No. 878,292. PATENTED FEB. 4, 1908.

A. M. JOHANSON & I. HULTMAN.

CALCULATING MACHINE.

APPLICATION FILED JUNE 6, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

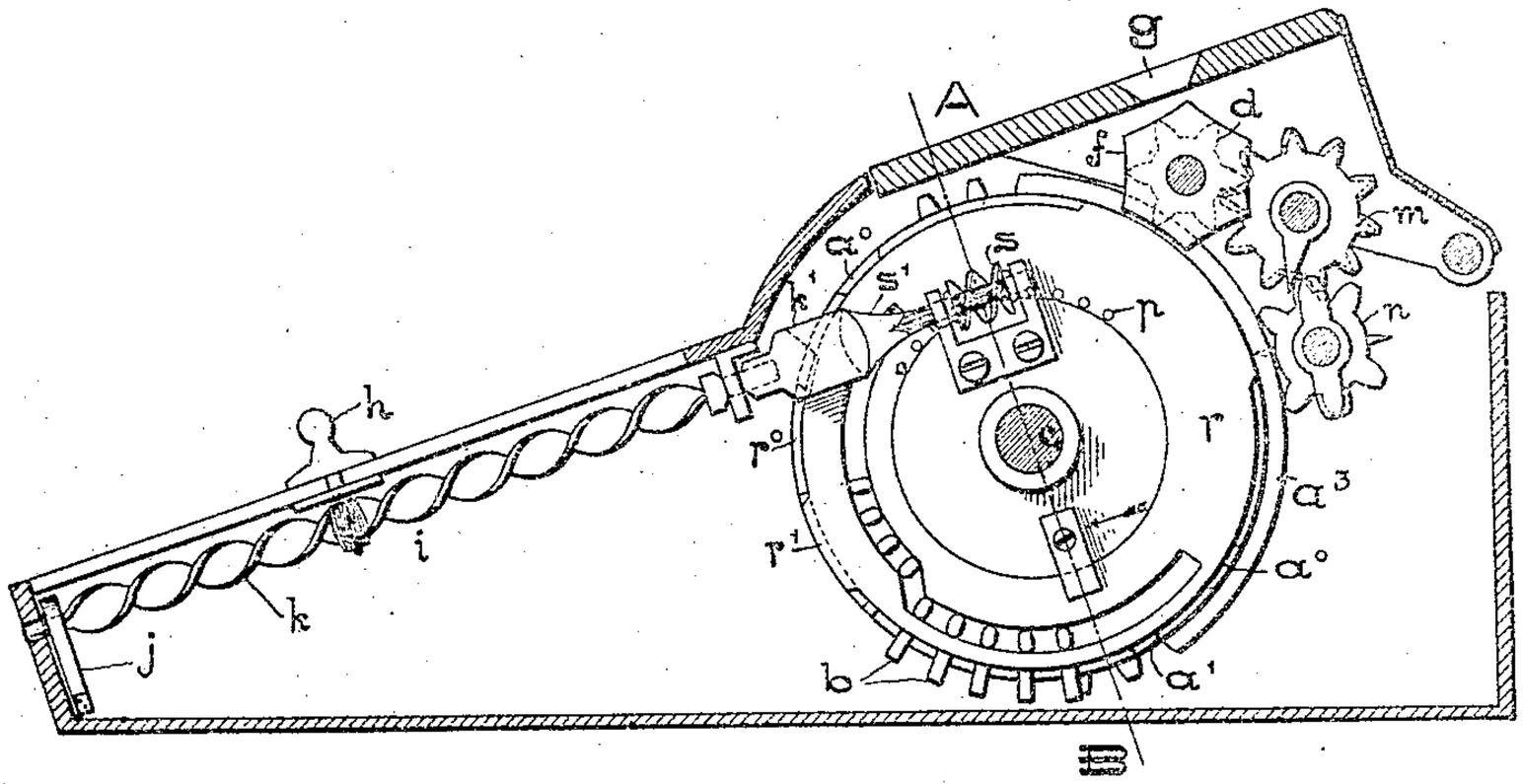


Fig. 2.

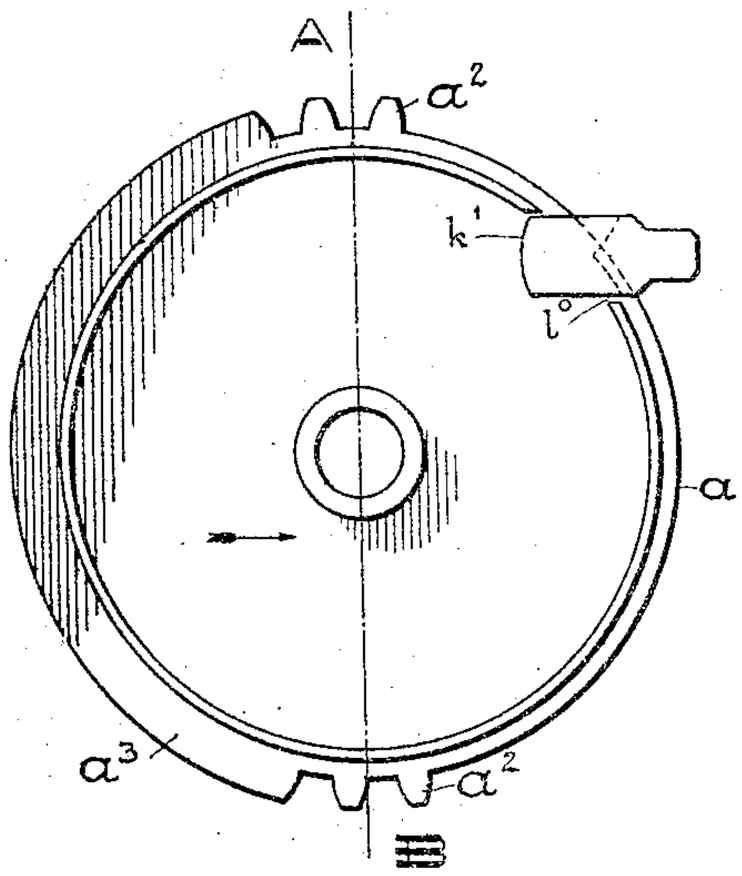
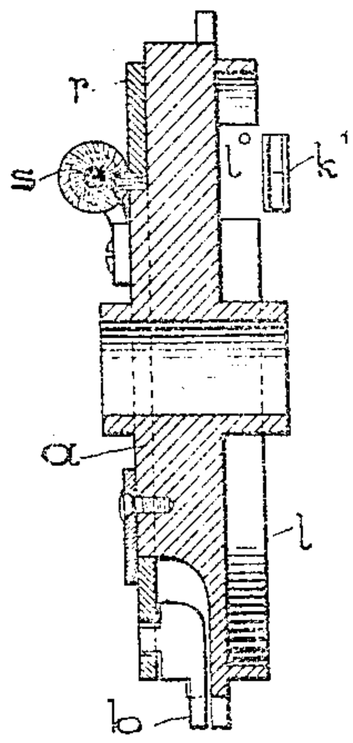


Fig. 3.



Witnesses:
Geo. Heinicke
F. Franke

Inventors:
Adolf Magnus Johanson
Ivar Hultman
by G. Dittmar
Attorney.

No. 878,292. PATENTED FEB. 4, 1908.

A. M. JOHANSON & I. HULTMAN.

CALCULATING MACHINE.

APPLICATION FILED JUNE 6, 1905.

2 SHEETS—SHEET 2.

Fig. 4

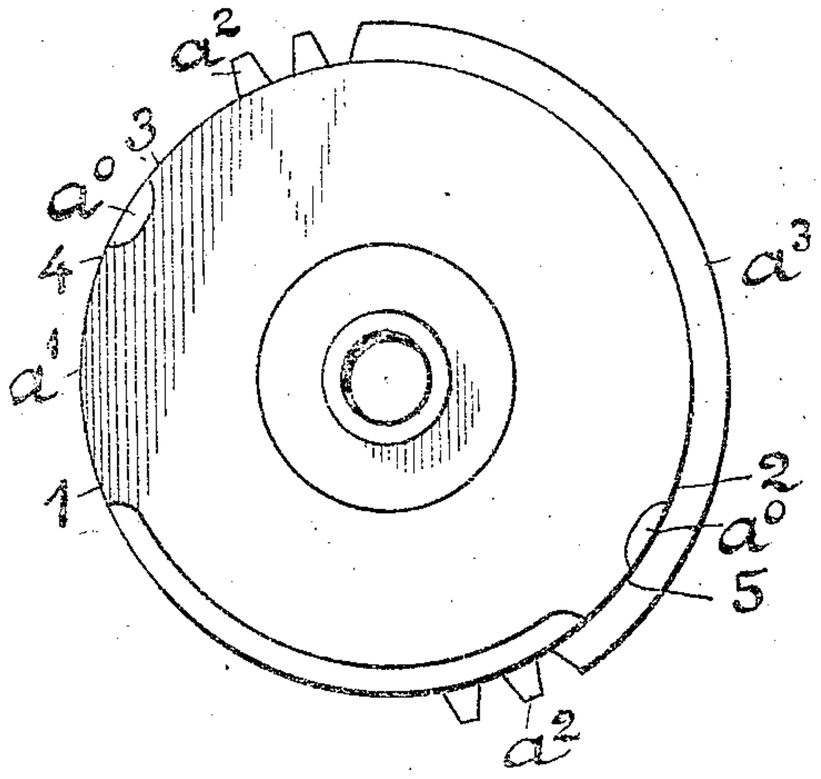


Fig. 5

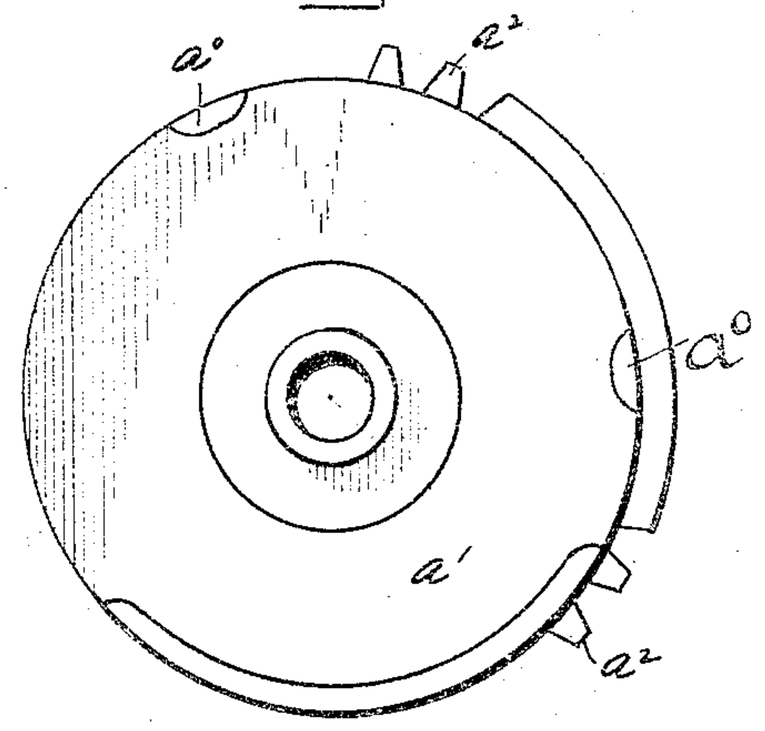


Fig. 6

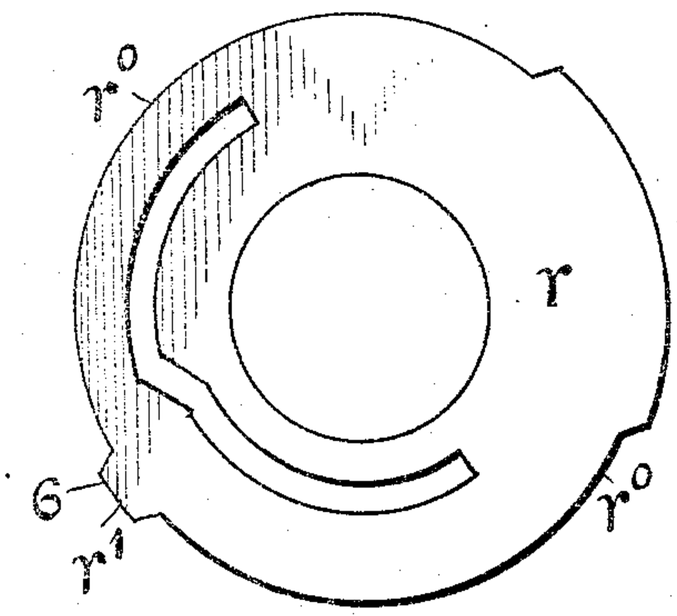
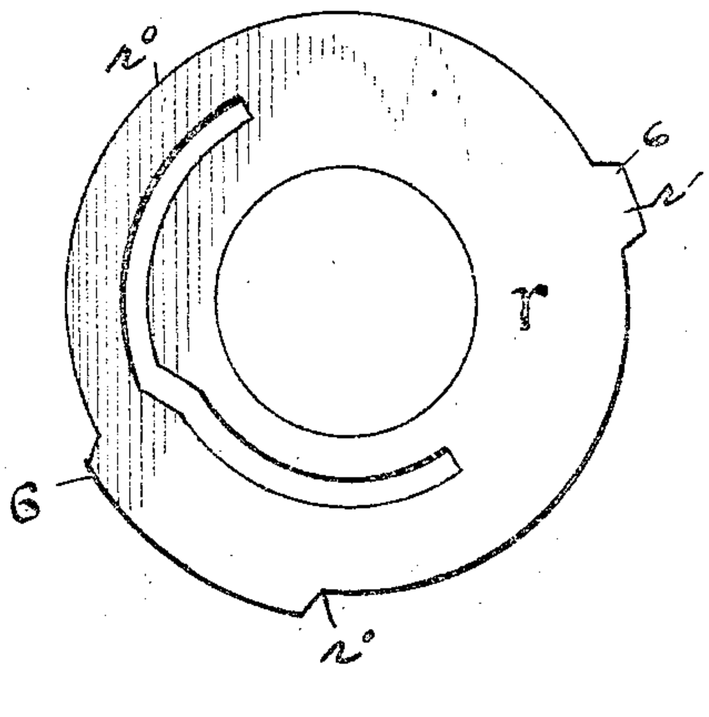


Fig. 7



Witnesses:
Geo. Steinitz
E. Dieman

Inventors:
A. M. Johanson
I. Hultman
by G. Dittman
Attorney.

UNITED STATES PATENT OFFICE.

ADOLF MAGNUS JOHANSON AND IVAR HULTMAN, OF STOCKHOLM, SWEDEN.

CALCULATING-MACHINE.

No. 878,292. Specification of Letters Patent. Patented Feb. 4, 1908.

Application filed June 6, 1905. Serial No. 263,961.

To all whom it may concern:

Be it known that we, ADOLF MAGNUS JOHANSON and IVAR HULTMAN, both of Stockholm, Sweden, have invented certain new and useful Improvements in Calculating-Machines, of which the following is a specification.

The invention relates to calculating machines more particularly to that class thereof, in which the main-wheels are provided each with nine shiftable cogs or teeth adapted to be brought into and out of active position by turning a movable disk or the like connected with the wheel for changing the number of the active cogs.

The object of the improvement is to stop, without failure and at the exact moment, the wheels acted upon by the shiftable cogs and to insure this result without increasing the resistance or affecting in any way the ease of handling the machine.

The device consists of fixed and movable cams, arranged on or connected to the main wheels and adapted to coact with polygonal disks or the like provided on or connected to the gears. The invention involves also means for shifting the position of the movable cams according to the number of acting cogs.

In the annexed drawings Figure 1 is a vertical section of a calculating machine embodying the invention. Fig. 2 is the side view of a main wheel. Fig. 3 is a substantially central sectional view of the same. Figs. 4 and 5 are side views of two of the main wheels showing the fixed cogs a^2 and the cam a^1 with its gaps a^0 (the ring r, and the shifting cogs b and their guides and some other parts are omitted). Figs. 6 and 7 are side views of the ring r, the pins p being omitted.

The main wheels a are fixed on a common shaft c, which is rotated directly or indirectly by a crank in the usual manner. At each turn of this shaft c the shiftable cogs b (*i. e.* the ones in acting position) will turn the corresponding gear wheels d (which are loose on their common shaft) a number of steps equal to the number of acting cogs and thereby cause the figure disks to rotate forwards or backwards (according to the direction of movement of the crank not shown, and show the corresponding figures giving the result of calculations in the opening g.

In order that the gear wheels d and the figure-disks connected to or controlled by them may not continue their movement when the cogs b have passed (which would cause a wrong result in the openings g) each wheel d has an angular or polygonal disk f, adapted to coact with cams a^1, r^1 provided on the corresponding main wheel a and on a ring r, turnable on the shaft of the latter, this ring also being used for shifting the cogs b in the usual manner.

The cams a^1, r^1 are placed the one in front of and the other behind the cogs b ("in front of" and "behind" being meant in peripherical direction) and are so high (in radial direction) that they will hinder turning of the disk f when passing the same. The one acts when the crank is turned forward, the other when the crank is turned backward, both being disposed so as to coöperate with the disk f for stopping the turning of the gear wheel d just when the cogs b have left the wheel d. By turning the ring r with regard to the wheel a the position of the cam r^1 is adjusted so as to insure the proper distance between it and the nearest working cog b. The cams preferably extend along so large a part of the periphery of the wheel a and of the ring r as the space will admit. The cam a^1 thus extends along more than half of the circumference so that its ends are at equal distance from both ends of the cog-series b. In our machine the "carrying" never takes place while the cogs b are in mesh with the wheel d, but does occur when the fixed cogs a^2 engage the carrying wheels n, which takes place only after the cogs b have left the wheel d. The cam a^1 is provided with gaps r^0 at points in front of the disk f (in front of is here meant in radial direction) at the moment of "carrying", so as not to hinder such "carrying". As the shifting cam r^1 never should cover these gaps the corresponding gaps r^0 in said cam r^1 must be enlarged in peripheral direction. In the drawing one of the gaps r^0 merges into the opening between the ends of the cam.

Referring to Figs. 4 and 5 the wheel a has three cams with five acting points 1, 2, 3, 4, 5. Point 1 acts when in backward movement the cogs b leave the wheel d. Point 2 acts when in forward movement the carrying is just ended. Point 3 acts when in backward movement the carrying is ended. Points 4 and 5 are intended to act when a turn begun by mistake is retracted without first completing the turn.

The carrying in the construction shown in the drawing is effected by means of the car-

rying-wheels n, which by means of intermediate wheels m and by means of arms connected to said wheels m n are brought in such position that they can coöperate with fixed teeth a^2 a^2 provided on the main wheels a. Said teeth a^2 should be disposed so as to not lie exactly opposite each other on different main wheels for avoiding two or more simultaneous carryings (which could cause wrong results). The gaps a^0 must of course be disposed in accordance therewith (Figs. 4 and 5). The prolongation of the teeth a^3 in peripheral direction is adapted to stop the turning of the carrying wheels n at the proper moment. Referring to Figs. 6 and 7 the cam r^1 has one acting point, which comes into operation when in forward movement the cogs D just leave the wheel d.

The shifting of the position of the cam r^1 relatively to the wheel a is effected by means of a worm s, mounted in bearings on the wheel a and gearing in a worm-wheel fixed or formed on the ring r. Or the worm-wheel is substituted by pins p. The worm s is turned by means of a screw or screw-like spindle k, mounted in bearings in the frame of the machine and having a fork k^1 between the prongs of which the wing-shaped end s of the axis of the worm enters when the main wheels are in the zero-position. The spindle k is turned by means of a knob h sliding in a slot in the cover and having two parallel rollers i, between which the angular or flattened spindle k is placed. Near each slot is to be arranged a scale of figures 0 1 2 3 4 5 6 7 8 9 (not visible in the drawing), which shows the different points to which the knob h should be shifted for properly adjusting the cam r^1 and at the same time bringing the corresponding number of cogs b into acting position.

The knob h should not be moved except when the wheels a are in their zero-position, as the movement in other cases would bring wrong results. For preventing such detrimental movement of the knob h and spindle k, the fork k^1 is flat and the adjacent wheel a has a flange l with a gap l^0 which latter is adjacent to the fork when the wheels a are in the zero-position. A spring j, adapted to press on a disk, provided on the spindle k and having two opposite notches for catching the spring, will facilitate the adjustment of the spindle k and keep it in the exact positions, so as to admit of the wing s^1 passing between the prongs of the fork when turning the wheels a.

The form shown in the drawing should be understood as an example only, as the invention involves modifications.

The handling of the machine is exactly the same as in other machines of that kind. The figures in question are set up by moving the proper knobs h to the corresponding figures in the scales (whereby simultaneously the movable cams r^1 and the corresponding numbers of movable cogs b are brought in acting position). Then the crank is turned so many full turns forward or backward as the number set up should be added or subtracted.

Having thus described our invention what we claim is:—

1. In a calculating machine the combination with the main wheels and the gear wheels coöperating therewith, of polygonal disks partaking in the movement of said gear wheels means for actuating the register wheels and fixed and shifting cams coöperating with the polygonal disks to positively stop the movement of said disks and the figure wheels at the proper moments, substantially as set forth.

2. In a calculating machine the combination with the main wheels and the fixed and movable cams, means for actuating the register wheels, of means for shifting the position of a movable cam, consisting of a worm on the main wheel, a worm wheel engaging the same and means for preventing movement of said worm except when the main wheel is in zero position.

3. In a calculating machine the combination with the main wheels and the fixed and movable cams, means for actuating the register wheels, of means for shifting the positions of a movable cam, consisting of a worm on the main wheel, a worm wheel engaging the same and means for preventing movement of said worm except when the main wheel is in zero position, said means embodying a flange on the main wheel having a gap and a spindle mounted in the casing and having a fork opposite said gap when said wheel is in zero position.

4. In a calculating machine the combination of the main wheels, the cams a^1 r^1, a ring r sleeved on the shaft of the main wheel, the gear wheels having polygonal disks, shiftable cogs, the cam a^1 having gaps and the shiftable cam r^1 having corresponding gaps, carrying wheels and intermediate wheels, the carrying cams corresponding to said gaps, means for actuating the register wheels and means for stopping the turning of the carrying wheels at proper intervals.

5. In a calculating machine, the combination of the main wheels the cams a^1 r^1, a ring r sleeved on the shaft of the main wheel, the gear wheels having polygonal disks, shiftable cogs, the cam a^1 having gaps and the shiftable cam r^1 having corresponding gaps carrying wheels and intermediate wheels, the carrying cams corresponding to said gaps means for actuating the register wheels and means for stopping the turning of the carrying wheels at proper intervals, a worm, a worm-wheel and connections for shifting the position of the movable cam relatively to the main wheel.

6. In a calculating machine the combination of the main wheels the cams a^1 r^1, a ring

r sleeved on the shaft of the main wheel the gear-wheels having polygonal disks, shiftable cogs, the cam a^1 having gaps and the shiftable cam r^1 having corresponding gaps carrying wheels and intermediate wheels, the carrying cams corresponding to said gaps means for actuating the register wheels and means for stopping the turning of the carrying wheels at proper intervals, a worm, a worm wheel and connections for shifting the position of the movable cam relatively to the main wheel, means for moving the spindle of said worm wheel and coöperating means for preventing actuation thereof except when the main wheels are in zero position.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

ADOLF MAGNUS JOHANSON.
IVAR HULTMAN.

Witnesses:
L. ROWELL,
BERTIL NYMAN.