

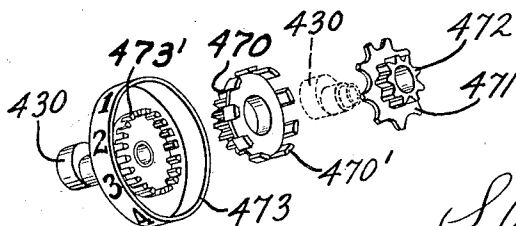
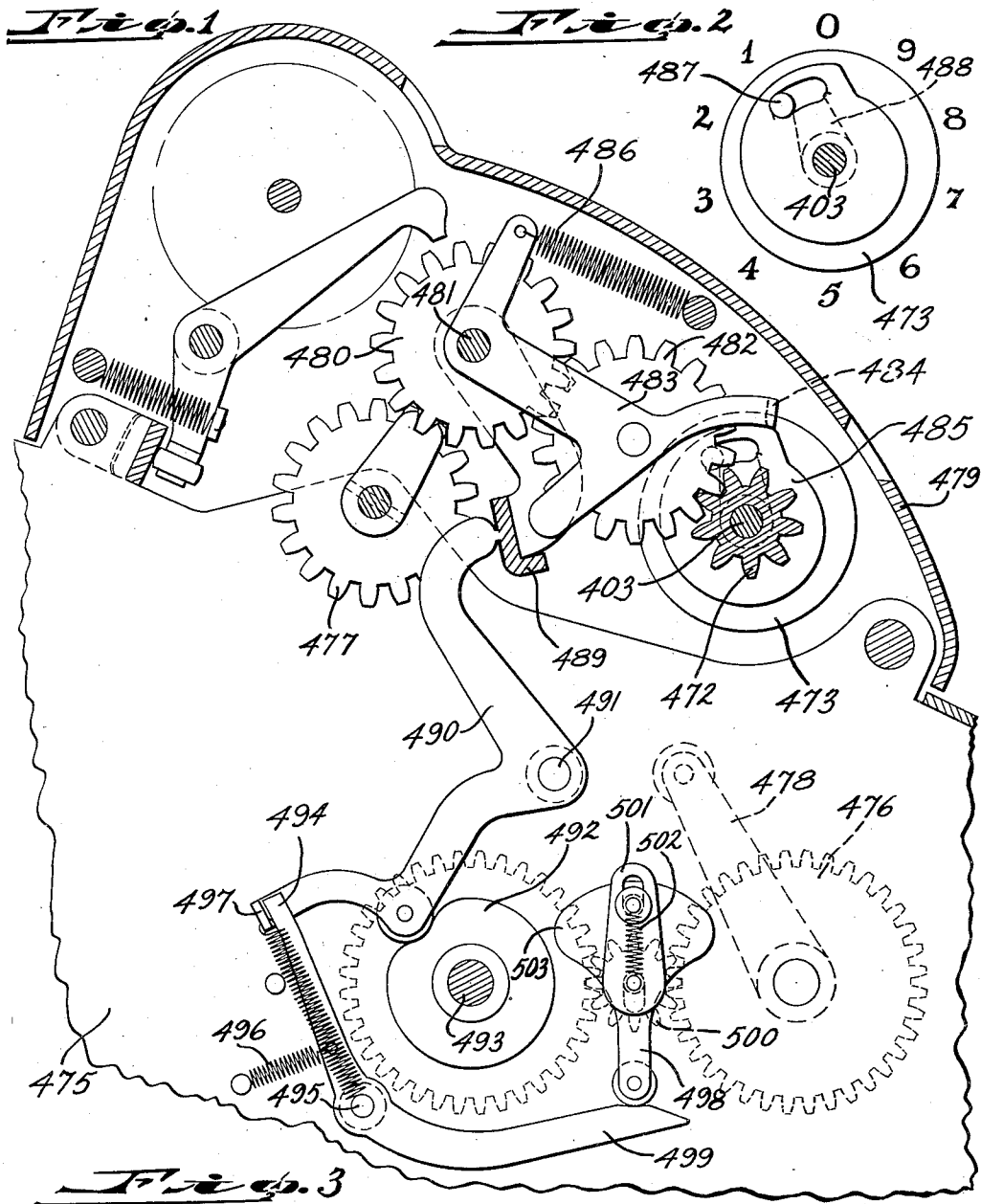
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2,089,682

CALCULATING MACHINE

· Filed July 28, 1936



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UNITED STATES PATENT OFFICE

2,089,682

CALCULATING MACHINE

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9 Claims. (Cl. 235—61)

The invention relates to calculating machines, and more particularly to means for aligning a series of numeral wheels equipped with tens transfer devices of the "crawl" type, so as to eliminate partial transfers therefrom and bring the numerals of said wheels accurately to the reading line.

Crawl type tens transfer devices have been extensively used in the art, both with and without reading alignment of the numeral wheels while the wheels are at rest. In the latter arrangement means have been provided for shifting from aligning to crawl position of the parts prior to registration of values on the wheels, by means of one or another of the preliminarily operated control devices of the machine. An important aspect of the present invention comprises the elimination of preliminary or extra cyclic adjustment of the mechanism from aligning to crawl condition.

The invention consists in the novel construction and combination of parts as set forth in the appended claims.

In the accompanying drawing, illustrating the invention:

Fig. 1 is a fragmentary cross sectional view of a calculating machine embodying the invention.

Fig. 2 is a detail side elevation of a numeral wheel and its alignor cam.

Fig. 3 is an exploded perspective view of a numeral wheel, with the related tens transfer devices.

The usual cyclically operated differential actuating mechanism is mounted in the base 475 of the machine, this mechanism being operatively connected with the cyclically driven gear 476, and serving to transmit, during each cycle of movement of the machine, variable degrees of movement to the intermediate gears 477.

Any one of the known types of actuating mechanism may be employed for this purpose (for instance that disclosed in U. S. application Serial No. 51,810, filed November 27, 1935 by George C. Chase).

The operating means, whereby the differential actuating mechanism and the gear 476 are rotated, may comprise a hand crank 478 (shown as fixed to the gear 476) or an electric motor drive device, as desired.

A series of numeral wheels 473, mounted upon a shaft 403 is located in a carriage 479, shiftable transversely with relation to the frame 475, movement being transmitted to each numeral wheel from the related intermediate gear 477 by means of a gear 480, mounted on a shaft 481 in

the carriage, a gear 482 mounted upon an arm 483, designed for pivotal movement about shaft 481, and a pinion 472 of the numeral wheel assembly. Pinions 472 form each one leg of a differential located between adjacent numeral wheels, the other leg of the differential comprising the tens transfer means.

The crawl tens transfer is effected by a train of orbital gearing of the kind designated as entocyclic in U. S. Patent No. 1,838,180, issued to Clyde Gardner on October 20, 1931, to which patent reference is made for a detail description of this gearing.

In comparing the present disclosure with that of the Gardner patent, it is to be noted that the form of the cooperating teeth on the parts 470 and 471 (given numerals relating to corresponding parts) has been interchanged, and that the cooperating gears on members 470 and 473, formerly shown as having nine and ten teeth respectively, are here shown as having eighteen and twenty teeth. However, the action and co-operation of the parts remains unchanged.

Each numeral wheel 473 is provided with internal gear teeth 473', adapted to mesh with the teeth of a floating gear 470, gear 470 being mounted on an eccentric hub 430 of the lower order numeral wheel. Hub 430 is connected to the lower order wheel by means of a concentric sleeve, upon which sleeve is mounted the pinion 472 of the higher order wheel and a coupling member 471, fast to said pinion. Coupling member 471 has a toothed periphery adapted to engage between lugs 470' of the floating gear 470, these lugs having sufficient play between the teeth of the coupling member to allow for the eccentric movement of the floating gear, and certain of the teeth of the coupling member being always in position to hold the floating gear in fixed rotative relation to the pinion 472. Therefore, rotation of the pinion 472 in accordance with a value to be registered, will rotate floating gear 470 correspondingly, this movement being transmitted through the internal gear teeth 473' to the related numeral wheel 473. This movement of wheel 473 will in turn rotate the connected eccentric hub 430, causing the floating gear 470 of the higher order wheel to move in an orbit around the shaft 403. Floating gear 470 is provided with a lesser number of teeth than the internal gear of the numeral wheel 473, so that the orbital movement of the floating gear, by camming action on the internal teeth of the numeral wheel, will rotate said wheel in the same direction as the lower order wheel from which

the movement originated. The gear ratios are such that the higher order wheel is advanced one-tenth of a step or figure space for each step of movement of the lower order wheel.

5 The aligning means operates on the principle set forth in U. S. Patent No. 1,246,087, issued to C. W. Gooch on November 13, 1917, according to which, partial transfers are compensated for by imparting opposite movement to the wheels, the extent of this movement being determined by a
10 snail cam on the lower order wheel and a lever device connected to the gearing of the higher order wheel and adapted to feel out the position of the cam.

15 In the present application however compensation is effected through the main transmission train, movement of the gears 482 about shaft 481 as a center being employed for counteracting the partial tens transfer, the arms 483 supporting these gears being each provided with
20 a lug 484 extending laterally into register with a graduated member or cam 485 mounted upon the lower order wheel 473. During the operation of the machine the lugs 484 and gears 482 are held upward, in position illustrated in Fig. 1,
25 by means to be hereinafter described, and at the end of the operation they are each moved downwardly by means of a spring 486, until lug 484 contacts with the cam 485 of the lower order numeral wheel, gears 482 walking around the
30 pinions 472. Thus, if the lower order wheel registers 3, giving an excessive displacement of the next adjacent higher order wheel of 3/10, the cam 485 of said lower order wheel will be in
35 position to limit the movement of gear 482 about the stationary teeth of gear 480 to a degree giving a 3/10 movement to the higher order wheel 473.

40 Since the partial transfers have been eliminated from the wheels 473 by the above described operation, the numerals upon these wheels will stand accurately upon the reading line until the next operation of the machine
45 is begun, whereupon the arms 483 will be raised, and the reverse operation of the gears 482 will restore the partial tens transfers to the wheels.

In order that a numeral wheel, set in operation through the related intermediate gear 477
50 at the beginning of an additive operation of the machine may not cause a bind of the shoulder of snail cam 485 with the related lug 484, before said lug can be moved out of the path of the cam, cam 485 is loosely mounted upon shaft 403,
55 and is connected to numeral wheel 473 by a pin and slot connection 487, a spring 488 serving to hold the cam yieldably in its true relation with the numeral wheel.

The arms 483 are raised and released by the
60 operation of a bail 489, extending beneath and engaging each of said arms, the bail being pivotally mounted on shaft 481. Bail 489 is operated for this purpose by a lever 490, fulcrumed in the base of the machine at 491 and
65 having a roller riding upon the periphery of a cam 492. Preferably a lever 490 will be mounted upon each of the side plates of the machine, and two cams 492, connected by a shaft 493 will cooperate with these levers. Shaft 493, and
70 therefore cams 492 are driven in 1:1 ratio from the gear 476. The low point of cam 492 is designed to be opposite the roller of lever 490 when the operating lever 478, the differential actuators, etc., are located in full cycle position, in
75 which position bail 489 is allowed to drop away

from the arms 483, as shown in Fig. 1. Movement of the roller of lever 490 onto the high portion of cam 492 will hold the arms 483 in raised position during the greater part of each cycle of operation.

In order to avoid the operation of the alignor mechanism at the end of each cycle of a multiple cyclic operation, a latch 494 is pivoted at 495 upon the frame of the machine, and is urged by a spring 496 into position to engage
10 beneath a lug 497 of lever 490 as soon as the roller is lifted to the high point of cam 492.

To release latch 494 when the machine is brought to rest at the end of an operation, a kinetic or centrifugal governor is provided, this governor comprising an arm 498 having a roller adapted to engage an arm 499 of latch 494. Arm 498 has a slot engaging the pintle of a pinion 500, said pinion meshing with the gear 476, and having as shown a 3:1 ratio therewith. The arm 498 is also provided with a pin engaging a slot formed on an arm 501, fast with gear 500. Owing to this pin and slot connection arm 498 may be moved radially of the pinion 500, a spring 502 normally holding the roller of said arm pushed outward, into position to engage arm 499 of latch 494. Upon operation of the machine however, rotation of pinion 500 will carry arm 498 around therewith, and the weighted end 503 of said arm will act by centrifugal force to retract the roller from contact with arm 499. Therefore as long as the machine remains in motion latch 494 will hold lever 490 in operated position, holding bail 489 raised and the alignor in inoperative position. When the machine is brought to rest, spring 502 will move the roller of arm 498 against arm 499, tripping latch 494, and allowing the springs 486 to align the numeral wheels.

I claim:

1. In a calculating machine having numeral wheels, crawl tens transfer devices between said wheels, and operating means including a cyclically operated member; the combination with means for aligning said wheels to eliminate partial transfers, of means cooperating with the cyclic member to disable the aligning means during mid-cycle movement of said member, and means operable to maintain the aligning means in disabled condition during movement of said member through full-cycle position.

2. In a calculating machine having numeral wheels, crawl tens transfer devices between said wheels, and operating means including a cyclically operated member; the combination with spring operated devices individual to the numeral wheels and adapted to compensate for partial tens transfers and thereby bring said wheels to aligned reading position, of means operable by the cyclic member to restrain the compensating devices, and means operable as the cyclic member is brought to rest to release the restraining means.

3. In a calculating machine having numeral wheels, crawl tens transfer devices between said wheels, and operating means including a cyclically operated member; the combination with means for aligning said wheels to eliminate partial transfers, of a cam driven by the cyclic member, a lever operable by said cam to adjust the aligning means to inoperative position, a latch adapted to hold said lever in operated position, and means operable as the cyclic member is

brought to rest in full-cycle position to trip the latch.

4. In a calculating machine having numeral wheels, crawl tens transfer devices between said wheels, and operating means including a cyclically operated member; the combination with means for aligning said wheels to eliminate partial transfers, of control means cooperating with the cyclic member and including a centrifugal governor driven by the operating means and elements controlled thereby to hold the aligning means in inoperative position during movement of said member and to adjust the aligning means to active position as the member is brought to rest.

5. In a calculating machine having numeral wheels, crawl tens transfer devices between said wheels, and operating means including a cyclically operated member; the combination with means for aligning said wheels to eliminate partial transfers, of a cam driven by the cyclic member, a lever operable by said cam to adjust the aligning means to inoperative position, a latch adapted to hold said lever in operated position, and a centrifugal governor driven by the operating means and adapted to trip the latch as the cyclic member is brought to rest.

6. In a calculating machine having operating means, means for controlling a function of said machine during movement of the operating means and comprising a control member, means for adjusting the control member to active position, a latch adapted to hold said member in adjusted position, and a kinetic governor driven by the operating means and adapted to trip the latch as the cyclic member is brought to rest.

7. In a calculating machine having operating means adapted to effect multiple cycle operations, and including a cyclically operated member, means for controlling a function of said machine during movement of the operating means and comprising a cam driven by the cyclic member, a control lever operable by said cam into active position, a latch adapted to hold said lever in operated position, and a centrifugal gov-

ernor driven by the operating means and adapted to trip the latch as the cyclic member is brought to rest.

8. In a calculating machine having numeral wheels, the combination with transmission gearing for said wheels including relatively shiftable selected digit transmission members and differential gearing related to each wheel, one leg of each differential adapted to transmit crawl tens transfer values and one leg adapted to transmit selected digital values to the related wheel, of a graduated member on each wheel, members each adapted to adjust the relatively shiftable member of a higher order wheel in accordance with the position of the graduated member of the next lower order wheel and thereby compensate for partial transfer movements of the differential gearing and align the wheels, and a universal member operable to displace all of the adjusting members, to shift the digit transmission members and hold them in crawl transfer position.

9. In a calculating machine having numeral wheels, the combination with a shaft, transmission gearing for said wheels including selected digit value transmission gears mounted upon said shaft, compensating gears meshing with said first named gears and mounted for individual movement about said shaft, and differential gearing related to each wheel, one leg of each differential adapted to transmit crawl tens transfer values to the related wheel and one leg including a gear meshing with the related compensating gear, of a graduated member on each wheel, members each adapted to adjust the compensating gear of a higher order wheel in accordance with the position of the graduated member of the next lower order wheel to shift the compensating gears about the shaft and thereby compensate for partial transfer movements of the differential gearing and align the wheels, and a bail operable to displace all of the adjusting members and hold them in crawl transfer position.

GEORGE C. CHASE.

CERTIFICATE OF CORRECTION.

Patent No. 2,089,682.

August 10, 1937.

GEORGE C. CHASE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 11, for the word "latter" read former; and second column, line 28, before "connected" insert rigidly; line 30, after "sleeve" first occurrence, insert the reference numeral 430'; and same line, before "mounted" insert freely; page 2, second column, line 6, for "the" after "avoid" read unnecessary; lines 41, 52 and 65; and page 3, first column, lines 3, 15, 27 and 36, claims 1, 2, 3, 4, 5, 6 and 7 respectively, after "machine" insert adapted for operation through repeated cycles of registering operation and; page 2, second column, lines 43-44, 54-55, and 67-68; and page 3, first column, lines 5-6 and 17-18, claims 1, 2, 3, 4 and 5 respectively, strike out "cyclically operated member" and insert instead member operated in cycle with the machine; same page; first column, line 28, claim 6, after "means" first occurrence, insert including a member operated in cycle with the machine; and same line, after "means" second occurrence, insert driven by the cyclic member; lines 37, 38 and 39, claim 7, strike out "adapted to effect multiple cycle operations, and including a cyclically operated member" and insert instead including a member operated in cycle with the machine; and second column, line 26, claim 9, before "compensating" insert the words and comma a series of arms pivoted upon said shaft;; line 27, same claim, after "mounted" insert upon said arm; line 29, same claim, strike out "related to each wheel" and insert instead between said numeral wheels; line 31, same claim, after "related" insert higher order; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of October, A. D. 1937.

Henry Van Arsdale.

(Seal)

Acting Commissioner of Patents.