Oct. 6, 1942. L. P. CROSMAN 2,298,201

LISTING CALCULATOR

Filed Oct. 18, 1938 6 Sheets-Sheet 1

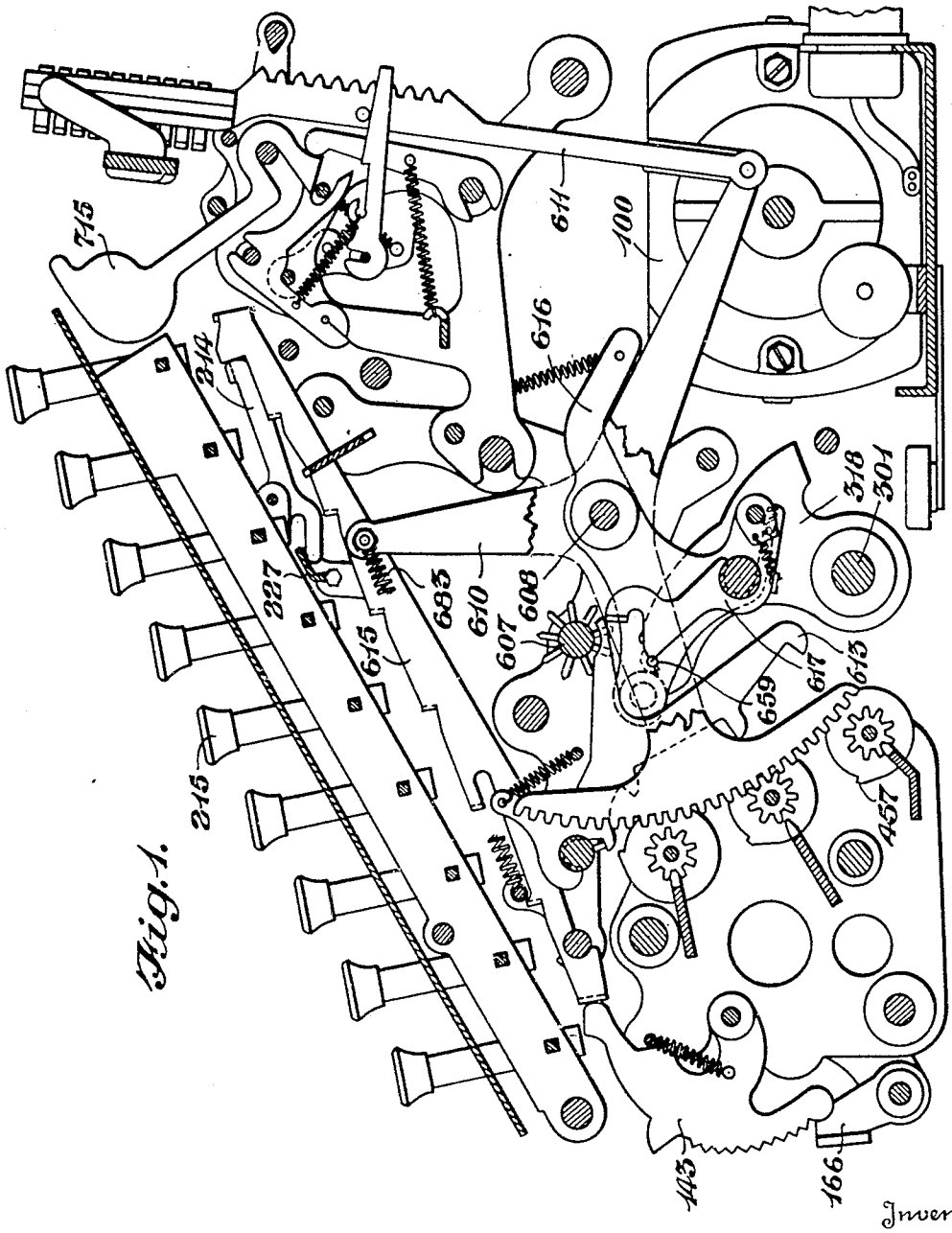


Fig. 1.

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LISTING CALCULATOR

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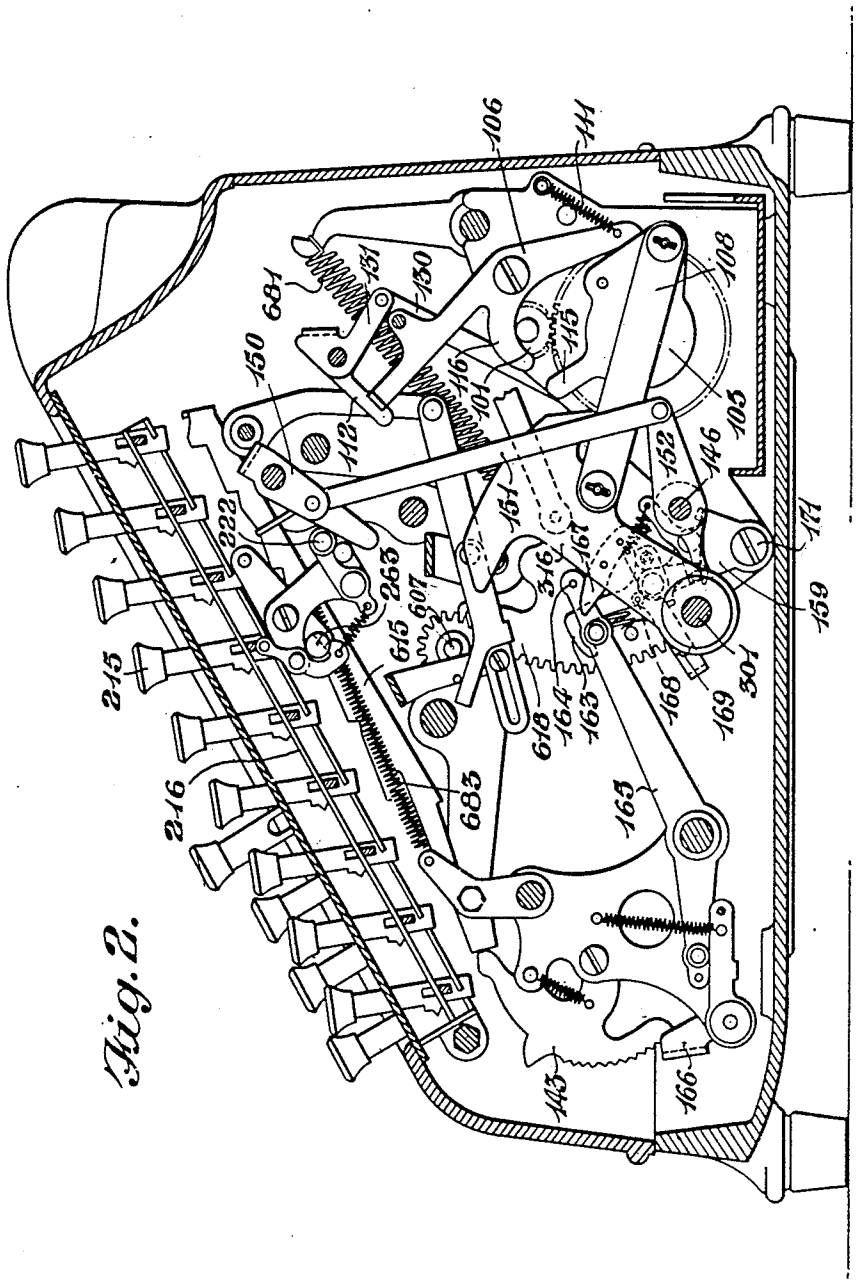


Fig. 2.

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LISTING CALCULATOR

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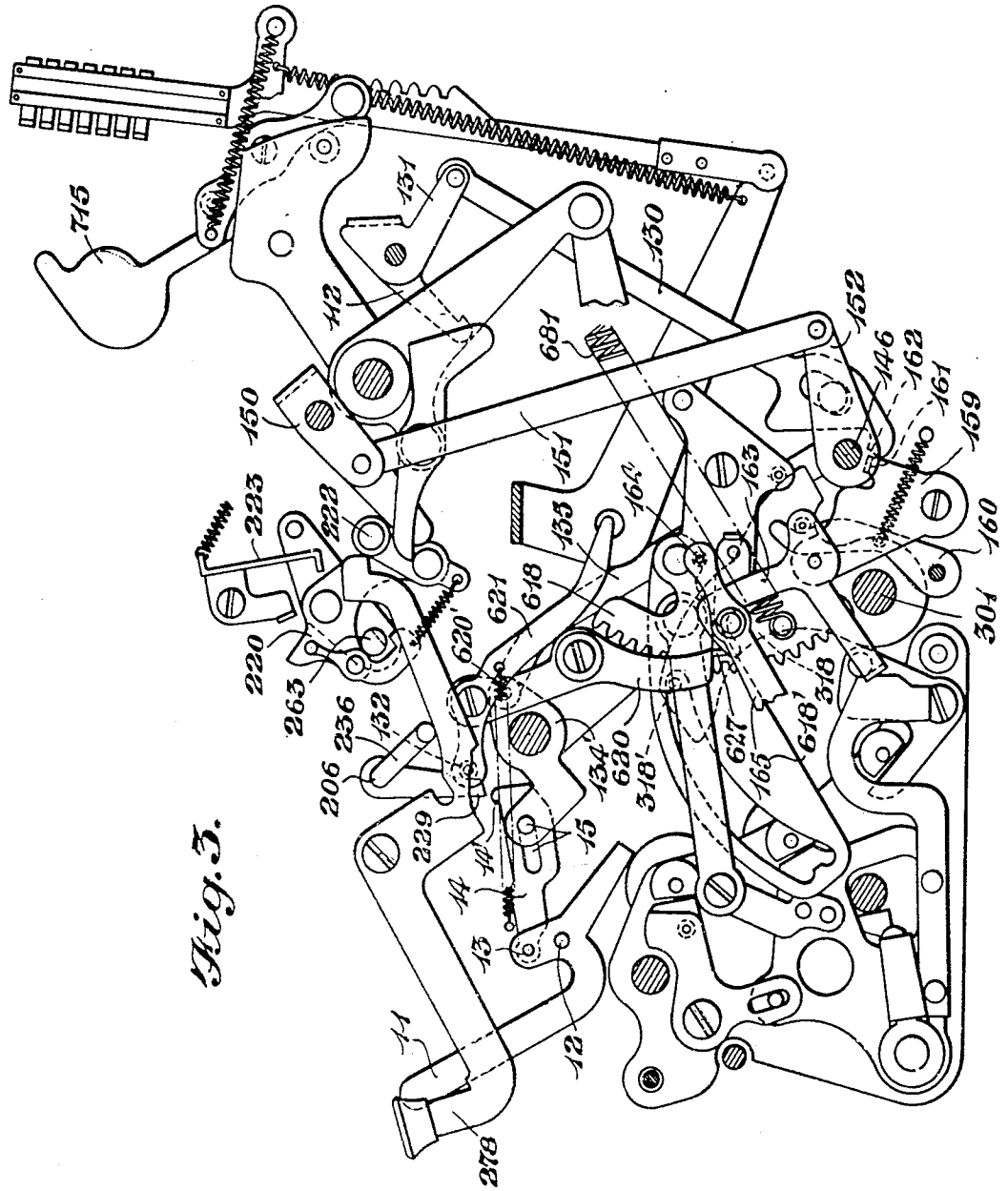


Fig. 3.

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LISTING CALCULATOR

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Fig. 6.

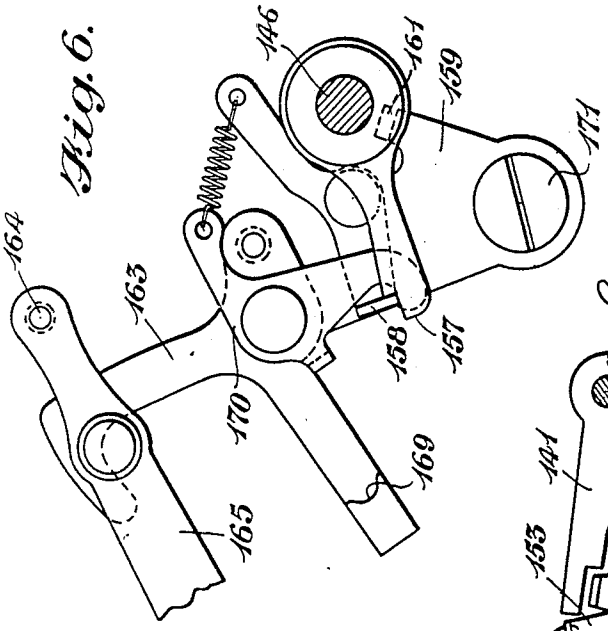
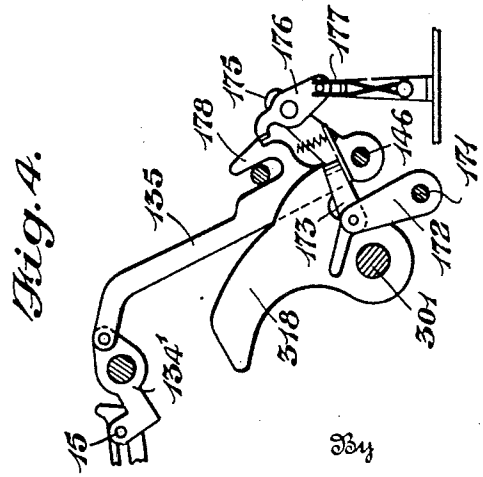


Fig. 5.

Fig. 4.



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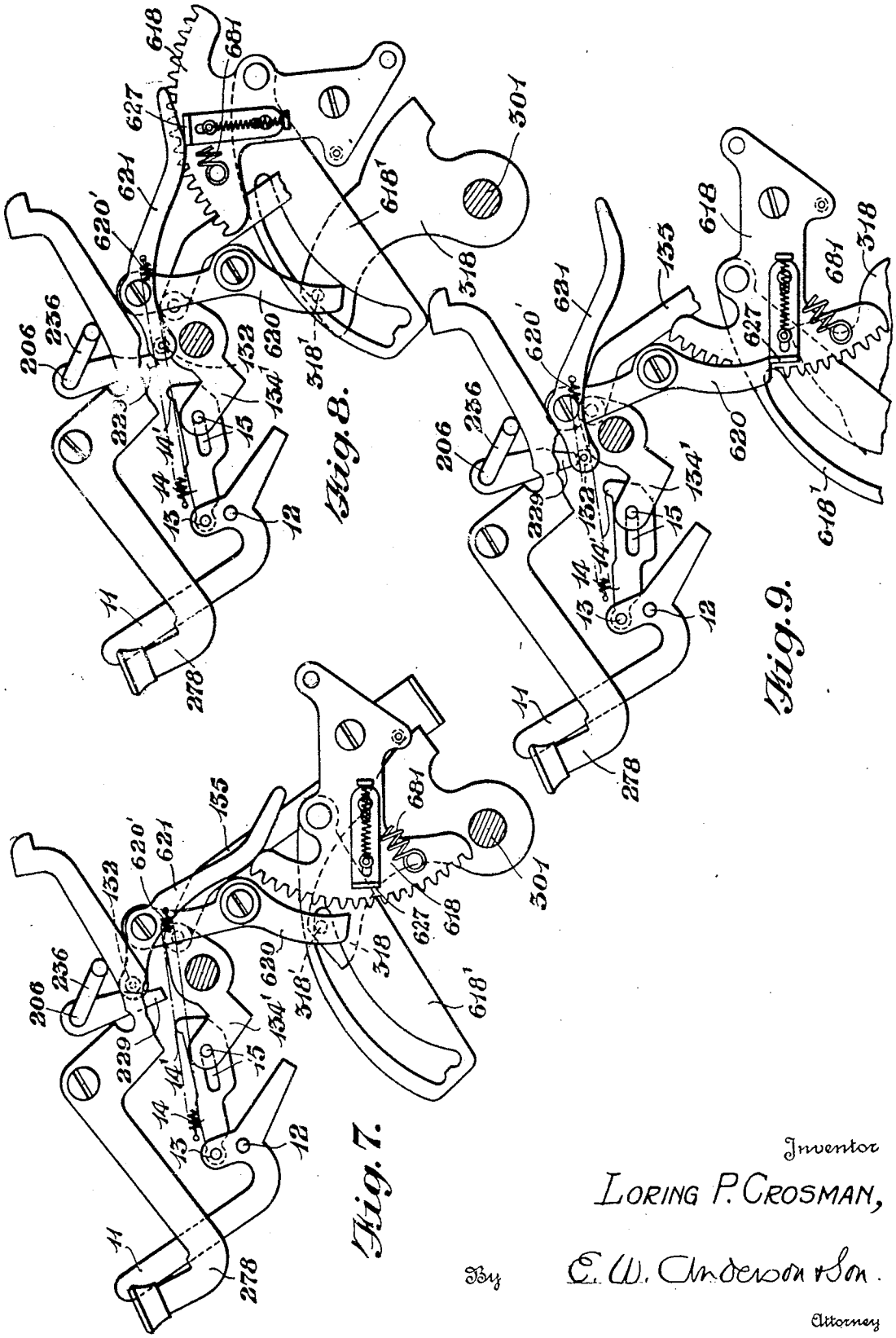
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Oct. 6, 1942. L. P. CROSMAN 2,298,201

LISTING CALCULATOR

Filed Oct. 18, 1938 6 Sheets-Sheet 5



Inventor

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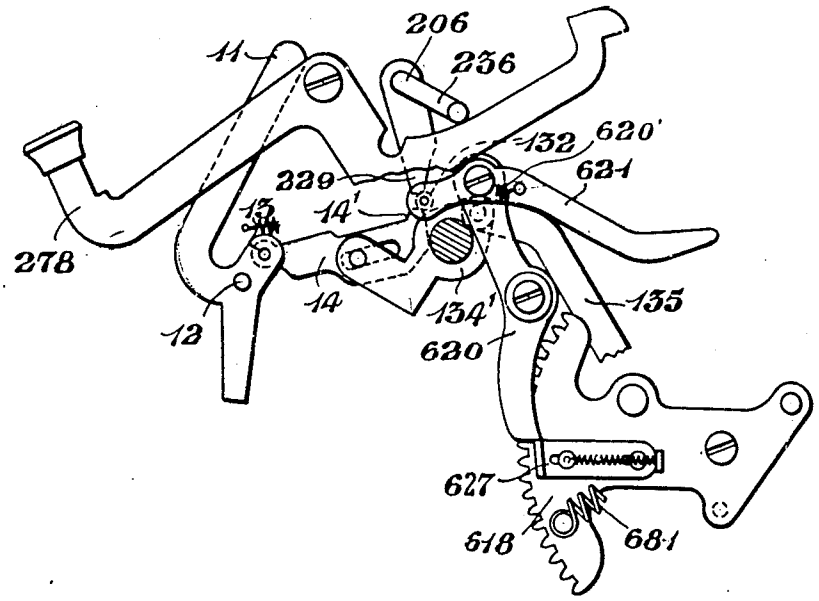
By C. W. Anderson & Son.

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LISTING CALCULATOR

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Fig. 10.



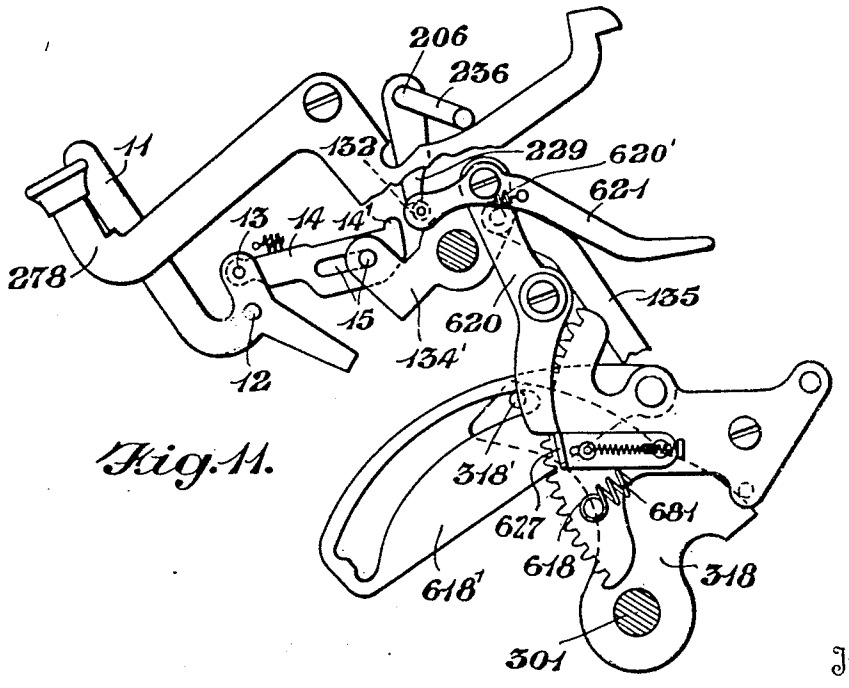


Fig. 11.

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Patented Oct. 6, 1942

2,298,201

UNITED STATES PATENT OFFICE

2,298,201

LISTING CALCULATOR

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

Application October 18, 1938, Serial No. 235,673

3 Claims. (Cl. 235—60)

The invention has relation to listing calculators wherein means are provided for accomplishing the registration of true negative totals, an object of the invention being to provide certain improvements upon the machine of the Patent Number 1,915,296, issued to Loring P. Crosman, June 27, 1933, whereby the machine may be brought to a stop prior to the printing of said totals and the operator having been made aware that the total represents an overdraft, may either print the true negative total on the statement sheet or on a separate sheet of paper or may arrange for clearing the total from the accumulator without printing; or alternatively the operator may print a total which is supposed to be negative without interruption of the total taking operation.

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 transverse section of the machine showing the registering and printing mechanisms.

Figure 2 is a transverse section of the machine showing the clutch control mechanism, etc.

Figure 3 is a side elevation of the machine showing the total printing mechanism.

Figure 4 is a detail side view of the total latch control devices.

Figure 5 is a detail side view of the negative total control devices.

Figure 6 is a detail side view of the control devices for locking the segment stops.

Figure 7 is a detail side elevation of the total control mechanism in position assumed immediately after depression of the total key.

Figure 8 is a similar view showing the parts in the positions assumed after operation of the total setting spring.

Figure 9 is a similar view showing the parts in the positions assumed after relatching of the total segment.

Figure 10 is a similar view showing the parts in position for tripping the total segment latch at the end of the second cycle of motor operation in the usual course, as a continuous operation.

Figure 11 is a similar view showing the parts in position for accomplishing the tripping of the total segment latch following an interval of stoppage of the machine.

General operation

For each denominational order, the machine is provided with a three-armed actuator lever, designated **610** (Fig. 1), these levers being loosely mounted on a shaft **608**. The forward arm of each lever **610** terminates in a segmental registering rack, the rearward arm has a lister type bar **611** pivoted thereto, and the upper arm has a pivotal connection with a differentially movable toothed member or stop bar **615**, cooperating with a column of digital keys **215**, one column for each said order.

The digital keys **215** which have been depressed to represent a value, are latched in depressed position by slide plates **216**, the lower ends of the key stems lying in the paths of movement of the related teeth of said bars **615**, thereby allowing said bars to advance a distance corresponding to the values of said keys, upon operation of the machine. Depression of a digital key will also remove a column latch **214** from the path of movement of its related bar **615**, these latches preventing movement of a stop bar **615** and a lever **610** in any column in which no digital key is depressed.

A rock shaft **301** is provided with cam means for governing the movement of a spring-tensioned rocker frame **616**, mounted on shaft **608**, said frame **616** carrying a series of dogs **617** normally engaged by studs **659** of the levers **610**. As shaft **301** is rocked forwardly, the frame **616** will be rocked, and any of the levers **610** which have been released by the depression of digital keys will be allowed to rotate under the influence of their springs **683**, until they are stopped by the related teeth of the bars **615** contacting the stems of the keys. Upon rearward movement of the shaft **301**, the dogs **617** will return the operated levers **610** to normal position.

This excursion of the levers **610** serves to register amounts set in the keyboard upon one or more accumulators and to set up a similar amount on the printing line of the type bars.

These accumulators are shown in Gardner Patent No. 1,867,002, as means for storing positive or negative totals to be printed. Tens carry mechanism is provided in accord with the disclosure of Gardner Patent No. 1,828,180.

Motor drive means

The shaft **301** is oscillated by means of an electric motor **100**, connected through gearing **101** (Fig. 2), and clutch means with a crank member **105**, the latter being connected to an arm **316** with shaft **301** by means of a connecting rod **108**, so that as crank arm **105** is rotated, the shaft **301** is oscillated.

Clutch lever 106 is provided with an insulated roller adapted to close certain contact members after lever 106 is moved out of restraining engagement with the spring element of the clutch, (see Fig. 3 of the Crosman Patent No. 1,932,013). These contact members constitute circuit breaking devices in the electrical connection of the motor 100.

Spring 111 tends to pull lever 106 away from the clutch, said lever being normally held in position to render said clutch ineffective by means of a latch 112. The clutch is disclosed in the Crosman Patent No. 1,932,013.

To establish the drive, latch 112 being released as will be hereinafter described, clutch lever 106 will be moved by its spring to render the said clutch effective, and said contact members will be engaged to thereby start the motor. Latch 112 being released will return under spring tension to latching position, and towards the end of the cycle of motor operation, an arm 115 of crank member 105 will contact a tooth 116 of clutch lever 106 and thereby force said lever back to latching position and bring the lower end of said lever into the path of movement of a member of the aforesaid clutch to render the latter ineffective.

The above described excursions of the actuator levers 610 will effect positive or negative registration of values set up in the keyboard as disclosed in the Gardner Patent No. 1,867,002.

Total printing

A total is taken by releasing the differentially movable elements or stop bars 615, the latter being then spring actuated to rotate the accumulators subtractively until suitable shoulders on the accumulator wheels contact with 0 stop members. This will set up the total in the type bars and the hammers will be tripped to print the total.

The machine is set for subtractive operation etc., upon depression of total key 278, as disclosed in said Crosman patent, first named.

Depression of the total key 278 (Fig. 3), will not only trip the column latches 214 (Fig. 1), through pin 263 and clearout bail 227, but will also trip a latch 620, through operation of crank arm 236 of shaft 206, arm 229 and control lever 621, pivotally connected to said latch. The latch 620 normally engages a lug 627, of total segment 618, thereby preventing movement of said segment under the influence of its spring 681. Upon tripping of said latch 620, total segment 618 will operate a shaft 607 (Fig. 1), having a helically arranged row of pins, acting to trip the latching dogs 617 mounted on frame 616, successively from right to left of the machine, releasing certain stop members 613 so that the latter will fall into the paths of the 0 stops 457 of the accumulator wheels and also releasing the studs 659 of and the actuator levers 610, as disclosed in the Gardner Patent No. 1,867,002.

When this zeroizing operation has progressed to the left hand side of the machine, a rearwardly extending arm of total segment 618 will contact a projection of rod 130 (Fig. 3), having connection with trigger 131, to move said rod downwardly, thereby releasing the latch 112 of clutch lever 106 whereby the motor clutch is rendered effective and the cycle of motor operation is started.

The machine being thus started, the oscillatory frame 616 (Fig. 1) will carry the dogs 617 downwardly and said dogs will snap under the studs 659 of the actuator levers 610. The printing hammers will now be tripped in known manner, if the total is a positive value, and upon rearward movement of said frame 616, said actuator levers will be restored to normal position.

Negative totals

In making a total, amounts carried up to the accumulator wheel located to the left of the keyboard are transferred to the printing devices by means of a two-armed lever 140 (Fig. 5), similar to the levers 610 but having no connection with the keyboard. This lever 140 is normally held inactive by latch 141, which in total taking is tripped by a finger 142 on the shaft 607 controlling the successive release of the said levers 610. If the total is negative, the complemental registration in the accumulator will include a nine in the above mentioned left hand wheel, and the movement of lever 140 from eight to nine printing position is utilized to set the true negative total devices in operative position.

The method of converting the complement of a true negative total, set in the type bars, to the true negative total is as follows:

A set of stops 143 (Fig. 1), yieldably engaging the stop bars 615 are locked in position as adjusted thereby in accordance with the complemental registration during a total taking operation and the actuator levers 610 are restored idly to normal position. Said levers 610 are now again released and will be stopped by the stops 143, the accumulator being meshed during this subtractive stroke of the said levers, whereby the complement is subtracted from zero, giving a registration of the true negative total. The said levers 610 are again restored idly to normal position by a cycle of operation of frame 616, and the stops 143 are released, so that a second zeroizing operation will now transfer the true total to the type bars. The printing of the total, which normally occurs at the end of the first total setting operation has in this case been delayed, and will occur after the true total is set. These operations include three cycles of motor operation and two total setting actions of total segment 618.

In moving from eight to nine printing position, lever 140 contacts with a latch plate 144 (Fig. 5), and moves the same out of engagement with an arm 145 of setting shaft 146, which latter will thereupon be rocked by spring 147. The rocking of shaft 146 suspends the operation of the printing and normalizing devices as follows:

A printing operation is prevented during the conversion of the complemental amount on the totalizer by means of a spring actuated arm 148 which is released by the rearward movement of arm 145 and will thereupon engage a latch 149 of the hammer restoring bail 707, latching said bail in position to prevent printing operation of the hammers 715 (Fig. 5).

The release of the total key 278 from its latch 223, (Fig. 3) is prevented by an arm 150 connected by link 151 with arm 152 of setting shaft 146, arm 150 being held in the rocked position of the shaft in engagement with a pawl 222 mounted on latch striker plate 220, so that said pawl may not be operated to actuate latch striker plate 220 so long as setting shaft 146 remains in rocked position (see Crosman Patent No. 1,932,013). Total key 278 thus remaining latched in operative position, the subsequent operations will be of a subtractive nature, and the column

latches 214 will remain inactive due to said total key remaining latched.

The latch 141 (Fig. 5), controlling the two-armed lever 140, and the extreme left hand type bar, having been tripped in the total setting operation, is held out of latching position when the total is negative by a pivoted member 153, engaging beneath said latch, member 153 being connected by a link 154 with an arm 155 of setting shaft 146. Said lever 140 being free from latch 141 will operate to its extreme degree of movement in the subtractive true negative total-setting operation of the accumulator hereinbefore referred to, and will thereby subtract nine from the accumulator wheel with which it is engaged, whereby the subtractive carry transmitted to this wheel during this same operation will be erased.

The first operation of the total taking mechanism under the influence of spring 681 has served to render the motor clutch effective for the purpose of restoring the actuator levers 610, etc. to normal position, and in order that a second cycle of motor operation may be secured, in which the subtractive operation of the accumulator will occur, the motor clutch will be maintained effective by means to be now described.

A latch arm 157 (Fig. 6), will be carried downward by shaft 146 out of engagement with a latching pawl 158 mounted on a plate 159, pawl 158 being held upward to permit the disengagement, by a second latching pawl 170. Plate 159 being released from the latch, will be drawn rearwardly by spring pressed member 160 (Fig. 3), and a lug 161 of plate 159 will engage lug 162 of the aforesaid link 130 (now in its lower position), connected to the aforesaid trigger 131 and holding the latch 112 out of latching engagement with previously mentioned clutch lever 106.

In order to lock said stops 143 in the positions assumed during the preliminary total taking, the plate 159 is provided with a pivoted extension 163 (Figs. 2 and 6), which in the rearward movement of plate 159 is held under tension against the roller 164 mounted on the free end of one arm of an intermediately fulcrumed lever 165. The consequent relative movement of plate 159 and extension 163 will release latching pawl 158 from the restraint of the second latching pawl 170, the former pawl falling upon latch arm 157. The forward arm of lever 165 operates a locking bail 166, engaging serrations of the stops 143, said lever being normally operated by a double faced cam 167 secured to arm 316 of operating shaft 301. As arm 316 moves forward, locking bail 166 is released, by the action of cam 167, while in the rearward movement of arm 316 the cooperating roller of lever 165 will ride the upper face of cam 167, whereby the locking bail is brought in contact with the stops 143. This will be the operation of the parts during the first cycle of motor operation which restores the actuator levers 610 to normal position. As the rear end of lever 165 is lifted by cam 167 however in the return movement of the parts, roller 164 will be lifted free of extension 163, and said extension will immediately move under said roller, holding locking bail 166 in engaging position, where it will remain during the subtractive stroke of the second cycle of motor operation, that is to say while the levers 610 move the accumulator wheels subtractively from 0 registering position to the extent allowed by the stops 143. At the end of this stroke, a pin 168 in arm 316 will engage a seat 169 in extension 163 and move plate 159 and its extension 163 forwardly, in which position the parts will be held by latching pawl 158, moving into engagement with the shoulder of latch arm 157.

Plate 159 being moved forwardly, lug 161 thereof will be disengaged from lug 162 of link 130, whereupon tripper 131 will be restored to latching position and the clutch will be rendered again ineffective at the end of the second cycle of motor operation and the machine brought to rest. The true negative total being now registered in the accumulator, the second total taking operation occurring in the final motor operation cycle will result in the printing of the true negative total. In the disclosure of the Crosman Patent No. 1,915,296 the total latch 620 is controlled to initiate this second total taking operation so that the tripping of latch 620 for the second time is delayed until the completion of the second motor operation cycle and at the end of said cycle the push rod 135 will be automatically actuated by rocker cam 318 to rock plate 134 and trip said latch.

According to the present invention however the machine is brought to rest at the end of the second cycle of motor operation with the true negative total registered in the accumulator and prior to the printing of said total and there is no automatic tripping (for the second time) of the latch 620 to initiate the final motor operation cycle wherein the second total taking operation takes place.

Thus modification of the machine of said patent is requisite to eliminate shoulder 133 of rocker plate 134 and automatic tripping (for the second time) of latch 620, there being substituted therefor means including a manipulative device to be now described for tripping said latch for the second time. The operator, having been made aware that the total represents an over-draft, may either print the true negative total on the statement sheet or on a separate sheet of paper, or may arrange for clearing the total from the accumulator without printing. (The latter by the use of the well-known non-print mechanism.)

To complete the taking of the total the operator will push rearwardly a lever 11 fulcrumed at 12, this lever being adapted to trip the latch 620, so that the total segment 618 will again be operated, said segment again tripping the latch 112 of clutch lever 106 to render the motor clutch effective, thereby effecting printing and final restoration of the parts to their normal positions.

Tripping of the latch 620 by manual lever 11 is effected as follows:

On the first total-taking operation, following the depression of total key 278, total segment 618 will rise from the position illustrated in Figure 7 into that shown in Figure 8, the lug 627 of said segment contacting a rear arm of latch control lever 621 and moving said lever so that the pin 132 thereof will be depressed and escape from the rear face of arm 229, whereupon the latch spring 620' will rotate the latch and control lever to bring the pin 132 beneath arm 229.

During the forward movement of the cam 318 the total segment 618 will be restored to normal position by means of a slotted link 618' pivoted upon said segment and engaged by a pin 318' fixed in the cam 318.

During this movement of segment 618, lug 627, which is formed as a slide mounted upon segment 618 and held in normal position by spring tension, will snap under the end of latch 620, bringing the parts into the position illustrated in Figure 9.

Thus the machine is brought to rest with pin

132 in a depressed position, and a finger 14, pivoted at 13 upon lever 11 eccentrically of the fulcrum 12 thereof is brought into a raised position, in which position manipulation of lever 11 will bring said finger into contact with pin 132 to trip the total segment latch as stated. Finger 14 is brought into this raised position as follows:

A member 173 (Fig. 4) is pivoted upon arm 172 of shaft 171, said member lying normally between rocker cam 318 and push rod 135. Shaft 171 is rigid with plate 159, and, as said plate moves rearwardly at the end of the first total-setting operation, pivoted member 173 will be carried out of register with rocker cam 318, so that, upon the subsequent return of said cam to normal position, push rod 135 will not be operated. During the subtractive cycle of operation, however, plate 159, being restored to normal position by pin 168 and seat 169, pivoted member 173 will be restored to position beneath rocker cam 318, and at the end of this cycle the push rod 135 will rock lever 134'.

Rock lever 134' is connected with finger 14 by a pin and slot connection 15, so that the rocking of said lever will raise the rear end of finger 14 to a position opposite the depressed pin 132. Operation of lever 11 by the operator will thus bring finger 14 into contact with pin 132 and will displace latch 620 from contact with lug 617, releasing total segment 618.

The depression of push rod 135 is utilized to restore setting shaft 146 to normal position. For this purpose shaft 146 is provided with an arm 175 carrying the pawl 176 which, as shaft 146 is rocked forwardly is held by spring 177 in contact with a shoulder 178 of push rod 135. As the rod is moved downwardly, pawl 176 and arm 175 will rock the setting shaft back to normal position. Setting shaft 146 and the parts controlled thereby being restored to normal position, the tripping of total latch 620 will effect an ordinary total-taking operation.

Should the operator desire to print a total which he supposes to be negative, without interrupting the total taking operation, lever 11 may be manipulated to its rearward position either before or immediately after depression of total key 278, and is manually so held during the first two cycles of operation. Thus finger 14 will be positioned as illustrated in Figure 10, until rock lever 134' is operated at the end of the second cycle of operation. This operation of rock lever 134' will bring a rounded or cam shoulder 14' of finger 14 upwardly against pin 132, camming said pin rearwardly and thus releasing total segment 618.

It will be obvious that this invention is readily applicable to registers wherein means are provided for accomplishing the registration of true negative sub-totals, as in the Fleming Patent No. 2,050,320.

I claim:

1. In a listing calculator, means for accomplishing the registration and printing of true negative total values, comprising a spring-urged device, a latch therefor provided with a control member, means including a total key for engaging said control member to trip said latch, means for restoring said spring-urged device and said latch, and means for tripping said latch for the second time including a power driven device, a manipulable device, and a member positionable by either device and operable by the other device to engage said control member and thereby trip said latch.

2. In a listing calculator, means for accomplishing the registration and printing of true negative total values, comprising a spring-urged device, a latch therefor provided with a control member, means including a total key for engaging said control member to trip said latch, means for restoring said spring-urged device and said latch, and means for tripping said latch for the second time including a manipulable means and a power driven means, a part of said manipulable means being positionable by said power driven means, said manipulable means thereafter being operable to engage said control member to thereby trip said latch.

3. In a listing calculator, means for accomplishing the registration and printing of true negative total values, comprising a spring-urged device, a latch therefor provided with a control member, means including a total key for engaging said control member to trip said latch, means for restoring said spring-urged device and said latch, and means for tripping said latch for the second time including a manipulable means and a power driven means, a part of said manipulable means being operable by said power driven means when said manipulable means is positioned, to engage said control member to thereby trip said latch.

LORING PICKERING CROSMAN.

CERTIFICATE OF CORRECTION.

Patent No. 2,298,201. October 6, 1942.

LORING PICKERING CROSMAN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 53, before "with" insert --fast--; page 2, second column, line 8, for "making" read --taking--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of November, A. D. 1942.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)

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