No. 767,525. PATENTED AUG. 16, 1904.

F. C. OSBORN.

ELECTRIC RECORDER.

APPLICATION FILED AUG. 3, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

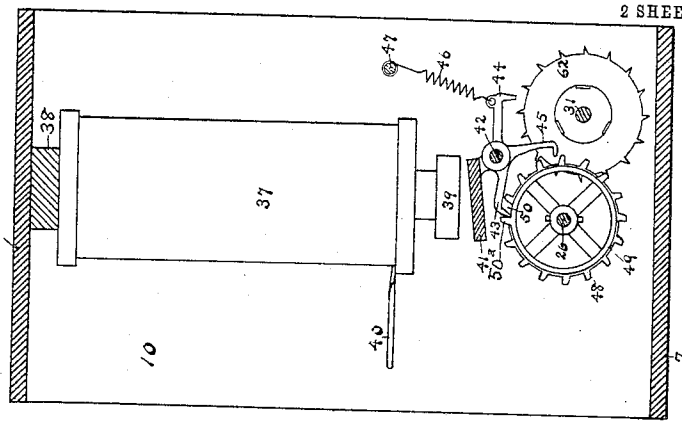

Fig. 2.

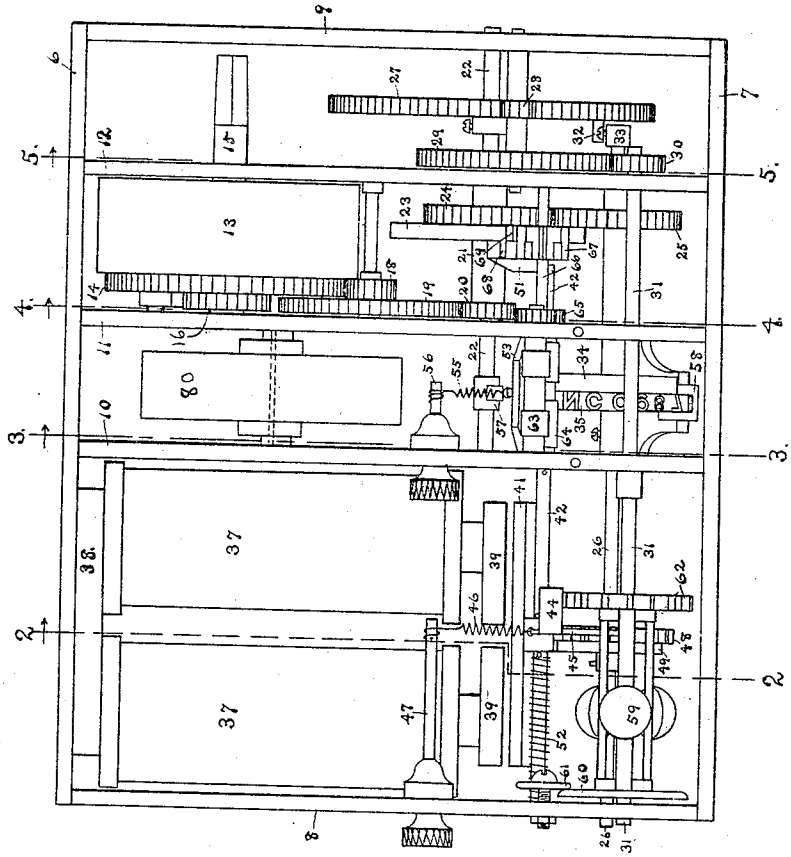

Fig. 1.

Witnesses.

C. O. Butterfield

S. J. Wilson

Inventor.

Francis C. Osborn.

by Edward N. Pagelsen.

his Attorney.

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NO MODEL. 2 SHEETS—SHEET 2.

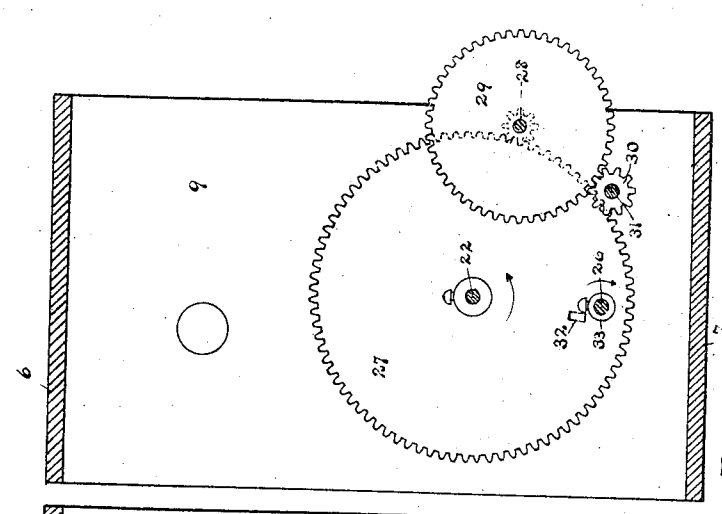

Fig. 5.

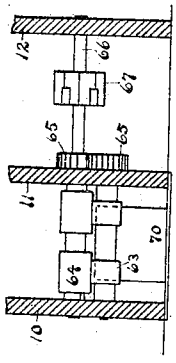

Fig. 6.

Fig. 8.

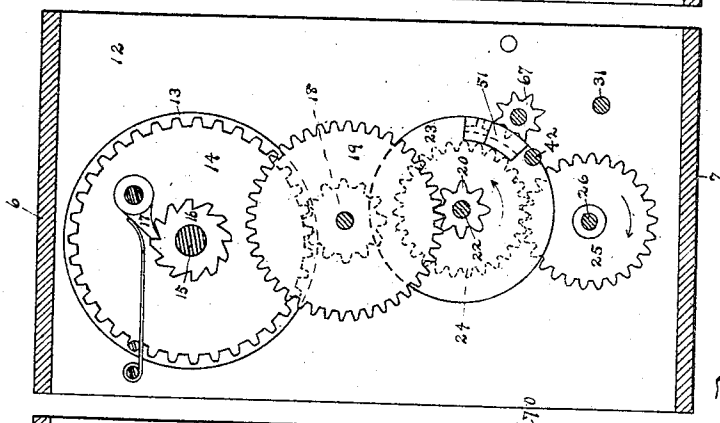

Fig. 4.

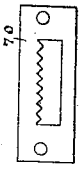

Fig. 7.

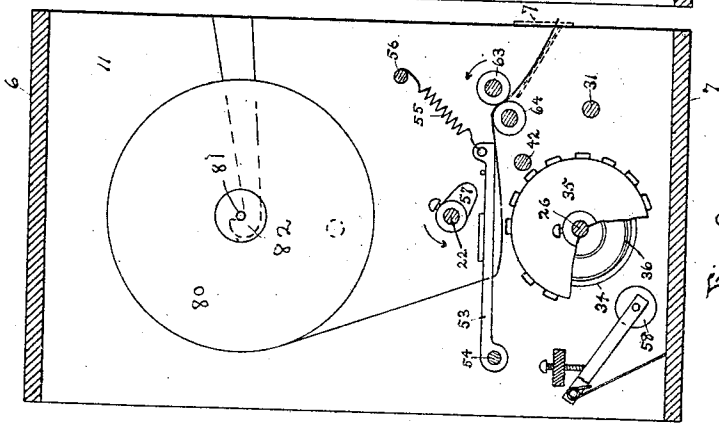

Fig. 3.

Fig. 9.

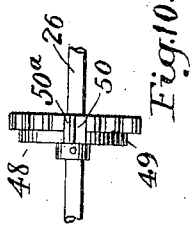

Fig. 10.

Witnesses.

C. D. Butterfield

S. J. Wilson

Inventor.

Francis C. Osborn.

by Edward N. Pagelsen

his Attorney.

No. 767,525. Patented August 16, 1904.

# UNITED STATES PATENT OFFICE.

FRANCIS C. OSBORN, OF DETROIT, MICHIGAN, ASSIGNOR OF TWO-THIRDS TO SAMUEL J. WILSON, JOHN M. SWEENEY, AND OSCAR B. MARX, OF DETROIT, MICHIGAN.

## ELECTRIC RECORDER.

SPECIFICATION forming part of Letters Patent No. 767,525, dated August 16, 1904.

Application filed August 3, 1903. Serial No. 167,969. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS C. OSBORN, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and Improved Electric Recorder, of which the following is a specification.

My invention relates to electrical recorders; and the objects of my improvements are to produce a recorder that will operate through impulses received over a single wire, the other pole being connected to the ground; that is simple in construction and not liable to get out of order, and that will print figures and letters on a tape in such a manner that these characters will be evenly spaced and the groups of characters separated by any desired spaces. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a front view of the recorder. Figs. 2, 3, 4, and 5 are sections on the lines 2 2, 3 3, 4 4, and 5 5 of Fig. 1, respectively. Fig. 6 is an end view of the spacing-wheel, taken from the side opposite to that in Fig. 4. Figs. 7 and 8 are views of the paper-cutter. Fig. 9 is a plan of the paper-feeding mechanism, and Fig. 10 is a plan of the escapement-wheel.

Similar reference characters refer to like parts throughout the several views.

This machine is intended to print figures and letters in groups on a tape and to leave a space between the groups of characters. Impulses may be sent to it over a single wire in any desired manner—such as, for instance, by the common messenger-call instrument. It is intended that each impulse shall permit the printing-wheel to turn one step, and as this wheel has no character at the first step a blank space will occur on the tape if but one impulse is sent during the first cycle. The machine is intended to receive one or a number of impulses during a fixed period or cycle of time. With the construction shown sixteen is the highest number receivable. Each impulse will permit the printing-wheel to turn one-sixteenth of a revolution and at the end of the cycle the character then presented will be printed and the mechanism restored to normal. The first impulse brings the blank space to the printing position; two to eleven impulses the figures "1, 2 to 9, 0." Twelve to sixteen impulses will bring the letters "C," "N," "W," "M," or "G" or any others that may be placed on the wheel. If the sender transmits a series of twelve, four, eight, three, two, and one impulses, the tape will receive "C3721—," the blank being caused by the printing-wheel presenting a blank space to the tape. The mechanism is constructed as follows:

The frame of the recorder is made up of the top and bottom plates 6 and 7, the end plates 8 and 9, and the partitions 10, 11, and 12. Between the partitions 11 and 12 is the spring-case 13, to which is attached the gear 14, both supported by the winding-shaft 15. Between the shaft and case a connection is made by the flat spiral clock-spring in the usual manner. The ratchet-wheel 16 on the shaft is engaged by the pawl 17, which pawl is pivoted on a pin which screws into partition 11. The gear 14 engages pinion 18 on the same shaft with and attached to gear 19. Gear 19 in turn meshes with pinion 20 on a sleeve 21, which sleeve is secured to shaft 22, which will be termed the "driving-shaft," and which makes one revolution for each character printed and for each space between the groups of characters. On this sleeve 21 are secured the disk 23 and gear 24, which meshes with gear 25 of equal size on a sleeve on shaft 26, which shaft will therefore also make one revolution with each cycle, but in the opposite direction to 22. On shaft 22 is secured gear 27, which meshes with pinion 28, which pinion is on the same shaft and secured to gear 29. This gear 29 meshes with pinion 30 on the governor-shaft 31. To gear 27 is attached the lug 32, which at the end of each cycle contacts with the screw in the collar 33 on shaft 26. Shaft 26 is stopped at the end of each cycle in a manner to be explained later, and by its stopping it stops gear 27, and with it the remainder of the mechanism. The adjustment between the screw-head and lug 32 is such that when shaft 26 revolves one-sixteenth 27 a revolution the lug will escape and wheel of be permitted to revolve.

As before stated, gear 25 is secured to a sleeve on shaft 26. The other end of this sleeve is expanded to form the spring-case 34. Secured to the shaft 26 is the printing-wheel 35, and between the shaft 26 and the inner wall of the spring-case is the spring 36, which is always under slight tension. This spring is long enough to permit wheel 25 to make nearly a full revolution while shaft 26 is held stationary.

Between the side 8 and the partition 10 are secured the spools 37 of an electromagnet, connected at the top by the bar 38 and having pole-pieces 39. The current passes in and out by the conductors 40, one being shown in Fig. 2. The armature 41 is secured to the shaft 42, which shaft is slidable endwise in the partitions. The spring 46, which is adjustable by the shaft 47, serves to keep the pawls in position shown in Fig. 2. To the shaft 26 is attached the escapement-wheel 48, having sixteen teeth, and an extended cylindrical flange 49. It will be observed that except at 50 the wheel at the spaces between the teeth is of greater diameter than the flange; also, that the tooth $50^a$ next to this space projects across the flange. The reason is this: When an impulse is received by the magnet, the armature is raised, the pawl 43 rises above the tooth, and the shaft 26 begins to turn. If but one impulse is received, the pawl 43 will be pulled down by the spring 46 in front of the next tooth. The printing-wheel 35 has therefore moved one step. The lug 32, however, has been permitted to escape, and the clockwork will continue to run, winding up spring 36. On the disk 23 is a wedge 51, which just before the end of the revolution of 22 passes across the end of shaft 42, forcing it outward. With it will be carried the pawls 43, 44, and 45. Pawls 43 and 45 will now be out of line with the teeth, but in line with the flange 49, on which pawl 43 will slide. While the shaft 26 was held by the pawl 43 the gear 25 and spring-case 34 revolved, putting spring 36 under tension. As soon as pawl 43 passes out of engagement with the teeth and into the plane of flange 49 the spring 36 turns shaft 26 and wheel 48 until the long tooth that projects across the flange 49 comes in contact with pawl 43. When wedge 51 passes the end of the shaft 42, the spring 52 pushes shaft 42 inward, and the pawl 43 slides in the deep notch 50 to normal position.

When succeeding impulses are received, the pawls permit the wheel 48, and with it the shaft 26 and printing-wheel 35, to turn additional distances. The wheel 35 has fifteen characters and one long space, which will come directly under the printing-platen whenever but one impulse has been received. Each additional impulse in a cycle will bring the next succeeding figure under the platen. This platen 53 is pivoted on pin 54 and is held up by spring 55 adjustable by shaft 56. On shaft 22 is secured the lug 57, which just previous to the end of each revolution of the shaft presses down the platen and the paper under it against the printing-wheel. This wheel is inked by the roller 58, each letter being inked at each cycle, as the printing-wheel makes a revolution with each revolution of shafts 22 and 26. The speed of shafts 22 and 26 is regulated by the governor 59, whose plate 60 contacts with the friction-stop 61. The pawl 44 acts on the toothed wheel 62 on the shaft 31 when the wheel 48 is advancing, thus preventing the clockwork from running when the wheel 48 is held by the pawl 45, and so losing power should the impulses be long.

Secured to the sides of the partitions 10 and 11, that face each other, are two inclines 82, with hooked ends formed of flat pieces of metal. Resting on these supports is the small shaft or roller 81, which carries a roll 80 of paper tape adapted to receive the record. The paper passes down through a slot in the platen, thence forward over the printing-wheel and between the rolls 63 64, and out through the opening in the cutter 70.

The paper is fed forward between the rollers 63 and 64, the former preferably of rubber and the latter of roughened metal. These revolve at the same speed, being connected by equal gears 65. The shaft 66 has the mutilated gear 67 attached to it, which gear meshes with the single tooth 68, projecting from the side of the disk 23, and with the space 69 in the edge of said disk. There is space enough between the wedge 51 and the disk 23 for the short teeth of the mutilated gear. As this gear has four short and four long teeth, the shaft 66 and the rolls will make one-fourth of a revolution after each impression. Should a single impulse come to the machine, no character will be printed, and a double space will result. The cutter 70 may be secured to partitions 10 and 11, as indicated in dotted lines in Fig. 3. The screw-holes are shown in Fig. 1. The means for supporting the paper are shown in Fig. 3.

The operation of the recorder is as follows: The electrical impulses are received in cycles that correspond to the time required by the shaft 22 to make one revolution. If a mechanical sender is used, the speed of the shaft 22 may be much greater than when the impulses are sent by a key. The gears 14, 18, 19, and 20 and shaft 22 are constantly under tension from the mainspring; but any other desirable means may be used for the purpose of driving shaft 22. The speed of this shaft is regulated by the governor 59 60 61, so that the revolution of the shaft will be uniform. As stated above, the armature 41 will vibrate with each impulse. With the first impulse the pawl 43 releases the wheel 48 and shaft 26, and thus also the gear 27 and shaft 22, which shaft 22 slowly revolves. As the following impulses, if any, are received the armature

vibrates, and the wheel 48 and shaft 26 are permitted to turn one-sixteenth of a revolution with each impulse and with shaft 26 the printing-wheel 35 will turn to present a new character to the platen at each impulse. After the impulses have ceased the pawl 43 will hold the wheel 48, shaft 26, and the printing-wheel, while the shaft 22, gears 24 and 25, and spring-case 34 continue to revolve under the stress of the mainspring. Toward the end of the revolution of shaft 22 the lug 57 presses down the platen toward the printing-wheel, and a further revolution of the shaft 22 causes the wedge 51 on the side of the disk 23 to press the shaft 42 to the left, Fig. 1, moving the pawls 43 45 into the plane of the flange 49, thus releasing the wheel 48 and permitting it to complete its revolution. As the tooth 50[a] extends across the flange 49 of this wheel, the shaft 26 will be stopped when the tooth contacts with the pawl 43. As soon as the incline 51 has passed the end of shaft 42 the spring 52 will slide the shaft and pawls to the right, and the escapement, pawls, printing-wheel, shaft 26, and collar 33 will be in the same position as at the beginning of the cycle. The shaft 22 continues to turn until the lug 32 strikes the screw in the collar 33 and is there firmly held until with the first impulse of the next cycle the screw moves out of the path of the lug 32. The impulses should all be received before the shaft 22 has revolved far enough to bring the lug 57 in contact with the platen, and the platen has resumed its upper position before the wedge 51 contacts with the end of the shaft 42. With this construction it is not necessary to reset the printing-wheel to zero, for it is positioned by the impulses, held in place until after the printing, and then released to complete one revolution. If but one impulse is received, the wheel 48 moves but one step, and the printing-wheel presents the blank space to the platen, and as a result there is a blank space on the record-tape. Should an impulse of great length or duration of time be received for any reason, the shaft 22 might revolve too far to permit the following impulses to be received. The pawl 44, contacting with the teeth of wheel 62, stops the shaft 31 and the shaft 22 during the time of the impulse and permits them to turn between the impulses, thus preventing incorrect records. As the feeding forward of the paper occurs with each cycle—that is, with each revolution of shaft 22—a new space is presented with each cycle. If but one impulse is received, a blank space will occur. If five impulses are received, the figure "4" will be printed; but irrespective of the number of impulses during the cycle no printing is done until the shaft 22 has almost completed its revolution. The tooth 68 on the disk 23 engages with the mutilated gear 67 just after the platen has risen and while the wedge 51 is holding the shaft 42 to the left, as shown in Fig. 4. As a result, the tape will be fed forward after each downward movement of the platen. To space the groups of characters, it is necessary that there should be one more cycle than there are characters in the group and that during either the first or last cycle only one impulse be received.

Having now explained my construction, what I claim as my invention, and desire to secure by Letters Patent, is—

1. In a recorder, the combination of a driving-shaft, a second shaft connected to the driving-shaft to revolve at the same speed, a printing-wheel flexibly connected to said second shaft, an electrically-controlled escapement connected to said printing-wheel, a platen, and a lug on the driving-shaft to press said platen against the printing-wheel.

2. In a recorder, the combination of a driving-shaft connected to make one revolution at each cycle, a second shaft similarly connected, a printing-wheel carried by and flexibly connected to said second shaft, an electrically-controlled escapement to position and hold said wheel in selected printing position, and means operated by the driving-shaft to release said printing-wheel and permit it to complete one revolution by the end of the cycle.

3. In a recorder, the combination of a printing-wheel, a shaft supporting said wheel, a lug on the end of said shaft, a sleeve on said shaft, a flexible connection between the sleeve and the shaft, a second shaft, gearing between said sleeve and said second shaft, and a lug carried by a gear on said second shaft to contact with the lug on the said printing-wheel shaft.

4. In a recorder, the combination of a power-shaft, a gear on said shaft having a lug, a second shaft, a sleeve on said second shaft, equal intermeshing gears on said power-shaft and sleeve, a printing-wheel on said second shaft, a flexible connection between said printing-wheel and sleeve, a platen for pressing paper against said printing-wheel, a cam on the driving-shaft for operating the platen, and a lug on the printing-wheel shaft for contacting with the lug on the gear on said driving-shaft to stop said driving-shaft just after the contact of the cam and platen.

5. In a recorder, the combination of the printing-wheel, a driving-shaft, a flexible connection between the driving-shaft and the printing-wheel, an electrically-operated governing mechanism, an escapement connected to the printing-wheel directly operated upon by the governing mechanism, a platen for the printing-wheel, and a cam on the driving-shaft for contacting with and pressing the platen toward the printing-wheel.

6. In a recorder, the combination of the power-shaft, a printing-wheel, a platen for said printing-wheel, a cam on said power-shaft to actuate said platen, paper-feeding rolls, an extended shaft for one of said rolls, a mutilated gear on said shaft, and a disk on said

power-shaft having means to actuate said gear just before the end of the revolution of said power-shaft.

7. In a recorder, the combination of a power-shaft, a second shaft, a sleeve on said second shaft, equal-sized intermeshing gears on said power-shaft and sleeve, a printing-wheel and escapement-wheel on said second shaft, a spring connecting said shaft and sleeve, a slidable shaft, pawls secured to said slidable shaft and contacting with said escapement-wheel, electrically-energized means for operating said pawls to permit step-by-step motion of said escapement-wheel, and means carried by said power-shaft to disconnect said pawls from said escapement-wheel to permit the wheel to complete one revolution under the influence of said spring.

8. In a recorder, the combination of a driving-shaft, a second shaft, a printing-wheel and an escapement-wheel mounted on said second shaft, electrically-operated pawls for controlling the operation of the printing-wheel shaft, a third shaft driven from the driving-shaft, a governor and an escapement-wheel on said third shaft and a pawl connected to and operable with said electrically-operated pawls for controlling the governor.

9. In a recorder, the combination of a power-shaft, a disk on said shaft, a cam on said disk, a second shaft, an escapement-wheel on said shaft having a flange, one tooth on said wheel extending across the flange and the space between said tooth and the preceding being cut down to the flange, the base of the other spaces projecting above the said flange, a third shaft slidable endwise, pawls carried by said third shaft to control the motion of said escapement-wheel, said pawls being moved into the plane of said flange to permit the completion of the revolution of said escapement-wheel by the action of the cam on said disk against the end of said third shaft, and a spring for returning said pawls to normal position.

10. In a recorder, the combination of the power-shaft, a printing-wheel, a shaft supporting said printing-wheel, an escapement-wheel on said printing-wheel shaft having teeth corresponding to the characters on said printing-wheel, pawls controlling the operation of the escapement-wheel and printing-wheel, electromagnets for actuating said pawls, a platen for said printing-wheel, a cam on said power-shaft to actuate said platen, paper-feeding rolls, an extended shaft for one of said rolls, a mutilated gear on said shaft, and a disk on said power-shaft having means to actuate said gear just before the end of the revolution of said power-shaft.

11. In a recorder, the combination of a power-shaft making one revolution for each operation of the printing mechanism, a shaft, a printing-wheel on said shaft, flexible means connecting the power-shaft and the printing-wheel shaft, electrically-operated controlling means permitting the advancement of the printing-wheel one step for each impulse received, and means carried by the power-shaft to cause the controlling means to permit the completion of a revolution by the printing-wheel just before the completion by the driving-shaft of its revolution.

12. In a recorder, the combination of a power-shaft making one revolution for each operation of the printing mechanism, a shaft, a printing-wheel on said shaft, flexible means connecting the power-shaft and the printing-wheel shaft, electrically-operated controlling means permitting the advancement of the printing-wheel one step for each impulse received, means carried by the power-shaft to cause the controlling means to permit the completion of a revolution by the printing-wheel just before the completion by the driving-shaft of its revolution, and means carried by the printing-wheel shaft to act as a stop for the driving-shaft.

13. In a recorder, the combination of a printing-wheel, a paper-feeder, a mechanical motor for operating the printing-wheel and said paper-feeder, and an electromagnet controlled by impulses received over a single wire for governing the extent of the operation of the printing-wheel and the speed of the motor.

14. In a recorder, the combination of the driving mechanism making one revolution for each cycle, a printing-wheel having characters, electrically-controlled means for permitting the printing-wheel to turn to present the desired character to printing position, and means operated from the driving mechanism to cause the controlling means to permit the printing-wheel to complete its revolution to normal position.

15. In a recorder, the combination of a driving mechanism constantly under tension and constructed to make one revolution for each cycle, a printing-wheel having characters and flexibly driven from said driving mechanism, electrically-controlled means permitting the printing-wheel to turn one step for each impulse to present the desired character to printing position, and means operated by the driving mechanism just before the completion of its revolution to cause the controlling means to permit the printing-wheel to complete its revolution to normal position.

16. In a recorder, the combination of a driving mechanism constantly under tension and constructed to make one revolution for each cycle, a printing-wheel having characters and flexibly driven from said driving mechanism, a printing-platen and means to operate the same from the driving mechanism, electrically-controlled means permitting the printing-wheel to turn one step for each impulse to present the desired character to printing position, and means operated by the driving mechanism just before the completion of its revolution to cause the controlling means to

permit the printing-wheel to complete its revolution to normal position, said printing-platen being operated just before said printing-wheel is permitted to complete its revolution.

17. In a recorder, the combination of a driving-shaft constantly under tension and constructed to make one revolution for each cycle, a printing-wheel having characters and flexibly driven from said driving-shaft, a paper-feeding mechanism and means to operate the same by the driving-shaft, electrically-controlled means permitting the printing-wheel to turn one step for each impulse to present the desired character to printing position, and means operated by the driving mechanism just before completing its revolution to cause the controlling means to permit the printing-wheel to complete its revolution to normal position.

18. In a recorder, the combination of the driving-shaft constantly under tension and constructed to make one revolution for each cycle, a printing-wheel having characters and flexibly driven from said driving-shaft, a printing-platen and means to operate the same from the driving mechanism, a paper-feeding mechanism and means to operate the same by the driving mechanism, electrically-controlled means permitting the printing-wheel to turn one step for each impulse to present the desired character to printing position, and means operated by the driving-shaft just before the completion of its revolution to cause the controlling means to permit the printing-wheel to complete its revolution to normal position, said printing-platen being operated just before said printing-wheel is permitted to complete its revolution.

19. In a recorder, the combination of a driving mechanism constantly under tension, an electrical controller operated by impulses, a printing-wheel, a locking mechanism for said driving mechanism, a governor for regulating the speed of said driving mechanism, said locking mechanism being released upon the first impulse and said governor being prevented from attaining normal speed during the time of the impulses.

20. In a recorder, the combination of a driving-shaft constantly under tension arranged to make one revolution for each cycle, an electric controller operated by impulses, a second shaft, a printing-wheel on said second shaft positioned by said impulses and a locking mechanism for said shaft operating at the close of the cycle.

21. In a recorder, the combination of a driving-shaft constantly under tension arranged to make one revolution for each cycle, an electric controller operated by impulses, a second shaft, a printing-wheel on said second shaft positioned by said impulses, a locking mechanism for said shaft operating at the close of the cycle, and means for retarding said driving-shaft during the impulses.

22. In a recorder, the combination of a driving-shaft constantly under tension arranged to make one revolution for each cycle, an electric controller operated by impulses, a second shaft, a printing-wheel on said second shaft positioned by said impulses, and a locking mechanism for said shaft operating at the close of the cycle and releasing said driving-shaft upon the first electric impulse.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANCIS C. OSBORN.

Witnesses:
LOUIS OTT,
EDWARD N. PAGELSEN.