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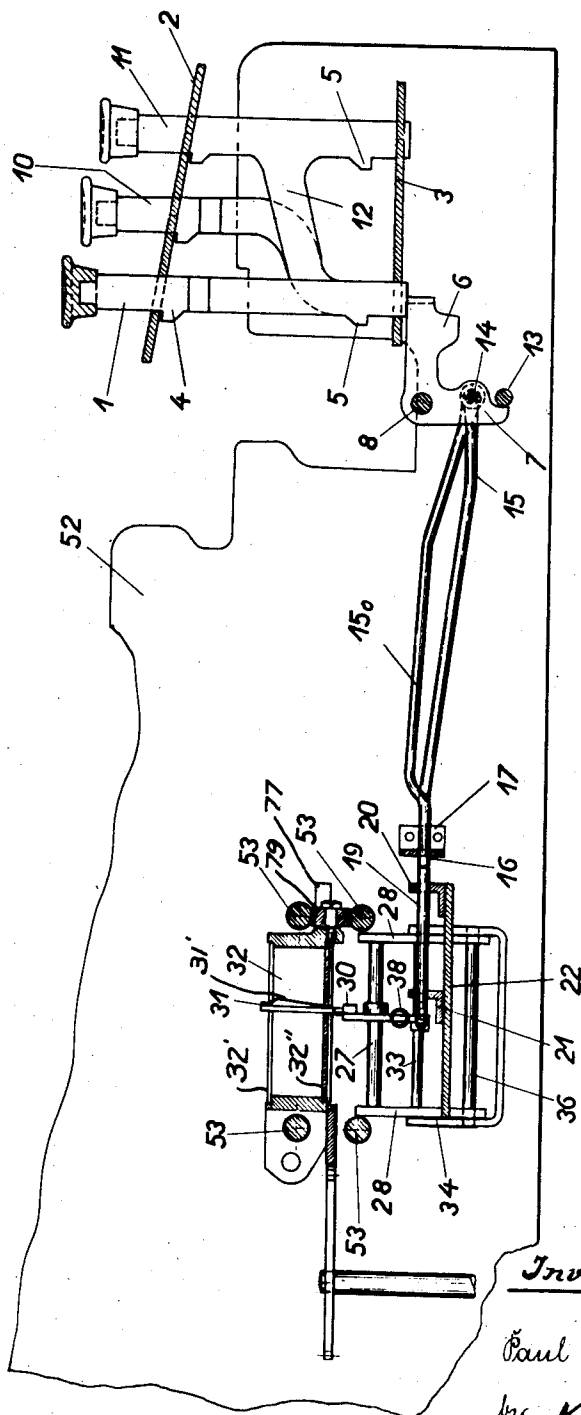
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CALCULATING MACHINE

1,990,350

Filed Aug. 12, 1931

3 Sheets-Sheet 1

Fig. 1



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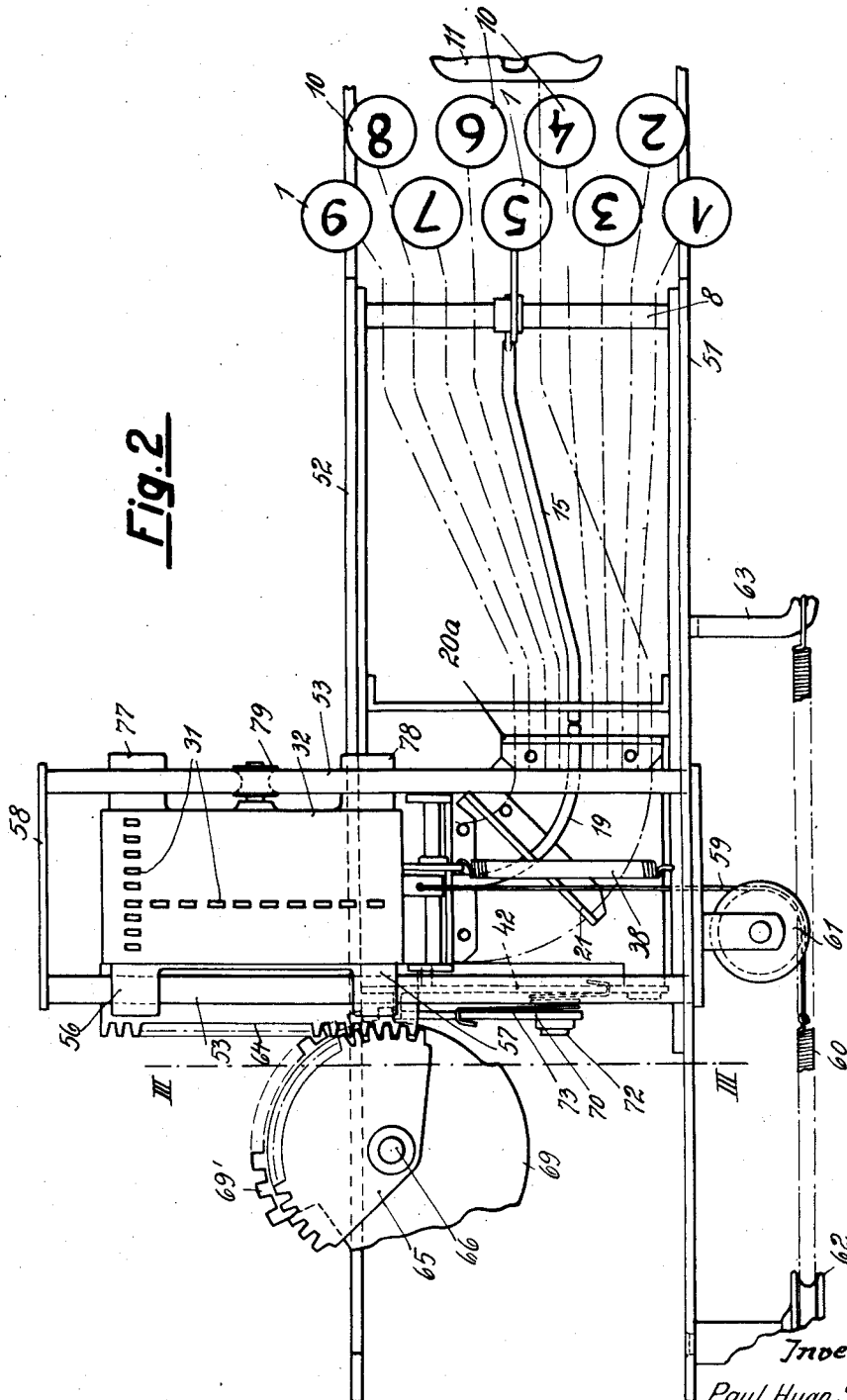
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CALCULATING MACHINE

Filed Aug. 12, 1931

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Fig. 2



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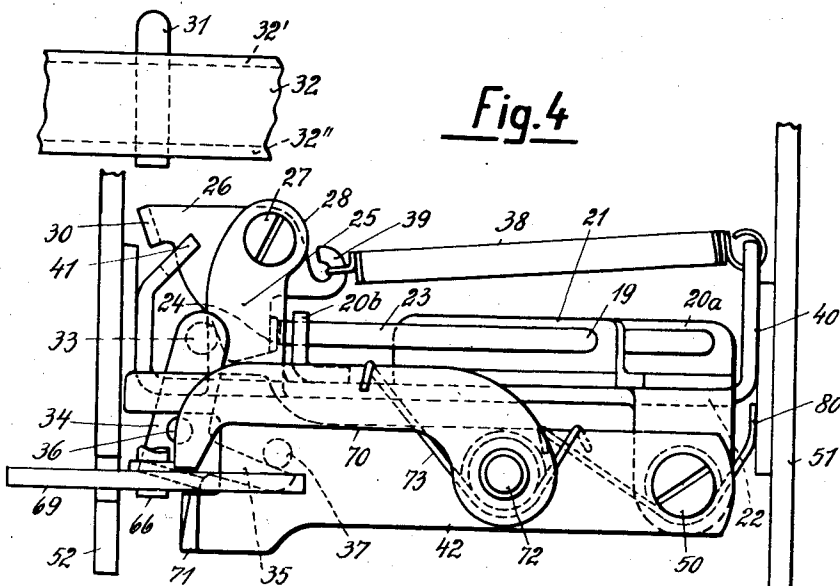
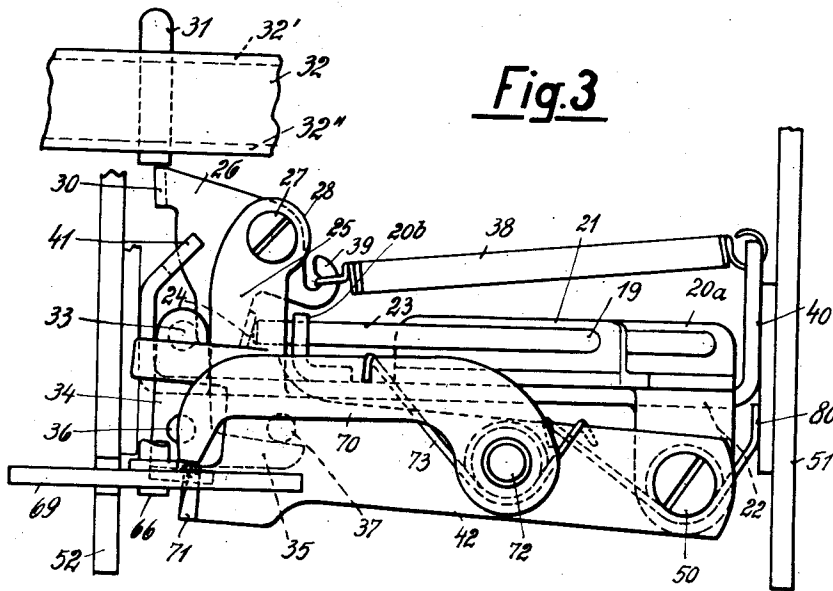
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1,990,350

CALCULATING MACHINE

Filed Aug. 12, 1931

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

1,990,350

CALCULATING MACHINE

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Application August 12, 1931, Serial No. 556,586
In Germany August 21, 1930

11 Claims. (Cl. 235—60)

My invention relates to a calculating machine which may be of the type having ten keys, and means for operating a calculating and a printing mechanism in combination with a carriage which is fed intermittently as often as a key is released.

My invention has particular reference to the transmitting means connecting the keys to the operating mechanism of the calculating set. Heretofore key levers were provided for operation by the keys and the levers in turn operated transversely arranged levers for operating the calculating set and effecting the feed of the carriage upon the release of a key. The carriage moves transversely to the key levers. This system has the drawback that it is very difficult to obtain the required accuracy since the keys and the parts connected to them must perform absolutely uniform movements under absolutely reliable conditions in a very restricted space.

It is an object of my invention to improve the transmitting means intermediate the keys and the operating mechanism with a view to simplifying such means without sacrificing its reliability. To this end I so design the transmitting means that it will transmit movement at an angle from the keys to the mechanism without rotary members such as bevel gears.

Various means may be provided for effecting the transmission, and by way of example transmitting means having thrust members and having tension members will be described.

In a preferred embodiment of my invention I provide bell-crank levers at both ends of the transmitting means. The bell-crank levers at the key end are actuated by the keys and in turn actuate the members of the transmitting means while the bell-crank levers at the mechanism end are actuated by the members and in turn actuate the pins on the carriage. The members of the transmitting means may be of the thrust or tension type, as mentioned, and may be solid or built-up from independent parts adapted to transmit thrust, such as balls. The bell-crank levers at the key end rock in planes at right angles to the planes in which rock the bell-crank levers at the mechanism end. In other words, the planes of the bell-crank levers at the key end extend at right angles to the rows of keys while the planes of the bell-crank levers at the mechanism end extend in parallel to the rows of keys and to the direction in which the carriage is fed. Springs are preferably connected to the bell-crank levers at the mechanism end which by their reaction hold the several cooperating members engaged and force the keys to return to their initial positions.

In the drawings affixed to this specification and forming part thereof my invention is illustrated diagrammatically by way of example as

adapted to a ten-key calculating machine of the general type set out above but it is understood that I am not limited to its adaptation to this particular type of calculating machine.

In the drawings

Fig. 1 is a partly sectional elevation showing the set of keys, the operating mechanism and the transmitting means, and the carriage,

Fig. 2 is a plan view of Fig. 1,

Fig. 3 is a section on the line III—III in Fig. 2, drawn to a larger scale, and

Fig. 4 is a section corresponding to Fig. 3 but showing the parts in another position.

Referring now to the drawings, 1, 10 and 11 are the keys of the machine which are arranged in three rows in the usual manner, as best seen in Fig. 2, and equipped with checks 4 and 5 for limiting their upward and downward movement, and with key plates bearing the numerals from "1" to "0". Allotted to each key is a bell-crank lever with a horizontal arm 6, and a vertical arm 7 which is mounted to rock about a rod 8 in a frame 18 between the side plates 51, 52 of the machine, a transmitting member, or parts constituting such member, as will be described, a bell-crank lever 25, 26 at the opposite end of the member which is mounted to rock about the pivot 27, and a pin 31 on the pin carriage 32. 53, Fig. 1, are four rails on which the carriage 32 is mounted to run in parallel to the rows of keys.

The pin carriage 32 has ninety setting pins 31 but only two rows of setting pins are illustrated. They are recessed and with the shoulder at the upper end of the recess bear on the lower plate 32' of the carriage 32 so that they will not drop out. Springs 31' exert lateral pressure on the pins so that the pins will not chatter. 32' is the upper plate of the carriage. The pin carriage 32 has two eyes 56 and 57 for guiding it on the rails 53 at the left viewed as in Fig. 1. At the right it has two projections 77 and 78 with a roller 79 between them which supports the carriage on the lower rail 53. The two projections 77 and 78 may be equipped with means (not shown) for indicating the position of the carriage at the key board.

59 is a tension member such as a steel band, which is attached to the inner end of the pin carriage 32, and 61 is a sheave which is mounted to rotate on the outer face of the left side plate 51 and about which the member 59 is taken to one end of a spring 50 whose free end is taken to a pin 63 on the side plate 61 about a sheave 62, which is also mounted to rotate on the side plate 51. The spring tends to pull the carriage 32 to the left.

64 is a rack on the pin carriage and 65 is a toothed sector on the upper end of a vertical shaft 66 which meshes with the rack 64. 69 is a locking member which is equipped with trapeze teeth 69' as shown in Fig. 2. 42 is a pawl which

is mounted to rock about a pin 50 projecting downwards from a base plate 22 mounted between the side plates 51 and 52, as best seen in Fig. 3. 80 is a spring which tends to turn the pawl 42 anti-clockwise. Mounted to rock about a pin 72 on the pawl 42 is a catch 70 the free end of which is adapted to engage a vertical projection 71 at the free end of the pawl 42, and 73 is a spring which urges the free end of the catch 70 toward the projection 71. 37 is a pin on the pawl 42 by which the pawl is raised when one of the keys is depressed, as shown in Fig. 3. When the pawl 42 is raised its catch 70 moves out of engagement with the tooth 69' of the locking member 69 it had engaged, and the shaft 66 is rotated by the action of the spring 60 on the carriage 32. However, the locking member 69 is arrested after having rotated through the pitch of one tooth by engaging with the projection 71. When the key which has been depressed, is released, the corresponding bell-crank lever 25, 26 is returned into its initial position by its spring 38 and the pin 37 on pawl 42 is released. The pawl and the frame 34, with the lever 35, return into their initial position under the action of spring 80. The projection 71 now releases the locking member 69, as shown in Fig. 4, but the catch 70 bears on the upper face of the locking member until it engages the interstice of the two subsequent teeth 69'. In this manner the pin carriage 32 is fed step by step in time with the depression of the keys.

The bell-crank levers 6, 7 are of equal size for all keys and the free ends of their horizontal arms 6 are formed with lugs at right angles thereto for the corresponding key to bear on. It will appear from Fig. 1 that the keys 1 in the first row are straight while the keys 10 in the second row are crooked and the only key 11 in the third row is provided with a forward extension 12 so that the ends of all keys which cooperate with the lugs on the arms 6, are in a single row. 9, Fig. 2, are distance sleeves on the rod 8 for holding the bell-crank levers 6, 7 against lateral displacement. 13 is a check for the rocking movement of the vertical arms 7 toward the operator's side.

The bell-crank levers 25, 26 are mounted to rock about a rod 27 in bearings 28 projecting upwards from the base plate 22. The rod 27 extends at right angles to the rod 8 of the bell-crank levers 6, 7. The vertical arm 25 of each bell-crank lever is equipped with a lug 24, Fig. 3, at right angles thereto, for the corresponding transmitting member to bear on, as will be described, and with a hook 39 for a pull-back spring 38 the opposite end of which is anchored in a bracket 40 extending upwards from the base plate 22. 30 is a lug at right angles to the free end of the horizontal arm 26 of each bell-crank lever for cooperation with the pins 31 of the carriage 32. 41 is a rack at the end of a bracket on the base plate 22 opposite the bracket 40 in which the horizontal arms 26 engage for distancing the bell-crank levers 25, 26. 33 is a bar which extends at right angles at the rear of the vertical arms 25 and is supported by the two upright arms of a horseshoe frame 34 fulcrumed at 36. 35 is an arm which extends to the operator's side from the pivot 36 about which the frame 34 is mounted to rock. The arm 35 engages below the pin 37 on the pawl 42 and controls the pawl 42 and its catch 70 for cooperation with the locking member 69. In this manner, as often as a key is depressed, the corresponding pin 31 on the

carriage is operated and when the key is released the carriage 32 moves on for one step.

Referring now particularly to Figs. 1, 2 and 3, 15 are substantially straight thrust members each of which is pivoted to the vertical arm 7 of a bell-crank lever 6, 7 at 14, and guided in a perforated bar 17 in the frame 18 at its other end 16. The thrust member 15 of the "0" key 11 extends to the left of the machine from its bell-crank lever 6, 7, as indicated in dot-and-dash lines in Fig. 2 where only the member 15 of the "5" key 1, being in a central position, is shown in solid lines, and therefore is crooked as shown in Fig. 1 so as to be free of the members of the "1", "3", "2", and "4" keys. Mounted to slide in three perforated guide bars 20a, 21, and 20b on the base plate 22, as best seen in Fig. 2, are curved thrust transmitting members 19 which in the present instance form arcs of 90 degrees. A curved transmitting member is allotted to each straight member 15, with the rear end 16, Fig. 2, of the straight member engaging the front end of the corresponding curved transmitting member. The opposite end 23 of each curved transmitting member cooperates with the lug 24 at the vertical arm 25 of the corresponding bell-crank lever 25, 26.

When a key is depressed, its bell-crank lever 6, 7 pushes to the rear the straight thrust member 15 to which it is connected at 14 and the end 16 of the thrust member 15 pushes the corresponding curved transmitting member 19 so that its end 23 moves beyond the guide 20b, rocks the corresponding bell-crank lever 25, 26 and operates a pin 31 on the carriage 32. At the same time the arm 25 engages the bar 33 of the horseshoe frame 34 which through the medium of the arm 35 and the lever 42 prepares the carriage 32 for feeding. The rocking movement of the lever 25 puts tension on its spring 38 and the reaction of the spring pressure not only causes the ends of the curved transmitting member 19 to be held firmly in contact with the parts with which they are in engagement but also returns the key into its initial position as soon as it is released, by rocking the corresponding vertical arm 7 toward the operator's side until it is arrested by the check 13 when the key is released the carriage 32 is fed for one step.

It will be understood that the strokes of the 50 keys and the parts operatively connected to them, and particularly the strokes of the bell-crank levers, are equal throughout the machine. There is no slack in the mechanism due to the reaction of the springs 38 and the pins 31 are operated positively. The reaction of the springs 38 is equally distributed all over the parts so that the touch of all keys is equally soft.

It will be understood that the mechanism including the transmitting means and the bell-crank levers is a self-contained unit in its frame 18 between the side plates 51 and 52 so that if it is desired to remove the mechanism for inspection or repair, all its parts will come out at a time with the frame 18.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

I claim:

1. A calculating machine comprising a set of keys, setting mechanism controlled by said keys and arranged at an angle to the rows of keys in said set, and means including shiftable straight and curved thrust transmitting members for

transmitting movement from said keys to said mechanism.

2. A calculating machine comprising a set of keys, setting mechanism controlled by said keys and arranged at an angle to the rows of keys in said set, and means including, per key, a straight thrust transmitting member adapted to be displaced in a straight line, and a curved thrust transmitting member with means for guiding its ends in straight lines at an angle to each other; for transmitting movement from said keys to said mechanism.

3. A calculating machine comprising a set of keys, setting mechanism controlled by said keys and arranged at an angle to the rows of keys in said set, means including shiftable straight and curved thrust transmitting members, and bell-crank levers at said mechanism and at said keys; for transmitting movement at an angle from said keys to said mechanism.

4. A calculating machine comprising a set of keys, setting mechanism controlled by said keys and arranged at an angle to the rows of keys in said set, and means including, per key, a straight thrust transmitting member adapted to be displaced in a straight line, a curved thrust member with means for guiding its ends in straight lines at an angle to each other; a bell-crank lever adapted to be engaged by the key at one arm, and to engage said straight member by its other arm, and a bell-crank lever adapted to be engaged by said curved member at one arm, and to engage a member of said mechanism by its other arm; for transmitting movement from said keys to said mechanism.

5. A calculating machine comprising a set of keys, setting mechanism controlled by said keys and arranged at an angle to the rows of keys in said set, and means including, per key, a straight thrust transmitting member adapted to be displaced in a straight line, a curved thrust transmitting member with means for guiding its ends in straight lines at an angle to each other; a bell-crank lever adapted to be engaged by the key at one arm, and to engage said straight member by its other arm, a bell-crank lever adapted to be engaged by said curved member at one arm, and to engage a member of said mechanism by its other arm, and a pull-back spring connected to said last-mentioned bell-crank lever tending to hold the arm which is engaged by the third member in contact with said member; for transmitting movement from said keys to said mechanism.

6. A calculating machine comprising a set of keys, setting mechanism controlled by said keys and arranged at an angle to the rows of keys in said set, and means including, per key, a straight thrust transmitting member adapted to be displaced in a straight line, a curved thrust transmitting member with means for guiding its ends in straight lines at an angle to each other; a bell-crank lever adapted to be engaged by the key at one arm, and to engage said straight member by its other arm, a bell-crank lever adapted to be engaged by said curved member at one arm, and to engage a member of said mechanism by its other arm; a pull-back spring connected to said last-mentioned bell-crank lever tending to hold the arm which is engaged by the third member in contact with said member; for transmitting movement from said keys to said mechanism, and a check on each key for limiting its return stroke under the action of its pull-back spring.

7. A calculating machine comprising a set of

keys, operating mechanism controlled by said keys and arranged at an angle to the rows of keys in said set, and means including, per key, a straight thrust transmitting member adapted to be displaced in a straight line, a curved thrust transmitting member with means for guiding its ends in straight lines at an angle to each other; a bell-crank lever adapted to be engaged by the key at one arm, and to engage said straight member by its other arm, a bell-crank lever adapted to be engaged by said curved member at one arm, and to engage a member of said mechanism by its other arm; for transmitting movement from said keys to said mechanism, and a frame in which said members and bell-crank levers are mounted.

8. A calculating machine comprising a set of keys, setting mechanism controlled by said keys and arranged at an angle to the rows of keys in said set, means including, per key, a straight thrust transmitting member adapted to be displaced in a straight line, a curved thrust transmitting member with its ends guided in straight lines at an angle to each other, a bell-crank lever adapted to be engaged by the key at one arm, and to engage said straight member by its other arm, a bell-crank lever adapted to be engaged by said curved member at one arm, and to engage a member of said mechanism by its other arm; for transmitting movement from said keys to said mechanism, and means operatively connected to said last-mentioned bell-crank levers for feeding the carriage of said calculating means.

9. A calculating machine comprising a set of keys, setting mechanism controlled by said keys and arranged at an angle to the rows of keys in said set, means including, per key, a straight thrust transmitting member adapted to be displaced in a straight line, a curved thrust transmitting member with its ends guided in straight lines at an angle to each other, a bell-crank lever adapted to be engaged by the key at one arm, and to engage said straight member by its other arm, a bell-crank lever adapted to be engaged by said curved member at one arm, and to engage a member of said mechanism by its other arm; for transmitting movement from said keys to said mechanism, and means operatively connected to said last-mentioned bell-crank levers including a bar on one arm of a bell-crank lever adapted to be engaged by said last-mentioned bell-crank levers, and a pin adapted to be engaged by the other arm of said last-mentioned bell-crank levers; for feeding the carriage of said calculating means.

10. A calculating machine comprising a set of keys, setting mechanism controlled by said keys and arranged at an angle to the rows of keys in said set, and means including, per key, a straight thrust transmitting member adapted to be displaced in a straight line, means for guiding one end of said straight member, a curved thrust transmitting member with means for guiding its ends in straight lines at an angle to each other; means for guiding said curved member at a point intermediate said end guiding means; for transmitting movement from said keys to said mechanism.

11. A calculating machine comprising a set of keys, setting mechanism controlled by said keys and arranged at an angle to the rows of keys in said set, and means including curved thrust-transmitting members for transmitting movement from said keys to said mechanism.