Oct. 1, 1929. A. A. HORTON 1,730,147

CALCULATING MACHINE

Filed June 25, 1926 3 Sheets-Sheet 1

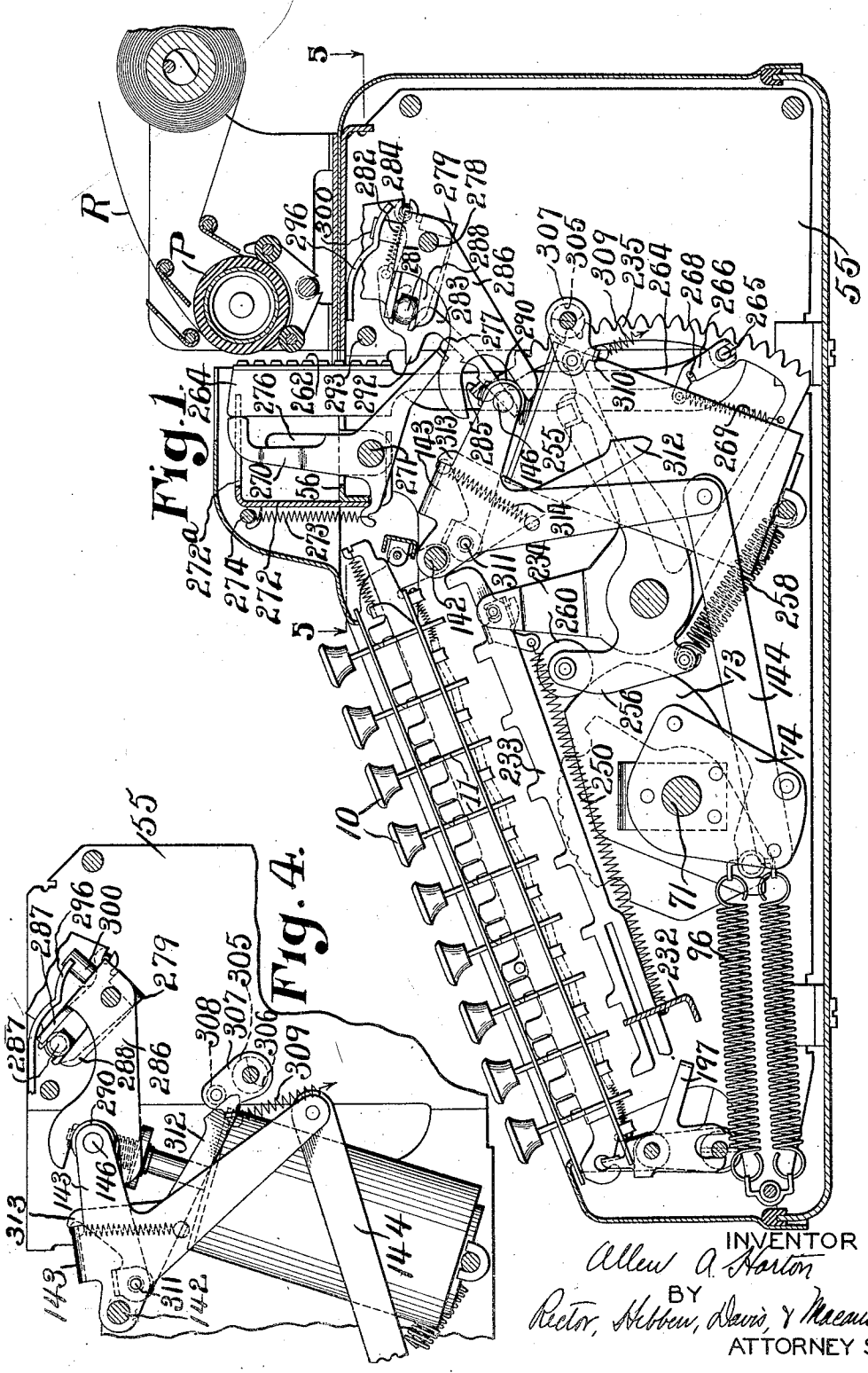


Fig. 1.

Fig. 4.

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Fig. 2.

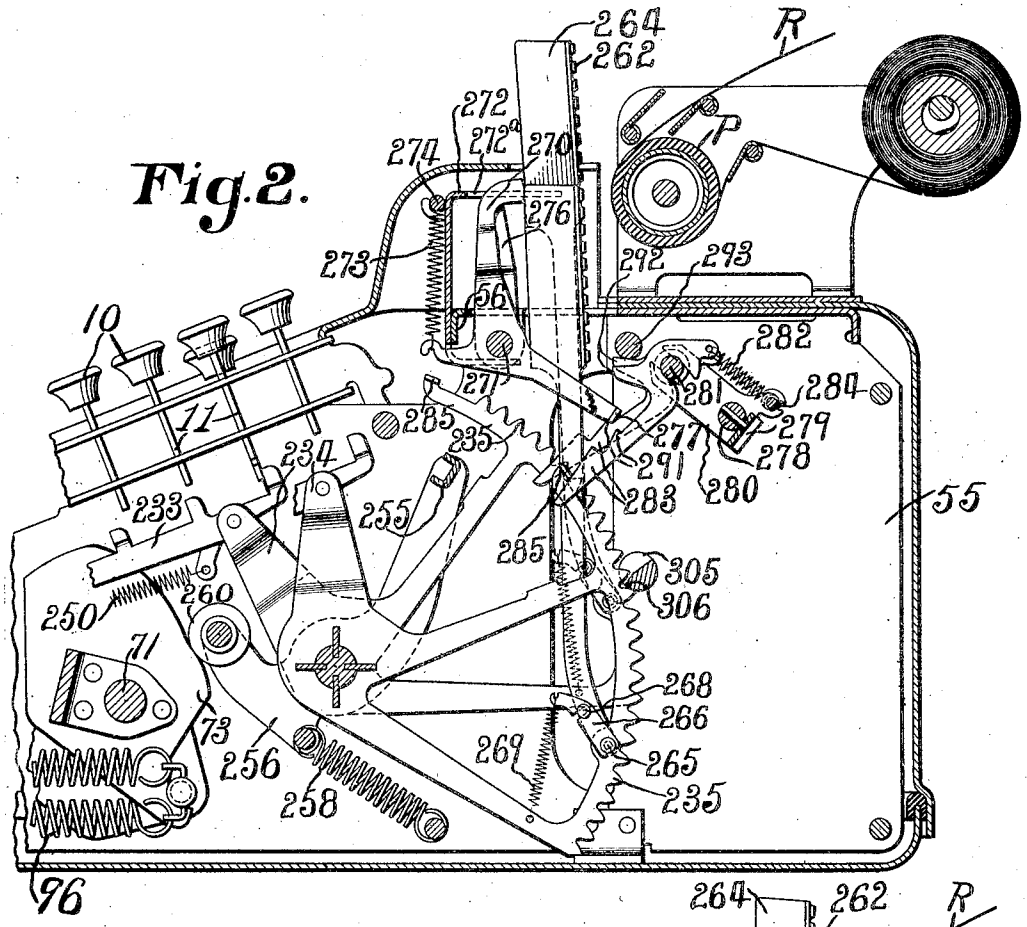


Fig. 3.

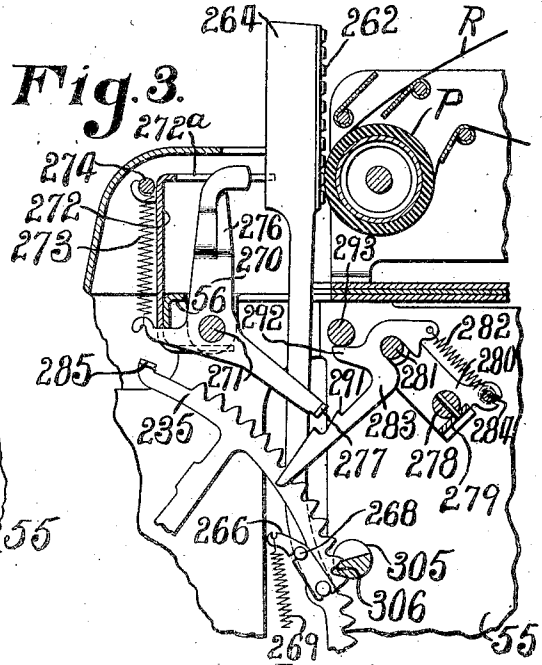
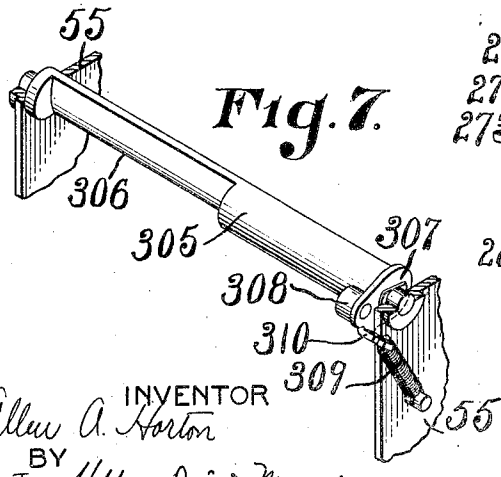


Fig. 7.



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Filed June 25, 1926 3 Sheets-Sheet 3

Fig. 5.

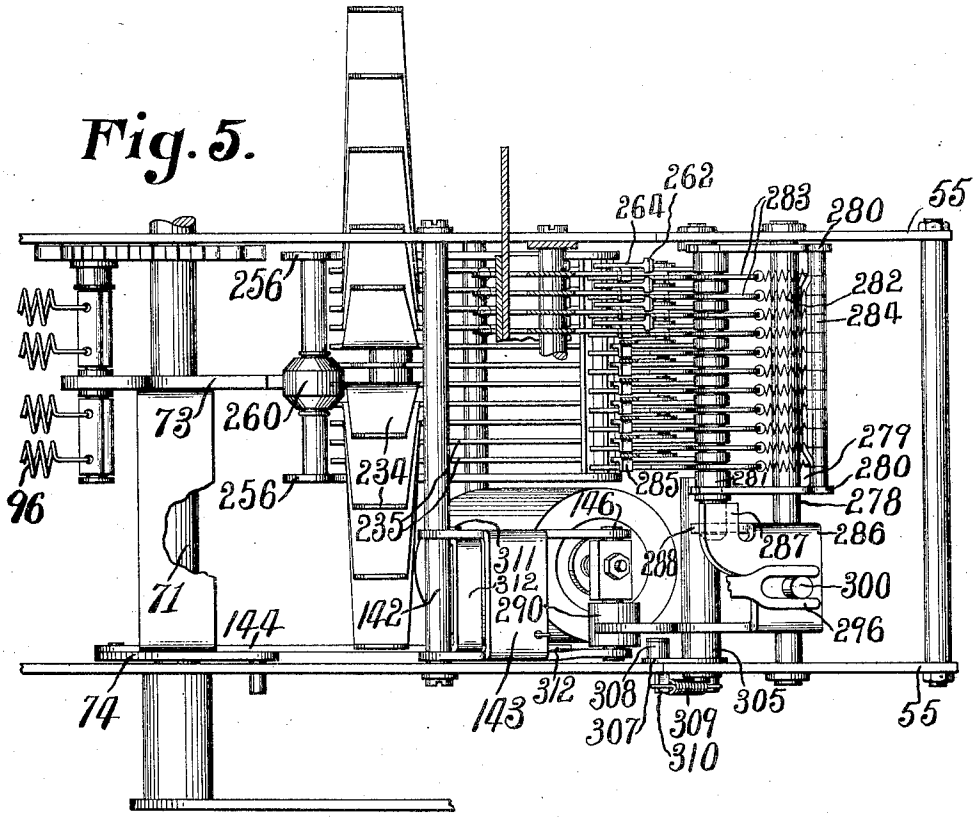
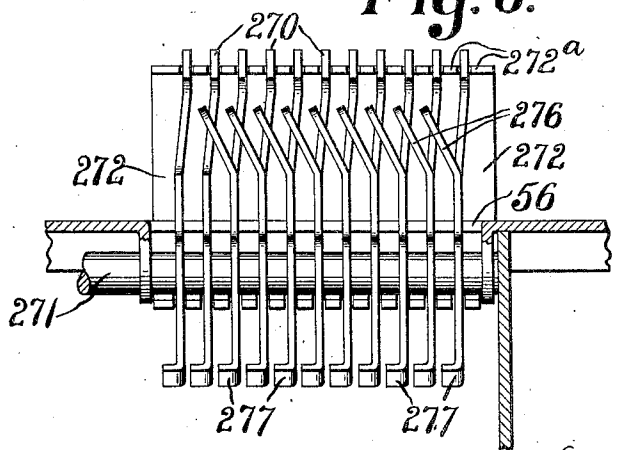


Fig. 6.



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UNITED STATES PATENT OFFICE

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CALCULATING MACHINE

Original application filed January 29, 1926, Serial No. 84,616. Divided and this application filed June 25, 1926. Serial No. 113,411.

The invention relates to a calculating machine. It is concerned primarily with the printing mechanism of such a machine, the present application being a division of my copending application, Serial No. 84,616, filed January 29, 1926.

The invention has for its general object the provision of an improved printing mechanism for a calculating machine. Some of its more particular objects are to provide an improved construction, mounting and operation of the cocking latches of a printing mechanism; to provide an improved connection between the type bars and the actuator segments; to provide an improved means for causing ciphers to be printed at the proper places to the right of a number that may be printed, and to provide an improved aligning device for aligning the type bars prior to printing.

Other objects and advantages of the invention will hereinafter appear.

An embodiment of the invention is illustrated in the drawings in which:

Fig 1 is a side elevation of the machine with the parts not pertinent to the printing mechanism omitted.

Fig. 2 is a partial side elevation similar to Fig. 1 showing the parts of the mechanism in different positions.

Fig. 3 is a fragmentary side elevation showing the position of the parts after the printing hammers have been fired.

Fig. 4 is a fragmentary side elevation showing the means for throwing the printing mechanism into and out of action and the means for actuating the aligning device.

Fig. 5 is a sectional plan view on the line 5—5 of Fig. 1.

Fig. 6 is a rear elevation of the type hammer section.

Fig. 7 is a perspective view of the aligning bar.

Inasmuch as the present application is directed particularly to the printing mechanism and associated parts, the general features and operation of the machine will be described only briefly, reference being made to said copending application for details. In so far as possible the same reference numerals will be used in this application as are used in the copending application to designate the same parts.

The machine has a plurality of banks of amount keys 10 having stems 11 which project through the keyboard and are adapted to be positioned in the path of differentially located stops on the stop bars 233. There is one of these stop bars for each bank of amount keys, their forward ends being slidably mounted in a comb plate 232 and their rear ends being connected to the vertical arms 234 of the actuator segments or racks 235 which operate the totalizer or counter pinions. The stop bars are urged forward by springs 250 but are normally held against such movement by the bail 255 which contacts the actuator segments. When the bail is raised the segments and stop bars move to differential positions determined by the amount keys that have been depressed.

The machine is driven by a main shaft 71 that is given a forward and a return stroke, the return stroke being assisted by the springs 96 which are tensioned during the forward stroke. Connected to the driving shaft 71 is a restoring cam 73 against which bears a cam roller 260 carried by the arms 256 of the bail 255. The bail is normally urged counter-clockwise by a spring 258 but is prevented from so moving by contact of roller 260 against cam 73. When the cam is moved to the position illustrated in Fig. 2, movement of the bail is permitted.

A zero stop 197 is provided for each of the stop bars 233 to prevent movement of the bars for banks in which no amount key is depressed. These zero stops normally occupy the position illustrated in Fig. 1,—that is, they are out of the path of the movement of the stop bars, but, as described in my copending application, when the machine is operated, the zero stop for each bank of keys in which no amount key has been depressed moves up into position to prevent movement of its respective stop bar while the zero stops for banks in which amount keys have been depressed are prevented from moving to a blocking position.

From this description it will be clear that,

when the machine is given a forward stroke, the bail 255 is raised and the springs 250 rotate the actuator segments 235 in a counter-clockwise direction to differential positions which are determined by the engagement of the stop bars 233 with the depressed amount keys. On the return stroke the bail 255 restores all the segments and stop bars to their normal positions.

Pivotally mounted on each actuator segment 235 is a type bar 264 provided with printing types 262 for printing on a record strip R fed about a platen P. A novel pivotal connection has been provided between the type bars and the actuators which includes a pin 265 on the bar projecting through a hole in the segment. This pin is held in place by a short arm 266, the lower end of which is bifurcated to engage a groove in the pin. The arm 266 is also provided with a notch engaging over a pin 268 on the type bar and a spring 269 holds the arm in the position shown in Fig. 1, one end of this spring being connected to the arm and the other to the actuator segment. This construction provides a connection which permits the type bars to be very easily connected to and disconnected from the actuators. The spring 269 performs an additional function and that is, it not only retains the connecting arm 266 in its assembled position, but it urges the type bar forwardly to its normal position and restores it to such position whenever it is moved rearwardly by the hammers which strike it to print on the record strip.

When the actuator segments 235 are moved differentially under the control of the amount keys, the type bars 264 are raised to bring the corresponding type to the printing line and the type bars are then struck by suitable hammers for the purpose of making a printing impression, the construction of such hammers and the means for actuating them being as follows:

The hammers 270 are pivoted on a rod 271 supported by depending ears struck downwardly from the plate 56. Riveted or otherwise secured to the forward depending flange of the plate 56 is a U-shaped plate 272, the rearwardly extending flanges of which form a comb plate 272a in the slots of which the hammers 270 project. The upper ends of the type bars 264 also project into the slots in the comb plate which thus guide the hammers and prevents lateral displacement of the type bars. The vertical arms of the hammers 270 are provided with noses normally engaging the forward upper edges of the type bars 264. The hammers are also provided with forwardly extending hooks to which the lower ends of springs 273 are connected, the upper ends of the springs being connected to a rod 274 carried by arms projecting forwardly from the comb plate 272. The hammers are provided with downwardly and rearwardly extending arms having lateral projections 277.

The tripping mechanism for the hammers includes a yoke-shaped member 279 fixed to a rock shaft 278 that is journaled in the side plates 55. The member 279 has forwardly extending arms 280 which carry at their forward ends a cross rod 281 on which is mounted a plurality of cocking latches 283, one for each hammer 270, the latches being provided with notches which fit over the rod. The rear ends of the latches 283 are connected to the forward ends of spring 282 which are connected at their rear ends to a small rod 284 seated in notches in extensions on the arms 280 of the yoke 279. These springs tend to normally urge the latches in a clockwise direction and they also act to return the tripping unit to normal position as will be later described. The forward ends of the cocking latches 283 normally extend under lateral lugs 285 on the actuator segments 235.

The rock shaft 278 is operated by a yoke shaped member 286 (Fig. 4) pivoted on it to the right of the yoke 279 (Fig. 5) and having a projection 287 which extends over the right hand end of the rod 281. The yoke shaped member 286 also has a projection 288 extending under the right hand end of the rod 281. The right hand side arm of the yoke 286 is provided with a forked end straddling a roller 290 on a rod 146 which is carried by a yoke member 143 pivoted at 142 and connected by a link 144 to the drive plate 74 operated by the main shaft 71. The yoke 286 is slidably mounted on shaft 278 and it is provided with a pin 300 (Fig. 4) on its top side that is straddled by a forked lever 296 by means of which the yoke can be slid to the right to move the projection 288 out from under shaft 281 which puts the printing mechanism in a non-operating condition.

The cocking latches 283 normally engage the lateral lugs 285 on the actuator segments 235 as shown in Fig. 1. Whenever any of these segments are moved counter-clockwise, as when they assume differential positions in the operation of the machine, the springs 282 for the corresponding latches 283 rock the latter about the shaft 281 to carry shoulders 291 on the latches in front of the lateral projections 277 on the hammers 270. The position of the parts is illustrated in Fig. 2 where the units rack has not been released but the tens rack has been and the tens latch 283 has moved up to position to engage its hammer.

The machine is timed so that after the type bars 264 have been differentially positioned by the actuators the roller 290 engages the upper projection on the forked arm 286 and rocks it clockwise which also rocks the arms 280 clockwise which carries the cocking latches 283 upward and rearwardly and the shoulders

291 on the latches which have been released engage the projections 277 on their hammers and thereby cock the hammers. Near the end of the clockwise movement of the arms 280 projections 292 on the cocking latches 283 engage a cross rod 293 which cams them counter-clockwise about the rod 281 with the result that the shoulders 291 are carried out of engagement with the projections 277 on the hammers as shown in Fig. 3 whereupon the springs 273 snap the hammers rearwardly. The type bars are held in engagement with the noses of their respective hammers by the springs 269 and when the hammers are cocked the type bars follow them forwardly. As the hammers are fired the type bars are carried with them, the hammers being stopped by the engagement of the projection at their lower ends with the plates 56 and 272 but the type bars are thrown rearwardly against the paper strip with a percussive blow to print the amount set up in the machine. The type bars are drawn back to normal by the springs 269. As the actuators are restored, their projections 285 engage the latches 283 and move them to normal position.

After a printing impression has been made, and as the roller 290 moves downwardly, the springs 282 which are under tension with the latches 283 held against clockwise movement by rod 293, rock the arms 280 counter-clockwise, as viewed in Fig. 3, to normal position. The springs thus serve to return the tripping unit to normal position as well as to urge the latches toward latched position.

It will be observed that the latches 283 are cocked during the forward stroke of the machine when the operator is positively moving the handle rather than during the return stroke when the springs 96 are returning the mechanism to normal.

In order to print the ciphers in an amount to be printed, each hammer 270 in the amount section, except that of the lowest order, is provided with a laterally inclined projection 276 extending behind the hammer of next lower order. Accordingly any hammer that is cocked cocks all of those to the right of it in the amount section that have not been cocked and ciphers are printed by all type bars to the right that have not been positioned to print other digits. The first hammer at the right of the series is for character printing and it fires independently.

It is desirable to align the type bars while a printing impression is being taken and for this purpose a novel aligning bar 305 has been provided which aligns both the actuating segments 235 and the type bars 264. This bar is in the form of a rock shaft journaled at its ends in the side plates 55 and cut away longitudinally to form an aligning edge 306. Fixed on the shaft 305 is an arm 307 carrying a roller 308. A spring 309 normally serves to hold the shaft 305 in the position shown in Figs. 1 and 7 with a lug 310 on the arm 307 in engagement with the forward edge of the frame plate 55. Pivoted on a rod 311 carried by the yoke-shaped member 143 which is operated by the drive plate 74 of the machine is a lever 312 having a projecting arm or shoulder 313 which is held in engagement with the rear edge of the cross bar of the member 143 by a spring 314. When the member 143 is moved counter-clockwise by the plate 74 during the forward stroke of the machine, the spring 314 causes the lever 312 to move with it and, near the end of this movement, the end of the lever 312 engages the roller 308 (Fig. 4) and rocks the shaft 305 to turn its aligning edge 306 between the teeth on the actuating segment as shown in Figs. 2, 3 and 4. This aligns the segments and with them the type bars. After a printing impression has been made and during the return stroke of the machine the lever 312 is lowered by the member 143 and the spring 309 rocks the shaft 305 out of its aligning position.

The action of this aligning shaft is quite positive in that it acts quickly with a hammer-type movement and positively engages the teeth to forcibly align the segments and type bars. It also prevents the aligning shaft and segments from locking and thus insures that the segments will always be released. The retracting movement is a rolling action away from the segments and away from the direction in which they tend to move in returning to normal.

It is understood that the construction shown is for purposes of illustration only and that variations may be made in it without departing from the spirit and scope of the invention as defined by the claims.

I claim:

1. The combination in a calculating machine of a series of actuators, means for moving said actuators from normal to differential positions. a type bar for each actuator, a printing hammer for each type bar, a cocking latch for each hammer, means for moving the cocking latches to cock the hammers, said latches being held out of engagement with the hammers by said actuators when in normal position but released when the actuators are moved from normal position, tripping projections on the latches, and means for engaging the tripping projections.

2. The combination in a calculating machine of a plurality of actuating segments having projections, a pivoted tripping hammer for each segment, a pivoted cocking latch for each hammer, each of said latches being normally held out of engagement with its hammer by the projection on its actuating segment, means for moving the cocking latches as the machine is operated to cause the latches which have been released by their segments to engage the hammers to cock them,

and a tripping stop for tripping the latches to fire the hammers.

3. The combination in a calculating machine of a series of printing hammers, a cocking latch for each hammer, a tripping device for the latches, means for moving the latches into engagement with the hammers and the tripping device, actuators movable by operation of the machine from normal to differential positions, said actuators being connected with the latches to prevent the latches from engaging the hammers and tripping device when the actuators are in normal position, and means for moving the latches released by the actuators to a position to cause them to engage the hammers and the tripping device when they are moved by the first moving means.

4. The combination in a calculating machine of a series of printing hammers, a cocking latch for each hammer, means for moving the latches into engagement with the hammers, actuators movable by operation of the machine from normal to differential positions, said actuators having portions which engage the latches to prevent them from engaging the hammers, and means for moving the latches when they are released by the actuators to a position to cause them to engage the hammers when the latches are moved by the first moving means.

5. The combination in a calculating machine of a series of printing hammers, a cocking latch for each hammer, a bodily movable shaft upon which said latches are pivoted, means for moving the shaft, actuators movable by operation of the machine from normal to differential positions, means for urging the latches about their pivots in a direction to position them to engage the printing hammers, projections on said actuators for preventing the latches from moving to hammer engaging position when the actuators are in normal position but releasing said latches when the actuators are moved to their differential positions, and a tripping device for moving the latches on their pivots when they are moved bodily with said shaft while in engagement with the hammers.

6. The combination in a calculating machine of a series of pivoted printing hammers, a cocking latch for each hammer having a projection for engaging the hammer, a shaft on which said latches are pivoted, means for moving the shaft bodily, means for urging the latches in a direction to cause them to engage the hammers, actuating segments movable by operation of the machine from normal to differential positions, said actuating segments having projections engaging the latches to prevent the latches from engaging the hammers while the segments are in normal position but releasing the latches where the segments are moved from normal position, said latches having tripping projections, and a tripping stop engaging said tripping projections to turn the latches on their pivots against the action of the urging means to disconnect them from the hammers.

7. The combination in a calculating machine of a plurality of actuators, a series of printing hammers, a series of cocking latches for engaging said hammers controlled by said actuators by direct engagement therewith, a shaft on which said latches are mounted movable bodily in response to operation of the machine for moving the latches that have been released by the actuator segments into engagement with the hammers, and a tripping stop for disengaging the latches from the hammers after they have moved the hammers to firing position.

8. The combination in a printing mechanism for calculating machines of a series of type bars adapted to be differentially positioned, a series of hammers for striking the bars, cocking means for each of said hammers and means associated with said hammers for causing the hammer that is cocked to cock all the hammers of the series to the right of it to cause zeros to be printed by all type bars to the right which have not been positioned by operation of the machine.

9. The combination in a calculating machine of actuating segments each having a projection, pivoted printing hammers having arms, pivoted latches each having a tripping projection and a projection for engaging the arm of its respective hammer, said latches being normally held out of engagement with the arms and being guided past said arms by the projections on the actuating segments but being released for engaging the latches when the actuator segments are moved, means for moving the latches in one direction to cock the hammers, and a stop for engaging said tripping projections after the latches have moved a predetermined amount to rock the latches in the opposite direction to release the hammer arms to fire the hammers.

10. The combination in a calculating machine of a plurality of actuating devices movable against key stops when released by operation of the machine, zero stops for said devices to prevent movement of all released devices for which a stop key has not been depressed, printing type bars connected with said devices and movable to different positions corresponding to the positions of the actuating devices, printing hammers for each type bar, cocking means for each hammer governed by movement of the respective actuating device with which it is associated, and means for tripping each cocking means, said hammers being inter-connected with each other so that the cocking of any hammer cocks all of those to the right of it to cause all the type bars to the right which

have not been moved by their segments to print zeros.

11. The combination in a calculating machine of a series of latches for cocking the printing hammers of a printing mechanism, means for moving the latches in a direction to cock the hammers, and means for urging the latches toward a position to engage the hammers, said urging means serving to return the moving means to normal position after it has been moved.

12. The combination in a calculating machine having a printing mechanism of a plurality of latches for cocking the printing hammers of said printing mechanism, means for moving the latches in a direction to cock the hammers, and springs normally urging said latches toward a position to engage the hammers, said springs serving to return the moving means to normal position.

13. The combination in a calculating machine provided with a printing mechanism having printing hammers of a series of latches for cocking the hammers, a shaft on which said latches are pivoted, means for moving the shaft to move the latches bodily, and spring means for normally urging the latches about their pivots on the shaft, said spring means also serving to return the shaft to normal position.

14. The combination in a calculating machine provided with a printing mechanism having printing hammers of a series of latches for cocking the hammers, a swinging shaft on which said latches are pivoted, means engaging the ends of the latches on one side of the shaft preventing movement of the latches about their pivot in one direction, and springs connected to the ends of the latches on the other side of the shaft, the swinging movement of said shaft being away from the line between the points where the latches are restrained and the anchors of the springs.

15. The combination in a calculatng machine provided with a printing mechanism having printing hammers, of a series of latches for cocking said hammers, a shaft on which said latches are pivoted, pivoted arms carrying said shaft, springs connected to said latches on one side of the shaft, the other ends of said springs being connected to an anchoring shaft carried by said arms, actuator segments having projections engaging the end of the latches on the opposite side of the shaft, said latches having projections for engaging the printing hammers and projections for engaging a tripping stop, and a tripping stop positioned to engage the tripping projections when the latches are moved bodily with the shaft to thereby turn the latches on their pivots against the action of the springs.

16. The combination in a calculating machine having printing mechanism of a type-bar adapted to occupy a normal position removed from a platen, a member to which said type bar is disconnectably connected, a latch for holding the bar in connected position, and a spring for holding the latch in connecting position, said spring also serving to hold the bar in its normal position.

17. The combination in a calculating machine having a printing mechanism of an actuating segment, a type-bar disconnectably connected to said segment, a latch for holding the bar connected to the segment, and a spring for holding the latch in connecting position and for holding the bar in a position removed from the platen of the printing mechanism.

18. The combination in a calculating machine having a printing mechanism of an actuating segment, a type-bar pivoted to said segment by a disconnectable pivot, a latch for maintaining said pivotal connection, and a spring connected to the segment and the latch for holding the latch in connecting position and for holding the type-bar in a position removed from the platen of the printing mechanism.

19. The combination in a calculating machine of a series of type bars, means for differentially positioning the same, a series of hammers, means for retracting the hammers and firing them, means for maintaining the type bars in engagement with the hammers as they are retracted, and stopping means for suddenly stopping the hammers as they are fired while permitting the type bars to move forward.

20. The combination in a calculating machine of a series of pivotally mounted elongated type bars, means for differentially positioning said bars, a series of hammers, retracting means normally maintaining said type bars in engagement with said hammers, means for retracting and firing said hammers, said retracting means for the type bars serving to move the type bars about their pivots to maintain the bars in engagement with the hammers as the latter are retracted, and stopping means for limiting the movement of the hammers as they are fired but permitting the type bars to move forward to make an impression, said retracting means serving to return the type bars to normal position.

21. The combination in a calculating machine having actuator racks and means for differentially positioning said racks, of means for aligning said racks after they have been differentially positioned comprising a pivoted member having an aligning edge adapted to engage between the teeth of said racks, and means for rocking said member on its pivot to turn said aligning edge out of engagement with said racks, said member being pivoted so that as it is turned, said aligning edge moves away from said racks in the direction of their movement in returning from their differential positions.

22. The combination in a calculating machine provided with actuator racks having a forward and a return stroke of movement and means for moving said racks, of means for aligning said racks in their different positions comprising a pivoted member having an aligning edge adapted to engage between the teeth of said racks, and means for rocking said member on its pivot to turn said aligning edge into and out of engagement with said racks, said member being pivoted so that as it is turned to move its aligning edge into engagement with the racks said edge moves in an arc toward said racks and in the direction of their forward movement and when said member is moved to turn the aligning edge out of engagement with the racks, said edge moves in an arc away from said racks and in the direction of their return movement.

23. The combination in a calculating machine having a series of toothed actuator racks and means for differentially positioning said racks; of means for aligning said racks after they have been differentially positioned comprising a pivoted member having a tooth-shaped aligning edge adapted to tightly engage in the spaces between the teeth of the actuator racks, said member being pivoted on an axis close to the path of movement of the actuator rack teeth, and means for moving said member to turn said aligning edge into mesh with the teeth of the racks in the direction of movement of the racks when moving to differential positions and for turning said aligning edge out of mesh with the teeth in the direction of movement of the racks in returning from their differential positions.

24. The combination in a calculating machine of a series of actuator racks, means for differentially positioning said racks, and an aligning means comprising a shaft positioned adjacent the teeth of the racks and having a cut-away portion through which the racks normally move, said cut-away portion forming an aligning edge which, when the shaft is rocked, moves into engagement with the teeth of the racks to align them.

25. The combination in a calculating machine provided with toothed actuator racks and means for moving said racks to different positions, of means for aligning said racks in their different positions comprising a rockable shaft extending across said racks adjacent their toothed edges, the portion of said shaft adjacent said racks being of substantially semi-circular cross section, and means for turning said shaft on its axis to turn the edge of said semi-circular portion into engagement with the racks to align them.

26. The combination in a calculating machine provided with toothed actuator racks having a forward and a return stroke of movement and means for moving said racks, of means for aligning said racks in their different positions comprising a rockable shaft extending across said racks adjacent their toothed edges, the portion of said shaft adjacent said racks being of substantially semi-circular cross section, and means for turning said shaft on its axis to turn one of the edges of its semi-circular portion into and out of engagement with said racks, said turning means acting when turning said shaft into engagement with said racks, to turn its engaging edge in the direction of forward movement of said racks and when turning said shaft out of engagement with said racks to turn its engaging edge in the direction of the return movement of said racks.

In testimony whereof, I have subscribed my name.

ALLEN A. HORTON.