

April 14, 1942.

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2,279,455

CALCULATING MACHINE

Filed June 2, 1937

3 Sheets-Sheet 1

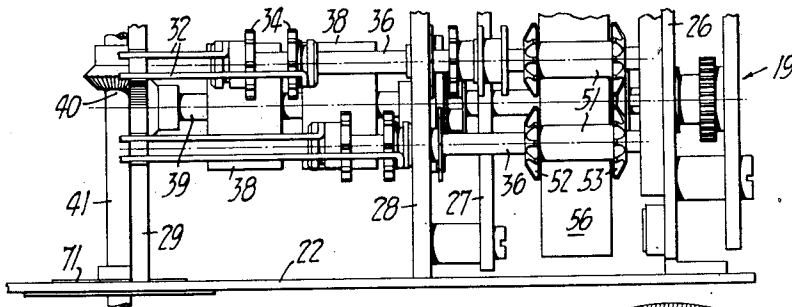


FIG. 2.

FIG. 1.

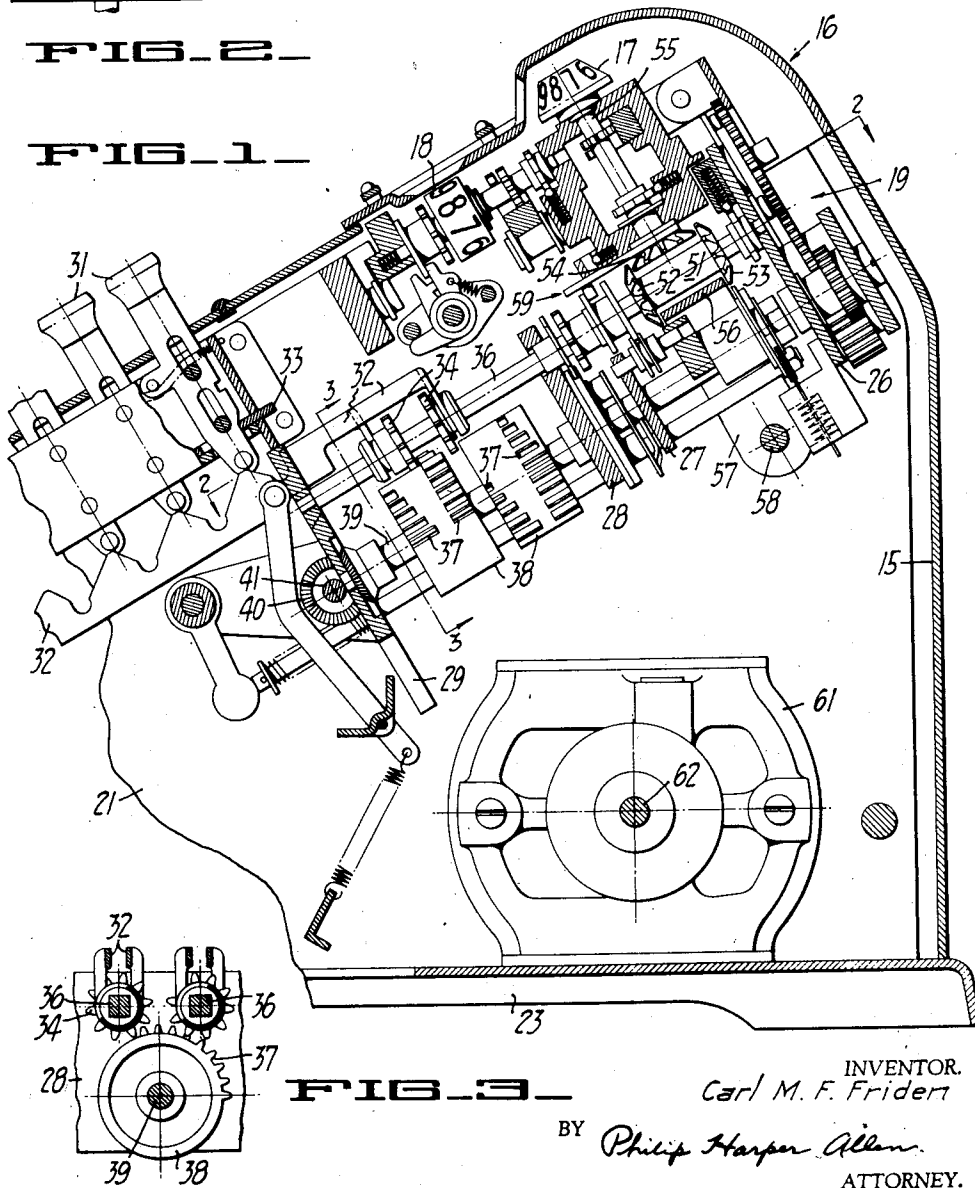


FIG. 3.

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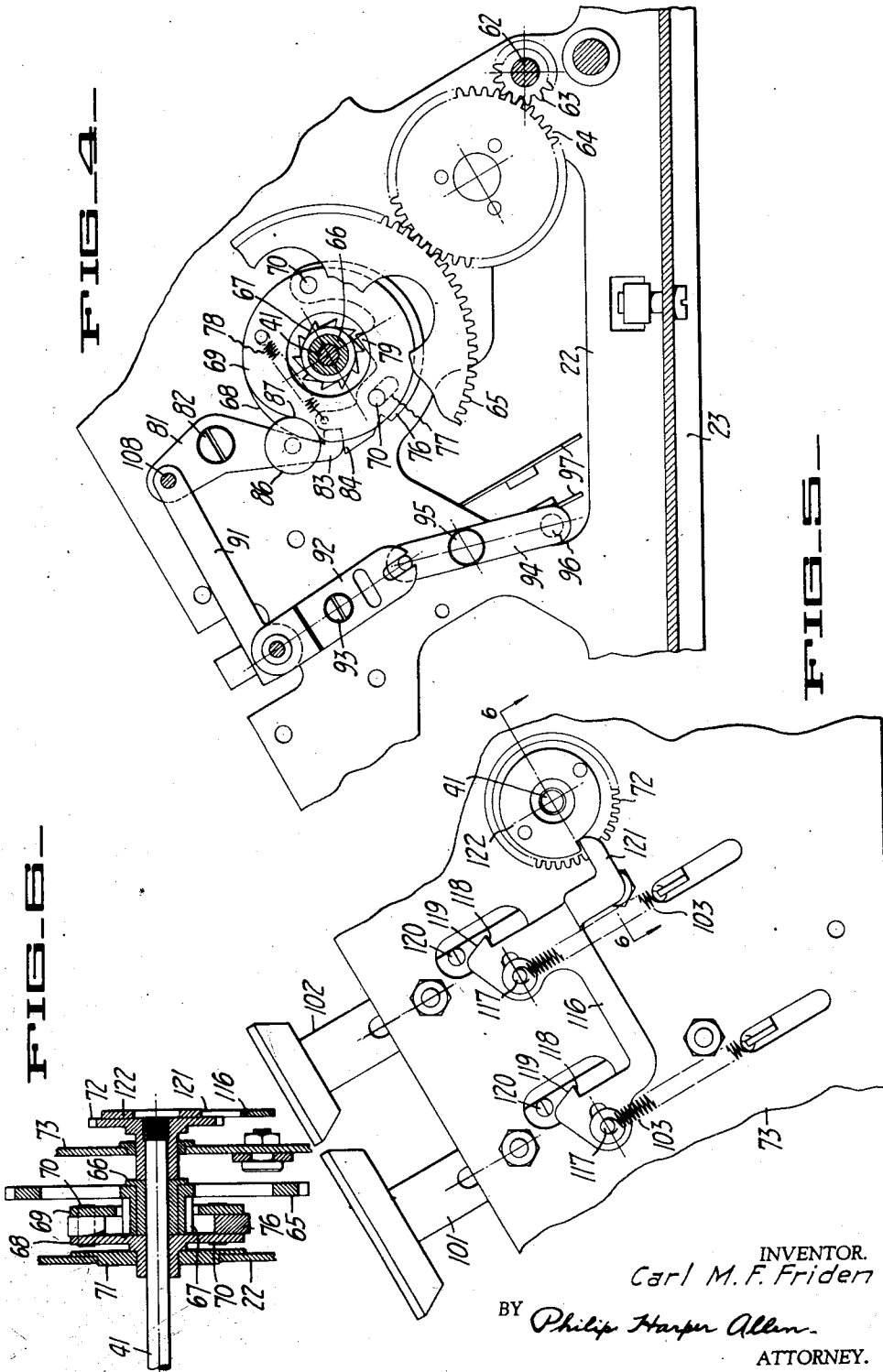
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C. M. F. FRIDEN
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2,279,455

Filed June 2, 1937

3 Sheets-Sheet 2



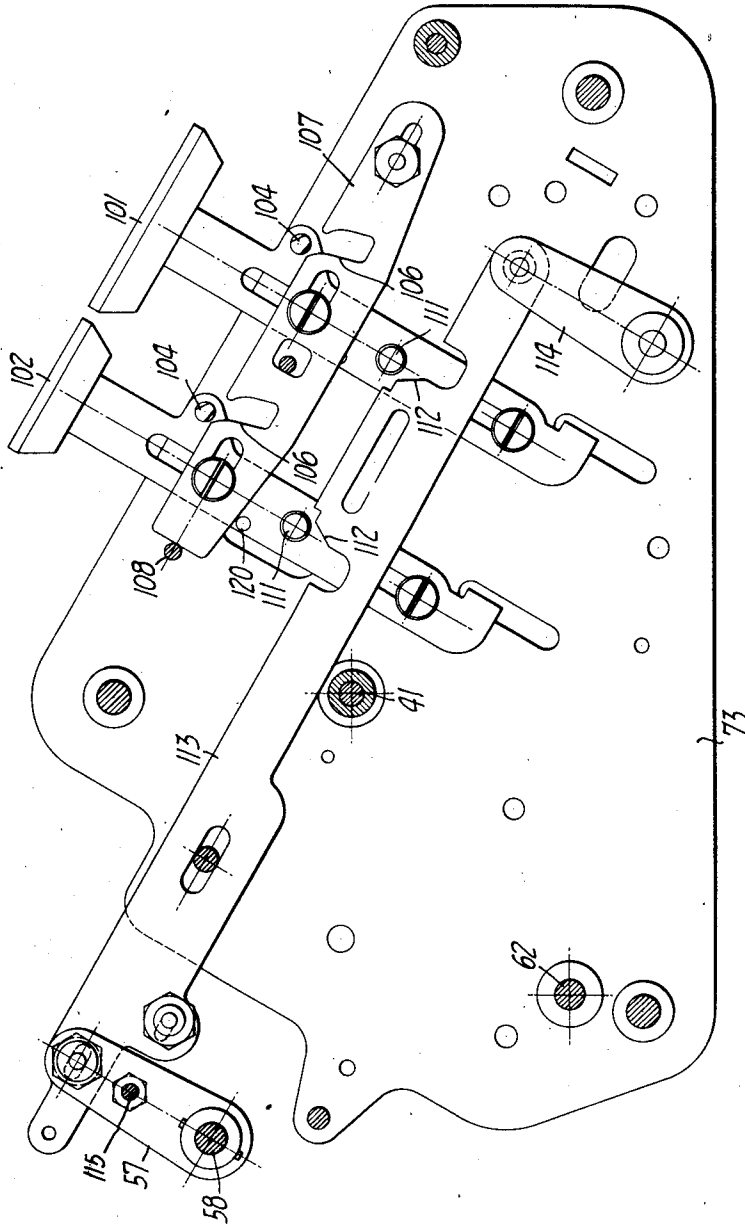
April 14, 1942.

C. M. F. FRIDEN
CALCULATING MACHINE
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2,279,455

3 Sheets-Sheet 3

FIG 7--



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2,279,455

CALCULATING MACHINE

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Application June 2, 1937, Serial No. 145,979

1 Claim. (Cl. 235—62)

This invention relates to calculating machines, and is concerned more particularly with the provision of improved drive and drive control mechanism for such machines.

It is a general object of the invention to provide a simple and reliable drive and drive control mechanism for a calculating machine.

Another object of the invention is to provide an improved calculating machine in which a rapid and incomplete depression of an operating key cannot cause misoperation of the machine.

Another object of the invention is to provide a calculating machine in which the foregoing objects are attained by means of a simple and economical construction.

Another object of the invention is to provide a calculating machine having simple and reliable cyclic clutch means for controlling the drive therefor.

Other objects will appear from the following description taken in connection with the accompanying drawings, in which:

Fig. 1 is a longitudinal sectional elevation of the selecting, actuating, accumulating and counting mechanisms.

Fig. 2 is a fragmentary plan view of the selecting and actuating mechanisms, taken in a plane indicated by the line 2—2 in Fig. 1, the actuating cylinders being shown schematically.

Fig. 3 is a transverse sectional elevation of a part of the selecting and actuating mechanisms, and is taken as indicated by the line 3—3 in Fig. 1, the teeth of the rear actuating cylinder being omitted.

Fig. 4 is a fragmentary elevational view of the clutch and drive means.

Fig. 5 is a fragmentary elevational view of the plus and minus keys and the latch means therefor.

Fig. 6 is a sectional view of the clutch and associated mechanism and is taken in the plane of the line 6—6 in Fig. 5.

Fig. 7 is an elevational view of the plus and minus keys and the plus-minus slide controlled thereby.

The invention is described as embodied in a preferred form and as adapted to a Thomas type calculating machine. Referring to Fig. 1, the machine includes body 15 in which the actuating, selecting, and control mechanisms are mounted, and carriage 16 which is mounted for endwise shifting movement transversely of body 15 and which carries numeral wheels 17 and 18 of the accumulator and revolutions counter, respectively. Carriage 16 may be shifted in either direc-

tion by suitable shifting means, such as indicated generally at 19, to change the ordinal relation of the registers to the actuating means therefor.

Within body or casing 15, the frame includes 5 similar left and right side plates 21, 22 (Figs. 1 and 2) which are suitably mounted on base 23 and are interconnected by a plurality of cross frame members 26, 27, 28 and 29 for supporting various mechanisms including the selecting and actuating mechanisms described hereinafter.

The values to be introduced into the accumu- 10
lator numeral wheels 17 are selected by means of a plurality of similar orders of selecting mechanism associated with numeral keys 31. For this pur-
pose, each bank or order of keys 31 cooperates 15
with a pair of similar parallel spring-urged value selecting slides 32 (Figs. 1-3) mounted for end-
wise movement by a suitable linkage and extend-
ing through suitable slots in cross frame mem-
ber 29. Each slide 32 is provided with cam sur-
faces of varying inclination for cooperation with
suitable pins on certain of keys 31 to effect a
differential movement of slide 32 on depression
of a key 31, one slide 32 of each order cooperates
25 with the "1" to "5" keys 31 of a bank, while the
other slide 32 of an order cooperates with the
"6" to "9" keys of the bank. Each bank of keys
31 has a latching slide 33 of conventional con-
struction associated therewith to latch any de-
pressed key 31 releasably in depressed position
against the tension of the spring associated
therewith. Each slide 32 is connected at its rear
end with a ten-tooth selecting gear 34 slidably
and non-rotatably mounted on square selecting
shaft 36, whereby movement of a slide 32 serves
35 to position the associated gear 34 on shaft 36
with respect to stepped teeth 37 of the associated
actuating cylinder 38 in accordance with the
value of the depressed numeral key 31. A pair of
actuating cylinders 38 for adjacent orders of the
40 machine are mounted on each actuating shaft
39, which is suitably journaled in cross members
28 and 29 and has a bevel gear connection 40
with transverse shaft 41. Shaft 41 is operable
45 cyclically in a single direction from clutch con-
trolled driving means as described hereinafter.

As seen in Fig. 2, the pair of selecting shafts 36 50
associated with each actuating shaft 39 are posi-
tioned above and to either side thereof, while
the sets of gears 34 on respective selecting shafts
36 are offset longitudinally of the machine for
cooperation with the similarly offset actuating
cylinders 38. By the above arrangement and
upon each rotation of the actuating means, a
55 selected number of increments of movement can

be imparted to each selecting shaft 36 by the associated actuating cylinder 33 in accordance with the adjusted position of gears 34.

Each selecting shaft 36 is suitably journaled in cross members 26, 28 and 29, and between members 26 and 28 has associated therewith selectively settable plus-minus gears for driving an aligned numeral wheel 17. The plus-minus gears of each order of the machine comprise a spool 51 (Figs. 1 and 2) slidably and non-rotatably mounted on shaft 36 and having opposed bevel gears 52, 53 arranged for selective engagement with similar gear 54 on numeral wheel shaft 55. The engagement of gears 52 and 53 with gear 54 is controlled by strap 56 which extends transversely of the machine between each set of plus-minus gears 52, 53 and is mounted by a pair of similar arms 57 for rocking movement with shaft 58, which is suitably journaled in side plates 21, 22. Shaft 58 is controlled in a manner hereinafter described to determine positive registration by meshing gears 52 with gears 54, and negative registration by meshing gears 53 with gears 54. In the neutral position shown in Fig. 1 in which gears 52 and 53 are held normally by suitable spring urged centralizing means, carriage shifting can be effected.

During both additive and subtractive registration of values in numeral wheels 17, suitable transfer mechanism indicated generally at 59 is operative to effect the tens transfer.

As stated above, the actuating means is operable cyclically to effect registration in the accumulator of the values set into the machine by depression of the numeral keys. For this purpose a clutch controlled drive is provided for the actuating mechanism, which preferably forms the sole drive means for all operating parts of the machine. The source of power of the drive means comprises electric motor 61 (Fig. 1) having drive shaft 62 carrying drive gear 63 (Fig. 4) which is connected by gear 64 with gear 65 journaled by flanged collar 66 (Figs. 4 and 6) on transverse shaft 41 and having driving clutch member or ratchet 67 formed on the hub thereof. The driven clutch member comprises disc 68 having its hub pinned on shaft 41 and ring 69 secured in spaced relation from disc 68 by suitable studs 70. Disc 68 is journaled in bearing 71 secured in side plate 22 and engages the hub of gear 65 and the end of collar 66, which has its opposed end in abutting relation with the hub of gear 72 secured on shaft 41 and journaled by a suitable bearing in frame plate 73.

The driven clutch member carries a drive establishing element in the form of pawl 76 which is pivoted at one end between disc 68 and ring 69 on one of studs 70, and has an arcuate slot 77 adjacent its other end engaged by another of studs 70. Pawl 76 is urged to active position by spring 78 and intermediate its ends has tooth 79 for engagement with the teeth of ratchet 67 to establish the drive connection. Pawl 76 is restrained from movement to active position in the neutral or full cycle position of the parts by clutch control lever 81 pivoted at 82 on side plate 22 and having a nose or stop 83 for engagement with shoulder 84 at the free end of pawl 76. Lever 81 carries roller 86 which seats in depression 87 on ring 69 in the full cycle position thereof, and in other positions thereof is engaged with the periphery of ring 69 to maintain lever 81 in its clutch engaging position for a purpose later referred to.

It is seen, therefore, that one or more cycles of

operation of the actuating mechanism can be determined by oscillation of clutch control lever 81. Simultaneously with movement of control lever 81, the circuit for motor 61 is established by means of link extension 91 (Fig. 4) of lever 92 pivoted at 93 on side plate 22. At its lower end lever 92 is pivotally associated with lever 94 pivoted at 95 on plate 22 and having pin 96 of insulating material overlapping one of spring contacts 97 of the motor circuit. Thus, movement of clutch control lever 81 simultaneously conditions the clutch and the motor circuit.

Means are provided for selectively determining positive or negative registration on the numeral wheels in the form of plus key 101 (Figs. 5 and 7) and minus key 102 which are slidably mounted for endwise movement by suitable studs on plate 73, and are urged to raised position by respective springs 103. Depression of either of keys 101, 102 serves to engage the clutch, close the motor circuit, and select the sign character of the registration.

To enable the drive, keys 101 and 102 (Fig. 5) have respective pins 104 in operative relation with cam surfaces 106 on clutch control slide 107 which is suitably mounted for endwise movement on plate 73. To effect control of the clutch and the motor circuit by such movement of slide 107, pin 108 (Figs. 4 and 7) on the upper arm of clutch control lever 81 abuts the rear end of slide 107, so that rearward movement of slide 107 oscillates lever 81 in a clockwise direction as viewed in Fig. 4 to release clutch pawl 76 for engagement with drive ratchet 67, and to close contacts 97.

It will be noted that roller 86 in maintaining control lever 81 in clutch engaging position when the actuating means is out of full cycle position, also serves to maintain contacts 97 closed so that the motor circuit can be interrupted only in or adjacent the full cycle position of the parts.

To determine the sign character of the registration, plus and minus keys 101 and 102 (Fig. 7) have respective rollers 111, disposed in operative relation with opposed cam surfaces 112 on plus-minus slide 113. Slide 113 is mounted for endwise movement at its front end by link 114 and at its rear end by one of arms 57 on shaft 58. As described above, arms 57 on shaft 58 (Figs. 2 and 3) carry transversely extending strap 56 which controls the engagement or disengagement of gears 52 or 53 with numeral wheel gears 54. Thus, depression of plus key 101 moves slide 113 rearwardly of the machine and rocks shaft 58 and strap 56 to effect meshing of gears 52, 54, determining positive registration on numeral wheels 17 of the value set in the keyboard. Similarly, depression of minus key 102 determines one or more negative registrations of such values by meshing gears 53, 54 upon forward movement of plus-minus slide 113.

A conventional full-cycle lock means is associated with the plus-minus slide 113 to insure meshing of plus-minus gears 52 or 53 with numeral wheel gears 54 throughout a complete cycle after the gears have been positioned by plus key 101 or minus key 102. One form of such full-cycle lock means is shown in my Patent 2,229,839, dated January 28, 1941. As shown herein, the full-cycle lock means includes a pin 115 (Figure 7) carried by one of arms 57 and adapted to cooperate with a suitable notched disc (not shown) on one of actuating shafts 39. The pin 115 is adapted for positioning at one side or other of the disc upon endwise movement of plus-minus

2,279,455

slide 113 to maintain the adjusted position of the slide until the notch in the disc again registers with pin 115 in the full-cycle position of the actuating means.

Latch means is provided to prevent misoperation of the machine by too rapid release of either of keys 101, 102, to thereby insure one cycle of operation for each depression thereof, the latch means being automatically disabled by power driven means during each cycle of operation. For this purpose, latching slide 116 (Fig. 5) is mounted for endwise movement by studs 117 on plate 73 and has respective latch shoulders 118 below respective cam surfaces 119 for cooperation with pins 120 on keys 101, 102. Pins 120 have their upper surfaces flat for engagement with shoulders 118 and, upon depression of a key, the associated pin 120 serves to cam latching slide 116 to the left as viewed in Fig. 5 against the tension of the right-hand spring 121 viewed in Fig. 5 which engages offset portion 121 of slide 116. In this manner the pin of the depressed key will engage beneath the associated shoulder 118 to hold the key partially depressed, whereby full depression of the key to establish the drive is required.

To effect release of the depressed key, latching slide 116 has offset cam follower extension 121 engaging cam 122, which is secured on gear 72. Extension 121 is held against the cam by the adjacent spring 103. The contour of cam 122 is such that the key will be released after substantially half the ensuing cycle of operation.

While I have shown and described my invention in connection with a preferred embodiment 35

thereof, it will be understood that such invention is capable of variation and modification, so that the scope of the invention should be limited only by the appended claim.

I, therefore, claim as my invention:

5 In a calculating machine having numeral wheels, cyclically operable rotary actuating means therefor of the uni-directional type, settable plus-minus gearing interposed between said numeral wheels and said actuating means, and full cycle mechanism for maintaining the setting of said plus-minus gearing during each cycle of operation of said actuating means; respective plus and minus keys mounted in juxtaposed relation for endwise sliding movement, a plus-minus slide 10 connected to said plus-minus gearing and operable by either of said keys, means controlled by said keys for driving said actuating means through one or more cycles of operation without interruption in response to manual depression of a key and to manual release of the depressed key, a common latch slide for said keys, yieldable means urging said slide to active position, and a cam driven in time with said actuating means for moving said slide to inactive position during 20 each cycle of operation of said actuating means, said latch slide insuring maintenance of said settable gearing in set position at the beginning of a cycle of operation until said full cycle mechanism becomes effective and said cam insuring release of the depressed key to allow stopping of the operation at the end of the selected cycle of operation.

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