Fig. 1.

Inventor

Clair Dennison Lake

By his Attorneys

Kerr, Page, Cooper & Hayward

Mar. 6, 1923.

1,447,871

C. D. LAKE

FRICTION DRIVE CONTROL FOR TABULATING MACHINES
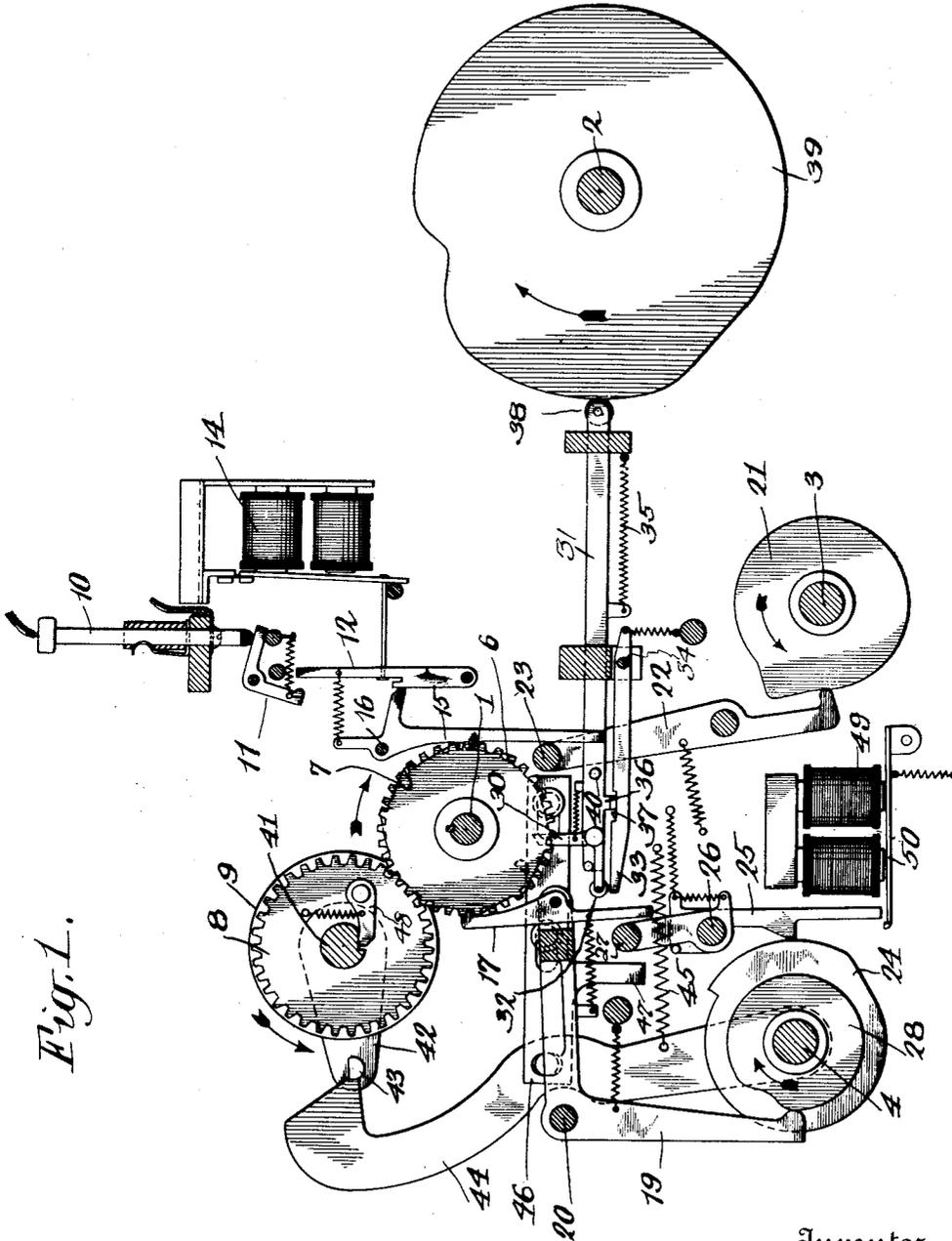
Filed Apr. 21, 1921

3 sheets-sheet 2

Fig.2.

Fig.3.

Inventor
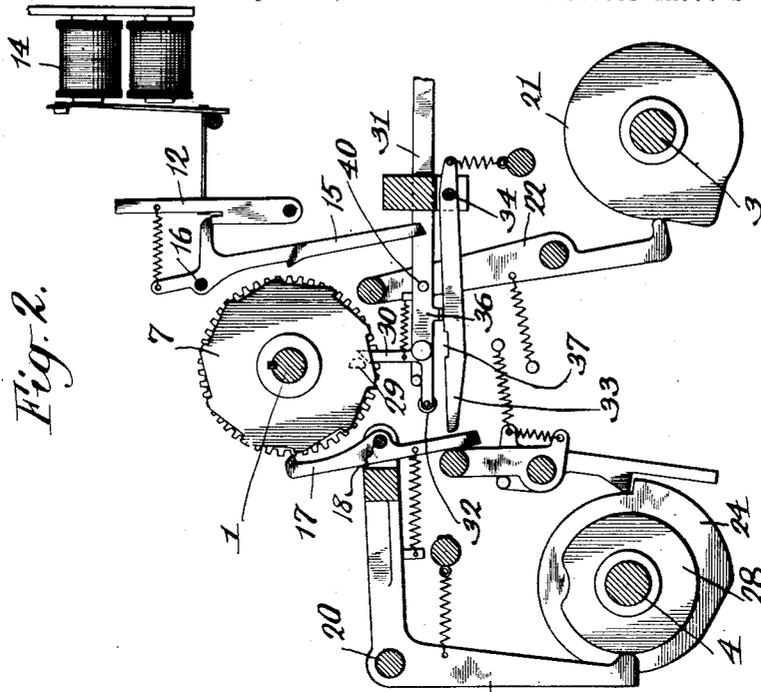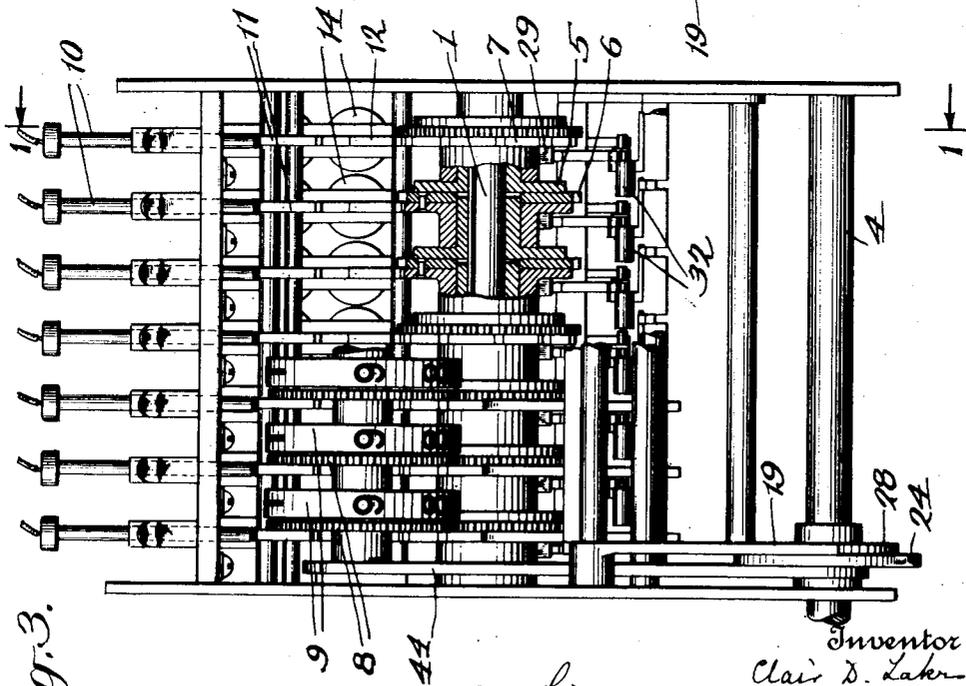Clair D. Lake
By his Attorneys

Mar. 6, 1923.

C. D. LAKE

1,447,871

FRICTION DRIVE CONTROL FOR TABULATING MACHINES
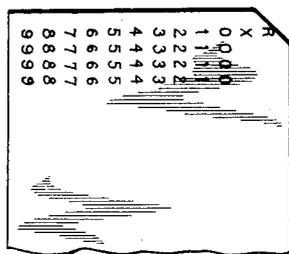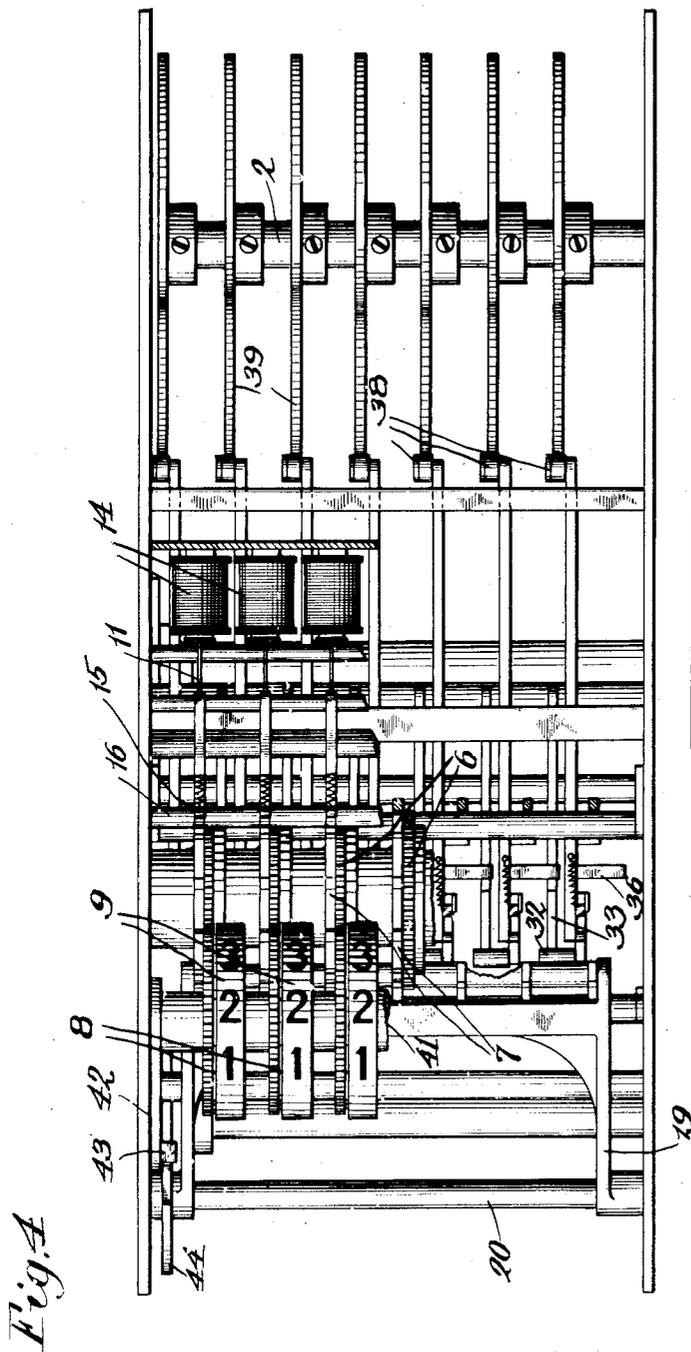
Filed Apr. 21, 1921

3 sheets-sheet 3

Fig.4.

Fig.5.

Inventor

Clair D. Lake

By his Attorneys

Kerr, Page, Cooper & Hayward

UNITED STATES PATENT OFFICE.

CLAIR DENNISON LAKE, OF BINGHAMTON, NEW YORK, ASSIGNOR TO THE TABULATING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

FRICTION DRIVE CONTROL FOR TABULATING MACHINES.

To all whom it may concern:

Be it known that I, CLAIR D. LAKE, a citizen of the United States, residing at Binghamton, in the county of Broome and
5 State of New York, have invented certain new and useful Improvements in Friction Drive Controls for Tabulating Machines, of which the following is a full, clear, and exact description.

10 The invention set forth and claimed in this application for Letters Patent is an improvement in friction drives for the counters of tabulating machines or similar apparatus. For a more ready understanding of the na-
15 ture and purpose of the said improvement, a certain knowledge of tabulating machines and these counters is necessary, and for this I may refer to my Patent No. 1,307,740, dated June 24, 1919, and to the now well
20 known and widely used Hollerith tabulator.

In the case of such machines a series of punched cards are run through under contact brushes and when a brush passes over a perforation it closes a circuit that oper-
25 ates a magnet in the counter at such point in a given cycle of operation as corresponds to the numerical value of that particular hole, and this magnet effects an operation of the counter by which the units, tens or other
30 wheel of the counter is turned to display or record such number. For example, if a card has punched the 9 hole in the units column and the next card the 6 hole in the same column, the counter wheels will first indicate 9
35 units and then 1 ten and 5 units and so on. A cycle of operation in such counters is usually one complete revolution of the counter drive shaft and occurs once during the passage of a single card through the machine.
40 In these counters as heretofore constructed the control of the type or indicating wheels by which they are caused to display or record the proper figures corresponding to the punched holes in a card is effected by
45 the use of clutch mechanisms of various kinds which lock and release the counter wheels or wheels driving the same at the proper instants of time in a cycle, and such mechanisms involve more or less complica-
50 tion and a great number of parts, besides being somewhat delicate and liable to derangement. My object in the present case is to provide another means for driving or setting the counter wheels, and for this purpose I
55 have devised a novel form of friction drive,

and upon this the present application is based.

In the drawings hereto annexed, I have shown only such parts of the apparatus as are necessary to a full understanding of my 60 improvement, and as these counters as regards their general plan of construction and operation are well known, I have shown the working parts mainly in their theoretical rather than their actual physical rela- 65 tions.

Fig. 1 is a view of practically the complete machine in which the parts are exhibited in such relation, the view being a theoretical section on line 1—1 of Fig. 3. 70

Fig. 2 is a similar view showing the parts in different relative positions.

Fig. 3 is an end and part sectional view of the counter as a whole.

Fig. 4 is a top plan and part sectional view 75 of the same, and

Fig. 5 is a plan view of a portion of a tabulator card.

The counter drive shaft 1 and the three cam shafts 2, 3 and 4 are in any proper 80 manner driven by suitable power, the shafts 2, 3 and 4 making one complete revolution for each card passed through the machine and during its passage. The drive shaft 1 carries as many friction disks 5 as there are 85 counter wheels, these disks being fast to the said shaft. Loose on said shaft are gear wheels 6 and ratchet wheels 7, pinned together, and when free these are rotated by frictional engagement with the disks 5. The 90 gear wheels 6 mesh with gear wheels 8 fast to or forming part of the counter wheels 9, and their movement is imparted to the said counter wheels.

The machine is provided with a series of 95 plugs 10, one for each counter wheel and in the use of the apparatus the plugs for as many counter wheels as it may be desired to operate are pushed in. This is the usual practice in such cases, but in this particular 100 instance, when a plug is pushed in it encounters a spring actuated locking lever 11, and turns its free end out of the path of a latch lever 12, controlled by the armature 13 of an electro-counter magnet 14. 105

Normally each ratchet wheel 7 is engaged by the pawls 17 pivoted at 18, to one arm of a bell crank lever 19, pivoted at 20. When, therefore, a card enters the machine it closes a circuit in the well known way that 110

starts up the machine and sets the cam 21 in rotation. The high point on this cam operates a lever 22 connected with a bail 23, that engages with the pawls 15 and releases them from engagement with the ratchet wheels 7 and the pawls 15 are latched in position by the engagement with the latch levers 12. The simultaneous rotation of the cam 24, permits the movement of a lever 25 as it drops off the high point of the cam and this lever swings about its pivotal point 26 and throws a bail 27 to the right with the result that all of the pawls 17 are withdrawn from engagement with the ratchets 7. The ratchets being thus released by both pawls 15 and 17 are free to revolve in company with the friction disks and continue their movement until the counter magnet 14 is energized by the passage of a card perforation under a brush and unlatches pawl 15 and allows it to engage and stop the ratchet 7.

Near the end of the cycle the depression in a cam 28 permits the bell crank lever 19 to swing and thereby raise the pawl 17 to a point above one of the teeth of ratchet 7.

Each ratchet wheel 7 carries a pin 29 and into the path of this pin extends the bevelled end of a small bell crank or right angled lever 30, spring actuated and pivoted to a slide bar 31. When any ratchet wheel 7 or gear wheel 6 has made a complete revolution, or a counter wheel is passing from 9 to zero in the window, the lever 30 is encountered by the pin 29 and its other end carrying a roller 32 depresses the lever 33 of the next high order of units pivoted to the frame at 34, and allows the slide 31, under the influence of a spring 35, to move to the right by disengagement of a projection 36 thereon from a notch 37 in that lever 33.

There is a slide bar 31, and locking lever 33, for each ratchet wheel 7, and at their ends these slide bars carry rollers 38 that travel over the periphery of a cam 39, that makes one revolution for each cycle. This cam is so formed that no slide bar can move until a certain point in the cycle is reached, and at or near the end of the cycle a depression is brought under the rollers 38, which permits the released bars to move a substantial distance. By such movement a pin 40 on the slide bar is brought against the pawl 15 and permits the ratchet controlled thereby to revolve one-tenth of a revolution, and by this means carrying is effected.

To illustrate, assume that the counter or adding wheels indicate 0999 in the window and that one unit is added to this total. The units ratchet will move one-tenth of a revolution and by this movement the pin 29 will engage its lever 30 which is pivoted to the

units slide, and this will unlatch the lever 33 of the tens ratchet. The slide thus released will be arrested by the cam 39, after moving a certain distance, but during this movement the lever 30 of the tens slide will engage pin 29 of the tens ratchet and will therefore unlatch the slide 31 of the hundreds ratchet and so on.

At the end of the adding all slides 31 that have been unlatched will drop into the depressions of cam 39 and move sufficiently to cause pins 40 to engage pawls 15, release their ratchets and permit such ratchets to revolve one-tenth of a revolution. All of the ratchets will then be locked by the pawls 15 and the slides 31 moved back by the cam 39 into re-engagement with the notches 37 in the levers 33. At this time also all of the pawls 17, by means of the levers 19 operated by the cam 28 will be moved backward a short distance in order to obtain an overlap on the pawls 15.

The means for resetting the counter wheels to zero is shown in Fig. 1. The shaft 41 of the counter wheels is provided with a crank or any means, not shown, for turning it by hand or otherwise. Fast to this shaft is an arm 42 carrying at its end a pin 43 which normally engages the end of an arm 44 pivotally mounted on the shaft 4. To reset the shaft 41 is turned one complete revolution, and at the start it releases the arm 44, which by means of a spring 45 swings to the right, carrying with it a plate 46 suitably guided. A projection 47 on this plate engages the bail 27 and thus releases the pawls 17. The end of the plate engages the bail 23 and thereby releases the pawls 15. The wheels do not start to revolve until the pawls 48 engage in the notch in the shaft 41, and at the very end of the rotation of the shaft 41 the arm 44 is again engaged by the pin 43 which causes the pawls 15 and 17 to again engage the ratchets 7 and thus prevent overthrow. The complete resetting to zero is not finally accomplished until the machine starts up again and the rotation of the friction disks brings a tooth of the ratchet 7 into engagement with the pawl 17.

The tabulator cards used with this machine, a specimen of which is shown in Fig. 5, have certain points other than those corresponding to digits. One of these is designated X and if a hole is punched at this point it means that no adding operation is being performed. For this purpose when a current is sent from that hole, it energizes a magnet 49 which then attracts its armature 50 and locks the lever 25, thus maintaining the ratchets locked throughout the cycle. Again, if a card has a zero hole punched in any column the ratchet for that column is held by the pawl 15 during the adding part of that cycle, to prevent tripping of carrying mechanism.

For the proper operation of the machine, it is manifest that sufficient clearance should be provided between the shaft 41 and the pawl 48, between the lever 33 and the pro-
5 jection on the slide 31, and between the teeth of ratchet 7, and the pawl 15. Other features necessary or desirable for good operation will be understood. For example, to prevent undue wear, a clutch controlled by
10 an inserted card should be used to disconnect the drive shaft from the power when no cards are passing in the machine, but this and other like matters are sufficiently understood to require no special illustration.
15 In the use of this counter it will be observed that the tabulator cards are run through the machine upside down, that is to say, the holes corresponding to lower numbers from 0 to 9 pass successively under the
20 brushes. The machine is accordingly designed to arrest the movement or rotation of the counter wheels when from the start of a cycle they have turned through as many number spaces as the punched hole corre-
25 sponds to. Were the cards run through the machine right side up, then the counter wheels must be released at such instants in the cycle that they will turn through the proper number of spaces before they are
30 again arrested at or near the end of a cycle. In a companion application I have shown a form of machine for accomplishing this.
In the above description, it will be noted, I have not gone into detail with regard to
35 the construction of tabulating machines nor their usual attachments further than was necessary to an understanding of the present improvement. Such omission, however, presupposes a familiarity with such apparatus.
40 For example, it will be understood that in this, as in most machines of this character, there is a positive stop position of the mechanism which occurs at a predetermined time with reference to the position of a card in
45 its relation to the brushes. These and other matters of like nature will, however, be well understood by those skilled in the art.
What I claim as my invention is:
1. In a counter for tabulating machines
50 and the like, the combination with counter wheels and a main drive shaft of friction disks fast thereon, ratchets and connected gear wheels for operating the counter wheels and engaging with the friction disks, pawls
55 normally engaging with and locking said ratchet wheels, cam operated means for disengaging and latching said pawls and counter magnets for unlatching the disengaged pawls at the proper moments to arrest the
60 ratchet and counter wheels at the desired points.
2. In a counter for tabulating machines and the like, the combination with counter wheels and a main drive shaft, of friction
65 disks for each counter wheel fast to said shaft, ratchet wheels and connected gear wheels for operating the counter wheels and in frictional engagement with the friction disks, of two sets of cam operated pawls adapted to be thrown out of engagement 70 with the ratchet wheels, counter magnets adapted to bring one set of pawls into locking engagement with the ratchets at the proper moments for stopping the rotation of the ratchet and counter wheels, the other 75 set of pawls being held out of engagement with the ratchet wheels by the cams during the main part of each cycle.
3. In a counter for tabulating machines and the like, the combination with counter 80 wheels and a main drive shaft, of friction disks for each counter wheel fast to said shaft, connected ratchet and gear wheels in frictional engagement with said disks for operating the counter wheels, pawls nor- 85 mally engaging the ratchet wheels to prevent their rotation, latches with which said pawls are adapted to engage when disengaged from the ratchet wheels, a cam and means operated thereby for disengaging 90 the pawls from the ratchet wheels at the beginning of a cycle of operation, and counter magnets for unlatching the disengaged pawls at the proper moments to stop the ratchet and counter wheels in the desired 95 positions.
4. In a counter for tabulating machines and the like, the combination with counter wheels and a main drive shaft, of friction disks fast to said shaft, means engaged 100 thereby to rotate the counter wheels, cam operated devices for controlling the operation of said means and counter magnets for bringing said devices into position to arrest the operation of said means at the proper 105 and desired instants for the operation of the counter.
5. In a counter for tabulating machines and the like, the combination with a counter wheel shaft and counter wheels thereon, of 110 a main drive shaft, friction disks fast thereon, connected ratchet and gear wheels in operative relation to said disks for imparting rotation to the counter wheels, pawls engaging with said ratchet wheels, means 115 for bringing the same into or out of engagement with the ratchet wheels for the proper operation of the counter, and means controlled by the rotation of the counter wheel shaft for disengaging the pawls to allow the 120 counter wheels to be turned in resetting to zero.
6. In a counter for tabulating machines and the like, the combination with counter wheels and a main drive shaft, of friction 125 disks fast to said shaft, connected ratchet and gear wheels in frictional engagement with said disks, pawls adapted to be thrown out of engagement with said ratchet wheels to permit them and the counter wheels in 130

gear therewith to rotate. counter magnets for bringing the disengaged pawls into engagement with the ratchet wheels at the proper moments in a cycle of operation, carrying 5 mechanism operated by the connected ratchet and gear wheels and a cam controlling means that momentarily disengage the said pawls to permit the carrying mechanism to impart the proper movement to the ratchet and counter wheels. 10

In testimony whereof I hereto affix my signature.

CLAIR DENNISON LAKE.