Nov. 24, 1931. S. E. SWICK 1,832,918

RECORDING DEVICE

Filed June 1, 1927 4 Sheets-Sheet 1

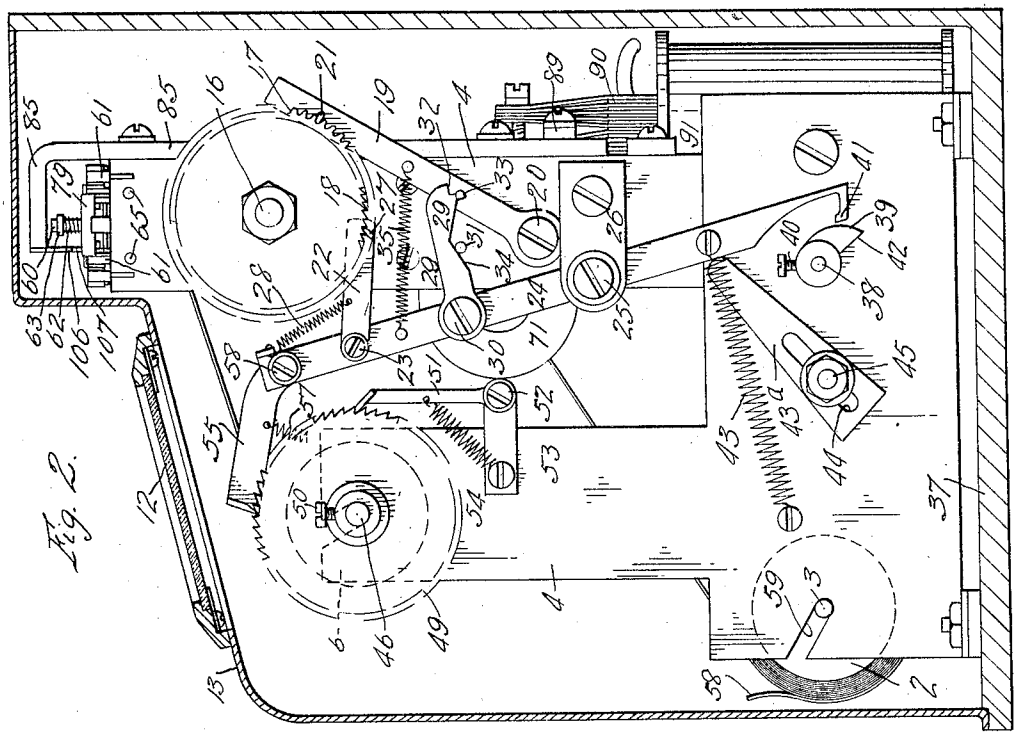


Fig. 2.

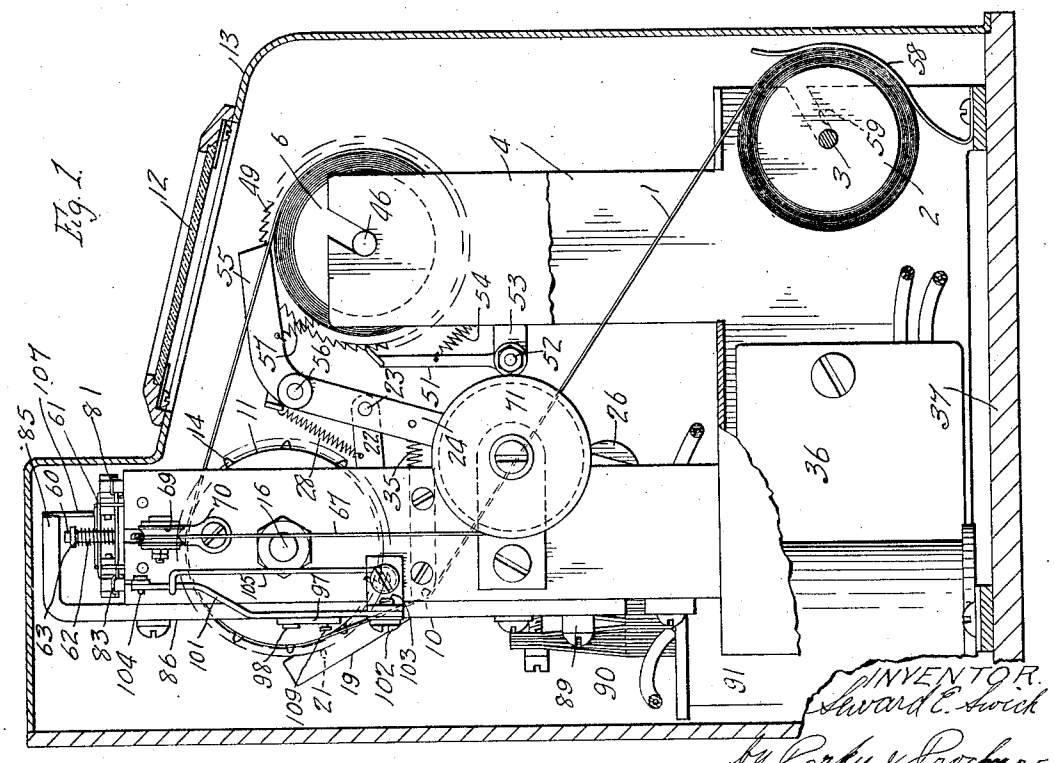


Fig. 1.

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RECORDING DEVICE

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Fig. 3

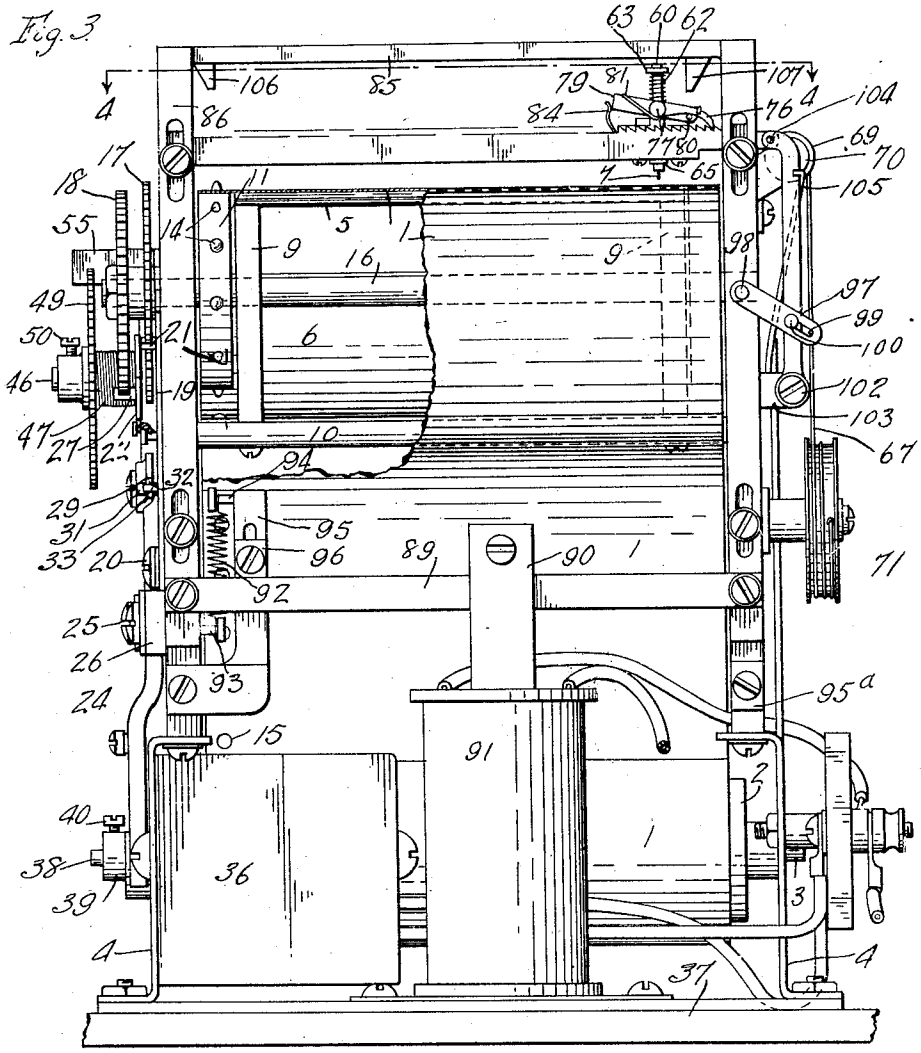
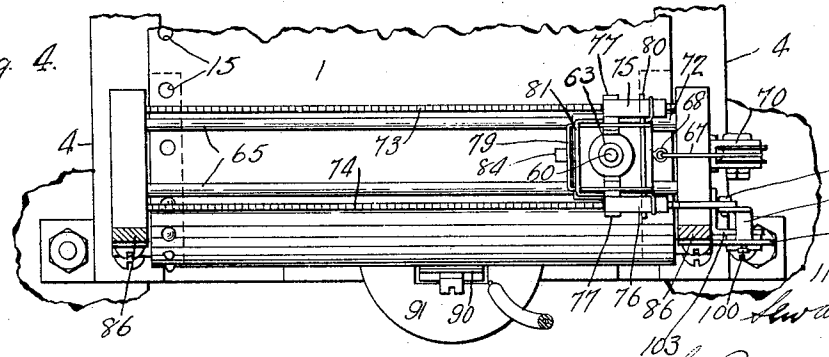


Fig. 4.



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Fig. 5.

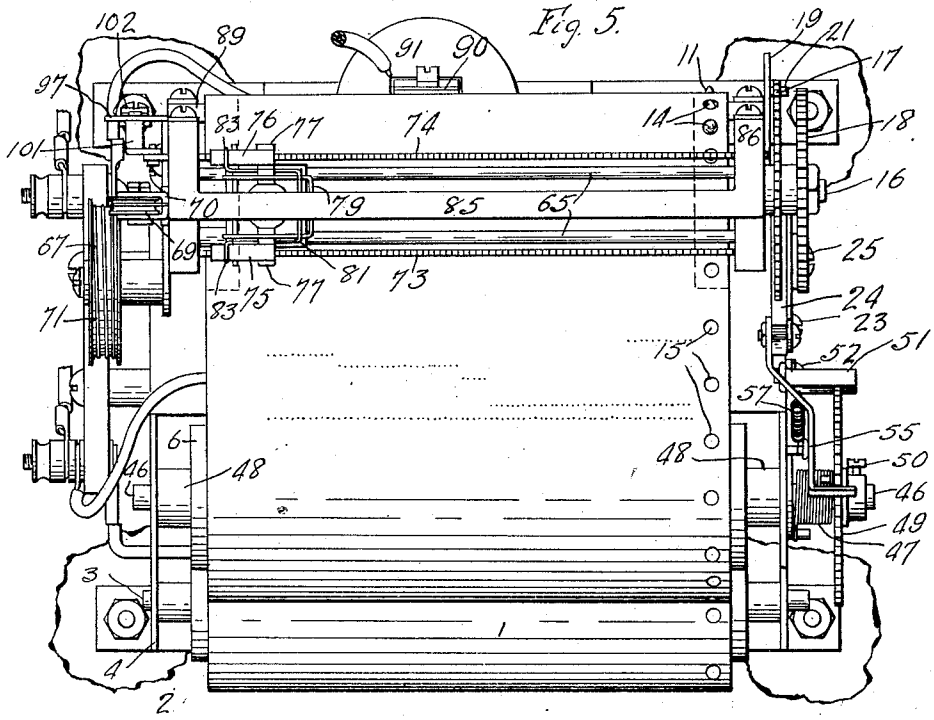
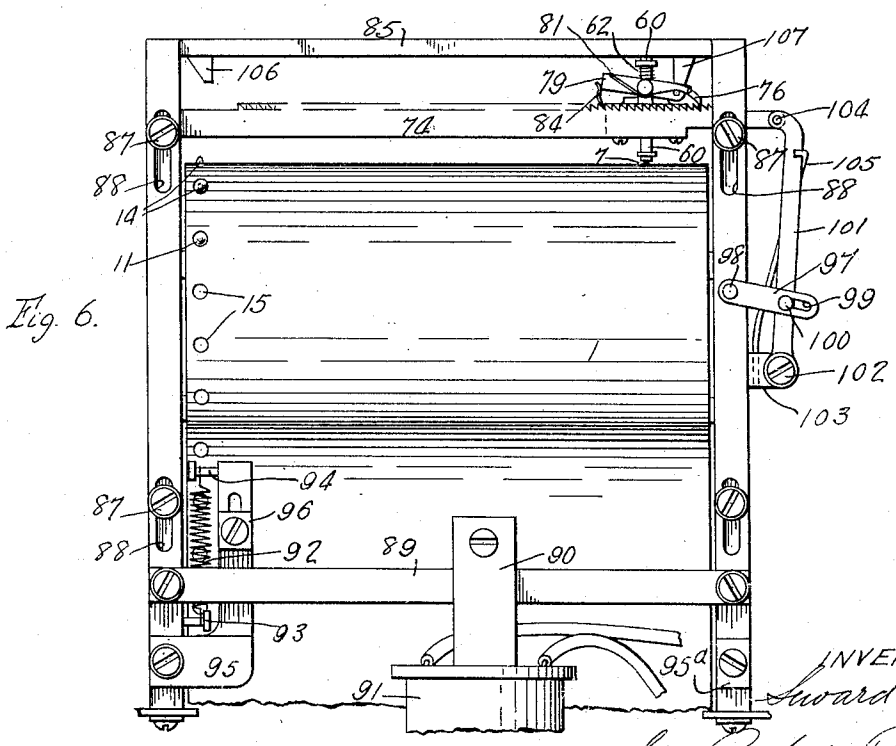


Fig. 6.



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RECORDING DEVICE

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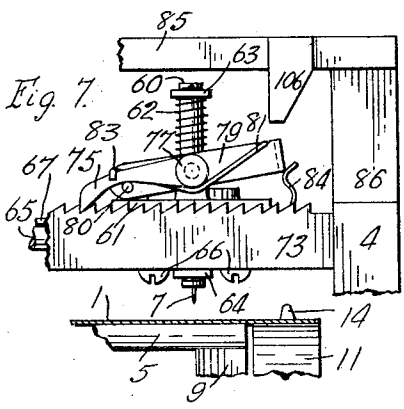


Fig. 7.

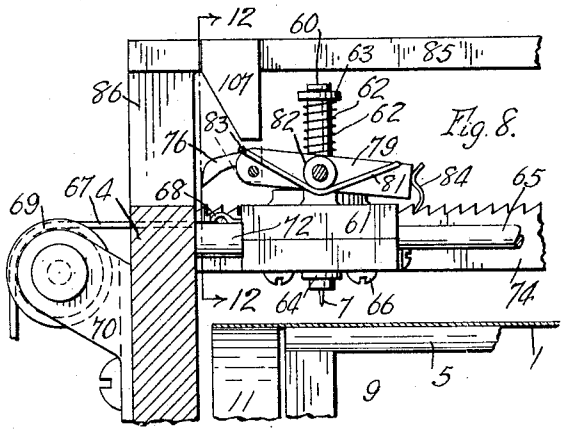
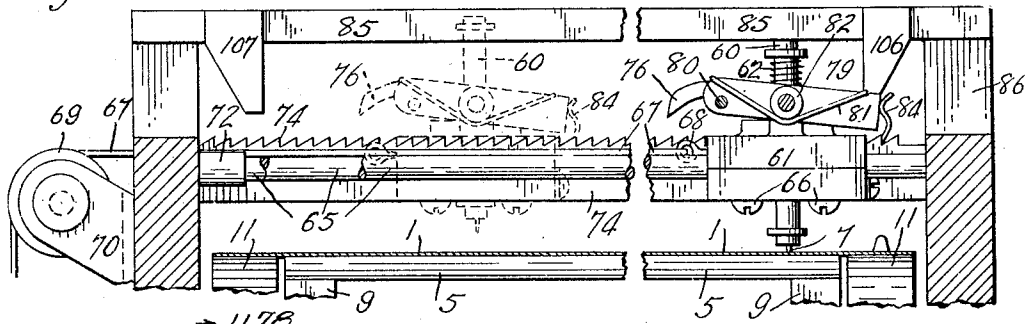


Fig. 8.

Fig. 9.



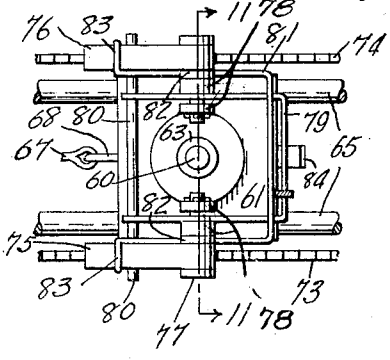


Fig. 10.

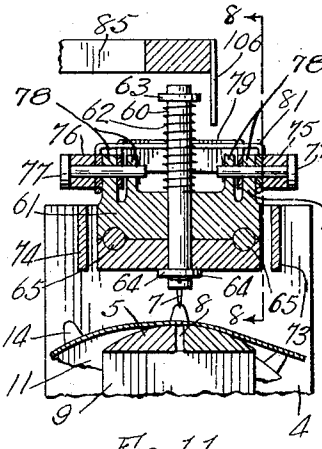


Fig. 11.

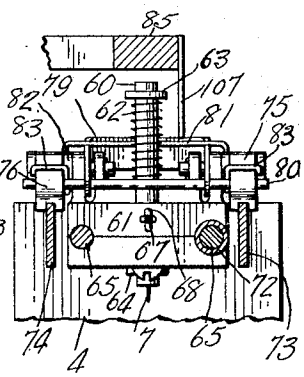


Fig. 12.

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Patented Nov. 24, 1931 1,832,918

UNITED STATES PATENT OFFICE

SEWARD E. SWICK, OF SYRACUSE, NEW YORK

RECORDING DEVICE

Application filed June 1, 1927. Serial No. 195,711.

This invention relates to recorders and particularly to that type which may be utilized for recording the operations of a machine or apparatus, both as to the total number of operations performed in any given duration of time, and also as to the time interval during which any particular group of operations were performed. The invention is also in the nature of an improvement upon the recording device disclosed and claimed in my prior copending application Serial Number 81,070, filed January 12, 1926.

An object of this invention is to generally improve and simplify recording devices, particularly those of the type disclosed in my said copending application.

A further object of the invention is to provide an improved recording device which will have the capacity of recording a considerable number of operations in any unit of time; and with which the total number of operations performed in any selected duration of time may be easily computed.

A further object of the invention is to provide, in a recording device, novel and improved means for advancing the recording element into new recording positions after each operation, and for automatically resetting the recording element to initial recording position after a selected number of operations have been recorded.

A further object is to provide an improved recording device which will be exceptionally dependable, durable, compact, and simple in construction, and relatively inexpensive.

Various other objects and advantages will be apparent from the following description of an embodiment of the invention, and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

In the accompanying drawings:

Fig. 1 is a side elevation, with the enclosing casing in section, of a recording device constructed in accordance with this invention;

Fig. 2 is a similar but opposite side elevation of the same;

Fig. 3 is a rear elevation of the same;

Fig. 4 is a sectional plan of a portion of the same, with the section taken approximately along the line 4—4 of Fig. 3;

Fig. 5 is a top plan of the device;

Fig. 6 is a rear elevation, similar to Fig. 3, but illustrating the relative position of the parts during a recording operation;

Fig. 7 is a sectional elevation of a part of the device, and illustrating the mounting for the recording element at the instant before it is returned to initial position;

Fig. 8 is a sectional elevation illustrating the position of the mounting and parts carried thereby at the instant after return to starting or initial position and before another recording operation has started, the section being taken approximately along the line 8—8 of Fig. 11;

Fig. 9 is an elevation of a part of the device showing the manner in which the mounting for the recording element is released for return;

Fig. 10 is a plan of the recording element and the mounting for the same;

Fig. 11 is a sectional elevation of the same; with the section taken approximately along the line 11—11 of Fig. 10; and

Fig. 12 is another sectional elevation through the same, with the section taken approximately along the line 12—12 of Fig. 8.

In the illustrated embodiment of the invention, a record sheet 1, which may, for example, be of parchment or paper, is preferably provided, as usual in the art, with a plurality of transverse rulings or lines (not shown) dividing the surface into transversely extending sections or areas corresponding to increments of time and which will correspond to the rate of travel of the strip. This record sheet is wound upon a supply roll 2, and the shaft 3 of the latter is rotatably mounted, in any suitable manner, in the side plates 4 of the supporting frame. The record sheet 1 is conducted from the supply roll 2 over a recording plate or table 5 (Figs. 3 and 11) and then is wound upon a take-up or receiving roll 6.

A recording stylus or element 7 is actuated into engagement with the portion of the record sheet over the table or plate 5 at each operation of the machine or apparatus whose

record of operations is to be kept, the stylus being normally out of engagement with the sheet, so as to permit movement of the sheet past the stylus progressively in accordance with the lapse of time. Hence, by the position of any record made by the stylus on the sheet, the time interval in which that record was made may be ascertained by observing the location of that record with respect to the time indications upon the sheet. At each operation the recording element or stylus 7 is advanced to a new recording position in a direction transversely of the direction of travel of the sheet, so that no two records will be made on the same spot or area of the record sheet.

The table or plate 5 preferably is cylindrically convex upon its upper surface and is provided in that surface with a groove, slot or depression 8 (Fig. 11) running lengthwise of the same immediately beneath the recording stylus or element 7. The stylus may be pointed, so that when it is moved into engagement with the record sheet, it will punch a hole in the sheet as a record of one operation, and the slot or groove 8 immediately beneath the sheet at the point where the record is made permits passage of the stylus entirely through the sheet without danger of injury to the piercing point of the stylus. The ends of the table or bar 5 are mounted upon upright plates 9 which are in turn mounted upon a cross bar 10, Fig. 3, extending between the side frame plates 4.

The supply roll 2 may be mounted adjacent the front of the frame formed by the plates 4, and the sheet 1 passed around the rear of the cross bar 10, thence over a portion of the periphery of a pair of feeding drums or cylinders 11 disposed at the ends of the uprights 9, then over the convex surface of the table or plate 5, and then forwardly to the supply roll, so as to carry the area of the sheet leaving the table or plate 5 for a short distance immediately beneath a sight window 12 which is provided in the upper surface or top of a casing 13 which encloses the entire recording device.

One of the drums or cylinders 11 is provided on its periphery with teeth 14 which are spaced apart in a direction peripherally of the drum by an amount corresponding to the space between adjacent perforations 15 (Figs. 5 and 6) that are provided along the adjacent marginal side edge of the record sheet 1. The teeth 14 enter the perforations or apertures 15 of the portion of the sheet passing over that drum 11, and by controlling the rotation of the drums 11 the rate of travel of the record sheet over the recording table or plate 5 may be controlled or regulated. While only one of the drums 11 is illustrated as provided with prongs or teeth 14, and only one side of the record sheet as perforated, it will be understood that similar teeth 14 and perforations 15 may be provided on the other drum 11 and the other side of the record sheet, if desired. The drums 11 are fixed upon a shaft 16 which extends between and is rotatably mounted in opposite parts of the side frame plates 4, the shaft at one end extending through one of the plates 4 and having fixed thereon a gear wheel 17 and a ratchet wheel 18.

A holding pawl or lever 19, pivoted at 20 upon one of the side frame plates 4, is provided with a tooth 21 which is adapted to enter the spaces between the teeth of the gear wheel 17 and normally lock the wheel 17, and through it the shaft 16 and drums 11 against rotation in either direction. A driving pawl 22 is pivoted at 23 to a main feeding lever 24, which in turn is pivoted by pivot pin or screw 25 upon a suitable bracket 26 provided upon one of the frame plates 4. The driving pawl 22 is provided with a nose or tooth 27 which engages with the teeth of the ratchet wheel 18, so as to drive the ratchet wheel and through it the shaft 16 and drums 11 when the main feeding lever 24 is oscillated in one direction, that is, clockwise, in Fig. 2, the tooth 27 running idly over the teeth of the ratchet wheel during movement in the opposite direction, that is, counter-clockwise in Fig. 2. A spring 28, connected between the pawl 22 and the lever 24, serves to hold the tooth 27 in contact with the teeth of the ratchet wheel 18, and therefore in driving relation therewith.

In order to release the ratchet wheel 18 and through it the shaft 16 and drums 11 during a driving operation of the pawl 22, suitable provision is made to remove the locking tooth 21 from engagement with the gear or toothed wheel 17 during the driving movement, and to return it into locking position immediately at the conclusion of the driving operation. For this purpose a cam lever 29 is pivoted, as at 30, to the main feeding lever 24 and rests by gravity upon a guide pin 31, projecting from an adjacent side frame plate 4. The lever 29 is provided in its lower edge, and preferably at its forward end with a notch 32 which is adapted to drop over and engage with a pin 33 provided on the lever or pawl 19. The portion of the lower edge of the lever 29 which engages with the pin 31 is inclined upwardly, so as to provide a cam surface 34 normally riding on the pin 31.

When the main lever 24 is swung counter-clockwise in Fig. 2, the cam surface 34 will ride down the pin 31 and the lever 29 can, as it moves rearwardly, fall and snap its notch 32 over the pin 33. Then during the reverse movement of the lever 24, that is clockwise in Fig. 2, and during which the driving pawl 22 is effectlve to rotate the drums 11, the lever 29 acting through the pin 33 pushes the locking pawl or lever 19 away from the gear or wheel 17, so as to disengage the locking tooth

21 from the gear or wheel 17, and permit movement of the ratchet wheel 18 and drums 11 under the driving action of the pawl tooth 27. During this propelling movement, however, the cam surface 34 has been riding up the pin 31, so as to cause a gradual disengagement of the lever 29 from the pin 33, which disengagement becomes complete just at the instant that the desired increment of movement has been given the ratchet wheel 18 and drums 11 by the driving pawl 22. When such a disengagement of the lever 29 from the pin 33 occurs, the holding pawl 19 will be released and will be shifted by a spring 35 towards the gear or wheel 17 to carry the locking tooth 21 into re-engagement with the gear 17 and stop further movement in either direction of the drums 11 and record sheet 1. The spring 35 which yieldingly urges the lever 19 towards the gear 17 may be connected at its other end to the lever 24, as shown, or to a suitable part of the frame plate 4.

In order to cause driving oscillations of the lever 24 at regular time intervals, a motor 36, operated synchronously in accordance with lapse of time, may be suitably mounted on the base 37 of the device, and the shaft 38 of such a motor extends through one of the frame plates 4 and carries thereon a cam 39. The cam 39 may be secured on the motor shaft in any suitable manner, such as by a set screw 40. The peripheral surface of the cam engages with a nose 41 of the lever 24, so as to force the lever 24 away from the motor shaft and then quickly release it as a drop 42 on the cam surpasses the nose 41. A spring 43 connected at one end to the lever 24, and at its other end to a suitable point of a frame plate 4, yieldingly urges the nose 41 of the lever 24 towards the cam 39. The movement of the nose 41 of the lever 24 towards the cam is limited by the locking of the ratchet wheel 18 and the gear 17 by the locking tooth 21 and also, if desired, by a stop member 43*a* adjustably, mounted by a slot 44 therein, upon a pin 45 carried by an adjacent frame plate 4, the lever 24 being limited in its clockwise movement (Fig. 2) by engagement with a projecting end of the stop member 43.

The motor 36 is preferably an electric motor of the alternating current synchronous type, which always rotates in synchronism with the generator supplying the current thereto regardless of the load, and the generator supplying this current is carefully synchronized with a suitable time piece, so that the rotation of the shaft of the motor 38 will be at an accurate and definite time rate. Through such a synchronous motor and the mechanism just described, as operated thereby for propelling the record sheet, the record sheet will be given step by step increments of movement corresponding accurately to intervals of time, which intervals will preferably correspond to the transverse rulings of the record sheet.

The take-up roller 6 upon which the record sheet is wound after passing recording position, is rotatably mounted upon a shaft 46, which is in turn rotatably mounted in opposite side frame plates 4. A helical spring 47 (Figs. 3 and 5) is anchored at one end to a sleeve extension 48 of the take-up roller, and at its other end to a ratchet wheel 49 which is fixed to the shaft 46 in any suitable manner, such as by set screw 50, Fig. 5. Unwinding of the spring 47 is prevented by the engagement with the ratchet wheel 49 of a holding pawl 51 pivoted at 52 upon a suitable bracket 53 carried by one of the frame plates 4. A spring 54 connected between the bracket 53 and the pawl 51 urges the pawl into continual contact with the ratchet wheel 49. A second driving pawl 55 is pivoted at 56 upon the main feeding lever 24 and also engages with the teeth of the ratchet wheel 49. A spring 57 connected at one end to the pawl 55 and at its other end to one of the frame plates 4 yieldingly urges the driving pawl 55 into continual engagement with the ratchet wheel 49.

When the lever 24 is operated counterclockwise, that is, while being set in a position ready to advance the record sheet a notch, and while the nose 41 is being forced along the inclined surface of the cam 39, the driving pawl 55 will propel the ratchet wheel 49 through a corresponding increment of movement, so as to tension the take-up spring 47 and keep it sufficiently wound at all times. A suitable leaf spring 58, secured to the base in any suitable manner, may be provided to bear at its free end upon the supply roller 2 and the record sheet wound thereon, as shown in Figs. 1 and 2, and frictionally retard the unwinding of the record sheet. The shaft 3 mounting the supply roll 2 may be mounted in the frame plates 4 by means of downwardly inclined slots 59, and the spring 58 not only retards the unwinding or feeding off of the record sheet, but also confines the shaft 3 of the supply roller to its bearings.

The recording stylus or element 7 is mounted on the lower end of a pin 60 which is mounted for vertical reciprocation in a carriage or mounting 61, the pin being normally and yieldingly held in its upper position, with the stylus 7 out of contact with the record sheet, by a compression spring 62 provided upon and surrounding the upper end of the pin 60 and compressed between the upper surface of the mounting or carriage 61 and a collar or ring 63 on the upper end of the pin. A collar 64 on the lower end of the pin, by its engagement with the under surface of the mounting 61, limits the upward movement of the pin 60.

The mounting or carriage 61 is supported and guided by parallel track rods 65 and the

latter in turn extend between and are supported by suitable parts of the frame plates 4, so as to guide the mounting or carriage 61 transversely of the direction of travel of the record sheet 1, that is, along the table or bar 5. For convenience of assembly and disassembly, the mounting or carriage 61 may be made of two parts fitting against the guide or track rods 65 from opposite sides, and secured together in any suitable manner, such as by screws 66, Fig. 8. A flexible cable or cord 67 is connected at one end to one end of the mounting or carriage 61, such as through an eye 68 on the mounting, passes through a suitable aperture in a frame plate 4, and is guided over a roller guide or pulley 69 mounted on a bracket 70 of the adjacent plate 4. The cable or cord 67 then descends and is wound around and secured to a spring take-up drum 71, which is spring actuated in one direction. Thus the spring drum 71, Fig. 1, yieldingly urges the mounting or carriage 61 in one direction along the guide rods 65 and thus into an initial position which may, for convenience, be considered an initial recording or starting position, this position being shown in Fig. 8.

The mounting or carriage may be limited in its movement towards initial position in any suitable manner, such as by a sleeve 72 provided upon one of the guide rods 65 adjacent one of the frame plates 4 and against which the mounting or carriage 61 strikes at the end of its movement. As the carriage or mounting 61 moves along the guide rods and across the record sheet away from initial position, it will pull the cable or cord 67 in a direction tending to unwind it from the spring drum 71, and thus will tension the spring in the drum 71.

A pair of racks 73 and 74 are disposed adjacent to and parallel with the guide or track rods 65 and adjacent to the mounting or carriage 61, one of these racks, such as 74, being mounted in opposite frame plates 4 for movement endwise of itself, that is, for reciprocating movements in directions parallel to the travel of the mounting or carriage 61. The teeth of both racks 73 and 74 are preferably of the ratchet type and are inclined in the same direction. The other rack 73 is fixed against movement in any direction. Referring particularly to Figs. 10 to 12, a pair of pawls 75 and 76 are pivoted on the mounting or carriage 61 at opposite sides thereof by headed bearing pins 77 which extend into bearing bosses 78 projecting from the upper surface of the carriage or mounting 61. These two pawls 75 and 76 fall or are biased by gravity against the upper toothed edges of the racks 73 and 74, so as to prevent by their engagement with the racks any movement of the mounting or carriage 61 by the cable 69 and the spring take-up drum 71.

A U-shaped frame 79 is tiltably mounted at points midway of its side arms upon the pivot pins 77 which mount the pawls 75 and 76, and the arms of this frame at their free ends are connected by a cross pin 80 which extends beneath the free ends of the pawls 75 and 76. Thus when the base or cross piece of the U-shaped frame 79 is tilted downwardly, the free ends of the arms which are connected by the cross pin 80 will be shifted upwardly and the pin 80 will engage and elevate both pawls 75 and 76 out of engagement with the racks 73 and 74. A U-shaped wire spring 81 may extend over the frame 79 at its rear end, then under suitable washers or spacers 82, provided on the pins 77 between the pawls 75 and 76 and the mounting or carriage projections 78, and the arms of this spring are bent laterally in opposite directions, as at 83 to hook over the pawls 75 and 76 and urge them yieldingly into engagement with the racks 73 and 74. The spring 81 thus assists gravity in urging the pawls 75 and 76 towards the racks 73 and 74 as far as permitted by the cross pin 80.

A leaf spring 84, Figs. 7 to 10, is secured at one end to the rear end of the carriage or mounting 61, and at its free end yieldingly engages with the base or cross piece portion of the U-shaped frame 79, so as to yieldingly hold the frame 79 in either of its tilted positions, shown in Figs. 7 and 8. The free end of the spring 84 may have a convex hump which engages slightly beneath the cross piece of the U of the frame 79 when the frame is tilted to permit engagement of the pawls 75 and 76 with the racks and to engage fractionally with the end of the frame and hold it elevated when the frame is tilted to remove the pawls 75 and 76 from engagement with the racks, as shown in Figs. 8 and 9.

When the pawls 75 and 76 are engaged with the racks, the rack 73 being fixed, will prevent return movement of the carriage or mounting 61 from any position into which it has been moved. While the carriage or mounting 61 is held in this manner after the movable rack is shifted endwise so that a new notch or tooth thereof snaps past the pawl 76, the resulting return movement of the rack 74 will then cause a movement, through the pawl 76, of the carriage or mounting 61 further in an advance direction by an amount corresponding to the number of teeth of the rack 74 which were moved past the pawl 76 during the previous opposite movement of the rack 74. Thus, by reciprocating the movable rack 74, the carriage or mounting 61 may be advanced step by step in increments, and thus successively advanced into new recording positions against the action of the spring drum 71.

An actuating member 85 in the form of a bar is disposed above the path of travel of

the recording pin 60 and extends in the direction of travel of the pin with the mounting or carriage 61. This bar is provided with depending sides 86 which extend along the rear of the supporting frame. These arms 86 are slidingly confined against the rear face of the supporting frame by pins or screws 87 which pass through vertically elongated slots 88 in the arms 86, thus permitting vertical reciprocation of the actuating member 85 and its depending side arms 86. The lower ends of the arms 86 may be connected by a cross bar 89 to which the core 90 of an electromagnet or solenoid 91 may be attached. Thus when the core 90 is attracted into the electromagnet 91 by the energization of the electromagnet, the actuating member 85, which extends over the carriage or mounting 61, will be pulled downwardly and by engaging the pin 60 regardless of the position of the pin 60 along its path of travel, will force the recording stylus into recording engagement with the record sheet 1, so as to pierce the same and form a record thereon.

A spring 92 may be connected between a pin 93 on a side arm 86 of the actuating member 85, and a suitable pin 94 on a bracket 95 of the supporting frame, so as to yieldingly bias the side arms 86 and the actuating member 85 upwardly and free of the recording pin 60. The upward movement of these parts under the action of the spring 92 may be limited by the engagement of the cross bar 89 with a stop member 96 adjustably mounted on the bracket 95. The downward movement of the side arms 86 of the actuating member 85 may be limited by the engagement of the lower ends of one of the side arms 86 with the bracket 95. A stop 95*a* may also be placed in a position to be engaged by and limit the movement of the other side arm 86. A link 97 is pivoted at one end by a pin 98 to one of the side arms 86 of the actuating member 85, and at its free end is provided with a slot 99 elongated lengthwise thereof, which receives the shank of a headed pin 100 extending through the slot from a lever 101.

The lever 101 extends approximately parallel to the adjacent side arm 86, and its lower end is pivoted by pin 102 to a bracket 103 of the support frame. The free end of the lever 101 is connected by a pin 104 to one end of the movable rack 74, so that the latter may be reciprocated by oscillating the lever 101. A spring 105, suitably anchored at one end, may bear at its free end upon the lever 101, so as to yieldingly urge it in a direction to propel or advance the carriage or mounting 61 into a new recording position. When the actuating member 85 is in its upper or normal position, the link 97 will be oblique to the side arm 86 to which it is connected, and the spring 105 will bias the lever 101 in a manner to hold the pin 100 at one end of the slot 99, the movement of the lever and its connected rack 74 being limited by the engagement of this headed pin 100 with the end of the slot 99.

When the actuating member 85 is pulled downwardly by the energization of the electromagnet 91, the link 97 will be rocked towards or into a straight out position normal to the side arm 86 to which it is connected, and in so moving will cam the lever 101 away from the support frame and draw the movable rack 74 endwise beneath the carriage or mounting 61, during which the pawl 76 will snap over one or more teeth of the movable rack. Then after the record has been made, and the actuating member 85 is elevated by the spring 92, the link 97 will return to its inclined position and permit movement of the lever 101 towards its former position under the actuation of the spring 105. During this movement, the lever 101 will return the movable rack bar 74 to its former position and the pawl 76 will advance the carriage or mounting 61 for the recording element one or more steps depending upon the number of teeth of the movable rack bar which had been previously shifted past the pawl 76. As the mounting 61 is advanced, the pawl 75 snaps over the teeth of the fixed rack 73, so as to prevent return of the mounting or carriage 61 from the new position into which it has been advanced.

The slot 99 in the link 97 is not absolutely essential, and if omitted and a plain pivotal connection provided between the link 97 and lever 101, the spring 92 which returns the actuating member 85 to its normal, inactive position, will through the link 97 pull the lever 101 in a direction to advance the mounting or carriage 61. It has been found, however, that less accuracy of manufacture is necessary by providing the slot 99, and furthermore by providing the slot 99, the lever 101 may at any time be manually actuated to advance the recording element to a new recording position without operation of the recording stylus into engagement with the sheet, if such manual operation should be desired.

The electromagnet 91 may be included in an electrical circuit, which is closed at each operation of a machine or apparatus, whose operations are to be recorded, and at successive energizations of this electromagnet, the recording stylus 7 will be actuated to make a record, and the other mechanism which has been described will be operated to advance the recording stylus in successive steps to new recording positions. After the recording stylus has been operated for a predetermined number of times, such as the number of times necessary to move it across the record sheet, the carriage or mounting 61 will move beneath a projection 106, depending from the actuating member 85, which will engage with the cross piece or

member of the U-shaped frame 79 as the stylus moves into engagement with the record sheet and will tilt the frame 79 from the position shown in Fig. 7 to the position shown in Fig. 9. In Fig. 9 the tilting is shown as completed at the completion of the downward or recording movement of the pin 60, which is depressed by the actuating member 85 in the downward movement of the latter.

The frame 79 in tilting disengages the pawls 75 and 76 from the racks 73 and 74, and therefore, as soon as the actuating member 85 starts upwardly following the deenergization of the electromagnet 91, the recording stylus will be disengaged from the record sheet and the carriage or mounting 61 will then be free for movement by the cable or cord 69 and the spring drum 71. This drum will then pull the carriage or mounting 61 back to initial or starting position, the dotted lines in Fig. 9 indicating the position of the recording element and its mounting at an intermediate point in their return movement. This return movement will continue until the mounting or carriage 61 strikes a stop which in this case is the sleeve 72, Fig. 8, and the parts will then remain in this position with the cross pin 80 directly beneath another projection 107 depending from the actuating member 85.

At the next energization of the electromagnet 91, which will cause the making of a new record, the actuating member 85 will descend and force the recording stylus 7 into the record sheet and during this actuating movement, the projection 107 will engage the cross pin 80 and tilt the pawl carrying frame 79 back into its position shown in Fig. 7 and permit reengagement of the pawls 75 and 76 with the racks 73 and 74. During this downward movement of the actuating member 85, as in all other recording movements, the movable rack 74 will be moved endwise, even before the pawl 76 engages therewith. When, in this case, the actuating member 85 starts upwardly again at the conclusion of the recording operation, the endwise movement of the rack 74 which results will through the pawl 76, advance the mounting or carriage 61 to a new recording position, the same as before, and this advancement will continue at each following recording operation until the mounting of the carriage reaches the opposite side of the record sheet the same as before, when a new return movement will be effected in the same manner.

In the operation of a recording device of this type, the electric motor 36 will be connected for operation in accordance with lapse of time increments, and as the shaft 38 rotates, it will repeatedly rock and then release the main feeding lever 24. This lever will operate the feeding drums 11 and advance the record sheet by increments, the record sheet being taken up, as rapidly as advanced, by the take-up roller which is operated by a spring whose tension is maintained by the pawl 55, which is also operated by the main feeding lever. The electromagnet 91 is included in an electrical circuit which is closed at each operation of a machine or device, or at any time that a record is to be made, and the energization of this electromagnet will cause the engagement of the recording stylus 7 with the record sheet to make a record, and following that the advancement of the recording stylus to a new recording position automatically. When the recording stylus has made a predetermined number of records after starting on its movement across the record sheet, or when the recording stylus has reached the opposite side of the record sheet, the mounting for the recording stylus will be released and returned to starting position automatically. At the next recording operation, the stylus will be advanced to a new recording position after the completion of that first record making operation.

It will be understood that while the recording stylus is making a single travel across the record sheet, the record sheet will be advanced by increments to such an extent that when the stylus returns to starting position at one side of the record sheet, it will be at a different point along the length of the record sheet from that at which it started in its previous travel across the record sheet. It will also be observed that the advancement and return of the recording stylus is effected between recording operations and when the stylus is out of contact with the record sheet, and that the construction is relatively simple, durable, dependable and inexpensive, as well as compact.

It will be understood that by the term "motor", as herein used, I intend to include clocks as the controlling or propelling power for the record sheet.

It will be obvious that various changes in the details, which have been herein described and illustrated, in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

I claim as my invention:—

1. In a recording device of the type having a record sheet advanced progressively, the combination of a recording element engageable with said sheet for recording thereon controlling operations, means operated automatically at each operation of the recording element for advancing said element to a succeeding recording position, means operable at the completion of a predetermined number of recording operations for incapacitating said advancing means and returning said element to initial recording position, and means operable automatically at the next recording operation for removing the incapacity of said advancing means.

2. In a recording device of the type having a record sheet progressively advanced, a recording element, a mounting for said element movable transversely of the direction of travel of said sheet and guiding said element into and out of recording relation with said sheet, means for advancing said mounting including a part movable with said mounting and a part arranged along the path of travel of said mounting, one of said parts being independently movable into and out of driving relation with the other part, means operable after a predetermined advancement of the mounting for effecting a disconnection of said parts and a return of said mounting to initial position, and means operable at the next recording operation for restoring said parts to driving relation with one another.

3. In a recording device of the type having a record sheet advanced progressively, a recording element, a mounting for said element guiding the element into recording engagement with said sheet, means for guiding said mounting in a direction transversely to the path of travel of said sheet, means yieldingly biasing said mounting into initial position, means for advancing said mounting in opposition to said bias progressively at each recording operation of said element, means for effecting a disconnection between said advancing means and said mounting after a predetermined number of recording operations to permit return of said mounting and recording element to initial position, means for preventing re-engagement of said mounting and advancing means during the return of said mounting, and means operable after the mounting has completely returned to initial position for restoring the connection between said mounting and said advancing means at the beginning of the next succeeding recording operation.

4. In a recording device of the type having a record sheet advanced progressively, a recording element, a mounting for said element, means for guiding said element in a direction transverse to the direction of travel of said sheet, means for biasing said mounting yieldingly into an initial position, a stationary rack extending in the direction of travel of said mounting, a second rack also disposed along the path of travel of said mounting and movable endwise in the same direction, a pair of pawls carried by said mounting and individually engageable with said racks to hold said mounting against movement by said biasing means, and means for causing endwise movement of said movable rack away from normal position during the movement of the recording element into engagement with said sheet and for returning it to normal position during movement of said element out of recording engagement with said sheet, whereby one of said pawls will be engaged with a new tooth of said movable rack during the movement of the recording element into recording engagement with said sheet, and the mounting moved to a new recording position by the return of said movable rack to normal position as the recording element moves out of engagement with the recording sheet.

5. In a recording device of the type having a record sheet advanced progressively, a recording element, a mounting for said element, means for guiding said element in a direction transverse to the direction of travel of said sheet, means for biasing said mounting yieldingly into an initial position, a stationary rack extending in the direction of travel of said mounting, a second rack also disposed along the path of travel of said mounting and movable endwise in the same direction, a pair of pawls carried by said mounting and individually engageable with said racks to hold said mounting against movement by said biasing means, means for causing endwise movement of said movable rack away from normal position during the movement of the recording element into engagement with said sheet and for returning it to normal position during movement of said element out of recording engagement with said sheet, whereby one of said pawls will be engaged with a new tooth of said movable rack during the movement of the recording element into recording engagement with said sheet, and the mounting moved to a new recording position by the return of said movable rack to normal position as the recording element moves out of engagement with the recording sheet, means operable automatically after a predetermined number of recording operations for removing said pawls from both of said racks and holding them disengaged, and means operable after the mounting has returned to initial position for returning said pawls into driving relation with both of said racks.

6. In a recording device of the type having a record sheet advanced progressively, a recording element, a mounting for said element, means for guiding said element in a direction transverse to the direction of travel of said sheet, means for biasing said mounting yieldingly into an initial position, a stationary rack extending in the direction of travel of said mounting, a second rack also disposed along the path of travel of said mounting and movable endwise in the same direction, a pair of pawls carried by said mounting and individually engageable with said racks to hold said mounting against movement by said biasing means, means for causing endwise movement of said movable rack away from normal position during the movement of the recording element into engagement with said sheet, and for returning it to normal position during movement of

said element out of recording engagement with said sheet, whereby one of said pawls will be engaged with a new tooth of said movable rack during the movement of the recording element into recording engagement with said sheet, and the mounting moved to a new recording position by the return of said movable rack to normal position as the recording element moves out of engagement with the recording sheet, means operable automatically after a predetermined number of recording operations for removing said pawls from both of said racks and holding them disengaged, means operable after the mounting has returned to initial position for returning said pawls into driving relation with both of said racks, and means operable automatically after the mounting has returned to initial position and at the beginning of the next recording operation for restoring said pawls to engagement with both of said racks.

7. In a recording device of the type having a record sheet advanced progressively, a recording element, a mounting for said element guiding the element into and out of engagement with said sheet, means for guiding said mounting transversely of the direction of travel of said sheet, means for advancing said mounting at each operation of the recording element including a rack part and a pawl part cooperating with one another, one of said parts being connected to said mounting for movement therewith and the other part being disposed adjacent thereto and mounted for limited movements to and from the normal position and in the direction of travel of said mounting, and means operable at each operation of said recording element into engagement with said sheet for causing a movement of said moving part to advance said mounting to a new recording position.

8. In a recording device of the type having a record sheet advanced progressively, a recording element, a mounting for said element guiding the element into and out of engagement with said sheet, means for guiding said mounting transversely of the direction of travel of said sheet, means for advancing said mounting at each operation of the recording element including a rack part and a pawl part cooperating with one another, one of said parts being connected to said mounting for movement therewith and the other part being disposed adjacent thereto and mounted for limited movements to and from the normal position and in the direction of travel of said mounting, means operable at each operation of said recording element into engagement with said sheet for causing a movement of said moving part to advance said mounting to a new recording position, means yieldingly biasing said mounting to initial recording position, means normally preventing movements of said mounting towards initial position, means operable automatically after a predetermined number of recording operations for effecting disengagement of said parts and incapacitating said return movement preventing means, and means operable after said mounting has returned to initial position for reconnecting said parts and removing the incapacitation of said return movement preventing means.

9. In a recording device of the type having a record sheet advanced progressively, a recording element, a mounting for said element guiding the element into and out of engagement with said sheet, means for guiding said mounting transversely of the direction of travel of said sheet, means for advancing said mounting at each operation of the recording element including a rack part and a pawl part cooperating with one another, one of said parts being connected to said mounting for movement therewith, and the other part being disposed adjacent thereto and mounted for limited movements to and from the normal position and in the direction of travel of said mounting, means operable at each operation of said recording element into engagement with said sheet for causing a movement of said moving part to advance said mounting to a new recording position, means yieldingly biasing said mounting to initial recording position, means normally preventing movements of said mounting towards initial position, means operable automatically after a predetermined number of recording operations for effecting disengagement of said parts and incapacitating said return movement preventing means, and means operable after said mounting has returned to initial position for reconnecting said parts and removing the incapacitation of said return movement preventing means, said reconnection of said parts being effective at the beginning of the first recording operation after the mounting has returned to initial position.

10. In a recording device of the type having a record sheet advanced progressively, a recording element, a mounting for said element guiding the element into and out of engagement with said sheet, means for guiding said mounting transversely of the direction of travel of said sheet, a supporting frame, an actuating member mounted on said frame for movement to force the recording element into engagement with said sheet at any position of said mounting, a pair of racks extending adjacent to and in the direction of travel of said mounting, pawls carried by said mounting and engaging with said racks, the engagement of the pawls and racks causing advancing movements of said mounting and preventing return movements, and means connected to said actuating member for causing endwise movement of one of said rack bars to cause the engagement

of an advance notch thereof with its cooperating pawl during movement of said recording element into engagement with said sheet and returning said movable rack to normal position as the recording element is released for movement away from said sheet, whereby the return of said movable rack bar to normal position will advance the mounting to a succeeding recording position. the engagement of the other pawl with the fixed rack preventing retrograde movement of said mounting while the movable rack is causing the engagement of its cooperating pawl with a new notch of that rack.

11. In a recording device of the type having a record sheet advanced progressively, a recording element, a mounting for said element guiding the element into and out of engagement with said sheet, means for guiding said mounting transversely of the direction of travel of said sheet, a supporting frame, an actuating member mounted on said frame for movement to force the recording element into engagement with said sheet at any position of said mounting, a pair of racks extending adjacent to and in the direction of travel of said mounting, pawls carried by said mounting and engaging with said racks, the engagement of the pawls and racks causing advancing movements of said mounting and preventing return movements, means connected to said actuating member for causing endwise movement of one of said rack bars to cause the engagement of an advance notch thereof with its cooperating pawl during movement of said recording element into engagement with said sheet and returning said movable rack to normal position as the recording element is released for movement away from said sheet. whereby the return of said movable rack bar to normal position will advance the mounting to a succeeding recording position, the engagement of the other pawl with the fixed rack preventing retrograde movement of said mounting while the movable rack is causing the engagement of its cooperating pawl with a new notch of that rack, means carried by said mounting and movable alternately between two positions in one of which it disengages both pawls from said racks, and in the other position of which it releases said pawls and racks, means for yieldingly holding said last named means in both of said positions, and means carried by said actuating member and operable upon said pawl controlling means for shifting it into its position to disengage the pawls from the racks after a predetermined movement of recording operations, and additional means also carried by said actuating member and operable on said pawl disengaging means for returning it to the other of its positions to release said pawls and said racks.

12. In a recording device of the type having a record sheet advanced progressively, a supporting frame, a recording element, a mounting for said recording element guiding said element into and out of engagement with said sheet, said frame guiding said mounting in movements transversely of the direction of movement of said sheet, an actuating member mounted for reciprocation on said frame, a pair of racks extending in the direction of movement of said mounting means, connecting means between said actuating member and one of said racks for reciprocating that rack at each operation of the recording element, and a pair of pawls carried by said mounting and engaging with said racks, one of said pawls and the stationary rack preventing return movement of said mounting, and the other pawl and the movable rack causing step by step advancement of the mounting during the return reciprocation movement of said movable rack.

13. In a recording device of the type having a record sheet advanced progressively, a supporting frame, a recording element, a mounting for said recording element guiding said element into and out of engagement with said sheet, said frame guiding said mounting in movements transversely of the direction of movement of said sheet, an actuating member mounted for reciprocation on said frame, a pair of racks extending in the direction of movement of said mounting means, connecting means between said actuating member and one of said racks for reciprocating that rack at each operation of the recording element, a pair of pawls carried by said mounting and engaging with said racks, one of said pawls and the stationary rack preventing return movement of said mounting, and the other pawl and the movable rack causing step by step advancement of the mounting during the return reciprocation movement of said movable rack, means connected to said mounting for biasing it into initial position from which it is moved by said movable rack, means carried by said mounting and operable by said actuating member after a predetermined advancement of said mounting for disengaging both of said pawls from said racks and holding them disengaged and means operable after the complete return of said mounting to initial position for restoring said pawls to cooperation with said racks.

14. In a recording device of the type having a record sheet advanced progressively, a supporting frame, a recording element, a mounting for said recording element guiding said element into and out of engagement with said sheet, said frame guiding said mounting in movements transversely of the direction of movement of said sheet, an actuating member mounted for reciprocation on said frame, a pair of racks extending in

the direction of movement of said mounting means, connecting means between said actuating member and one of said racks for reciprocating that rack at each operation of the recording element, a pair of pawls carried by said mounting and engaging with said racks, one of said pawls and the stationary rack preventing return movement of said mounting, and the other pawl and the movable rack causing step by step advancement of the mounting during the return reciprocation movement of said movable rack, means connected to said mounting for biasing it into initial position from which it is moved by said movable rack, means carried by said mounting and operable by said actuating member after a predetermined advancement of said mounting for disengaging both of said pawls from said racks and holding them disengaged, and means operable after the complete return of said mounting to initial position for restoring said pawls to cooperation with said racks, said last named means being operated by said actuating member at the beginning of the first recording operation after the mounting has returned to initial position.

15. In a recording device of the type having a record sheet advanced progressively, the combination of a supporting frame, a mounting guided by said frame for movement transversely of the direction of travel of the sheet, a recording element carried by said mounting for independent movement thereon into and out of engagement with said sheet, an actuating member mounted on said frame for causing movement of said element into engagement with said sheet in all positions of said mounting, a rack extending in the direction of movement of said mounting and mounted for reciprocation in that direction, a connection between said member and said rack for causing a complete reciprocation of said rack at each complete movement of said actuating member, and means associated with said mounting and rack for causing the step by step advancement of said mounting by said rack at each recording operation, and for causing the complete return of said mounting to initial position after a predetermined number of recording operations.

16. In a recording device of the type having a record sheet progressively advanced, the combination of a supporting frame, a mounting guided by said frame transversely of the direction of movement of said sheet, a recording element carried by said mounting and engageable with said sheet, a pair of racks extending in the direction of travel of said mounting, a pair of pawls carried by said mounting and individually engageable with said racks in a manner to prevent movement of the mounting in one direction and permit free movement of the mounting in the other direction, means yieldingly biasing said mounting for movement in the first direction which is prevented by said racks and pawls, an actuating member mounted for reciprocation on said frame, a lever pivoted to said frame and connected at one end to one of said racks to cause endwise reciprocation thereof when said lever is oscillated, and means including a link connecting said actuating member and said lever for causing an oscillation of said lever and through it a reciprocation of said actuating member, whereby said mounting will be advanced one step at each operation of said actuating member.

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