Oct. 8, 1929. W. W. LASKER 1,730,513

OPERATING MECHANISM FOR TABULATING AND LIKE MACHINES

Filed June 7, 1927 3 Sheets-Sheet 1

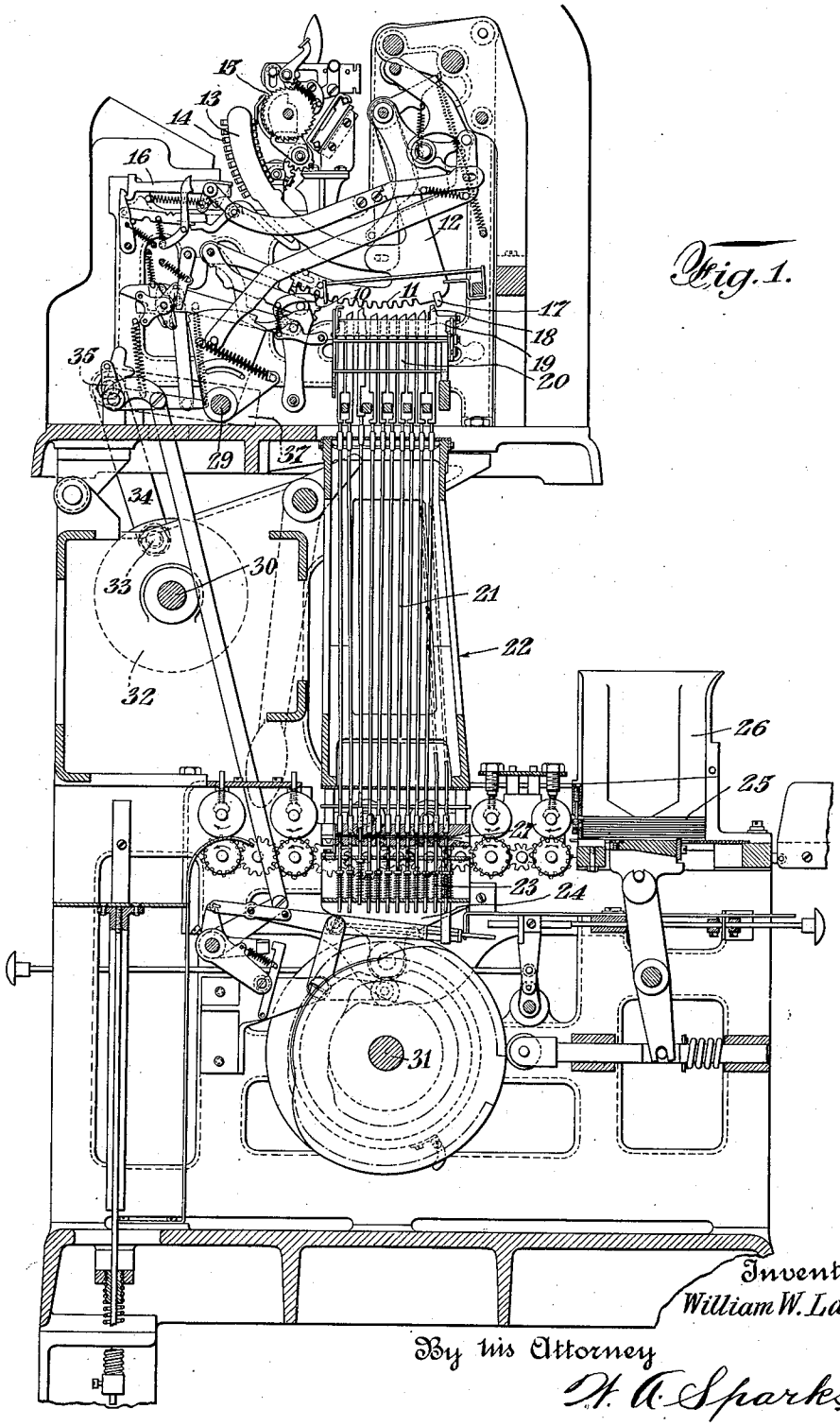


Fig. 1.

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Fig. 2

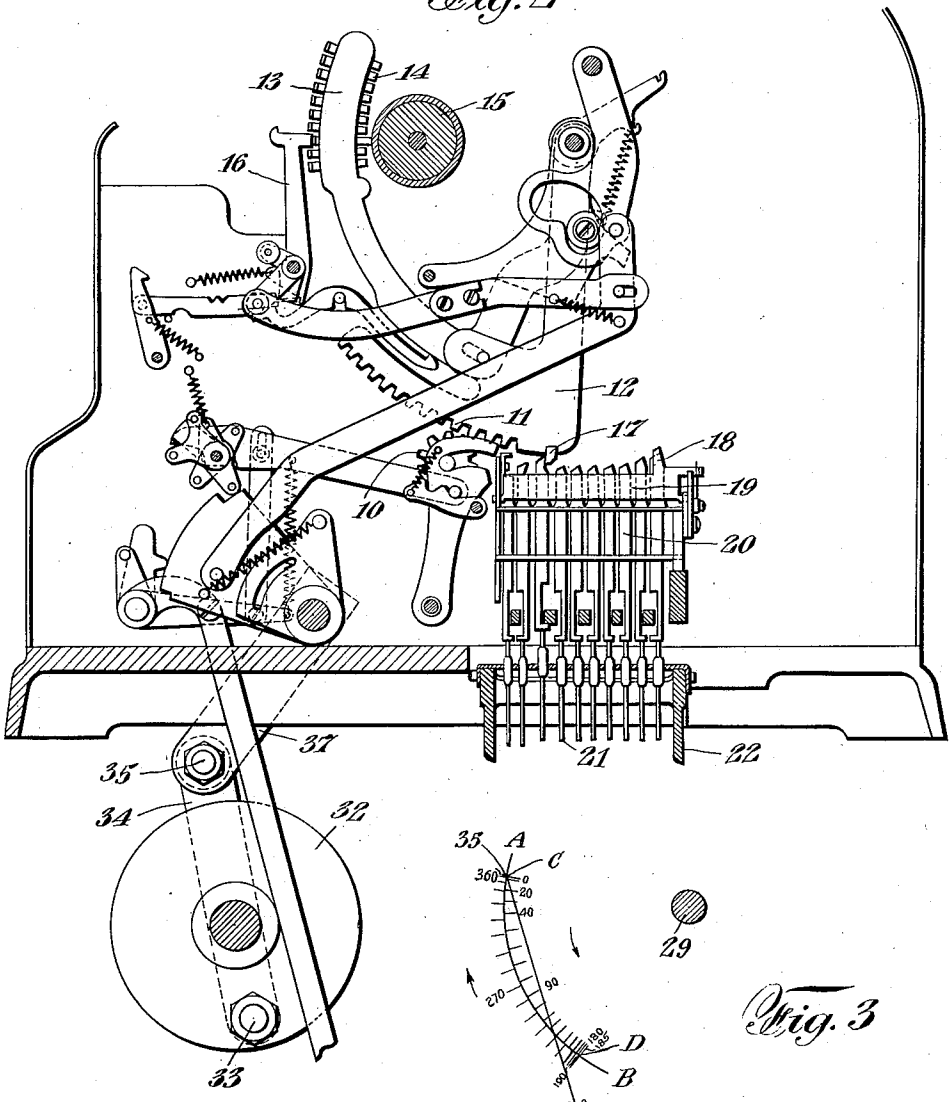


Fig. 3

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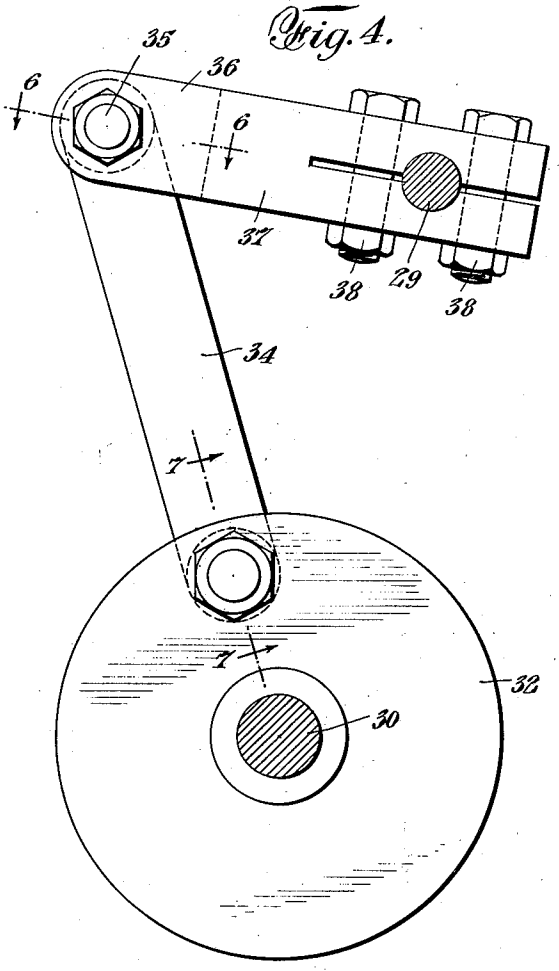
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OPERATING MECHANISM FOR TABULATING AND LIKE MACHINES

Filed June 7, 1927 3 Sheets-Sheet 3

Fig. 4.



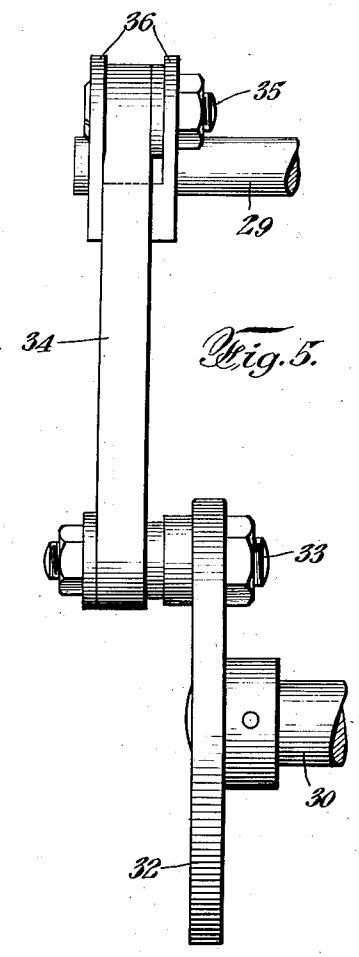


Fig. 5.

Fig. 6.

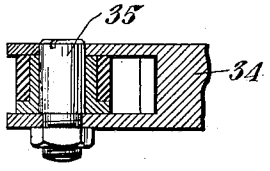
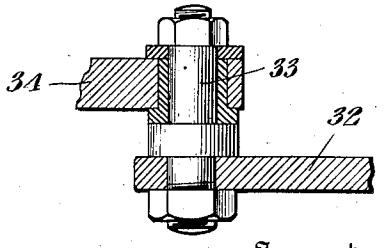


Fig. 7.



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Patented Oct. 8, 1929

1,730,513

UNITED STATES PATENT OFFICE

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OPERATING MECHANISM FOR TABULATING AND LIKE MACHINES

Application filed June 7, 1927. Serial No. 197,200.

This invention relates to operating mechanism for tabulating and like machines and particularly for tabulating machines now well known on the market as the Powers tabulator.

One of the principal objects of the invention is to minimize jar and possible straining of parts which has hitherto been impossible where machines have been run at very high speed.

Another object is to obtain as nearly as possible a noiseless mechanism of this type.

Another object is to provide simple and efficient means for effecting dwells for printing and engagement and disengagement of the accumulator gears.

Another object is to provide a device of this nature whereby a greater speed may be obtained in a card-controlled tabulating machine.

Another object is to allocate a greater portion of the cycle of operation to the forward movement of the type sectors than to the return movement thereof.

Other objects will appear from the following description and appended claims and from the accompanying drawings, in which:

Fig. 1 is a front-to-rear vertical sectional view of a Powers tabulator provided with my improved operating mechanism with the machine in normal condition.

Fig. 2 is a fragmentary view of the same showing the mechanism at the instant of printing.

Fig. 3 is a diagram indicating the corresponding movements of certain parts.

Fig. 4 is a detail elevation of the improved driving mechanism.

Fig. 5 is an edge view of the same.

Fig 6 is a fragmentary sectional view taken substantially on line 6—6 of Fig. 4.

Fig. 7 is a fragmentary sectional view taken substantially on line 7—7 of Fig. 4.

Like characters of reference refer to like parts in all views.

Heretofore it has been common practice to effect the movements of the type sectors and accumulator gears by means of cams, several different types of cams having been tried with varying degrees of effectiveness at high speed. But the difficulty which has been constantly encountered with these cam-operated devices has been abrupt movements of parts, resulting in undue wear, and always accompanied with more or less jar and noise. The present invention contemplates the use of a link motion to replace the cams, so as to provide quick pick-up and slowing down with a harmonious control, eleminating vibration and noise, initiating movements of the recording mechanism with a smooth, even control, and increasing the speed at which a machine of this nature can be run.

Referring to the drawings in detail, 10, Fig. 1, represents accumulator gears which are adapted to be thrown into and out of mesh with racks 11 carried by actuators 12. Type sectors 13 are movable with the actuators 12 to bring desired type 14 to printing position, the type 14 being driven against a work sheet carried by a platen and paper carriage indicated generally at 15 by hammers 16.

The actuators 12 carry heels or stop lugs 17 normally held against forward excursions by stops 18 on movable shutters 19. When one of the shutters 19 is operated to swing its stop 18 out of the path of the respective heel 17, then the respective actuator 12 is permitted to make an excursion, the extent of which is determined by stops 20 in the plane of the heel 17 and movable up into the path of the heel 17. It will, therefore, be seen that the stops 20 limit the forward movement of the actuators 12 and thereby determine the extent of rotation of the accumulator gears 10 and the positioning of the type 14.

The raising of the stops 20 is effected by rods or wires 21 arranged in a connection box indicated generally at 22. The rods 21 are operated by spring pins 23 arranged in a vertically reciprocable pin box 24. In the normal operation of the machine cards 25 are fed from a magazine 26 into a card throat 27. In Fig. 1 a card is shown in the throat 27 and the pin box 24 is shown in its raised position. The card shown in the throat 27 has had a perforation or aperture in registry with one of the spring pins 23 so that the particular pin has passed thru the aperture or perforation and has raised the respective rod 21 and

its correlated stop 20. As shown, this particular stop is the "7" stop and will permit forward movement of the respective actuator and type sector so as to effect addition of seven on the respective accumulator gear and printing of "7" by the type. It will also be noted that the card in the card throat detains all pins not in register with perforations.

It may be well at this point to call attention to the fact that a tabulator usually comprises a plurality of sets of accumulator wheels and a plurality of sets of printing sectors and accumulator actuators; and that it may effect adding and printing from the various sets singly or in various combinations simultaneously so that the machine is subjected to stresses of a very different nature from a mere adding and listing machine, and the amount of work done in various succeeding operations may vary tremendously. It is therefore necessary to have driving mechanism which will handle the maximum load without difficulty and at the same time not give rise to any difficulty when the minimum load is to be handled.

The accumulator gears 10 are hung in a frame and are movable into and out of engagement with the actuator racks by suitable mechanism well known in the art. This engagement and disengagement always takes place either when the racks have completed their excursion in one direction or the other or when the racks are in home position, the time of such engagement and disengagement being reversed for total printing from what it is for item printing, as is also well known in the art. A dwell is therefore made at each of these points for insuring correct meshing of the pinions and racks. One of the elements controlling the engagement and disengagement of the pinions and racks and also controlling the excursion and return of the racks and type segments, is segmental body 28, Fig. 1, fixed on a shaft 29.

A shaft is indicated at 30, which for the purpose of this application may be considered as a constantly running shaft. In reality it is controlled by a clutch (not shown) but as long as the clutch is in the shaft continues running, cycle after cycle. The same is true of shaft 31 which effects the reciprocation of the pin-box, shafts 30 and 31 running in synchronism to produce the various functions of the machine in proper sequence.

All of the above described mechanism is old and its operation well known in the art.

Secured to the end of shaft 30 for rotation therewith is a disk 32. A stud 33 is secured to disk 32 and pivotally mounted on the stud 33 is a link 34. The upper end of link 34 is pivoted on a pin 35 passing thru the bifurcations 36 of a rock arm 37, the link 34 being between the bifurcations 36 so as to form a knuckle joint. The rock arm 37 is secured to shaft 29, bolts 38 being provided for clamping the rock arm 37 to shaft 29, and providing means for easily adjusting the connection.

In the machine shown, the shaft 29 rocks through an arc of approximately 63°. This is standard in machines of this type as are also the locations of the shafts 29 and 30. Under these conditions, if the arm 36 and link 34 are of the lengths shown and the arm is located in the angular position to the horizontal as shown, the downward or forward movement will consume more time than the upward or return movement as hereinafter fully set forth. If it is desired to provide for more time for the forward movement, this can be done by fastening the arm to its shaft 29 in a more nearly horizontal position, and, vice versa; the time can be decreased by fastening the arm to the shaft so that the angle between the arm and the horizontal is larger. The forward time can be decreased slightly also by shortening the arm 36.

Referring now particularly to Fig. 3 which is a diagrammatic view indicating the relative movements of pins 35 and 33 during a cycle of movement of the disk 32, it will be seen that for each cycle of the pin 33 there is a single complete oscillation of the pin 35 along the arc A—B from point C to point D and return to C and that there is a considerable variation in the rate of movement between the forward and return movements. On this figure of the drawing, the downward or initial movement of pin 35 is charted on the inside of the arc A—B in terms of the relative degrees of movement of the pin 33, and the upward or return movement is charted at the exterior of the arc. It will also be noted that at the beginning of the downward and upward strokes there is a gradual but rapid acceleration and at the end of each stroke there is a gradual but rapid deceleration. This avoids jars and noise and provides a quick and positive change of movement. It will be further noted that at the beginning of the cycle of disk 32 the centers of pins 35 and 33 and the center of shaft 30 are in alignment and that they do not again come into alignment until the disk has passed thru approximately 185° of its cycle of movement. Hence the forward or downward stroke of pin 35 consumes 185° of the cycle of disk 32 and the return stroke consumes 175° of such cycle. This gives a comparatively slow forward stroke and a comparatively rapid return. Furthermore the change in relative position of the various centers gives a comparatively uniform rate of motion during the major portion of the forward stroke, and a more rapid but also comparatively uniform motion during the major portion of the return stroke.

While I consider the form of the invention shown to be admirably adapted to the purposes set forth, it is obvious that changes could be made in the specific form of con-

struction without departing from the spirit of the same, and I therefore do not limit myself to the exact structure shown nor to anything less than the whole of my invention as herein set forth and as hereinafter claimed.

What I claim is:

1. In a tabulating machine, the combination with actuators, type segments controllable thereby, and means for controlling excursions of said actuators including an oscillatory shaft, of a rotatable shaft, and means connecting said shafts whereby the first said shaft is oscillated by the second said shaft and including parts so constructed and arranged that a greater portion of the operation of said rotatable shaft is required to effect the movement of said oscillating shaft in one direction than in the opposite direction.

2. In a tabulating machine, the combination with actuators, type segments controllable thereby, and means for controlling excursions of said actuators including an oscillatory shaft, of a rotatable shaft, and means connecting said shaft whereby the first said shaft is oscillated by the second said shaft and including parts so constructed and arranged that a greater portion of the operation of said rotatable shaft is required to effect the movement of said oscillating shaft in one direction than in the opposite direction, and that said means may cause rapid acceleration and deceleration at each stroke of said oscillatory shaft.

3. In a tabulating machine, the combination with actuators, type segments controllable thereby, and means for controlling excursions of said actuators including an oscillatory shaft, of a rotatable shaft, and means connecting said shafts whereby the first said shaft is oscillated by the second said shaft and including parts so constructed and arranged that a greater portion of the operation of said rotatable shaft is required to effect the movement of said oscillating shaft in one direction than in the opposite direction, and that said means may cause rapid acceleration and deceleration at each stroke of said oscillatory shaft and will cause a substantially uniform motion of said oscillatory shaft between each acceleration and deceleration thereof.

4. In a tabulating machine, the combination with actuators, type segments controllable thereby, and means for controlling excursions of said actuators including an oscillatory shaft, of a rotatable shaft, a link secured to said rotatable shaft, and a rocker element secured to said oscillatory shaft and connected to said link, the construction and arrangement being such that the center of said rotatable shaft and centers of the connections of said link are in alignment at two positions of said rotatable shaft which positions are other than 180° apart.

5. In a tabulating machine, the combination with actuators, type segments controllable thereby, and means for controlling excursions of said actuators, and operating mechanism for said tabulating machine whereby more than half a cycle of operation of said machine is allocated to the excursion of said actuators and type segments in one direction and less than half the cycle of operation of the machine is allocated to the movement of the said parts in the opposite direction.

6. In a tabulating machine, the combination with actuators, type segments controllable thereby, and means for controlling excursions of said actuators, and operating mechanism for said tabulating machine whereby more than half a cycle of operation of said machine is allocated to the excursion of said actuators and type segments in one direction and less than half the cycle of operation of the machine is allocated to the movement of the said parts in the opposite direction and whereby excursions of said actuators in each direction may be controlled for gradual but rapid acceleration, substantially uniform movement during the major operation of the excursion and rapid and smooth deceleration at the end of the acceleration.

In testimony whereof I affix my signature.

WILLIAM W. LASKER.