, 316, fixed upon the rock shaft 301. Rocker device 325 as set for normal operation provides for movement of said cam plates 419, 421 towards each other, as soon as the machine is put into operation and prior to movement of the actuator levers. At the beginning of the return movement of rock shaft 301, rocker device 325 will be operated in a reverse direction to return the cam plates to the position illustrated in Fig. 3, before the return movement of the actuator levers is begun.

Each of the cam plates 419, 421, is provided with two cam faces 452, 454, which are transversely offset from each other. In the position illustrated in Figure 3, the cam faces 452 of said plates are located opposite the shafts 403; whereas, upon movement of said plates by rocker 325, the cam faces 454 will be brought opposite the shafts 403.

Each shaft 403 is provided with a cam 453 lying in the plane of the related cam face 452, and a cam 455 lying in the plane of the related cam face 454. The shafts 403 may be held in either of three rotated positions, whereby the high points of said cams 453 or 455 or the low points thereof may be brought opposite the cam faces of the plates 419, 421. The shafts 403 are urged by spring means away from the segmental racks of the actuator levers, suitable guides in the stationary framing being engaged by said shafts. Thus the shafts 403 will hold the accumulators 473 out of mesh with said segmental racks unless a cam face 452 or 454 is engaged by a cam 453 or 455, in which case the accumulator will be moved into engagement with the related segmental rack.

To set the accumulators for addition, the cams 453 are rotated to active position engaging the cam faces 452 of said plates, so that the accumulators will stand in engagement with the segmental racks of said actuator levers when the machine is at rest; will be allowed to drop out of mesh with said racks by action of rocker 325 as soon as the machine is put into operation, and will be reengaged with said racks at the beginning of the return stroke thereof. It may be noted that the upper accumulator is set for addition in Figure 3, the lower accumulator being set for non-add. To set the accumulators for subtraction, the cams 455 are rotated into the paths of movement of the cam faces 454 of said plates. When the machine is started, the rocking of the plates 419, 421 will bring the cam faces 454 into contact with the cams 455 and will move the accumulator gears into mesh with the segmental racks of the actuator levers prior to the initial movement of said racks. Before the return movement of said racks has started, the plates 419, 421 will again be rocked, moving the cam faces 454 away from the cams 455 and allowing the accumulator gears to move out of mesh with said racks.

All of the above noted operations relate to normal registration, which is effected upon depression of a normal operation key or plus bar, which depression releases a latch lever 147 from engagement with a spring-urged clutch control lever 150. The effect of the additive or subtractive setting of the cams 453, 455 may be reversed upon depression of a reverse operation key or minus bar, acting to trip the latch lever 147 and adjust the rocker device 325 as set forth in said Crosman patents and in the Gardner Patent No. 1,867,002. This reversing adjustment of the rocker device 325 provides that the plates 419, 421 shall remain in the position illustrated in Figure 3 until the completion of the downward stroke of the segmental rack of the actuator lever, whereupon said plates 419, 421 will be rocked towards each other and held in this adjusted position during the return stroke of said rack.

*Reversible plus, minus bar mechanism*

The plus bar and the minus bar form part of normal operation and reverse operation key devices having each primary and secondary portions. Supplemental carriage-controlled means to be described include means for rendering operative the secondary portion of either key device by the primary portion of the normal operation key device and for simultaneously rendering operative the secondary portion of the other key device by the primary portion of the reverse operation key device, whereby the registration of items of either of opposite signs may be effected upon depression of said plus bar and corrections of registrations of items of either of opposite signs may be effected upon depression of said minus bar.

The normal operation or plus key lever 1, having plus bar 1', is fulcrumed at 2, and connected by link 3 with a lever 4, fulcrumed at one end thereof at 5, and at its other end having pivoted thereto at 6, a pendant switch member 7, these parts constituting the primary portion of the normal operation key device. The secondary portion of the normal operation key device comprises a lever 8, fulcrumed at one end thereof at 5, and at its opposite end having lug 8' adapted to be contacted by switch member 7, said lever 8 having link connection 11 with a lever 12, fulcrumed at one end thereof at 2, and at its free end being adapted to rock latch lever 147 from engagement with the spring-urged clutch control lever 150.

The reverse operation or minus key lever 13, having minus bar 13', is fulcrumed at 5, and the free end of its work arm has pivoted thereto at 6, a pendant switch member 14, these parts constituting the primary portion of said key device; the secondary portion of which comprises a bell crank lever 15, the free end of one arm of which has a lug 15', adapted to be contacted by switch member 14, the free end of the other arm of lever 15 having a roller 15'' adapted to rock plate 140 to thereby release latch lever 147 from engagement with the clutch control lever 150. This rocking of plate or lever 140 also through lever 41 and link 42 adjusts the rocker device 325 to reverse the effect of the additive or subtractive settings of the cams 453, 455, as aforesaid.

Switch member 7 is provided with a lug 7' adapted to be neutrally, that is to say, centrally and inoperatively positioned with respect to the spaced lugs 8' and 15' of the levers 8 and 15 following completion of a machine cycle as will be explained, and in the adjustment of said switch member to one or the other side by said supplemental carriage-controlled means, said lug 7' will

be operatively positioned with respect to the lug 8' of lever 8 for normal or plus operation upon depression of the plus bar, or will be operatively positioned with respect to the lug 15' of lever 15 for reverse or minus operation also upon depression of said plus bar.

Switch member 14 is provided with two spaced ledges 14' and 14'' and in the adjustment of said member to one or the other side by said supplemental carriage-controlled means (said adjustment taking place simultaneously with the similar adjustment of switch member 7) the ledge 14' will be operatively positioned with respect to the lug 15' of lever 15 for reverse or minus operation of the machine upon depression of the minus bar, or the ledge 14'' will be operatively positioned with respect to the lug 8' of lever 8 for normal or plus operation, also upon depression of the minus bar. The spaced ledges 14' and 14'' are adapted to be neutrally, that is to say, inoperatively positioned with respect to the spaced lugs 8' and 15' of levers 8 and 15 following completion of a machine cycle as will be explained.

Thus, for the plus key device there is provided a switch member 7 and a cooperating member 8, and for the minus key device there is provided a switch member 14 and a cooperating member 15, and said supplemental carriage-controlled means to be now described is adapted to simultaneously adjust both switch members to operatively position the same with respect to the cooperating members of the opposite sign key device.

Loosely supported upon shaft 16 (Fig. 2), mounted on auxiliary frame plate 17 on the left hand side of the machine is a series of ten disks 18, each of which has a peripheral notch 19, the functioning of the mechanism herein described having reference to only one of these disks, the other disks and related mechanism being for the purpose of controlling various other functions of the machine not described herein. These disks are riveted together and by pin and slot connections are made fast to a gear 20 which meshes with a gear 21 fastened to the spring drum 8'' which carries the carriage shifting tape 9' for shifting the carriage 5'. Also supported on frame plate 17 is a shaft 22, upon which is loosely mounted a series of ten feeler levers 23, the members of which series fit between the teeth of and are laterally guided by comb 24 and at their upper ends have each two spaced lugs 23' and 23''. The lugs 23' of feeler levers 23 are so zoned that they may each enter a peripheral notch 19 of a related disk 18 (Fig. 2), or, if the notch is not located diametrically opposite said lug, it may strike upon the periphery of said disk (Fig. 5). These feeler levers 23 have each a lower forward arm 25, which by the tension of its spring 26 is held in contact with the underside of the bail arm of a lever 27 common to the series of feeler levers. The bail levers 27 through arm 28 thereof, link 29, bell crank lever 30 and link 31, is connected to crank arm 58', fast upon a shaft 58'. The actuation of shaft 58' and crank arm 58' is described in the Crosman Patent No. 1,946,572. Also mounted on shaft 22 is a series of ten levers 32, the members of which series engage between the teeth of and are laterally guided by comb 33 and carry at their upper ends fulcrumed thereto at 34', each a toggle hook lever 34, the upper arm of which has a slot 35, with which a pin 36 of a related feeler lever engages.

Counterclockwise movement of crank arm 58', through link 31, bell crank lever 30 and link 29, will rock bail lever 28 and lift the bail arm thereof. As a result, the feeler levers 23, under influence of their springs 26, will be rocked counterclockwise towards the program disks 18. Pivoted to the lower arm of a related lever 32 is a link 37, having pin and slot connection 38 with a bell crank lever 39, fulcrumed at 40, and having a rearward arm 41 overlying the bail arm of lever 27. Thus upon upward movement of the bail arm of lever 27 during the first half revolution of crank arm 58', bell crank lever 39 will be actuated to move said lever 32 clockwise to its mid position; and if the supplemental carriage controlled means has located a disk 18 with its peripheral notch 19 diametrically opposite the lug 23' of said feeler lever, said lug will enter the notch and the feeler lever will be moved further counterclockwise during the first half revolution of crank arm 58'. At the same time the related toggle hook lever 34 by the camming action of pin 36 of said feeler lever in slot 35 of lever 34 will have the hooked end thereof brought under the bail arm of lever 27 which is at this time in raised position. During the second half revolution of crank arm 58', the toggle hook lever 34, the hooked end of which is now located beneath the bail arm of lever 27, will be moved downwardly by said bail arm to thereby move said lever 32 further clockwise for an augmented movement which is just twice that without such augmentation and may be termed a full movement as contrasted to its movement to mid position which may be termed a modified or half way movement.

To the lower arm of said lever 32 is fastened one end of a Bowden cable 42, which extends around the front of the machine and at its opposite end is connected to the main arm of a control lever 51, the tail arm of which has connected thereto a spring 52 which urges said control lever clockwise (Fig. 3) and exerts tension upon said Bowden cable which latter limits the movement of said control lever.

If however the supplemental carriage controlled means has located a disk 18 with its peripheral notch 19 otherwise than diametrically opposite the lug 23' of said feeler lever, during the first half revolution of crank arm 58', the feeler levers under influence of their springs 26 being rocked counterclockwise towards the program disks 18 as aforesaid, said lug will strike upon the periphery of said disk (Fig. 5), and during the second half revolution of crank arm 58' said lever 32 will be moved counterclockwise and returned from its mid position to its first position, due to the aforesaid tension upon said Bowden cable.

Within a recess in the left side of the keyboard provided with a cover plate 43 (Fig. 1), is a series of ten latch levers 44 only one of which is utilized in the present case but each of which has at its rear end a hook engageable between the spaced lugs 23' and 23'' of a related feeler lever to disable said feeler lever. Each latch lever is provided with a toggle spring 45 to hold the adjustment.

The switch members 7 and 14 have individual springs 46 and 46' connecting the lower ends thereof with the upper end of one arm of a lever 47, loosely fulcrumed at 48 between the right hand side frame of the machine and latch lever 147, the latter also being fulcrumed at 48. The lever 47 has the free end of the lower arm thereof provided with a lug 47' adapted to engage a notch 49' of a latch member 49, pivoted at 50

upon the free end of one arm of said control lever 51, also fulcrumed at 48.

The latch member 49 has pin and slot connection 53' with the upper end of a lever 53, fulcrumed at its lower end at 54 upon the line spacing lever 55. A light spring 56 connected to lever 53 tends to actuate lever 55 pivotally about its fulcrum 55' and to maintain its free end in contact with a lever 57, which is part of the back plate assembly. Operation of lever 55 causes the platen of the record carriage to be given a line spacing movement, said spring 56 urging said lever 53 clockwise about its fulcrum 54, thus tending to rock latch member 49 counterclockwise about its pivot 50 and maintaining the notch of said latch member engaged with the lug 47' of said lever 47.

The lever 47 has three positions, namely neutral, normal and reverse, being shown in Fig. 3 in its neutral position, whereas the control lever 51 is shown in its normal position.

Pull being exerted upon Bowden cable 42 by actuation of its related lever 32 as described to its mid position, the control lever 51 will be moved from its normal to its neutral position, wherein the latch member 49 will have the notch 49' thereof engaged with the lug 47' of lever 47, and such pull continuing as an incident of the full movement mentioned of lever 32, the control lever 51 will be moved further counterclockwise and assume its reverse position, carrying therewith the lever 47 and said switch members 7 and 14, the former to its reverse position and the latter to its normal position (Fig. 6), wherein lug 7' of member 7 will be operatively positioned with respect to the lug 15' of lever 15 forming part of the secondary portion of the reverse operation or minus key device, and wherein the ledge 14'' of member 14 will be operatively positioned with respect to the lug 8' of lever 8 forming part of the secondary portion of the normal operation or plus key device, in consequence of which subtractive operation of the machine will result upon depression of the plus bar and additive operation will result upon depression of the minus bar.

Otherwise, as an incident of the modified or half-way movement mentioned of lever 32, the control lever 51 after being moved to its neutral position during the first half revolution of crank arm 58' to engage the notch of latch member 49, with the lug 47' of lever 47 will, during the second half revolution of crank arm 58', be returned to its normal position, carrying therewith the lever 47 and the switch members 7 and 14, the former to normal position and the latter to reverse position (Fig. 7), wherein the lug 7' of member 7 will be operatively positioned with respect to the lug 8' of lever 8 forming part of the secondary portion of the normal operation or plus key device, and the ledge 14' of member 14 will be operatively positioned with respect to the lug 15' of lever 15 forming part of the secondary portion of the reverse operation or minus key device, in consequence of which additive operation of the machine will result upon depression of the plus bar and subtractive operation will result upon depression of the minus bar.

The control lever 51 remains in either normal or in reverse position as the case may be until another cycle of the crank arm 58' is initiated.

The crank arm 58' being revolved each time the carriage 5' is shifted to a new column in accord with the program, lever 32 will be brought to neutral or mid position at the half cycle of the crank arm and from mid position will move forward to normal position if the related disk 18 is then so located that its peripheral notch 19 is not diametrically opposite the lug 23' of the related feeler lever, but will move rearward to reverse position if said notch 19 is located diametrically opposite said lug.

Each time the latch lever 147 is tripped, to release the spring urged clutch control lever 150, this tripping taking place upon depression of the plus bar or the minus bar as the case may be, a roller 58 of said clutch control lever is adapted to close the contacts of an electric switch to start the motor (not shown) and the machine cycle.

The stud 59 of clutch control lever 150 upon which roller 58 is mounted is adapted to engage a hump 53'' of lever 53 when the line spacing lever 55 is normally located. Thus when a machine cycle is initiated the stud 59 moves lever 53 and latch member 49 sufficiently to disengage the notch of latch member 49 from lug 47' of lever 47, thereby allowing springs 46 and 46' to return lever 47 and switch members 7 and 14 to neutral position as soon as pressure is released from the plus bar or the minus bar. In line spacing the paper, lever 55 being actuated as aforesaid, lever 53 will be raised bodily and the hump 53' thereof will be raised out of the path of movement of stud 59 of spring urged clutch control lever 150 so that when lever 150 is thrown following tripping of latch lever 147, the stud 59 will not move lever 53 and latch member 49 and there will be no disengagement of the notch of latch member 49 from lug 47' of lever 47. This arrangement provides that if the platen of the record carriage is given a line spacing movement, so that a second operation may be performed in the same column, the normal or the reverse setting of the switch members 7 and 14 will not be disturbed. The lever 57 is fulcrumed at 57' to the framing of the machine, and in line spacing operations, upon actuation of line spacing lever 55, lever 57 is rocked clockwise (Fig. 8), thereby rocking bell crank 205 counterclockwise about its pivot 206, and rocking lever 208—210, fulcrumed at 209, clockwise, one end portion 212 of arm 210 of said lever acting to cam the latch 214 out of the path of movement of the line spacing bar or bail (not shown), thereby allowing line spacing movement of the platen of the record carriage as described in the Crosman Patent No. 1,946,572. A projection 289 of said arm 210 will meanwhile rock the latch 182 out of the path of movement of projection 186 of arm 179 to render inoperative the carriage escapement means, also described in said Crosman patent. In neutral position the lug 7' of switch member 7 is located between the lugs 8' and 15' of levers 8 and 15 and the ledges 14' and 14'' of switch member 14 are located at the sides of said lugs 8' and 15', so that depression of the plus bar will cause lug 7' to enter between the spaced lugs 8' and 15' and depression of the minus bar will cause ledges 14' and 14'' to miss the lugs 8' and 15' and consequently there will be no operation of either of the levers 8 or 15, or of the machine.

The primary portions of the plus and minus key devices are never locked or held against depression or actuation but as soon as a cycle of the crank arm 58' is initiated upon release of the carriage 5' and shifting thereof to the left following completion of a machine cycle the switch members 7 and 14 will be moved to their neutral positions (Fig. 3) so that any depression of either

plus bar or minus bar will not initiate a succeeding machine cycle or even trip the latch lever 147 to release clutch control lever 150. If the operator should depress either plus bar or minus bar prematurely during the course of a program sequence of operations, that is before the cycle of crank arm 58' has taken place, the switch members 7 and 14 being thereby raised, the lug 7' and the ledges 14' and 14'' of said members will miss the lugs 8' and 15' of the levers 8 and 15 as aforesaid. In this case, the springs 46 and 46' will tension the said switch members 7 and 14 against the lugs 8' and 15' and in order to start the machine cycle the operator will be obliged to release the plus bar or the minus bar and depress it again. The switch members 7 and 14 will however be moved from their neutral positions to their normal or to their reverse operation positions by the aforesaid supplemental carriage controlled means, so that the machine never stands idle with the switch members in neutral position.

Disk 18 may obviously be provided with a plurality of peripheral notches 19, each of which will function for a separate column.

I claim:

1. In a listing calculator, having an accumulator, sign control means, and means for adjusting the sign control means and for initiating registration of either of opposite signs in said accumulator including a normal operation key device having a plus bar and a reverse operation key device having a minus bar; each key device having a switch member and a cooperating member, and means for simultaneously and variably adjusting both switch members to operatively position the same with respect to the cooperating members of the opposite sign key devices, whereby depression of the plus bar will result in initiation of registration of either of opposite signs in said accumulator and depression of the minus bar will result in initiation or registration of either of opposite signs reverse to the sign of registration under control of the plus bar for a given adjustment of the switch members.

2. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, and means for adjusting the sign control means and for initiating registration of either of opposite signs in said accumulator including a normal operation key device having a plus bar and a reverse operation key device having a minus bar; each key device having a switch member and a cooperating member, and carriage-controlled means for adjusting simultaneously both switch members to operatively position the same with respect to the cooperating members of the opposite sign key devices.

3. In a listing calculator, having an accumulator, sign control means, and means for adjusting the sign control means and for initiating registration of either of opposite signs in said accumulator including a normal operation key device having a plus bar and a reverse operation key device having a minus bar; each key device having primary and secondary portions, and means for rendering operative the secondary portion of either key device by the primary portion of the normal operation key device and for simultaneously rendering operative the secondary portion of the other key device by the primary portion of the reverse operation key device, whereby depression of the plus bar will result in initiation of registration of either of opposite signs in said accumulator and depression of the minus bar will result in initiation of either of opposite signs reverse to the sign of registration under control of the plus bar.

4. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, and means for adjusting the sign control means and for initiating registration of either of opposite signs in said accumulator including a normal operation key device and a reverse operation key device; each key device having primary and secondary portions, and carriage-controlled means for rendering operative the secondary portion of either key device by the primary portion of the normal operation key device and for simultaneously rendering operative the secondary portion of the other key device by the primary portion of the reverse operation key device.

5. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, and means for adjusting the sign control means and initiating registration of either of opposite signs in said accumulator including a normal operation key and a reverse operation key; switch mechanism interposed between the sign control means and said keys and adapted for adjustment to reverse the effective action of said keys, means controlled by said carriage for adjusting the switch mechanism from neutral to and holding the same in operative position relative to the opposite sign keys and means controlled by said keys for restoring the switch mechanism to neutral position following initiation of registration thereby.

6. In a listing calculator having a shiftable record carriage, an accumulator, sign control means, means for adjusting said sign control means and initiating registration of either of opposite signs in said accumulator including a normal operation key and a reverse operation key, and tabulating means for shifting the carriage, normally cooperating with the registering means and including carriage escapement means; switch mechanism interposed between the sign control means and said keys and adapted for adjustment to reverse the effective action of said keys, means controlled by said carriage for adjusting the switch mechanism from neutral to and holding the same in operative position relative to the opposite sign keys, means controlled by said keys for restoring the switch mechanism to neutral position following initiation of registration thereby, and means for disabling the carriage escapement means and the means for restoring the switch mechanism to neutral position.

7. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, and means for adjusting the sign control means and initiating registration of either of opposite signs in said accumulator including a normal operation key and a reverse operation key; switch mechanism interposed between the sign control means and said keys and adapted for adjustment to reverse the effective action of said keys, carriage controlled means for adjusting the switch mechanism from neutral to and holding the same in operative position relative to the opposite sign keys including a latch and means for engaging said latch, and means controlled by said keys and functioning following initiation of registration thereby for releasing said latch.

8. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, means for adjusting said sign control

means and initiating registration of either of opposite signs in said accumulator including a normal operation key and a reverse operation key, and tabulating means for shifting the carriage, normally cooperating with the registering means and including carriage escapement means; switch mechanism interposed between the sign control means and said keys and adapted for adjustment to reverse the effective action of said keys, carriage controlled means for adjusting the switch mechanism from neutral to and holding the same in operative position relative to the opposite sign keys including a latch and means for engaging said latch, means controlled by said keys and functioning following initiation of registration thereby for releasing said latch, and means for disabling the carriage escapement means and the latch releasing means.

9. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, and means for adjusting the sign control means and initiating registration of either of opposite signs in said accumulator including a normal operation key and a reverse operation key; switch mechanism interposed between the sign control means and said keys and adapted for adjustment to reverse the effective action of said keys, carriage controlled means for adjusting the switch mechanism from neutral to and holding the same in operative position relative to the opposite sign keys including spring means for normally holding the switch mechanism in and returning the same to neutral position, a latch and means for engaging said latch, and means controlled by said keys and functioning following initiation of registration thereby for releasing said latch.

10. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, means for adjusting said sign control means and initiating registration of either of opposite signs in said accumulator including a normal operation key and a reverse operation key, and tabulating means for shifting the carriage, normally cooperating with the registering means and including carriage escapement means; switch mechanism interposed between the sign control means and said keys and adapted for adjustment to reverse the effective action of said keys, carriage controlled means for adjusting the switch mechanism from neutral to and holding the same in operative position relative to the opposite sign keys including spring means for normally holding the switch mechanism in and returning the same to neutral position, a latch and means for engaging said latch, means controlled by said keys and functioning following initiation of registration thereby for releasing said latch, and means for disabling the carriage escapement means and the latch releasing means.

11. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, and means for adjusting the sign control means and initiating registration of either of opposite signs in said accumulator including a normal operation key device and a reverse operation key device; each key device having a switch member and a cooperating member, means controlled by said carriage for adjusting the switch members from neutral to and holding the same in operative position relative to the cooperating members of the opposite sign key devices and means controlled by said key devices for restoring the switch members to neutral position following initiation of registration thereby.

12. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, means for adjusting the sign control means and initiating registration of either of opposite signs in said accumulator including a normal operation key device and a reverse operation key device, and tabulating means for shifting the carriage, normally cooperating with the registering means and including carriage escapement means; each key device having a switch member and a cooperating member, means controlled by said carriage for adjusting the switch members from neutral to and holding the same in operative position relative to the cooperating members of the opposite sign key device, means controlled by said key devices for restoring the switch members to neutral position following initiation of registration thereby, and means for disabling the carriage escapement means and the last named means for restoring the switch members to neutral position.

13. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, and means for adjusting the sign control means and initiating registration of either of opposite signs in said accumulator including a normal operation key device and a reverse operation key device; each key device having a switch member and a cooperating member, carriage controlled means for adjusting the switch members from neutral to and holding the same in operative position relative to the cooperating members of the opposite sign key devices including a latch and means for engaging said latch, and means controlled by said key devices and functioning following initiation of registration thereby for releasing said latch.

14. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, means for adjusting the sign control means and initiating registration of either of opposite signs in said accumulator including a normal operation key device and a reverse operation key device, and tabulating means for shifting the carriage, normally cooperating with the registering means and including carriage escapement means; each key device having a switch member and a cooperating member, means controlled by said carriage for adjusting the switch members from neutral to and holding the same in operative position relative to the cooperating members of the opposite sign key devices including a latch and means for engaging said latch, means controlled by said key devices and functioning following initiation of registration thereby for releasing said latch, and means for disabling the carriage escapement means and the latch releasing means.

15. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, and means for adjusting the sign control means and initiating registration of either of opposite signs in said accumulator including a normal operation key device and a reverse operation key device; each key device having a switch member and a cooperating member, carriage controlled means for adjusting the switch members from neutral to and holding the same in operative position relative to the cooperating members of the opposite sign key devices including spring means for normally holding the switch members in and returning the same to neutral position, a latch and means for engaging said latch, and means controlled by said key devices and func-

tioning following initiation of registration thereby for releasing said latch.

16. In a listing calculator, having a shiftable record carriage, an accumulator, sign control means, means for adjusting the sign control means and initiating registration of either of opposite signs in said accumulator including a normal operation key device and a reverse operation key device, and tabulating means for shifting the carriage, normally cooperating with the registering means and including carriage escapement means; each key device having a switch member and a cooperating member, means controlled by said carriage for adjusting the switch members from neutral to and holding the same in operative position relative to the cooperating members of the opposite sign key devices including spring means for normally holding the switch members in and returning the same to neutral position, a latch and means for engaging said latch, means controlled by said key devices and functioning following initiation of registration thereby for releasing said latch, and means for disabling the carriage escapement means and the latch releasing means.

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