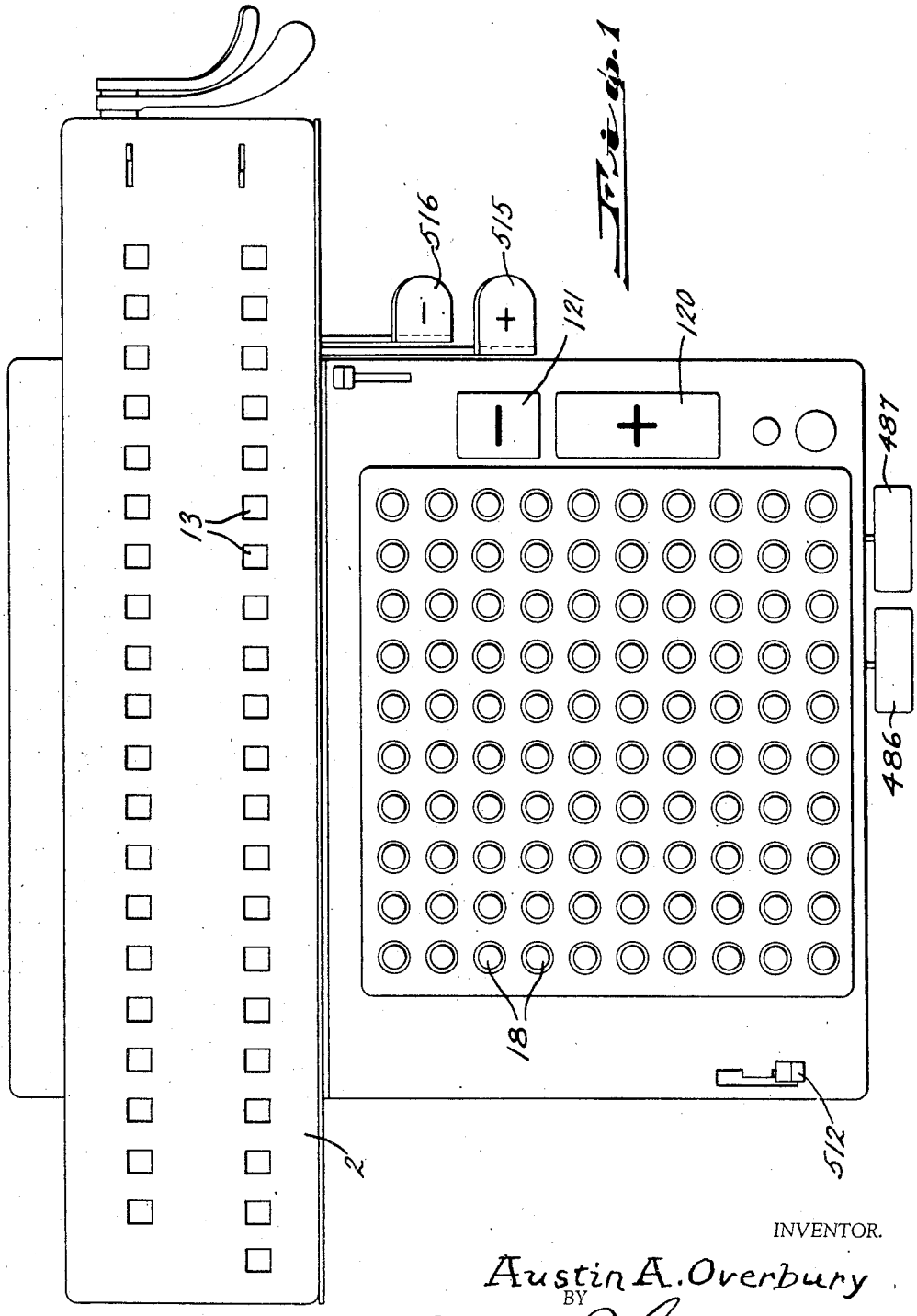
Oct. 19, 1937. A. A. OVERBURY 2,096,465

CALCULATING MACHINE

Filed May 2, 1936 5 Sheets-Sheet 1



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CALCULATING MACHINE

Filed May 2, 1936 5 Sheets-Sheet 2

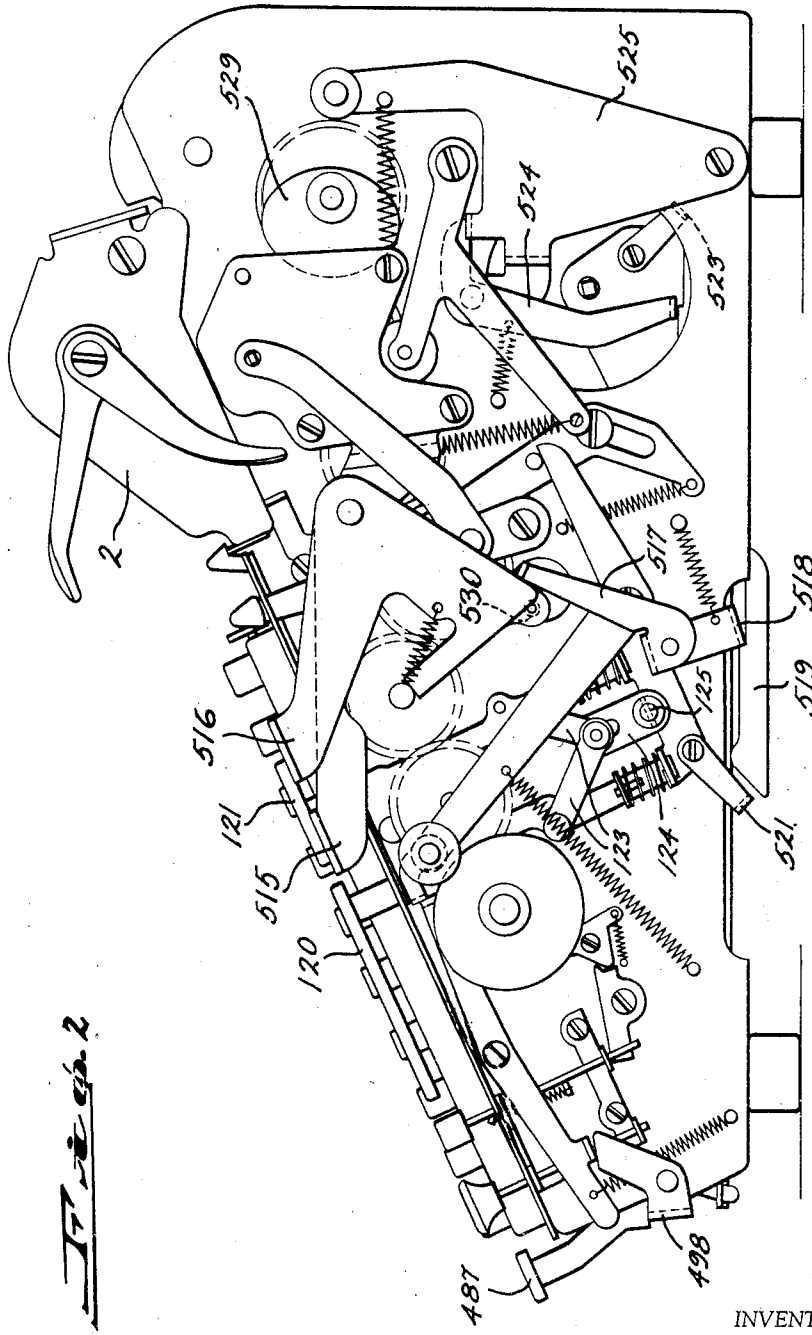

Fig. 2.

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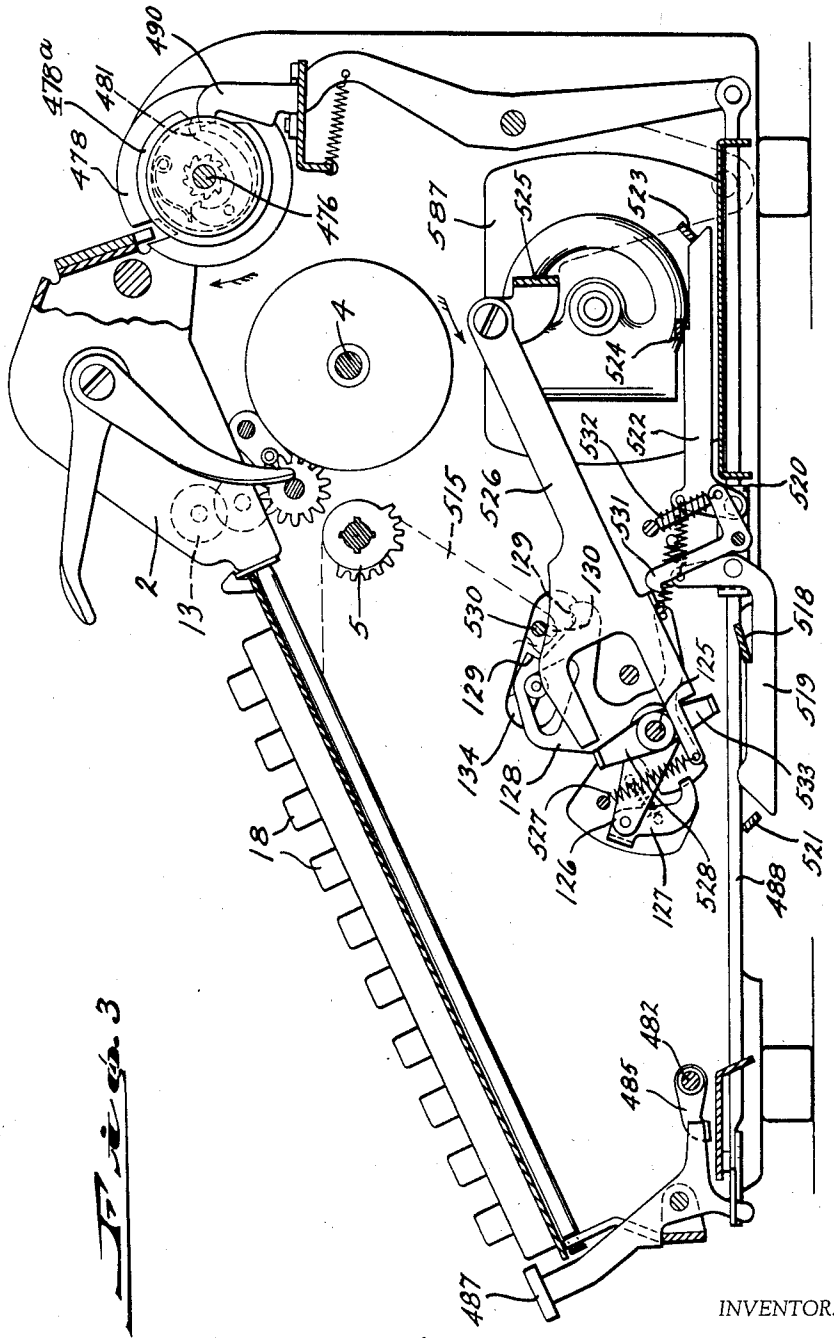

Fig. 3

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CALCULATING MACHINE

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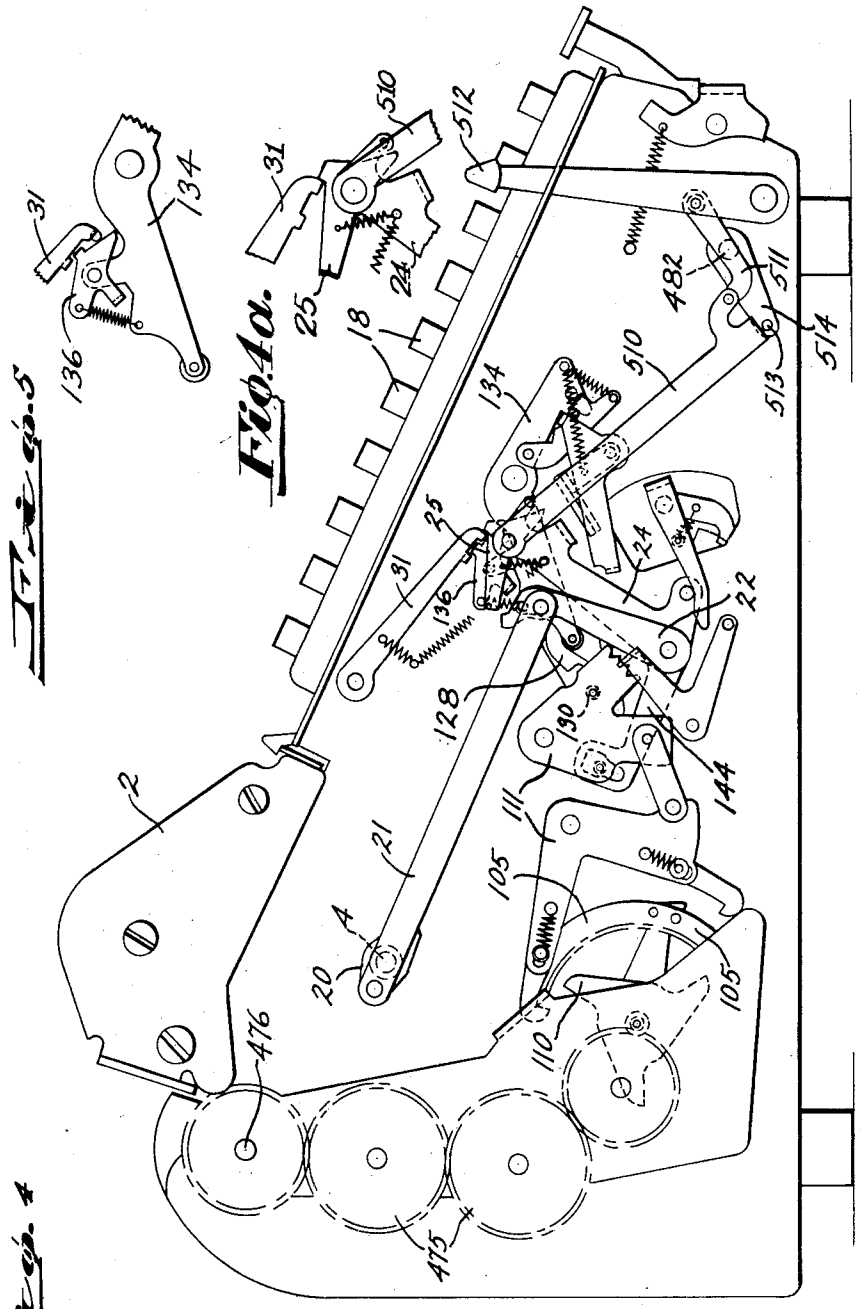

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CALCULATING MACHINE

Filed May 2, 1936 5 Sheets-Sheet 5

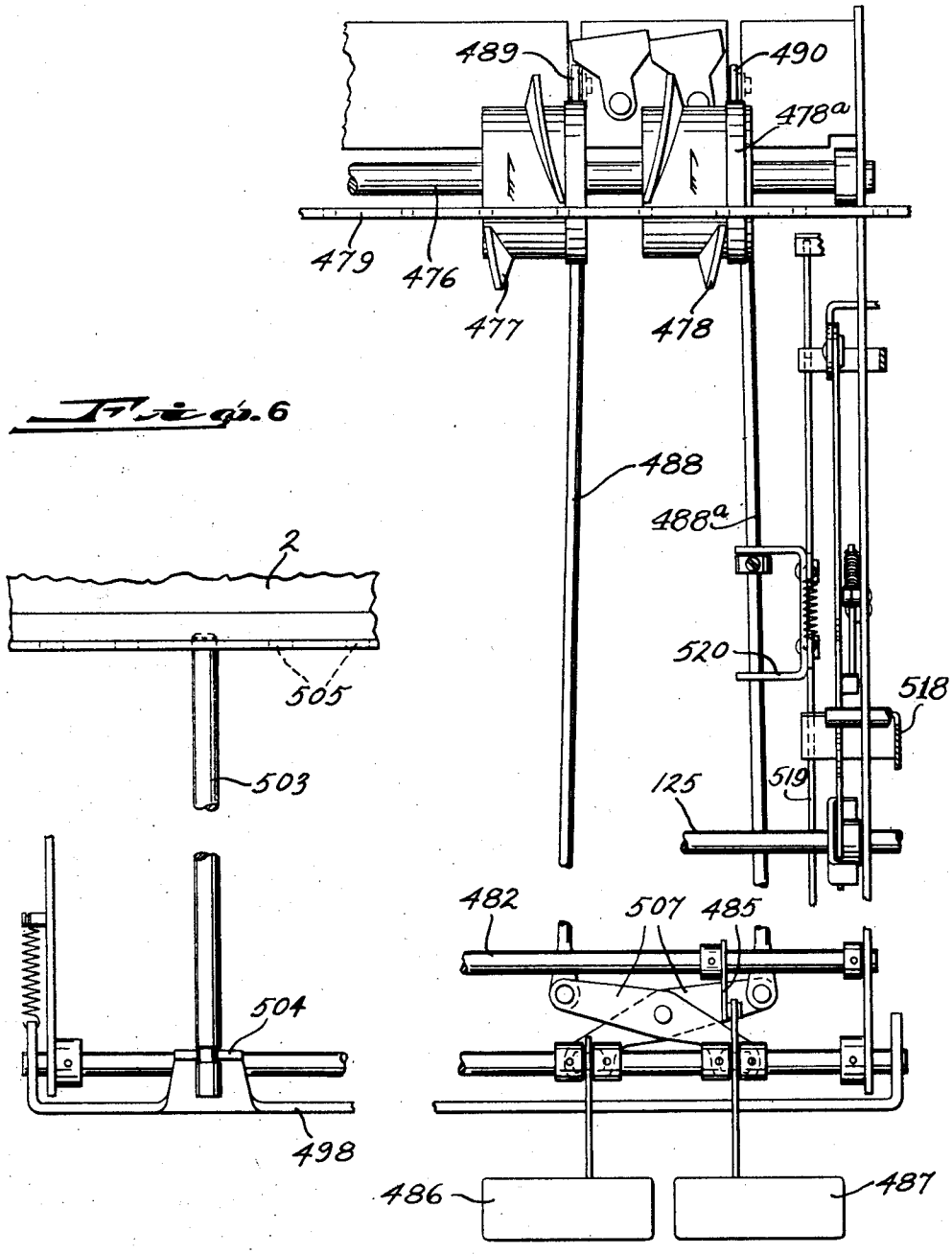

Fig. 6

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Patented Oct. 19, 1937

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UNITED STATES PATENT OFFICE

2,096,465

CALCULATING MACHINE

Austin A. Overbury, East Orange, N. J., assignor to Monroe Calculating Machine Company, Orange, N. J., a corporation of Delaware

Application May 2, 1936, Serial No. 77,512

3 Claims. (Cl. 235—63)

The invention has relation to calculating machines equipped with automatic means for shifting the numeral wheel carriage, and more particularly to means for correcting an erroneous operation of such a machine. The invention is particularly useful in connection with machines whereon multiplication is performed by holding down an operation key for a sufficient time to allow the machine to make the desired number of registering cycles, and provides means for shifting back the numeral wheel carriage to the position in which the last registration was made, for making a single corrective registration with the carriage in such position and for again advancing the carriage into position for the succeeding registration.

The invention consists in the novel construction and combination of parts, as set forth in the appended claims. The invention is shown as applied to a calculating machine of the Monroe type, illustrated in Patent No. 1,773,026, issued to George C. Chase, on August 12, 1930. Certain modifications of the carriage shifting mechanism are in accordance with the disclosure of Patent No. 1,964,478, issued to Austin A. Overbury on June 26, 1934.

In the accompanying drawings, illustrating the invention:

Fig. 1 is a plan view of a calculating machine embodying the invention.

Fig. 2 is a right side elevation of the same, with the casing removed.

Fig. 3 is a section taken inside the right hand frame plate of the machine.

Fig. 4 is a left side elevation with the casing removed.

Fig. 4*a* is a detail elevation of the stopping pawl etc.

Fig. 5 is a detail elevation of parts shown in Fig. 4.

Fig. 6 is a fragmentary plan view showing the right and left carriage shift mechanism.

Registering means

The calculating machine is of well known type, wherein values set up on the keys **18** (Fig. 1) and thereby on the differential actuators **5** (Fig. 3) will be registered one or more times on the numeral wheels **13**, upon operation of appropriate motor keys.

These motor keys comprise a plus bar **120** and a minus bar **121** (Figs. 1 and 2), depression of either one of these bars acting to rock a shaft **125**, by means of links **123** and crank arm **124**. This motion of shaft **125** is transmitted to a setting lever **128** (Fig. 3) through crank arm **126** and coupling pawl **127**. Setting lever **128** is provided with opposed shoulders **129** adapted to act upon a pin **130** in one member of a compound clutch lever **111** (Fig. 4) rocking said lever to bring one or the other of two opposed jaws thereof into clutching engagement with a given element of a differential gear transmission, to drive the actuators **5** in the desired direction. Depression of plus bar **120** will rock the shaft **125** in clockwise direction as viewed in Figs. 2 and 3, rocking the two parts of lever **111** in clockwise direction as viewed in Fig. 4, and bringing the lower jaw of said lever into engagement with the addition clutch element **105** of the differential transmission, effecting additive rotation of the differential actuators **5** and the numeral wheels **13**. Depression of the minus bar **121** will rock the parts in an opposite direction, bringing the upper jaw of lever **111** into engagement with a subtraction clutch member **110** of the differential transmission, to effect rotation of the actuators **5** and numeral wheels **13** in the opposite direction.

Upon release of finger pressure from the bar **120** or **121**, the differential actuators will complete a cycle of operation and will be brought to rest as follows:

Rocking of setting lever **128** by the depression of the plus or minus bar will effect the depression of the rearward arm of an intermediately fulcrumed lever **134** (Figs. 3, 4 and 5) by means of a cam surface of the lever **128** acting upon a roller fixed upon the lever **134**. A pawl **136** is pivotally mounted on the rearward arm of lever **134**, said pawl in the depression of this rearward arm (from its normal position, illustrated in Fig. 5) moving away from a suitable stop pin and moving pivotally, under the influence of a spring, so that a lug of the pawl is brought beneath the lug of a trigger **31**. Upon release of the key, the rearward arm of lever **134** will be raised by spring means, and pawl **136** will lift trigger **31**, bringing the end of said trigger out of engagement with a spring pawl **25** (Figs. 4 and 4*a*) mounted on a stopping arm **24**, allowing said pawl to move pivotally into position to engage a shoulder of a reciprocatory lever **22**, connected by link **21** and crank arm **20** with the shaft **4** of the tens transfer mechanism. Crank arm **20**, moving through dead center position at the end of a cycle of operation, will rock the lever **22** into contact with the pawl **25**, continued rotation of the parts carrying stop arm **24** forwardly with reciprocatory lever **22**, until a lug of arm **24** encounters a fixed stop. At the same time a rearward extension

144 of arm 24 will act to cam a pin fixed in the clutch lever 111 and move the clutch lever into its neutral position. Actuators 5, being now unclutched from the motor drive, will be returned to their full cycle position by means of a spring connected to the arm 24, during which movement the pawl 25 will again contact with the end of trigger 31 and will be lifted out of engagement with the shoulder of reciprocating lever 22.

Carriage shifting means

Means are provided for automatically shifting the numeral wheel carriage 2 one step toward the right at the end of each calculation by the plus or minus bar. For this purpose a push rod 510 (Fig. 4) is pivoted at one end to the stopping arm 24 and is held at the other end by a link 511 and lever 512. When lever 512 is located in its forward position, as illustrated in Figs. 1 and 4, the lower end of push rod 510 will be held opposite a pin 513 fixed in an arm 514 of shaft 482. Shaft 482 extends across the front of the machine, and has fixed thereon an arm 485 (Figs. 3 and 6) having a lug underlying the rearward arm of a shift key lever 487. A depending arm of lever 487 engages a rocker 507, said rocker being connected at its other end with a rod 488 extending to the rear of the machine, where it has pivotal connection with intermediately fulcrumed lever 489 (similar to the lever 490 illustrated in Fig. 3). Lever 489 forms a stop for a spring clutch device, acting upon removal of the stop to connect a right hand shifting worm 477 with a shaft 476, driven through gearing 475 from the motor 587. This clutch is similar to the clutch connecting the left hand shifting worm 478 with shaft 476, which will be later described.

The shifting clutch, upon engagement, provides for a single rotation of worm 477, this worm acting upon the rack 479, fixed upon the numeral wheel carriage 2, to give the carriage a single step of movement. Upon the completion of this movement the clutch will reengage lever 489, and the connection between worm 477 and shaft 476 will be released.

The key 487 may be used for shifting the carriage to the right at any time, or independently of the operation of the plus and minus bars, and a similar key 486 is provided for shifting the carriage to the left by operation of the left hand shifting worm 478. The carriage is normally locked by engagement of a rod 503 with a rack 505 on the forward edge of the carriage, and this lock is removed upon depression of either key 486 or 487, by means of a bail 498 underlying the key levers, and having a forked lug 504 engaging a shouldered portion of the rod 503.

Correction keys

Multiplication is commonly performed by holding down the plus bar 120 to give the correct number of repeated additions in each ordinal position of the numeral wheel carriage 2. Another well known method of performing multiplication is performed by holding down the minus bar 121 to give a number of subtractions equal to the complement of the multiplier figure, and thereafter multiplying by ten, by single cycle depression of the plus bar in the next higher order. In both of these methods of operation the lever 512 may be set to its forward position, providing for an automatic shifting of the numeral wheel carriage 2 to the right.

In case an error has been made, by holding the plus bar or the minus bar too long, or by not holding the bar long enough to effect the proper registration, it has heretofore been necessary to move the numeral wheel carriage 2 one step to the left, and then to depress the plus or minus bar to effect a registration of opposite sign, if the registration has been too great, or a registration of like sign if the previous registration has been too small.

According to the present invention the depression of a single key will effect the movement of the carriage to the left, a corrective operation of the machine and the movement of the carriage back to the right, ready for the next operation. The corrective operation will be additive or subtractive in accordance with the depression of an additive correction key 515 or of subtractive correction key 516 (Figs. 1 and 2). The key levers 515, 516 are of bell crank form, the lower arms of each key lever engaging a lug formed in an intermediately fulcrumed lever 517. The lower end of lever 517 is provided with an extension 518 engaging a shoulder of link 519, which link is pivotally connected with a slide 520 (Figs. 3 and 6) supported upon the rod 488*a* connecting the left hand shift key 486 with the clutch lever 490. Depression of either correction key will therefore move rod 488*a* forwardly and withdraw the upper end of lever 490 from restraining engagement with clutch pawl 481, allowing said pawl to fall into contact with one of a series of clutch teeth upon shaft 476 to effect the clutch, under the influence of a suitable pawl spring. Further movement of lever 517 by the correction key will bring a beveled end of link 519 into contact with a fixed member 521, camming said link out of engagement with the extension 518 of lever 517, so that slide 520 can move back to normal position at the proper time, whether the correction key is still held in depressed position or not. Lever 490, upon disengagement from clutch pawl 481 will be held in retracted position by engagement with a cylindrical surface 478*a* attached to the worm 478, where it will remain until the worm has made nearly a complete rotation, whereupon a cut away portion of the cylindrical surface will be brought opposite lever 490, and said lever (under the influence of a suitable spring) will fall back into position to engage the clutch pawl 481. Pawl 481 being again brought in contact with the end of lever 490 in the rotation of the parts, the pawl will be disengaged from the clutch teeth, completing the left hand shifting operation.

As slide 520 was moved forwardly by the depression of the correction key a latch 522 will have its beveled end moved away from a fixed stop 523, a shoulder of said latch being moved upwardly by spring means into position in front of the laterally bent end of an intermediately fulcrumed lever 524. Slide 520 and latch 522 are held in forward position so long as lever 490 rests upon the periphery of the cylindrical surface of the clutch assembly, but upon movement of lever 490 into position of engagement with the clutch pawl 481, the rod 488 will move rearwardly, allowing slide 520 and latch 522 to move with it, the latch thereupon operating to move lever 524. The opposite arm of lever 524 forms a latch for a spring hammer 525 (Fig. 2), said hammer upon release operating to rock the shaft 125 and thereby to set the machine into operation. This is effected by means of a push rod 526, having pivotal connection with the hammer 525, and normally held by spring 527 in position to engage an arm 528 secured upon shaft 125, contact of push rod 526

with said arm serving to rock shaft 125 in a counter-clockwise direction as viewed in Fig. 3, to effect a cycle of subtractive registration. During this cycle, a cam 529 (Fig. 2) will engage a roller of hammer 525, retracting the hammer and the push rod 526, and engaging the hammer with the latch arm of lever 524. This release of pressure upon arm 528 will give an action similar to the release of finger pressure upon the plus or minus bar, bringing the machine to a stop and providing for the shifting of the numeral wheel carriage one step to the right.

This is the entire action of the subtractive correction key 516. The additive correction key 515 has a similar action in setting the slide 520, and in addition is provided with means for setting the push rod 526 into position to operate an arm 533 (Fig. 3) of shaft 125, said arm being located on the shaft diametrically opposite to arm 528, so that the movement of the push rod, under the influence of hammer 525, will rock the shaft 125 in a clockwise direction as viewed in Fig. 3 and will therefore set the machine for a single cycle of additive operation.

It will be observed, therefore, that the position of push rod 526 determines the arithmetical sign of the corrective operation.

This means comprises a pin 530, fixed in the key lever 515 and operable upon depression of the key to depress the forward end of push rod 526 to bring it out of registry with the contacting portion of the arm 528 and into registry with that of the arm 533. Push rod 526 is held in its adjusted position by means of a spring latch 531 engaging a lug of the push rod to hold it against the action of spring 527 until it is moved forwardly by the hammer 525, whereupon it will escape from the latch 531, which is held by a stop 532, and will return upon the restoration of hammer 525 to its normal position.

I claim:

1. In a calculating machine having a transversely shiftable carriage and numeral wheels thereon; the combination with means including registering devices and carriage shifting devices operable successively to register selected values on said wheels and thereafter to shift said carriage in a given direction; of correction key devices, means operable thereby and cooperating with the carriage shifting devices to shift said carriage reversely of said given direction, and means including elements set by said key devices and cooperating elements controlled by the reverse shifting means to effect operation of said registering devices.

2. In a calculating machine having a transversely shiftable carriage and numeral wheels thereon; the combination with means including registering devices and carriage shifting devices operable successively to register selected values on said wheels and thereafter to shift said carriage in a given direction; of correction key devices, means operable thereby and cooperating with the carriage shifting devices to shift said carriage reversely of said given direction, and means adapted to effect operation of said registering devices, including a normally restrained spring actuated arm, a trigger, and a trigger operating member adjustable by said key devices and operable by the reverse shifting means to release said arm.

3. In a calculating machine having a transversely shiftable carriage and numeral wheels thereon; the combination with means including registering devices and carriage shifting devices operable successively to register on said wheels selected values of a given arithmetical sign and thereafter to shift said carriage in a given direction; of correction key devices including two keys, means operable thereby and cooperating with the carriage shifting devices to shift said carriage reversely of said given direction, and spring means controlled by the reverse shifting means to effect operation of said registering devices respectively in accordance with or oppositely to said given sign, including a sign determining member adjustable by one of said keys.

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