May 18, 1937. G. BAER 2,080,857

CALCULATOR

Filed July 27, 1935

Fig. 1

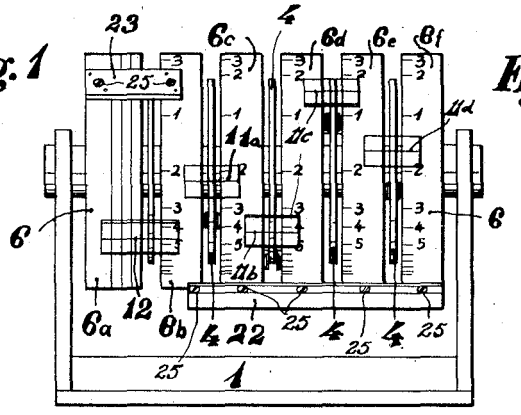


Fig. 2

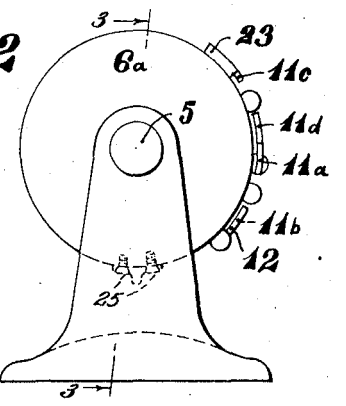


Fig. 3

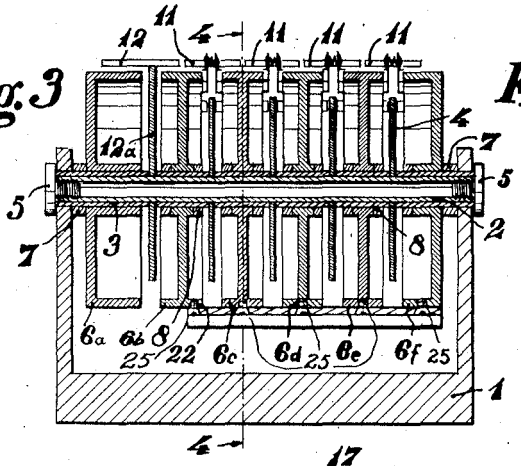


Fig. 4

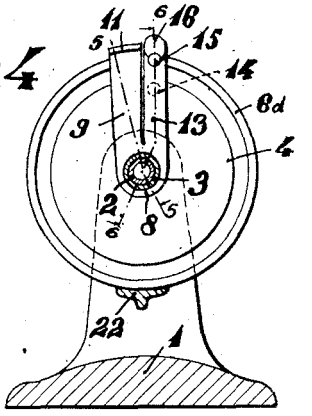


Fig. 5

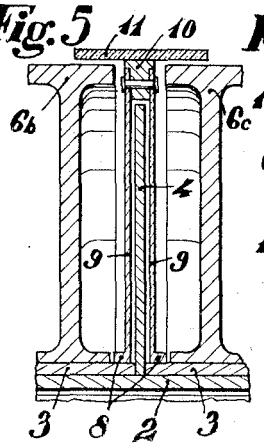


Fig. 6

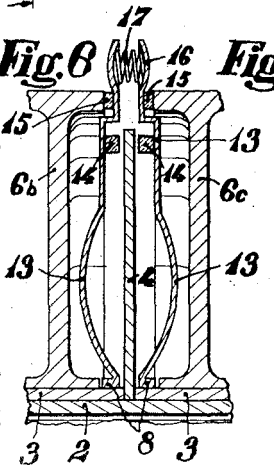


Fig. 7

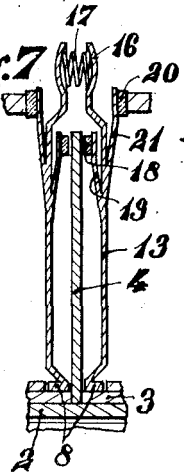


Fig. 8

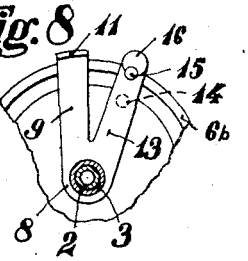
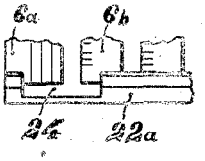


Fig. 9



G. Baer
Inventor

By: Glascock Downing & Seebold
Attys.

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2,080,857

CALCULATOR

Georges Baer, Pandex, Switzerland

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In Germany August 9, 1934

4 Claims. (Cl. 235—87)

This invention relates to calculating apparatus and has as its primary object the provision of an apparatus which is of simple construction, reliable and efficient in use, and easily manipulated.

Another object of the invention is the provision of a calculating apparatus in which, after having effected a calculating operation, the adjustments of the various setting members can be checked.

With these and other objects in view, as will appear from the following specification, the invention comprises the various novel features of construction and arrangement of parts as described hereinafter and shown in the annexed drawing, in which

Figure 1 is a side elevation of a calculating apparatus according to the invention.

Figure 2 is an end view thereof.

Figure 3 is an axial section on the line 3—3 of Fig. 2.

Figure 4 is a section along the line 4—4 of Fig. 3;

Figures 5 and 6 show fragmentary axial sections through the apparatus along the lines 5—5 and 6—6, respectively, of Fig. 4 and drawn to a larger scale.

Figure 7 is an axial section analogous to that of Fig. 6 but showing a modified arrangement of a detail.

Figure 8 is a fragmentary transverse section of a modified apparatus.

Figure 9 shows a further modification.

The represented apparatus comprises a frame work 1 forming two bearings which support a hollow shaft 2 carrying a certain number of sleeves 3. Four disks 4 and a disk 12*a* are clamped between each two successive sleeves 3. Clamping pressure is obtained by means of two screws 5 screwing into the ends of the hollow shaft 2. In this manner the shaft 2, the sleeves 3 and the disks 4 and 12*a* form together a rigid structure. A cylindric body 6 is mounted on the sleeves 3 and is formed of six single cylinders 6*a*, 6*b*, 6*c*, 6*d*, 6*e*, and 6*f*, which are rigidly connected to each other by straps 22 and 23. The straps are fixed by means of screws 25 to the various cylinders. The cylinders are carried by the sleeves 3 with such a friction that the cylinders and sleeves do not move relative to each other unless one of the two parts is maintained by hand while the other part is being turned. Sleeves 7 are inserted between the cylindric body 6 and the frame work 1.

On either side of each disk 4 a ring 8 is loosely mounted on the corresponding sleeve 3 between the disk 4 and the corresponding cylinder. Each ring 8 carries two arms 9 and 13 made from sheet material. The arms 9 of the two rings 8, disposed on either side of a disk 4, are connected with their outer ends to a piece 10 carrying an index plate 11 (Fig. 5).

The arms 13 are resilient and between each two adjacent arms 13 there is inserted a spring 17 (Fig. 6) tending to push the arms away from each other. On the sides facing each other, the two adjacent arms 13 carry coupling members 14 capable of frictionally engaging the disk 4 when the ends 16 of the arms are pressed against each other. The outer sides of the arms 13 carry coupling members 15 which are normally engaging the two corresponding adjacent cylinders 6*b*, 6*c*, 6*d*, 6*e* or 6*f*. Fig. 7 shows a modification in which the coupling members 18 and 20 are carried by additional resilient extensions 19 and 21, respectively. The ends 16 of the arms 13 project beyond the periphery of the cylinders so that they can be gripped by the fingers.

Each cylinder 6*a*, 6*b*, etc. carries logarithmic graduations to permit effecting of multiplication and division. The cylinder 6*b* is provided with four logarithmic graduations corresponding to the numbers 1 to 10 and arranged successively around the periphery of the cylinder. The four graduations cover slightly less than the entire circumference of the cylinder, since the strap 23 covers a portion of this circumference. Similar graduations are provided on the cylinders 6*c*, 6*d*, 6*e*, and 6*f*, and on these latter cylinders two graduations extend from a common origin in opposed directions.

The index plates 11 carry sighting lines 11*a*, 11*b*, 11*c*, and 11*d* and each plate extends simultaneously over a portion of the width of two adjacent cylinders, so that each index can be used for two readings, when graduations are provided along both edges of the cylinders.

The operation of the apparatus is as follows: When the extensions 16 of two arms 13 disposed on either side of a disk 4 are pressed towards each other, the coupling members 15 are disengaged from the two adjacent cylinders and the coupling members 14 firmly grip the disk 4. The arms 13, rings 8, arms 9 and the gripped disk 4 can then be turned relative to the cylinders, the index carrying plate 11 turns also and the index line can be adjusted on a desired division line of the corresponding graduation.

It shall be supposed that all the indexes are ad-

justed to the origin of one of the graduations provided on each cylinder and that the following calculation shall be made:

$$x = \frac{1.3 \times 3 \times 1.6}{1.42}$$

For the multiplication there will be used three index plates 11 which must be moved all in the same direction, and one index plate will be used for the division and must be moved in opposite direction. Since on the cylinder 6b the graduations are extending in one direction only, this direction determines the direction of movement of the index plates 11 for effecting the multiplication. As represented in Fig. 1, the index plates 11 must be moved downwards for multiplication and upwards for division. Accordingly the index plate carrying the line 11a is moved downwardly on the graduation line corresponding to the figure 1.3 of the cylinder 6c. The index line 11b is moved downwardly on the figure 3 of the cylinder 6d, and the index line 11d is also moved downwardly on the graduation line corresponding to figure 1.6 of the cylinder 6f. The index line 11c has been moved upwardly on the graduation line corresponding to 1.42 of the cylinder 6e for effecting the division. As soon as the extensions 16 of the arms 13 are free, the arms 13 engage with the adjacent cylinders and disengage from the disk 4. Each time one of the index plates 11 has been moved, this movement has been transmitted to the shaft 2 by the disks 4 engaging with the corresponding coupling members 14, and consequently the result indicator 12 has effected a movement equal to the algebraic sum of the effected movements of the index lines 11a, 11b, 11c, and 11d. The result of the problem given above, that is approximately 4.4, is indicated by the index 12 on the scale provided on the drum 6b. For effecting a calculation, it is only important that the extensions 16 are let free while the index line is well adjusted; coupling of the index plates with the cylinders is not necessary, but has the advantage that it gives the possibility to check at any time the adjustment of the index lines, permitting thus to check the obtained result. The friction between the sleeves 3 and the cylinders prevents any undesired movements of the index 12 relative to the cylinder 6b.

Other graduations may be provided on the cylinder 6a to permit effecting of auxiliary calculations as it is known in ordinary slide rules, as for instance the indication of the square and the cube, or the logarithm. The number of successively arranged graduations on the result indicating cylinder 6b will always be equal to the number of the setting cylinders 6c to 6f.

According to Fig. 9 a number of result indicating indexes equal to the number of setting cylinders may be provided for cooperation with the scales on the cylinders 6a and 6b equal to the number of setting cylinders. The strap 22a connecting the various single cylinders is then provided with a recess 24 permitting movement of the index plates all around the two cylinders.

The manner of mounting of the cylindrical body 6, as described, provides that this body as a whole is rotatable, so that always the portion of the cylinders on which a setting or a reading is made can be brought before the eyes of the operator.

There can be provided devices for automatically returning the indexes to the origin of the corresponding graduations after a calculation has been effected. It is however not necessary to return the indexes after a calculation, when after having read the result the shaft 2 and the cylinders are not moved relative to each other. A new calculation can be started without bringing the indexes first to the factor 1. Only when for the new calculation not all indexes, which were used for the previous calculation, are necessary, then the not used indexes must be returned to the origin of their corresponding graduations before the result can be read, and for returning these indexes, they must be coupled with the corresponding disks 4.

In its most simple form of execution, the apparatus according to the invention comprises only one setting member and two logarithmic graduations, one of which cooperates with the index of the setting member and the other with the result reading index. In this case the setting index is moved several times according to the numbers of multiplicators and divisors present in the calculation, and after each setting the index is returned to the origin of the graduation after having been disengaged from the result indicating index.

I claim:

1. A calculator comprising a shaft, a member provided with factor scales and with a result scale loosely carried by said shaft, a plurality of setting members cooperating each with one of the factor scales and loosely mounted on said shaft, a result indicator cooperating with the result scale and rigidly connected to said shaft, a clutch for each setting member, said clutch including clutch elements normally connecting the members provided with the scales to the setting members, clutch elements adapted to connect the setting members to said shaft, and clutch operating means operative to simultaneously effect disengagement of the setting member from the scales carrying member and engagement of the setting member with said shaft.

2. A calculator comprising a shaft, a member provided with factor scales and with a result scale loosely mounted on said shaft, a plurality of setting members cooperating each with one of the factor scales, a result indicator cooperating with the result scale and rigidly connected to said shaft, each setting member including two resilient arms normally urged away from each other to engage with said member carrying the scales, a friction disk extending between each two arms of a setting member, and rigidly connected to said shaft, said two arms being arranged to be seized for moving the setting member whereby the arms are pressed towards each other and disengaged from the scales carrying member while engaging said friction disk to transmit the movement imparted to the setting member to said shaft.

3. A calculator comprising a shaft, a member provided with factor scales and with a result scale loosely mounted on said shaft, a plurality of setting members cooperating each with one of said factor scales, a result indicator cooperating with the result scale and rigidly connected to said shaft, a clutch for each setting member adapted to connect the setting member to said shaft, operating members for moving the setting member relative to the scales carrying member, said operating members, upon being seized to move the setting members, being effective to actuate the clutch for connecting the setting members to said shaft to transmit the movement im-

parted to the setting member to said result indicator.

4. A calculator comprising a shaft, a plurality of coaxial spaced cylinders rigidly connected to each other and loosely carried by said shaft, one of said cylinders being provided with a result scale along its circumference and the other cylinders being provided with factor scales along their circumferences, a result indicator cooperating with the result scale and rigidly connected to said shaft, a plurality of setting members each cooperating with one of the setting scales, each setting member including two resilient arms loosely carried by said shaft and extending between two adjacent cylinders, said arms being normally urged away from each other to engage with adjacent cylinders, a friction disk extending between each two arms and rigidly connected to said shaft, said arms being arranged to be seized for moving the setting member whereby the arms are pressed towards each other and disengaged from the cylinders while engaging said friction disk to transmit the movement imparted to the setting member to said shaft.

GEORGES BAER.