June 26, 1934. A. A. OVERBURY 1,964,478

CALCULATING MACHINE

Filed Dec. 3, 1932 5 Sheets-Sheet 1

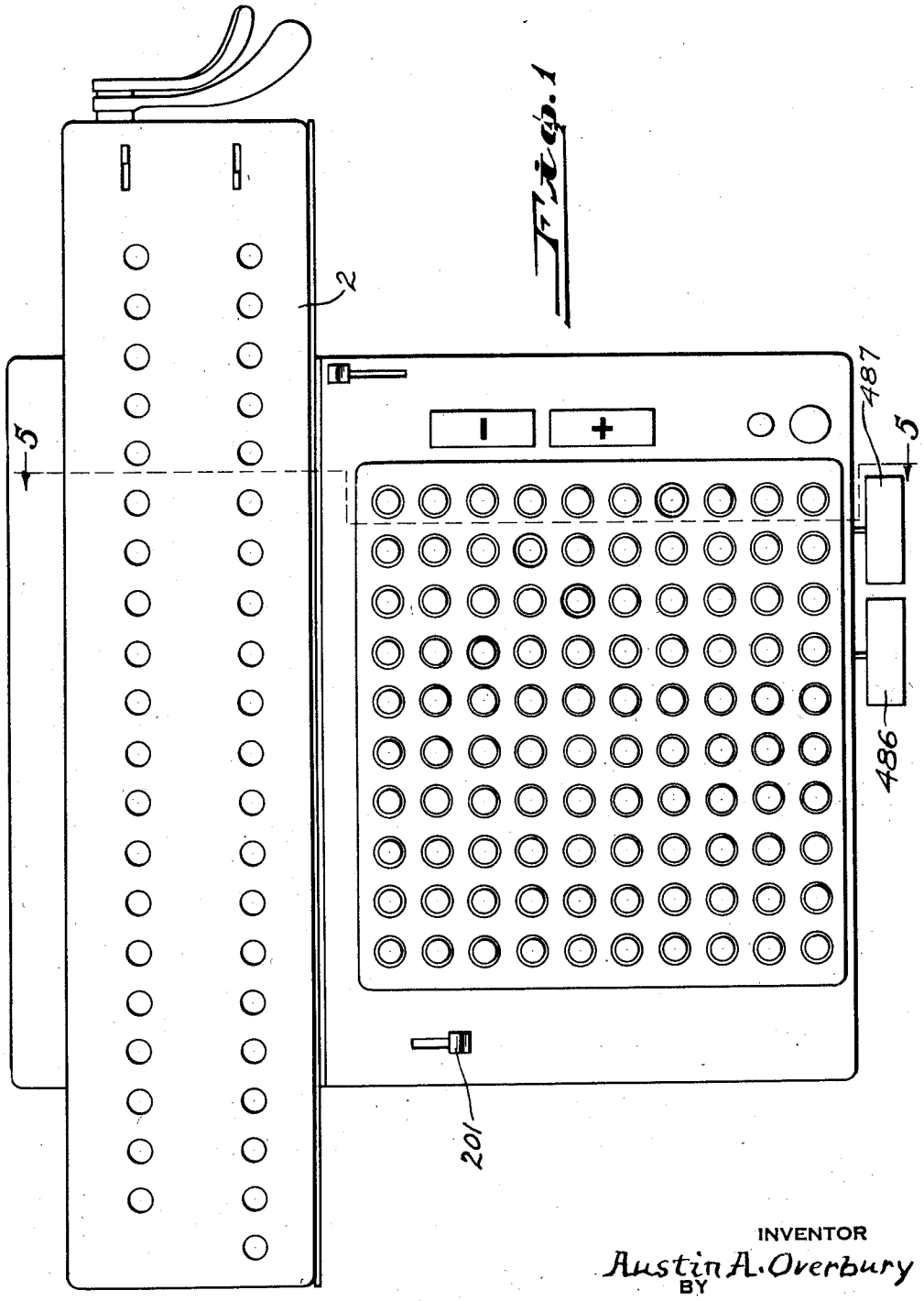

Fig. 1

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CALCULATING MACHINE

Filed Dec. 3, 1932 5 Sheets-Sheet 2

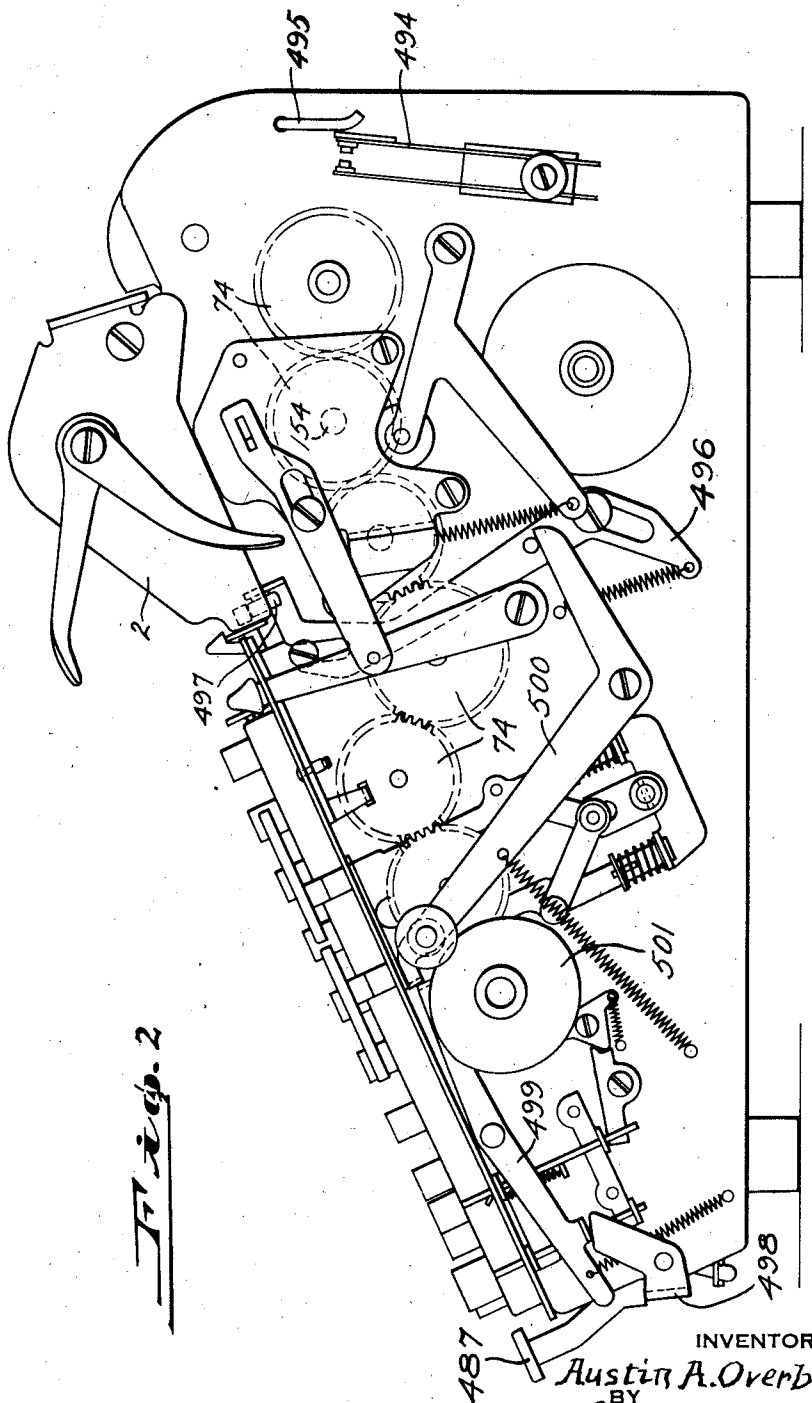

Fig. 2

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CALCULATING MACHINE

Filed Dec. 3, 1932 5 Sheets-Sheet 3

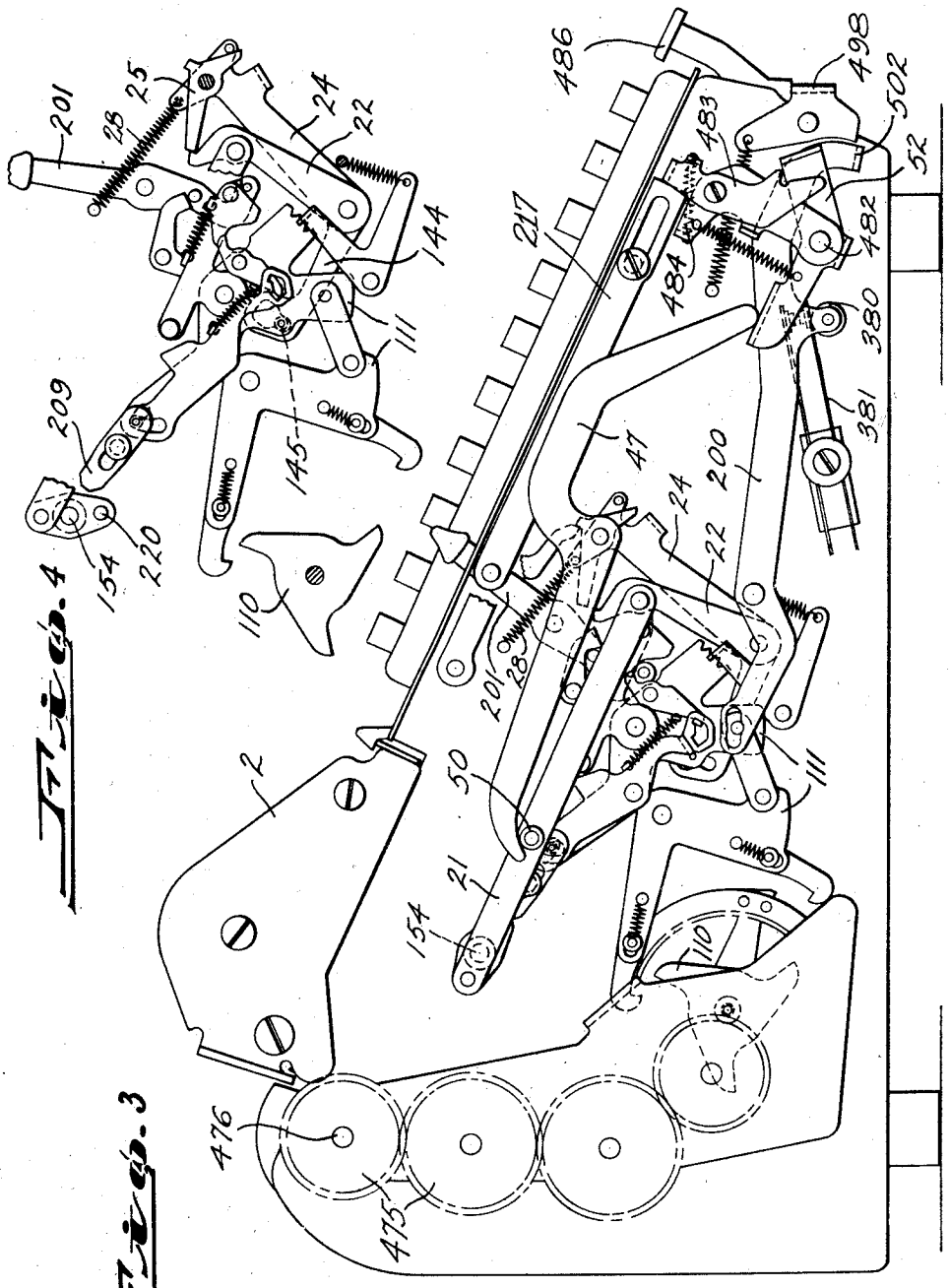

Fig. 4

Fig. 3

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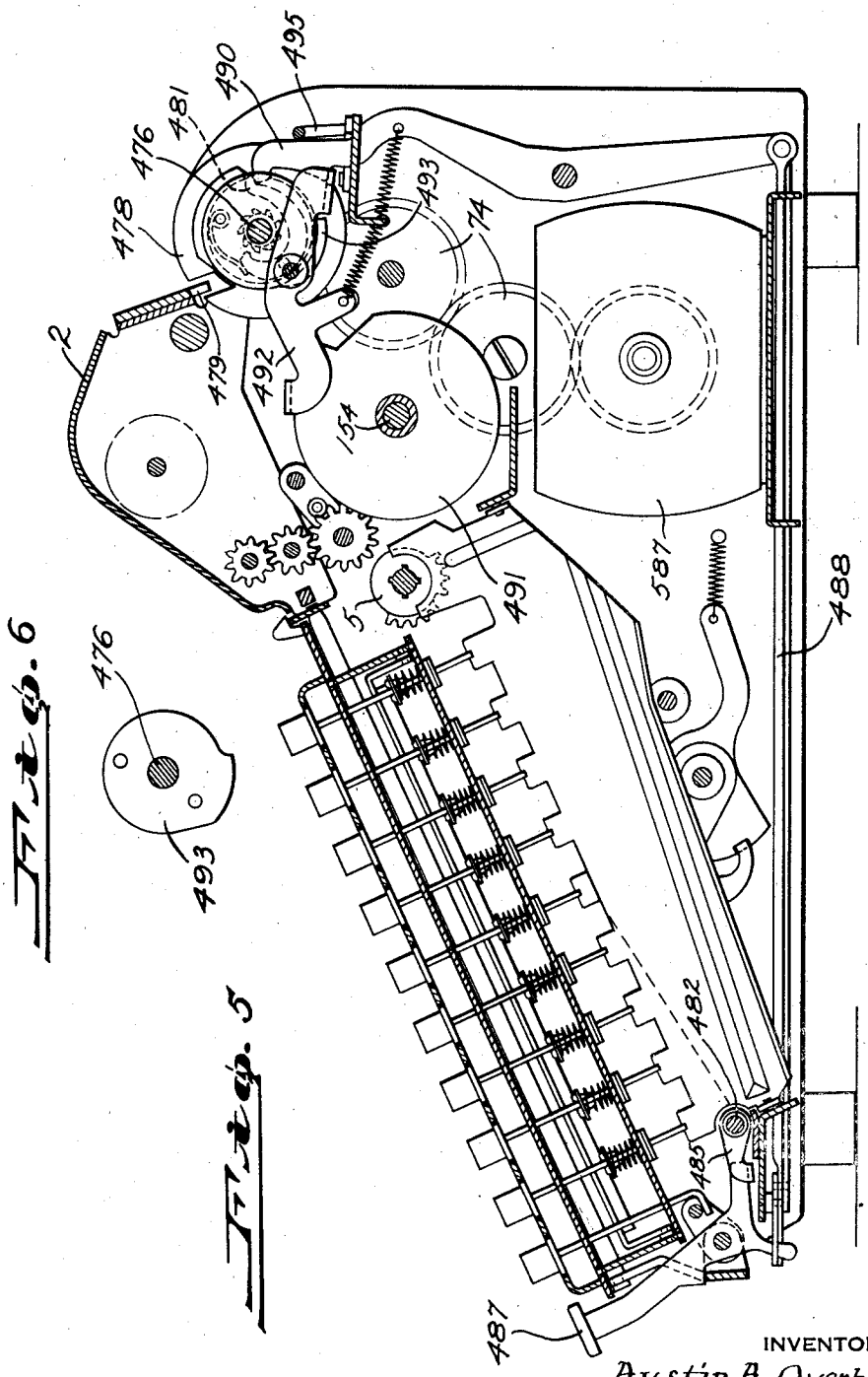

Fig. 6

Fig. 5

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CALCULATING MACHINE

Filed Dec. 3, 1932 5 Sheets-Sheet 5

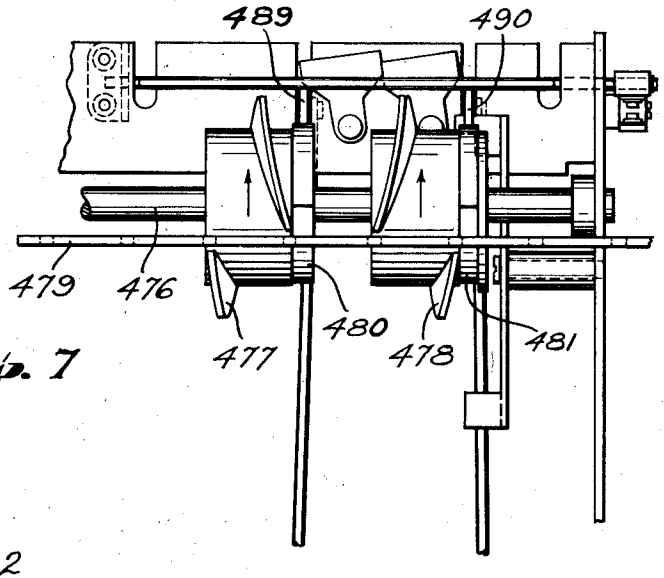
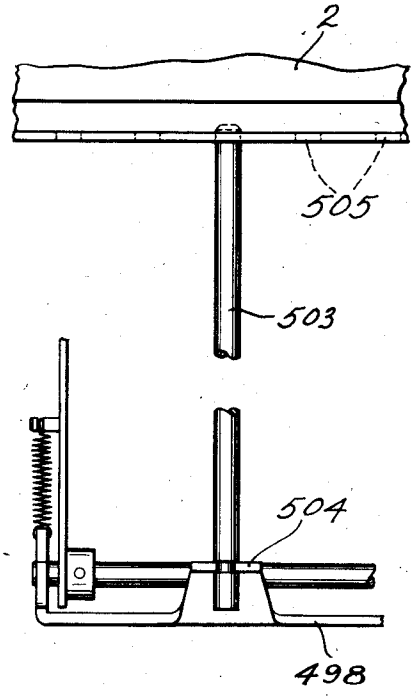
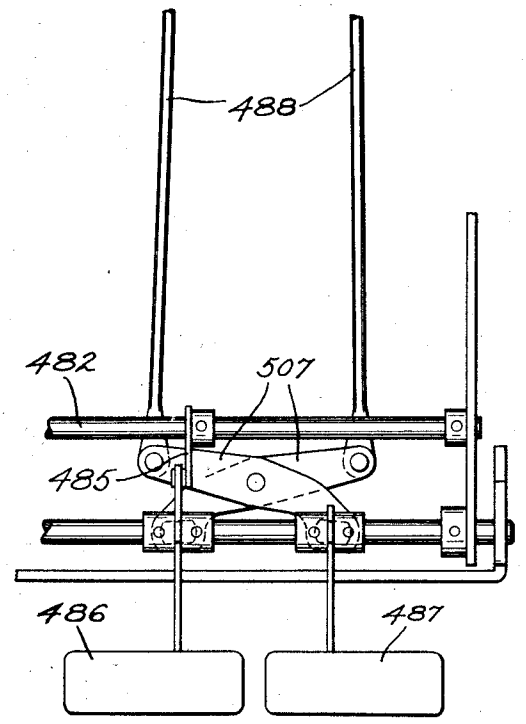


Fig. 7





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Patented June 26, 1934 1,964,478

UNITED STATES PATENT OFFICE

1,964,478

CALCULATING MACHINE

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

Application December 3, 1932, Serial No. 645,562

2 Claims. (Cl. 235—63)

The invention has relation to calculating machines, and more particularly to means for coordinating the different operating elements of the machine for the performance of automatic calculations involving registration in a plurality of ordinal places. Operations of this character may be of various kinds such as the division operation described in U. S. Patent No. 1,888,161, issued to George C. Chase on November 15, 1932 and entitled Automatic control for calculating machines, or the multiplication operation described in the application of A. A. Overbury, Serial No. 634,297, filed September 22, 1932 and entitled Calculating machines.

The invention consists in the novel construction and combination of parts, as set forth in the appended claims.

In the present disclosure, the invention is illustrated as applied to a Monroe calculating machine, constructed substantially in accordance with the above-noted patent and application.

In the accompanying drawings, illustrating the invention:

Fig. 1 is a plan view of a calculating machine constructed in accordance with the invention.

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

Fig. 3 is a left side elevation of the machine, with the casing removed.

Fig. 4 is a detail left side elevation of certain parts seen in Fig. 3, the parts being shown in a position taken during operation.

Fig. 5 is a section, taken on line 5—5 of Fig. 1.

Fig. 6 is a detail face view of a control cam.

Fig. 7 is a detail fragmentary plan view of the carriage shifting keys and worms.

Patent No. 1,888,161, above-referred to, describes means for accomplishing full automatic division by setting the machine in operation subtractively, reversing the numeral wheel actuators, upon over-subtraction in said wheels, and making a single additive cycle, which effects a tens carry to the higher order wheels, the tens carry movement being utilized to determine disengagement of the clutch and shifting of the numeral wheel carriage. During these last named operations, a spring device was also connected with the actuators, to check the momentum thereof after release of the clutch, the reaction of this spring also serving to throw the clutch again into engagement, for subtractive operation in the new ordinal position.

According to the present disclosure, a different form of carriage shifting mechanism is employed from that shown in the above-noted patent, and it has become desirable to retard the operation of the spring device in reengaging the clutch until the carriage shifting devices have been brought to rest.

Upon engagement of a clutch 110, 111 (Fig. 3) the numeral wheel actuators 5 of the machine will be driven, through gearing 74 (Figs. 5 and 2). A parallel train of gears 475 (Fig. 3) connect the motor 587 with the carriage shifting shaft 476 (Figs. 5 and 7). Reversely threaded worms 477 and 478 (Figs. 5 and 7) are supported upon shaft 476 and are adapted to be connected with said shaft by means of clutches 480 and 481, the worms 477 and 478 engaging notches of a rack 479 secured to the carriage 2, and serving upon engagement of the respective clutches to shift the carriage to the right or to the left. The clutches 480 and 481 are of a well known type, adapted for engagement upon displacement of a clutch lever and for disengagement in full cycle position upon contact of the clutch pawls with the restored clutch levers.

In the automatic operations hereinbefore referred to the clutches 111 and 481 are alternately engaged, the disengagement of clutch 111 and engagement of clutch 481 being controlled by the overcarry in the numeral wheels occurring during the corrective additive cycle.

This is accomplished as follows: Upon overcarry movement of the numeral wheels a pawl 25 (Fig. 4), mounted on a rock arm 24, is released and allowed to drop into contact with a second rock arm 22, connected by a link 21 (Fig. 3) with an arm of shaft 154. Shaft 154 is one of the operating shafts of the machine, driven through the gearing 74. Therefore, after the eccentric connection of link 21 with shaft 154 passes through dead center position, (which corresponds with the full cycle position of the actuators 5) arm 22, moving forwardly, will carry arm 24 therewith, and an extension 144 of arm 24 will be raised and a suitable cam face of said extension, acting on a pin 145 of the compound clutch lever 111, will disengage said lever from the cooperating clutch member and free the actuators from the motor drive. At the same time a spring 28 attached to arm 24, will absorb the momentum of the moving parts and thereafter restore these parts to full cycle position. During the forward movement of arm 24, lever 47, fulcrumed upon said arm, will be carried forwardly, and a cam end of the lever will engage a roller 50 mounted upon link 21, whereby the lever 47 will be operated to displace a lever 52. Lever 52 is loosely mounted on a shaft 482 and has an extension adapted to engage a pawl 483 of an arm 484 rigidly secured upon shaft 482, so that upon movement of lever 52 shaft 482 will be rocked. Shaft 482 has connection 485 with a left hand shift key lever 486, this lever being similar to the right hand shift key lever 487 illustrated in Fig. 5. The shift key levers have operating connections 507 with connecting rods 488 attached to the clutch levers 489 and 490 of the clutches 480, 481. Therefore, upon move-

ment of shift key lever 486 through shaft 482, clutch lever 490 will be moved and clutch 481 will be engaged, to shift the carriage one space toward the left.

In order to continue the operation, in the new ordinal position, the retraction of the actuator mechanism by the spring 28 is utilized to reengage the clutch lever 111. This is accomplished by a pin 220 (Fig. 4) carried in an arm of shaft 154, contacting with a tooth 209 mounted upon one of the elements of the compound lever 111. As the parts are returned, through full cycle position, pin 220 will engage tooth 209 and throw lever 111 into engagement with the clutch element 110, to connect the actuator train 74 with the motor and rotate said train in a subtractive direction.

In order that clutch 111 may not be reengaged until the carriage shifting operation is completed and the carriage shift clutch disengaged, a notched disk 491 (Fig. 5) is secured upon shaft 154, and a check arm 492 is pivotally mounted on the frame of the machine. As arm 24 moves forwardly, a lug of check arm 492 will drop into the notch of disk 491, said disk at this time rotating counter-clockwise as viewed in Fig. 5. During the return movement of arm 24, disk 491 will be rotated in a clockwise direction, bringing a cam shoulder of the notch of said disk against the lug of check arm 492. At this time the carriage shifting clutch 481 is approaching its full cycle position, and a cam 493 (Fig. 6), fast to said clutch will engage a second lug of check arm 492, raising the first mentioned lug out of engagement with the wall of the notch, the cam angle of said wall providing for free movement of the arm 492.

Means are provided for breaking the circuit of the electric motor when the machine is not in operation, and in order that the circuit may remain closed during a carriage shifting operation as well as a registering operation, two circuit breakers 381 and 494 are provided (Figs. 2 and 3) in parallel motor circuits. A lever 200 controls the contacts of circuit breaker 381, this lever having cam faces engaged by a pin of clutch lever 111, so that when said lever is moved to engaging position a roller 380 will engage the contacts and close the circuit. The contacts of circuit breaker 494 are controlled by a lever 495, engaged by the clutch levers 489 and 490 and movable thereby to engage said contacts, as the clutches are engaged.

The levers 489 and 490 after releasing the clutch, and being themselves released by the control means, will ride upon the periphery of the clutch drums, until allowed to drop into position of rest at the full cycle position of the drums.

In order to provide for a slight clearance between the teeth of the gears of the numeral wheel train which are mounted in the carriage and of the gears which are mounted in the frame of the machine, a slide 496 (Fig. 2) is provided on the frame of the machine, said slide having a roller 497 engaging a track bar of the carriage. The keys 486 and 487 contact with a bail 498 extending across the front of the machine, said bail having an extension at its right hand end engaging a trigger 499, and adapted to move said trigger when either key is depressed, to release a spring operated lever 500, engaging a pin of slide 496, to raise the carriage and hold it in raised position until the registering means is again operated. Upon operation of the registering means a cam 501, driven by the gear train 74 will contact with lever 500 and restore the same to normal position, where it will be latched by trigger 499, whereupon the carriage will be allowed to seat in registering position.

Bail 498 is also utilized as an interlock between the registering and shifting mechanism, the left hand end of said bail having an extension cooperating with a lug 502 (Fig. 3) of lever 200. When clutch lever 111 is moved into engaging position, lug 502 of lever 200 will be brought into the path of movement of the extension of bail 498 locking the keys 486 and 487 and the carriage shifting mechanism controlled thereby in inoperative position. In order to locate the carriage 2 accurately in registering position, a slide rod 503 (Fig. 7) is mounted in the frame of the machine and engaged by an arm 504 of bail 498. The rear end of rod 503 engages one of a series of notches 505 in a bar of the carriage 2. As bail 498 is rocked upon depression of a carriage shift key, rod 503 will be pulled out of engagement with the notch 505, and when bail 498 returns to normal position the beveled end of rod 503 will engage the walls of the aligned notch, and move the carriage into exact aligned position. Rod 503 also serves to hold the carriage in position as adjusted.

In operations other than multiplication and division, certain of the mechanism herein described is designed to control the actuator mechanism, but in this case, no automatic operation of the carriage shifting mechanism should occur. Therefore, when the multiplication-division lever 201 stands in inoperative position, as seen in Fig. 3, the pawl 483 will be held by a bar 217 connected with said lever out of the path of movement of lever 52, so that no automatic operation of shaft 482 will occur.

I claim:

1. In a calculating machine having a transversely shiftable carriage, numeral wheels thereon and differential actuators for said wheels; motor drive means including an actuator driving train, a clutch in said train, a carriage shifting train, and a clutch in said train, and control means including devices operable automatically to release the actuator clutch and to engage the carriage shift clutch, spring devices operable to reengage the actuator clutch, and a speed regulator operable to retard the effective movement of the reengaging devices during the carriage shifting action.

2. In a calculating machine having a transversely shiftable carriage, numeral wheels thereon and differential actuators for said wheels, motor drive means including an actuator driving train, a clutch in said train, a carriage shifting train, and a clutch in said train, and control means including devices operable automatically to release the actuator clutch and to engage the carriage shift clutch, spring devices operable to reengage the actuator clutch, and a speed regulator including a cam driven by the carriage shifting train and operable to retard the effective movement of the reengaging devices during the carriage shifting action.

AUSTIN A. OVERBURY.