Sept. 16, 1930. E. KUHRT 1,776,076

PRINTING MECHANISM FOR CALCULATING MACHINES

Original Filed Sept. 11, 1920 3 Sheets-Sheet 1

Fig. 1.

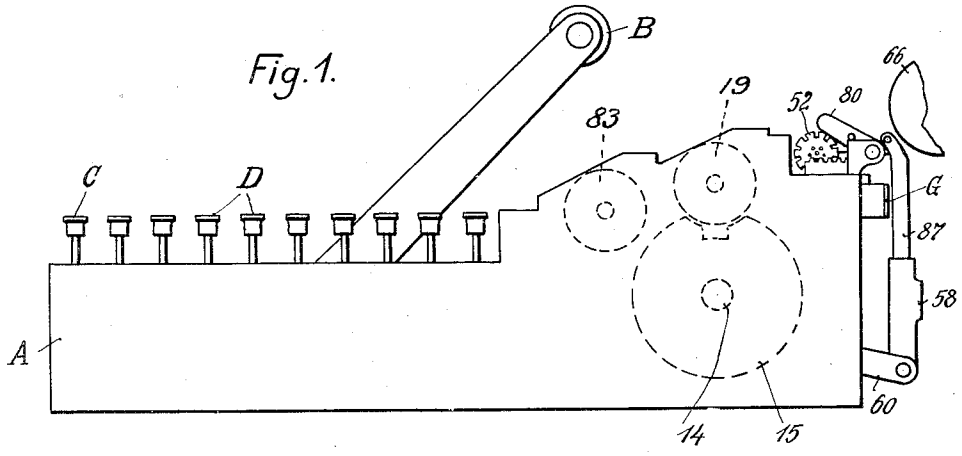
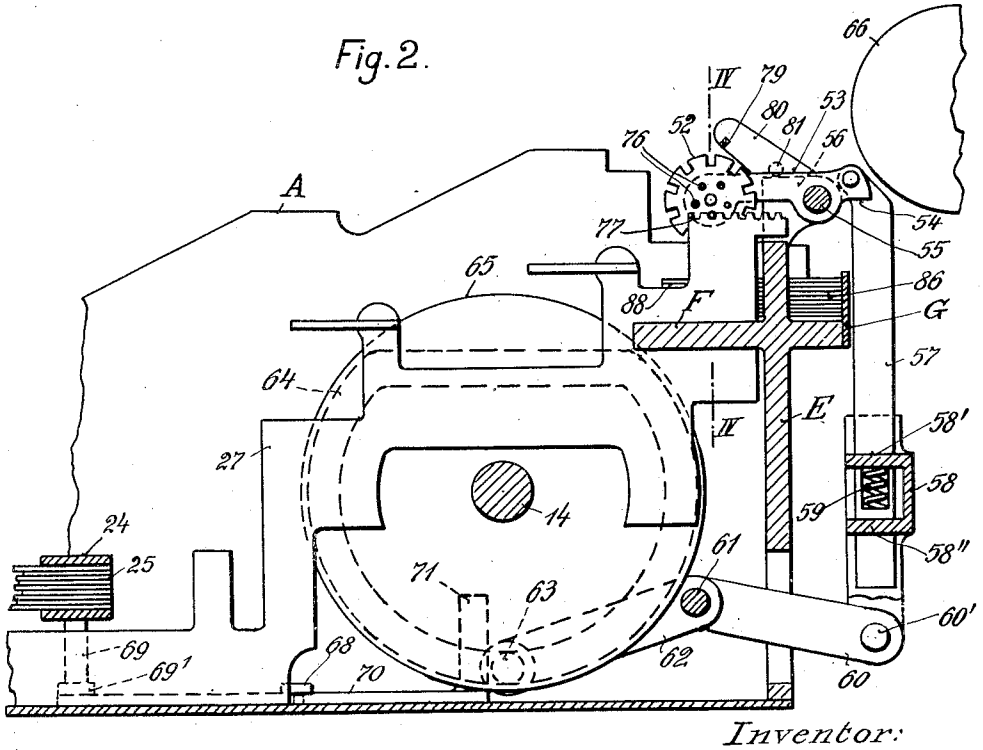


Fig. 2.



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Fig. 3.

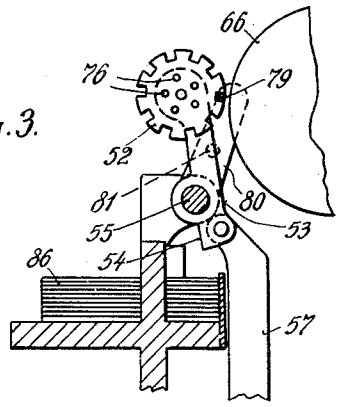
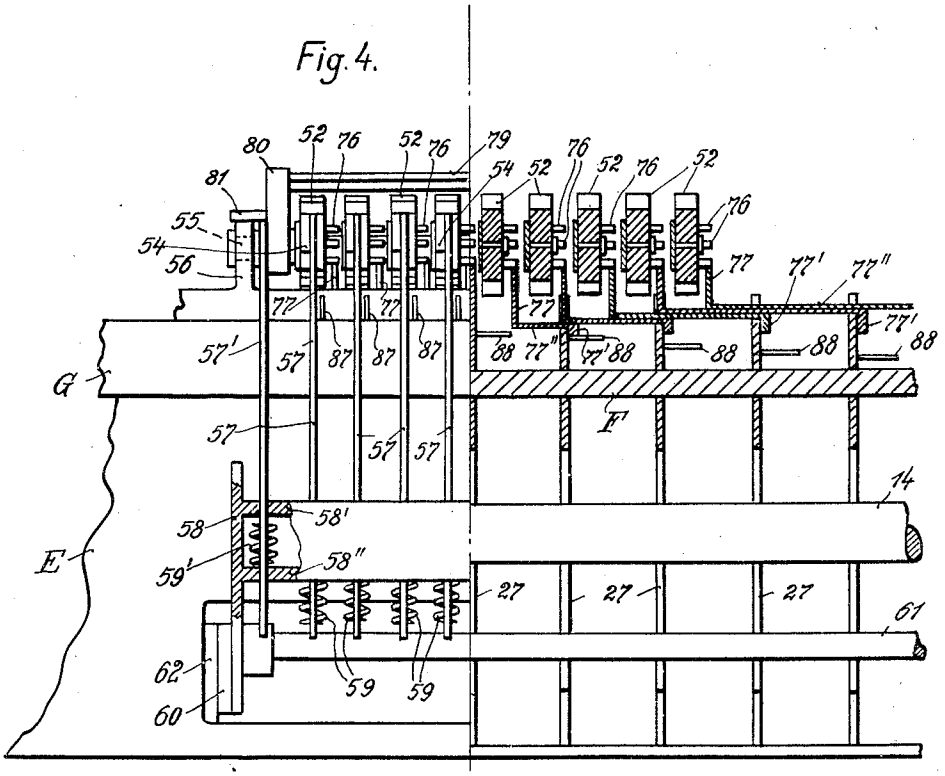


Fig. 4.



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PRINTING MECHANISM FOR CALCULATING MACHINES

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Fig. 5.

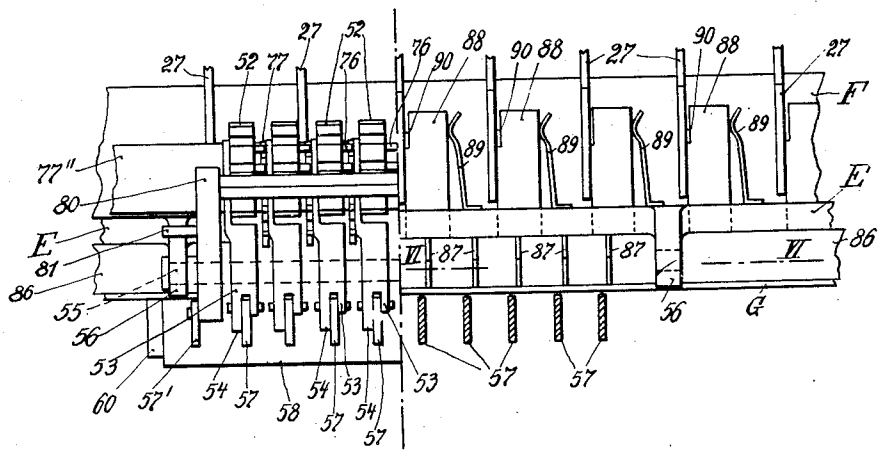


Fig. 6.

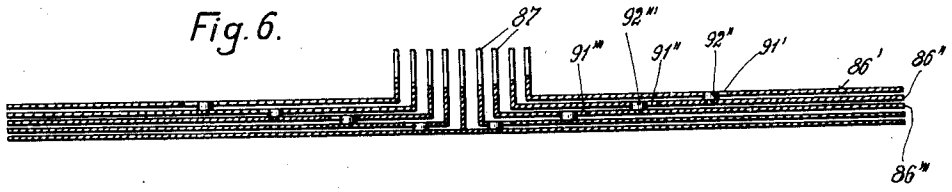


Fig. 7.

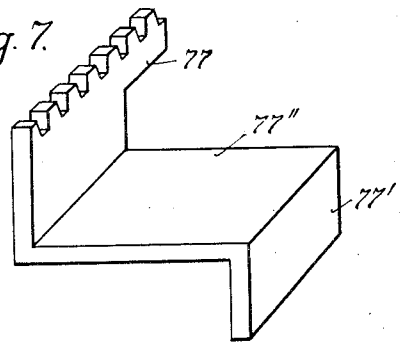
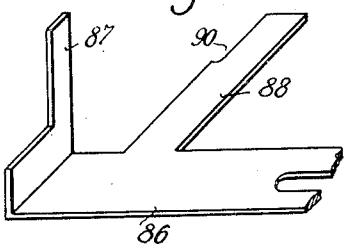


Fig. 8.



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Patented Sept. 16, 1930

1,776,076

UNITED STATES PATENT OFFICE

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PRINTING MECHANISM FOR CALCULATING MACHINES

Original application filed September 11, 1920, Serial No. 409,748, and in Germany September 13, 1919. Divided and this application filed November 2, 1927. Serial No. 230,553.

My invention relates to printing mechanism for calculating machines of any kind, adding machines, cash registers, and the like. It is an object of my invention to provide a mechanism of this kind which while permitting an unobstructed survey of the field of observation, does not involve the drawbacks of mechanisms which have already been suggested for the same purpose.

To this end, while providing rocking type carriers instead of slides, similarly to the mechanism aforesaid, I so design the type carriers that each of them is operated independently of the others. In this manner I reduce the weight of moving parts and obtain clear impressions as compared with the aforesaid mechanisms where all type carriers are moved in unison for each printing operation so that not only the inertia forces are considerable but also the clearness of the impression is interfered with, as the several type carriers, being rigidly connected, are unable to yield to unevenness of the surface printed upon.

In the accompanying drawings, a printing mechanism embodying my invention is illustrated diagrammatically by way of example in combination with a calculating machine, but it is to be understood that I am not limited to its combination with any particular type of machine.

In the drawings

Fig. 1 is a diagram showing the outline of a calculating machine, and some of the parts within its frame, to which my mechanism is fitted,

Fig. 2 is a section of the mechanism taken on the central vertical plane of the machine,

Fig. 3 is a detail showing one of the type carriers in printing position,

Fig. 4, on the left, is a part end elevation of the mechanism viewed from the right in Fig. 2, and on the right is a section on the line IV—IV in Fig. 2,

Fig. 5, on the left, is a part plan view of the mechanism, and on the right is a part plan view of its controlling parts,

Fig. 6 is a part section on the line VI—VI in Fig. 5, drawn to a smaller scale, showing the checking strips by which those type cylinders which must not partake in the printing, are retained,

Fig. 7 is a perspective illustration of one of the racks for operating the type carriers,

Fig. 8 is a perspective illustration showing the inner end of one of the checking strips illustrated in Fig. 6.

Referring now to the drawings, and first to Fig. 1, A is the frame of a calculating machine as described in my co-pending application Serial No. 409,748, B is the crank by which the machine is operated, C are its multiplicator keys, D are its multiplicand keys, 19 and 83 are its dials for multiplication and addition, and for subtraction and division, respectively, 14 is the main driving shaft of the machine to which motion is imparted by means of the crank B and which in turn operates the dials 19, setting wheels 15, and the dials 83 through the medium of parts, not shown, as fully described in my said copending application. 52 are the type cylinders, 66 is a platen, and 60 are two parallel levers by which rocking motion is imparted to the type cylinders.

Referring now to Figs. 2 to 8, the printing mechanism is operated from the main driving shaft 14 of the machine through the medium of a cam way 64 in a disc 65 on the shaft. 63 is a roller at the end of a lever 62 which is carried on a shaft 61 extending along the rear end plate E of the machine, and the parallel levers 60 are keyed on the shaft 61 and fulcrumed at 60′ to the ends of a substantially rectangular frame 58 so that reciprocating motion is imparted to the frame when the roller 63 enters the straight portion of the cam way 64. The reciprocating motion of the frame 58 is transmitted to a set of connecting rods 57 each of which is fulcrumed to the rocking lever 53 of one of the type cylinders 52, the rocking levers being fulcrumed on a shaft 55. 59 are springs inserted in recesses of the connecting rods 57 and abutted, respectively, on the upper and lower bars 58′ and 58″ of the frame 58.

56, 56 are two brackets extending upwardly and rearwardly from the upper edge of the end plate E of the machine, and support-

ing the shaft 55 for the rocking lever 53. 80, 80 are arms, and 79 is a bar, constituting in combination, a U-shaped frame which is also fulcrumed on the shaft 55 so that the type cylinders 52 are surrounded by the frame. The bar 79 of the frame is adapted to enter the gaps between the types of the type cylinders 52 when the cylinders are in their printing position as shown in Fig. 3 so that rotation of the cylinders is prevented after the bar 79 has entered one of their gaps, and at the same time, the printing cylinders are properly aligned.

27 are slides adapted to reciprocate in co-operation with the mechanism of the calculating machine as described in my said co-pending application. Each slide 27 is slotted at its rear end and, with its slot, is supported on a horizontal plate or table F which projects from the front and rear faces of the plate E and extends all over the width of the machine. Each slide at its upper rear end is connected with a rack 77 for engaging pins 76 on the type cylinder, so that upon reciprocation of the slides 27, the type cylinders are rotated in conformity with the movement of the slides. As described in my said co-pending application, the slides for which multiplicand keys D have been depressed, are restrained on their return stroke, that is, when moving to the left in Fig. 2, and they will rotate the type cylinders 52 through a corresponding angle.

Only the rack 77 of the central slide 27 is integral with the slide, while the racks of the other slides are separate parts, as shown in Fig. 7, and attached to the respective slides by means of flanges 77′, the horizontal webs 77″ of the racks extending from the corresponding slide to the corresponding type cylinders 52. This arrangement has been made with the object of reducing the pitch of the type cylinders as compared with the pitch of the slides 27.

The aligning frame 79, 80 is operated from the frame 58 through the medium of two connecting rods 57′, one of which is arranged at either end of the frame 58 as shown in Fig. 4. Each connecting rod 57′ is equipped with a spring 59′, similar to the springs 59, but, the springs 59′ are abutted against the upper face of the transverse bar 58′. 81 are pins projecting from the outer faces of the arms 80 and adapted to rest on the brackets 56 when the parts of the printing mechanisms are in their initial position, as shown in Fig. 2. As the pins project from the outer faces of the frame only, they do not interfere with the rocking motion of the levers 53 with respect to the frame when the parts are moving into the printing position, Fig. 3.

Each rocking lever 53 is equipped with a projection 54 at its rear end, and this projection is adapted to cooperate with a lug 87 on a set of checking strips 86 which are arranged at the rear of the end plate E in a sort of trough which is formed by securing a jib G to the rear edge of the plate or table F. Each checking plate is provided with a tongue 88 which projects in forward direction through a slot in the end plate E, as best seen in Fig. 5. The ends of the tongues 88 are partly cut away at one side as shown at 90, and are provided with springs 89 engaging the other side of the tongue so as to urge them to the left in Figs. 4 and 5. Each strip except the top and the bottom strips is provided with a pin 92 adapted to engage a slot 91 in a strip above. The top strip is only slotted but has no pin, and the bottom strip only has one pin and is not slotted.

The operation of the calculating machine comprises a backward and forward movement of the crank B but the printing mechanism must print only after the dials 19 or 83, as the case may be, have been set, that is, it must be inactive during the setting operation. Means for throwing out the printing mechanism are provided in operative connection with the frame 24 in which the multiplicator carriers 25 are supported, as shown at the left in Fig. 2 and fully described in my said co-pending application. The frame 24 moves to the left and to the right of the machine in time with the rocking movements of the crank B and a connection is provided between the frame 24 and the roller 63 for moving the roller out of the cam way 64 when the frame 24 moves to the right. To this end a pin 69 is provided on the frame 24 and adapted to engage a lug 69′ at the end of a lever 70 which is fulcrumed at 68 on the base plate on the frame A. A blade 71 projects upwardly from the lever 70 and engages a slot in a part of the roller 63 which projects from the cam way 64. When the frame 24 is reciprocating, the blade 71 alternately makes and breaks the operative connection of the roller 63 with the disc 65.

The operation of my printing mechanism is as follows:—

By operating the crank B and through the medium of setting wheels fully described in my said co-pending application and the above mentioned parts which are not shown, respectively, the dials 19 or 83 are set upon the return movement of the slides 27, that is, when the slides move to the left in Fig. 2. As mentioned, those of the slides for which multiplicand keys D have been depressed, are not permitted to return to their initial positions, like those slides for which keys have not been depressed, but are arrested after having performed a given portion of their return stroke. This limited movement of the slides causes corresponding partial rotation of the dial wheels 52 through the medium of the racks 77 and places into printing position those types on the cylinders which correspond to the values for which the dials 19, 83

have been set by their slides. When the straight portion of the cam way 64 engages the roller 63, the lever 62 will be moved upwards, causing downward movement of the pair of levers 60 and of the frame 58 to which the levers are connected by the pivots 60'. All connecting rods 57 in the frame 58 partake in its downward movement under the action of the spring 59, but only those type wheel carrying levers 53 are permitted to perform their printing stroke which are not prevented from doing so by the lugs 87 of the checking strips 86, as will now be described. Referring to Fig. 5, the slides 27 only release the tongues 88 after the slides have moved so far that their ends register with the recesses 90 in the tongue 88, this occurring when a slide has performed a complete return stroke. As mentioned, only those slides 27 are free to perform a complete stroke which are not retained by any of the multiplicand keys D. The ends of those slides 27 which are retained by any multiplicand keys D will not attain the recesses 90 of the corresponding tongues 88, and therefore the checking strip 86 which is allotted to this particular slide, is retained so that its lug 87 remains in the position illustrated in Fig. 4 in which it is beyond reach of the projection 54 of the corresponding type-cylinder lever 53. Therefore the lugs of these strips do not interfere with the upward movement of the printing cylinder 52 when the frame 58 is pulled down by the cam way 64, so that these cylinders move into the printing position shown in Fig. 3. Those strips, however, which are released by the rear ends of the slides 27 registering with their recesses 90, are moved to the right by their springs 89 (the terms "left" and "right" are understood as viewed by the operator and, as Figs. 4 and 5 are viewed from the rear of the machine, the parts will appear to move in opposite direction in these figures, the springs 89 urging the tongues 88 to the left in Fig. 5) so that their lugs 87 will move into the part of the corresponding projections 54 on the levers 53 and the type cylinders of these levers are not permitted to move into printing relation to the platen 66. The movement of the frame 58 is not interfered with by the checking of these type cylinders as the springs 59 of the corresponding connecting rods will be compressed. In the particular case of the numeral "0" being printed at the end of an item, that is, at the right, the checking strips for these printing cylinders by which the numeral "0" is printed, and which are at the right of the strip corresponding to the type cylinder which has printed the last numeral before the "0", are retained by the pins 92, so that they are not permitted to move into the position in which their lugs interfere with the projections 54 and therefore the corresponding type cylinders are moved into printing position the same as those cylinders for which the slides 27 have been arrested on their return stroke. However, those strips, the lugs of which are at the left of a lug which has been retained as described, are not restrained by the pin 92, as these pins are free to move as far as permitted by the slots 91 of the adjacent strips. Movement of those strips to the right is, consequently, not interfered with, and therefore, their lugs are free to move to the right and to arrest the projections 54, as described. For instance, when the second strip 86'' from the top at the right in Fig. 6, (this figure being viewed as "from the operator") has been arrested, its pin 92'' will arrest the top strip 86' against movement to the right as the slot 91' in the top strip extends to the right from the pin 92'' and so this strip is arrested as well as the strip 86''. On the other hand, the pin 92''' of the third strip 86''' from the top is not arrested by the strip 86'' as the recess 91'' in the strip 86'' also extends to the right of the pin 92''' and so the strip 86''' is free to move to the right. Throughout the set of strips, the strip which is above a given strip is arrested against movement to the right when the given strip has been arrested but the strip below the given strip is free to move to the right notwithstanding the arrestation of the strip above it. At the left in Fig. 6, conditions are the same but reversed as compared with those of the right, the slots 91 extending to the left of the pins 92.

When the slides 27 return to their initial positions they force the tongues 88, and consequently the lugs 87, back into the position in which they do not interfere with the reciprocation of the levers 53.

As mentioned, by providing separate type wheels for independent operation, I eliminate the drawbacks of the existing mechanism in which all type carriers must be set in motion when one of them is operated.

When the type cylinders have moved upwards through a given angle, the bar 79 of the frame surrounding the type wheel enters that slot which is at the right of the type to be printed, Figs. 2 and 3, and the frame moves upwards with the printing wheels. The springs 59' of the connecting rods 57' only become active after the bar 79 has been engaged by the type wheels as the upper ends of the spring are at some distance below the upper bar 58' of the frame 58 as shown in Fig. 4 but from this moment the springs 59' act exactly like the springs 59. The bar 79 serves for preventing displacement of the type wheels on their shaft after they have been released by the racks 77, and, at the same time, aligns the types properly so that the numerals will appear in a straight line.

I wish it to be understood that I do not desire to be limited to the exact details of con-

struction shown and described, for obvious modifications will occur to a person skilled in the art.

I claim:—

1. A printing mechanism for calculating machines comprising a set of type cylinders adapted to perform rocking motion about a pivot, and means operatively connected with said calculating machine for imparting independent rocking motion to each type cylinder.

2. A printing mechanism for calculating machines comprising a set of type cylinders adapted to perform rocking motion about a pivot, means operatively connected with said calculating machine for imparting independent rocking motion to each type cylinder, said means comprising a cam disc operatively connected with the calculating machine and defining a cam way, and means operatively connecting said cam way with said type cylinders.

3. A printing mechanism for calculating machines comprising a set of type cylinders, a rocking lever on which each type cylinder is carried, and means operatively connected with said calculating machine for imparting independent rocking motion to each rocking lever.

4. A printing mechanism for calculating machines comprising a set of type cylinders adapted to perform rocking motion about a pivot, and means operatively connected with said calculating machine for imparting independent rocking motion to each type cylinder, and for selectively locking said type cylinders against movement.

5. A printing mechanism for calculating machines comprising a set of type cylinders, a rocking lever on which each type cylinder is carried, means for imparting independent rocking motion to each rocking lever, a projection on each rocking lever, and a set of checks having lugs adapted to be displaced by the calculating machine so as to be moved selectively into the way of said projections.

6. A printing mechanism for calculating machines comprising a set of type cylinders adapted to perform rocking motion about a pivot, and means operatively connected with said calculating machine for imparting independent rocking motion to each type cylinder, and for selectively locking said type cylinders against movement, said locking means comprising super-imposed strips equipped with lugs adapted to cooperate with said type cylinders, defining slots and equipped with pins so that each strip when moved in a given direction, positively imparts movement to certain other strips, so that these strips partake in the locking operation while the remainder of the strips is left stationary.

7. A printing mechanism for calculating machines comprising a set of type cylinders adapted to perform rocking motion about a pivot, means operatively connected with said calculating machine for imparting independent rocking motion to each type cylinder and for selectively locking said type cylinders against movement, said locking means being operatively connected with reciprocating parts of said calculating machine so as to be released for operation in certain positions of the reciprocating parts.

8. A printing mechanism for calculating machines comprising a set of type cylinders adapted to perform rocking motion about a pivot and means for imparting independent rocking motion to each type cylinder, said means comprising a frame to which reciprocating motion is imparted by means operatively connected with said calculating machine, and resilient means intermediate said operatively connected means and said type cylinders.

9. A printing mechanism for calculating machines comprising a set of type cylinders, a rocking lever on which each type cylinder is carried, a connecting rod pivoted to each rocking lever, a frame to which reciprocating motion is imparted by means operatively connected with said calculating machine, and a spring inserted between each connecting rod and said frame.

10. A printing mechanism for calculating machines comprising a set of type cylinders, a rocking lever on which each type cylinder is carried, a pin on which said rocking levers are free to turn, means operatively connected with said calculating machine for imparting independent rocking motion to each rocking lever, a frame surrounding said set of type cylinders and comprising a bar adapted to engage notches in said type cylinders so as to align them, means for supporting said frame so that said bar is disengaged from said type cylinders when said type cylinders are in their inactive position and resilient means connecting said frame with said means for imparting independent rocking motion to each rocking lever so as to hold it in its inactive position but to permit it to move with said type cylinders when they are moving into their active position.

In testimony whereof I affix my signature.

ERNST KUHRT.