No. 725,242. PATENTED APR. 14, 1903.

N. GOLDFARB.

CALCULATING MACHINE.

APPLICATION FILED JULY 24, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig: 1.

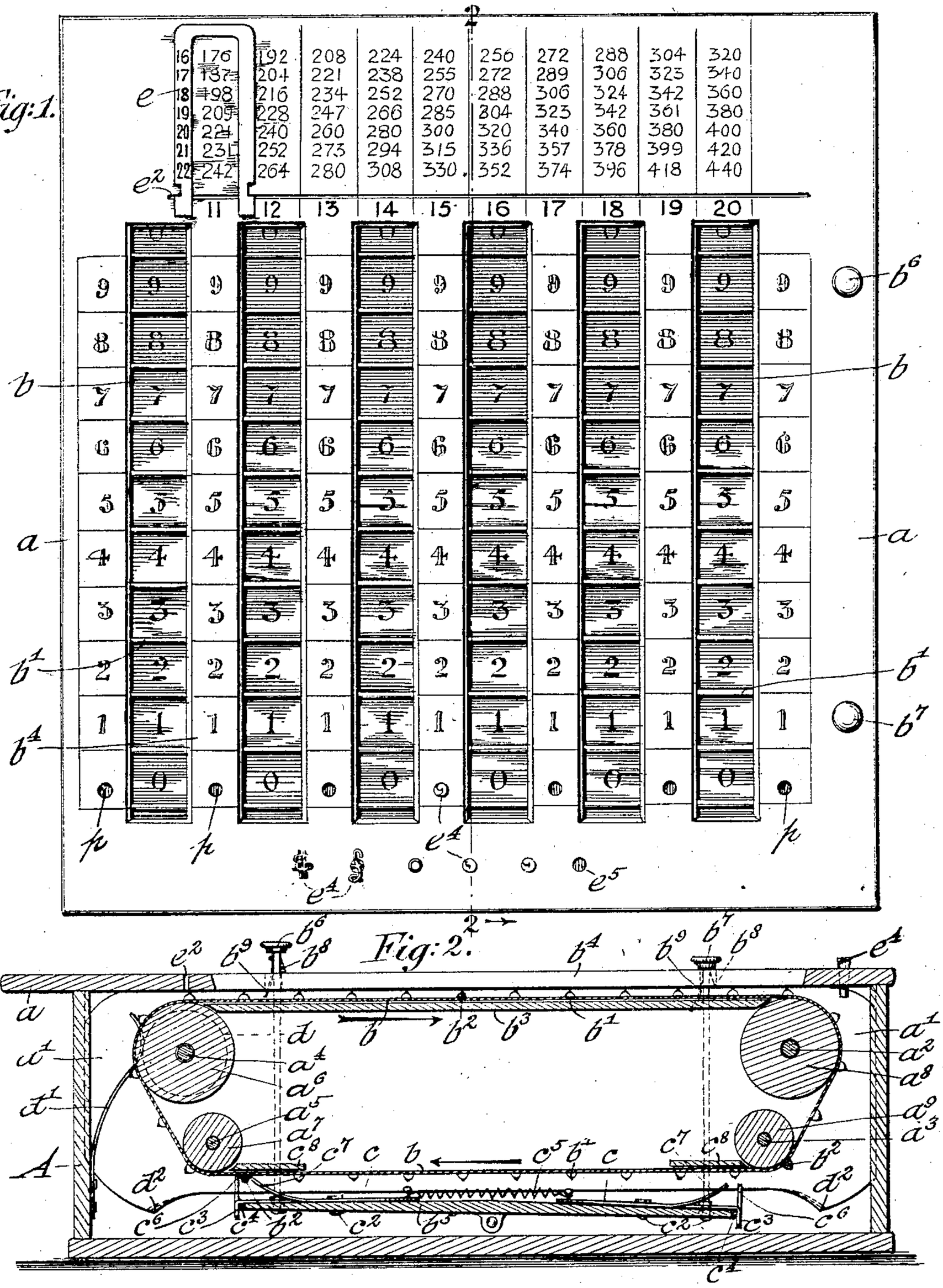

Fig: 2.

Fig: 6.

Fig: 5.

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CALCULATING MACHINE.

APPLICATION FILED JULY 24, 1902.

NO MODEL. 2 SHEETS—SHEET 2.

Fig: 3.

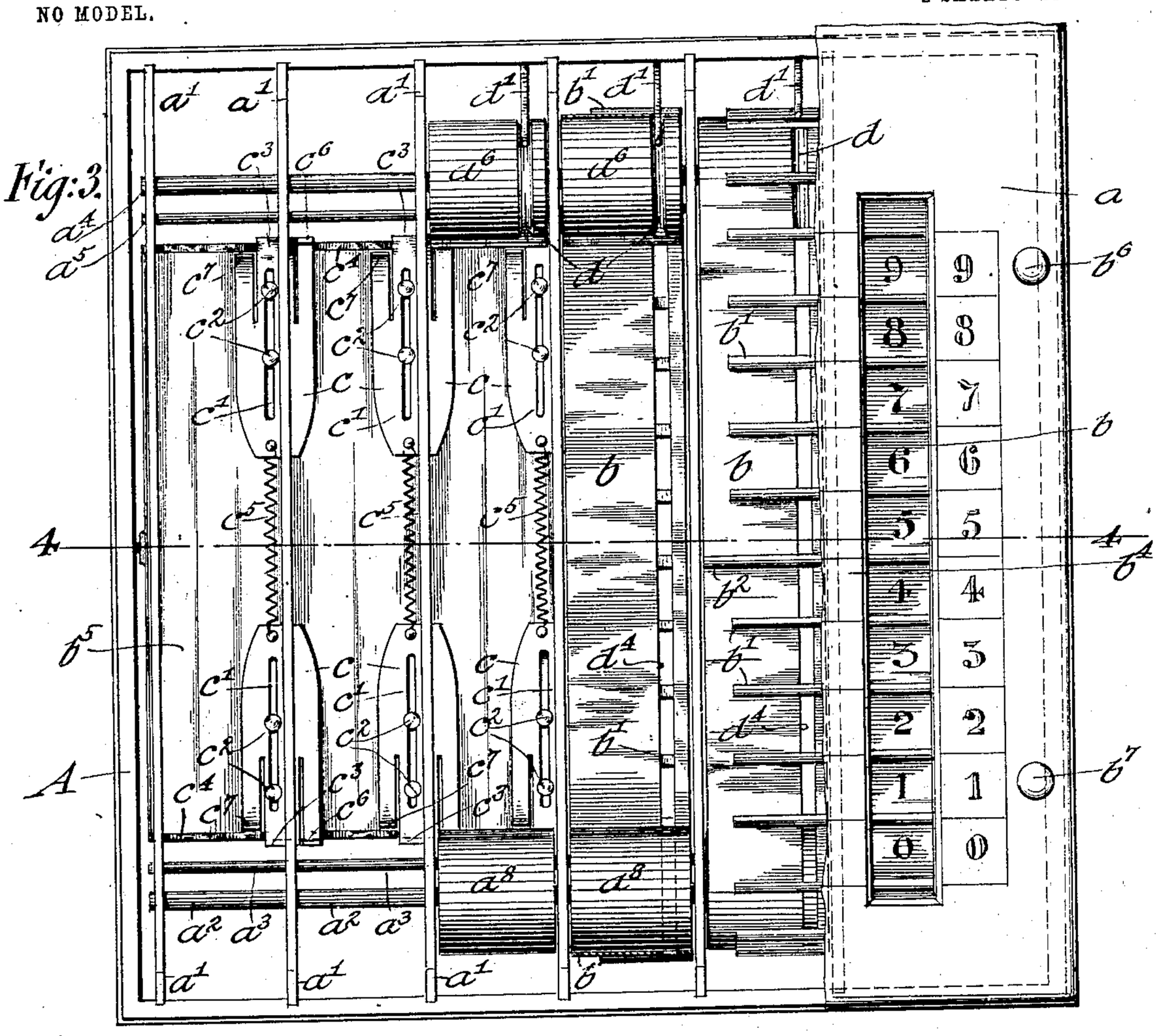


Fig: 4.

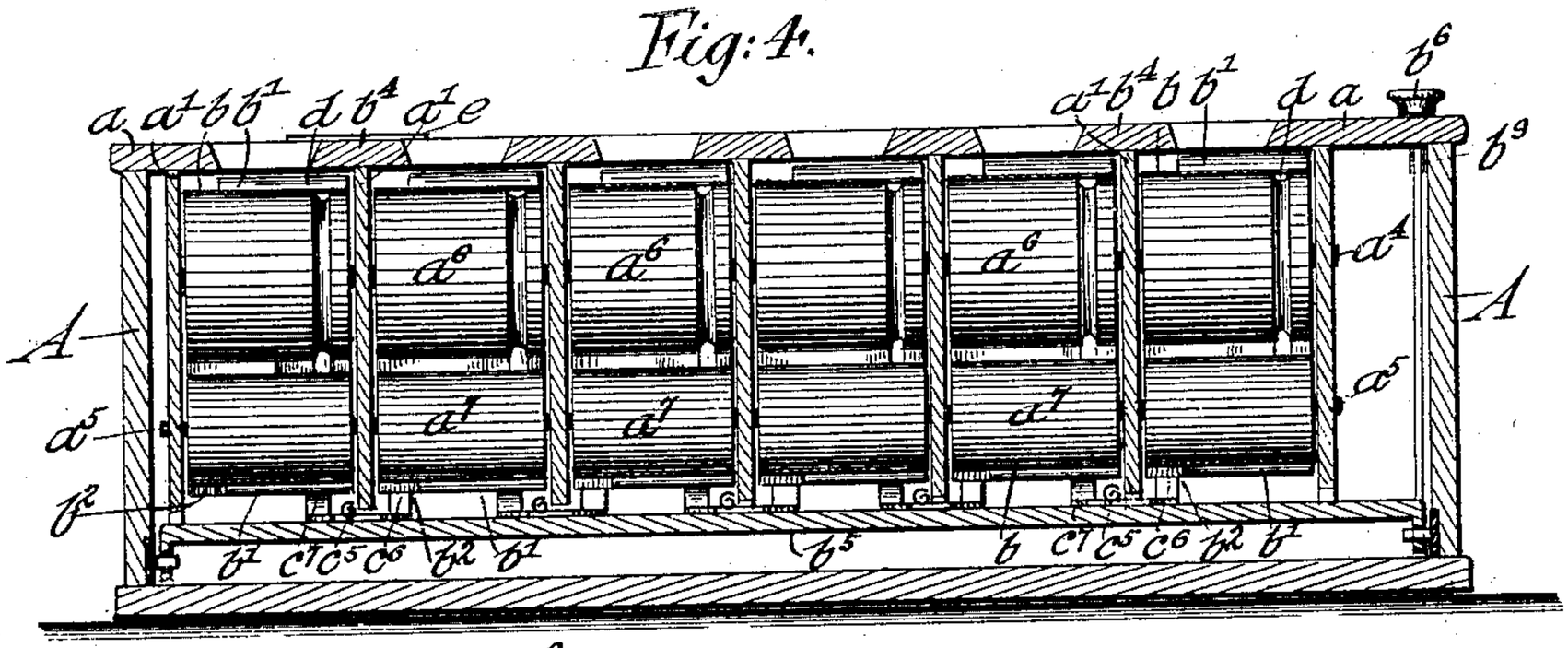
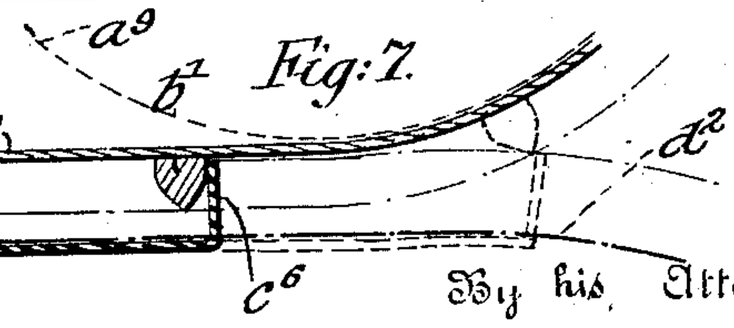


Fig: 7.



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CALCULATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 725,242, dated April 14, 1903.

Application filed July 24, 1902. Serial No. 116,785. (No model.)

To all whom it may concern:

Be it known that I, NATHAN GOLDFARB, a citizen of the United States, residing in New York, borough of Manhattan, in the State of New York, have invented certain new and useful Improvements in Calculating-Machines, of which the following is a specification.

Calculating-machines as heretofore commonly constructed have been usually quite complicated in construction and costly to make, requiring in many cases the use of large numbers of gear-wheels and other comparatively costly devices.

The object of the present invention is to provide a simple and reliable calculating-machine capable of being operated with facility and which can be manufactured at a comparatively low cost, which contains no highly-expensive parts, and in which especially the carrying mechanism between the bands is simplified and rendered inexpensive.

The invention consists in certain combinations of parts, which will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 is a top view of my improved machine. Fig. 2 is a vertical transverse section on line 2 2, Fig. 1. Fig. 3 is a top view with parts removed. Fig. 4 is a vertical longitudinal section on line 4 4, Fig. 3. Fig. 5 is a perspective view of one of the division-mark plugs employed. Fig. 6 is a detail perspective view showing one of the driver-plates and adjacent parts; and Fig. 7 is a vertical section through a portion of one of the bands, showing the form of the band-teeth.

Similar letters of reference indicate corresponding parts.

In the drawings, A indicates the box-like casing of the machine. The box or casing is divided transversely by a number of parallel vertical partitions a', extending from front to rear, said partitions being secured in position in any suitable manner. Two pairs of shafts are arranged in the casing longitudinally of the same, one pair, a^2 a^3, at the front and the other pair, a^4 a^5, at the rear. On said shafts are loosely mounted band-wheels a^6 a^7 a^8 a^9. Between the partitions are arranged upon the band-wheels calculating-bands b, each of which is provided with preferably thirty teeth b'. Every tenth tooth b^2 extends entirely across the band; but the intermediate nine teeth extend only part way across the same, as indicated in Figs. 3 and 4. The partitions a' are provided with slots, and through said slots extends a band-supporting plate b^3. Above each partition is arranged a calculating-bar b^4, which is preferably formed integral with the cover a and provided with numerals corresponding with the numerals on the calculating-bands b. Below the partitions is located a rock-plate b^5, pivoted at its ends to the sides of the casing, so as to rock in vertical direction either toward the front pair of band-wheels and away from the rear pair, or vice versa. For actuating the rock-plate two shift-keys b^6 b^7 are pivoted to the same and extend upwardly through the casing-cover a. The shank of each key is provided with a rigid tooth b^8 for engaging the cover and maintaining the key in raised position and with a spring b^9 for throwing the shank, so that the tooth is retained in engagement with the cover. Upon the rock-plate, at either side of the same, are arranged driver-plates c. The plates are arranged in opposite directions, and each plate is provided with a slot c' and is guided on the rock-plate by means of headed studs c^2, passing through the slot. The driver-plates are arranged directly below the partitions, and each plate is provided with a downwardly-projecting hook and with two upwardly-projecting teeth, one tooth at one side of the partition for being engaged by the long teeth or driver-teeth of the band at that side and the other at the opposite side of the partition and engaging both the driver-teeth and calculating-teeth of the band at that side.

The downwardly-projecting hook c^3 of the plate c abuts against a rubber buffer c^4 at the edge of the rock-plate, and thereby limits the return movement of the driver-plate after actuation. The driver-plates are preferably spring-actuated in inward direction by a single spring c^5 between the inner ends of each pair. The upwardly-projecting driven tooth c^6 is located in advance of the driving-tooth c^7 for a distance approximately equal to the width of one of the calculating-teeth b', so that the driven tooth c^6 is at the forward side

of a calculating-tooth of one band while the driving-tooth c^7 is at the rear side of a calculating-tooth of the adjacent band. When the shift-key b^6 is depressed, the driver-plates c at the forward side of the rock-plate b^5 are thrown into engagement with the teeth of the bands and the driver-plates at the rear side of the rock-plate thrown out of engagement, while when the shift-key b^7 is depressed the driver-plates at the forward side or front of the casing are thrown out of engagement and those at the rear thrown in, as indicated in Fig. 2. When in the latter position, the bands may be operated for addition in the direction indicated by the arrows, and when in the opposite position may be operated in the reverse direction for subtraction. In order that the driving-tooth c^7 shall reliably engage behind the next calculating-tooth when the rock-plate is shifted from one position to the other, the rock-plate is pivoted below the plane of the driver and driven teeth, as indicated, so that said teeth are moved to a very slight degree inwardly as they are moved in upward direction, so that the driving-teeth reliably engage the teeth of the bands. The partitions a' are each provided adjacent the lower band-wheels with slots, and in each of said slots is located a reinforcing strip or guide, said guides c^8 being arranged just above the bands, so as to prevent them from yielding when engaged by the driver-plate. Each band is provided with a longitudinal slot d^4 in the spaces between the teeth, and the band-wheel a^6 is provided with an annular groove d for accommodating a wedge-shaped spring-actuated detent-pawl d', mounted upon the casing and adapted to bear simultaneously upon any two adjacent teeth of the band for controlling the position of the band and causing the same to always come to rest in proper position. The pawl also maintains the alinement of the band in lateral direction.

For disengaging either of the driver-teeth b^2 of a band from the driven tooth c^6 of the driver-plate the lower band-wheels a^7 a^9 are preferably made of small radius, so that the tooth b^2 of the band moves upwardly out of engagement with the tooth c^6 of the plate at the proper time. For still further insuring disengagement at the proper time the partition between the bands is provided near its end in the path of the driver-plate with a downwardly-projecting curved portion or heel d^2, which engages the driver-plate and causes the forward end of the same to bend downwardly, so that the tooth c^7 is disengaged from the tooth b^2.

The calculating-bars b^4 are made of such width as to extend at one side to the ends of the short teeth b' of the bands and at the other side to the inner edge of the slots d^4 of the bands, so as to close and protect the same and serve as guides for the finger of the operator, whereby the fingers are prevented from slipping off the ends of the bars or the finger-nail engaging in the slots. The downwardly-projecting portions d^2 of the partitions are located successively each slightly farther inward than the preceding, as indicated in dotted lines in Fig. 2, so that the driver-plates are caused to be disengaged in succession, the last band or band of highest denomination being disengaged first and then the preceding bands successively to the unit or first band. The openings or slots between the bars b^4 are made slightly longer than ten spaces on the bands, so that either of the bands may be pulled slightly beyond its proper point in order to effect the disengagement of any driver-plate should the same not promptly disengage, the band being then returned to normal position by the pawl d'. The calculating-bars are arranged between the rows of numerals of the successive bands, so that the numerals of the bands and the numerals of the bars are exposed side by side in alternate rows to the view of the operator. This arrangement facilitates the use of the machine and enables the same to be used with speed and convenience.

For facilitating the operations to be performed on the machine a table of numbers is arranged upon the cover, said table containing the products of a series of numbers, the multipliers being arranged below each row of products. The multiplicands are arranged upon one side or leg of a gage e, consisting of a suitable plate of sheet metal provided with a vertical slot adapted to expose one row of said table at a time and with projections, one at either side or leg of the gage, extending downwardly into a slot e^2 in the cover for guiding the gage.

The forward space of each calculating-bar is provided with a perforation p, adapted to receive a division-mark plug e^4, bearing upon its upper surface the representation of a period, comma, or other mark, said perforations being arranged so that the plugs when inserted are in proper line with the figures upon the calculating-bands between the bars. The cover is provided with a number of perforations e^5 for receiving the division-mark plugs when not in use.

In Fig. 1 the machine is shown set to zero. When, for example, in adding, the figure "9" passes out of indicating position beneath the forward portion of the cover, one of the driver-teeth b^2 of the band engages the driven tooth c^6 of the driver-plate, and thereby actuates the driver-plate and causes the driving-tooth c^7 of the same to draw the succeeding band forward one step. At this point the tooth b^2 disengages from the tooth c^6, and the driver-plate c is quickly returned by its spring c^5, the driving-tooth c^7 riding over and into position behind the next tooth b' of the second band, ready to again actuate the same when another tooth b^2 of the first band arrives at the driven tooth c^6 of the driver-plate. When it is desired to subtract, the shift-key b^6 is depressed and the bands operated in the reverse direction.

It is obvious that various changes may be made in the details of the construction without departing from the spirit and scope of the invention. In place of pairs of band-wheels a single wheel at the front and a single wheel at the rear may be employed; but in order to secure reliable disengaging of the teeth of the driver-plate from the teeth of the band it is preferable to employ a pair of band-wheels, the lower one of the pair being of small radius. The bands may be made of strong tape or other suitable material, and in such case the band-wheels may be dispensed with and in their place suitable curved guides employed. The band-teeth $b' b^2$ may be made of hard wood or suitable composition and secured in any suitable manner to the band.

In order that subtracting may be performed immediately after addition and without changing the position of the bands, (when, for example, it is desired to subtract a number from a sum obtained by addition,) the driver-plates are arranged nine spaces apart, as shown in Fig. 2, so that a band carried forward one step by the last addition is immediately returned when operating the bands in reverse direction for subtracting.

The teeth of the bands are preferably not made in semicircular form, but are angularly formed at their upper portion or top, as shown in Fig. 7, so as to secure the reliable forward movement and release of the driver-plates at the exact point desired.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a calculating-machine, the combination, with calculating-bands, and means for guiding the same, of calculating-teeth on one of said bands, extending only partially across the same toward the adjacent band, a laterally-projecting driver-tooth intermediate each nine calculating-teeth and extending beyond the same toward said adjacent band, and a spring-actuated driver-plate having a driven tooth located in the path of the driver-teeth of the first band and a yielding and spring-actuated driving-tooth adapted to engage both the calculating-teeth and driver-teeth of the second band, substantially as set forth.

2. In a calculating-machine, the combination, with calculating-bands, and means for guiding the same, of calculating-teeth on one of said bands extending only partially across the same toward the adjacent band, a laterally-projecting driver-tooth intermediate each nine calculating-teeth and extending beyond the same toward said adjacent band, a spring-actuated driver-plate having a driven tooth located in the path of the driver-teeth of the first band and a yielding and spring-actuated driving-tooth adapted to engage both the calculating-teeth and driver-teeth of the second band, and means for guiding the driven tooth of the driver-plate out of engagement with a driver-tooth of said calculating-bands after a movement of said driver-plate for a predetermined distance, substantially as set forth.

3. In a calculating-machine, the combination, with calculating-bands, and means for guiding the same, of a plurality of vertical partitions between said bands, calculating-teeth on each of said bands extending only partially across the same toward the adjacent band, a laterally-projecting driver-tooth intermediate each nine calculating-teeth and extending beyond the same toward said adjacent band, spring-actuated driver-plates located below said partitions and provided each with a driven tooth located in the path of the driver-teeth of the band at one side of the partition and a yielding and spring-actuated driving-tooth adapted to engage both the calculating-teeth and driver-teeth of the band at the other side of the partition, and a downwardly-projecting heel on each partition, in the path of the driver-plate, for disengaging the driven tooth of the same from the driver-teeth of the bands, the heel of each partition being arranged in further advanced position than the preceding, so as to cause the disengagement of the driver-plates from the bands successively from one end of the machine to the other, substantially as set forth.

4. In a calculating-machine, the combination, with calculating-bands, and means for guiding the same, of teeth on said bands, a rock-plate, and driver-plates on said rock-plate, at either side of the same, arranged in opposite directions, and means for actuating said rock-plate so as to bring the driver-plates at either side of the same into engagement with the calculating-bands, substantially as set forth.

5. In a calculating-machine, the combination, with a casing, and parallel calculating-bands guided in the same, of calculating-teeth on said bands, driver-teeth on said bands, a rock-plate pivoted transversely of the bands, spring-actuated driver-plates on said rock-plate, at either side of the same, arranged in opposite directions, and two shift-keys connected with said rock-plate, one at either side, for operating the same, so as to place the driver-plates at either side into engagement with the calculating-bands, substantially as set forth.

6. In a calculating-machine, the combination, with a casing, and calculating-bands guided in the same, of calculating-teeth, on said bands, driver-teeth on said bands, a rock-plate pivoted transversely of the bands, spring-actuated driver-plates on said rock-plate, at either side of the same, arranged in opposite directions, two shift-keys connected with said rock-plate, one at either side, for operating the same, so as to place the driver-plates at either side into engagement with the bands, and means on said shift-keys for engaging said casing for retaining the rock-plate in the position to which it is moved, substantially as set forth.

7. In a calculating-machine, the combination, with a casing, and a series of calculating-bands guided in the same and provided with numerals, of a cover on the casing adapted to expose the numerals on the bands at the upper portion of the same, and a series of stationary calculating-bars also provided with numerals and extending across said cover parallel with the bands and between the rows of numerals of said bands, so that the numerals of the bands and the numerals of the intermediate bars are simultaneously exposed side by side in alternate rows to the view of the operator, substantially as set forth.

8. In a calculating-machine, the combination of a calculating-band provided with transverse teeth, slots in said band between said teeth, a band-wheel provided with an annular recess, and a spring-actuated pawl adapted to enter said slots and the recess of the wheel for retaining the band on the latter, substantially as set forth.

9. In a calculating-machine, the combination of a calculating-band provided with transverse teeth, slots in said band between said teeth, a band-wheel provided with an annular recess, and a spring-actuated pawl adapted to enter said slots and recess for retaining the band on the wheel, said pawl being of wedge shape and adapted to bear simultaneously on two of said teeth so as to determine the longitudinal position of the band, substantially as set forth.

10. In a calculating-machine, the combination, with a casing, of calculating-bands guided in the same and provided each with slots adjacent one edge, teeth on each band extending partially across the same toward the opposite edge, and bars arranged above said bands, each bar extending on one side to the ends of the teeth of one band so as to prevent the finger of the operator escaping therefrom, and extending on the other side so as to cover and protect the slots of the adjacent band, substantially as set forth.

11. In a calculating-machine, the combination, with calculating-bands, and means for guiding the same, of teeth on said bands, a rock-plate, and driver-plates on either side of said rock-plate and adapted to be moved into contact with said bands, said driver-plates being arranged at a distance apart of nine spaces on said bands, so as to permit immediate carrying of the bands by said plates in reverse direction for subtraction, substantially as set forth.

12. In a calculating-machine, the combination, with calculating-bands, of teeth on said bands, a driver-plate adapted to be engaged by said teeth, and means for guiding said driver-plates away from said bands so as to disengage the teeth therefrom, said teeth being formed with an angular upper portion or top so as to secure the reliable forward movement and release of the driver-plates at the exact point desired, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

NATHAN GOLDFARB.

Witnesses:
PAUL GOEPEL,
JOSEPH H. NILES.