

Oct. 16, 1923.

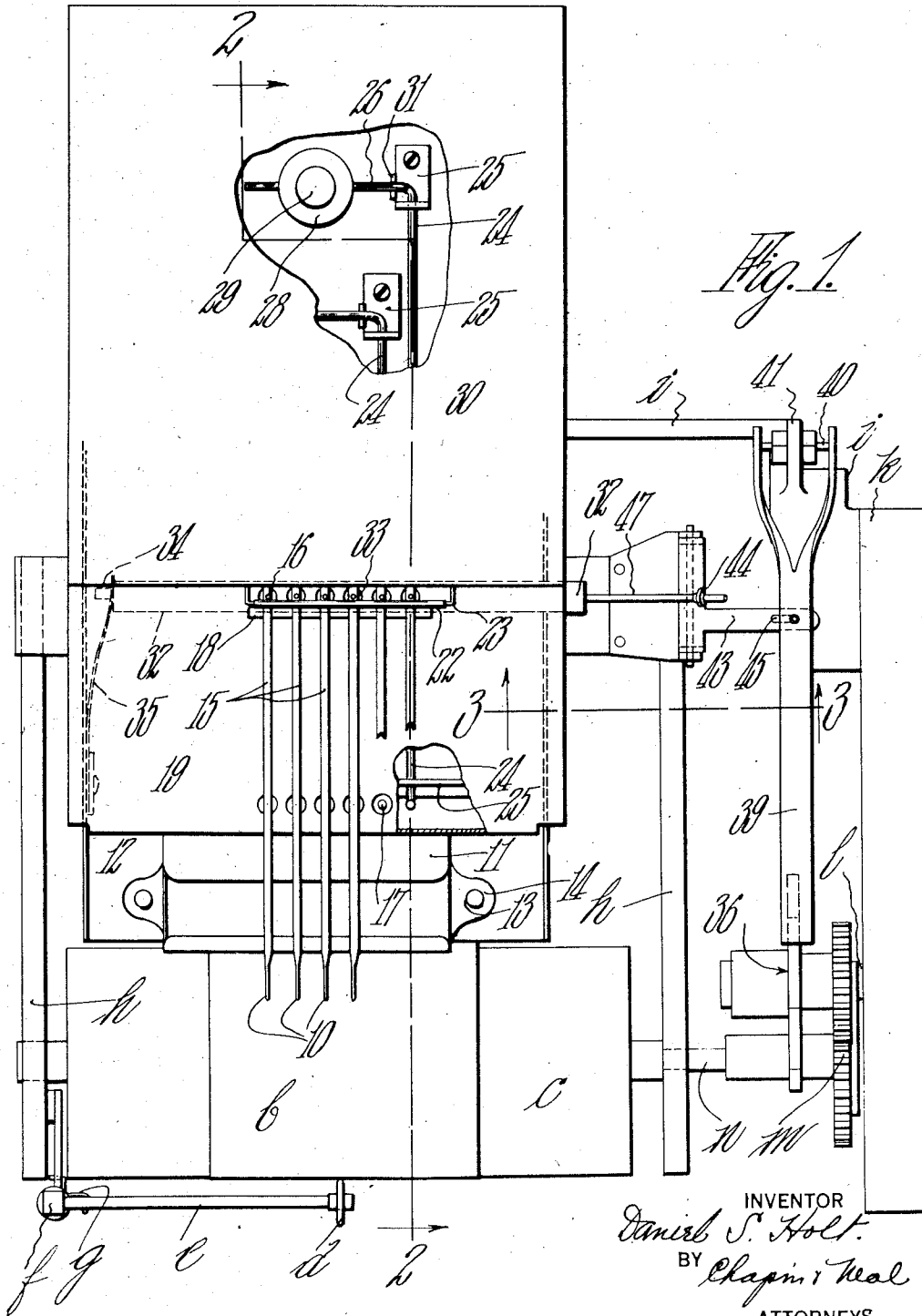
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D. S. HOLT

RECORDING MECHANISM

Filed Oct. 13, 1921

3 Sheets-Sheet 1



Oct. 16, 1923.

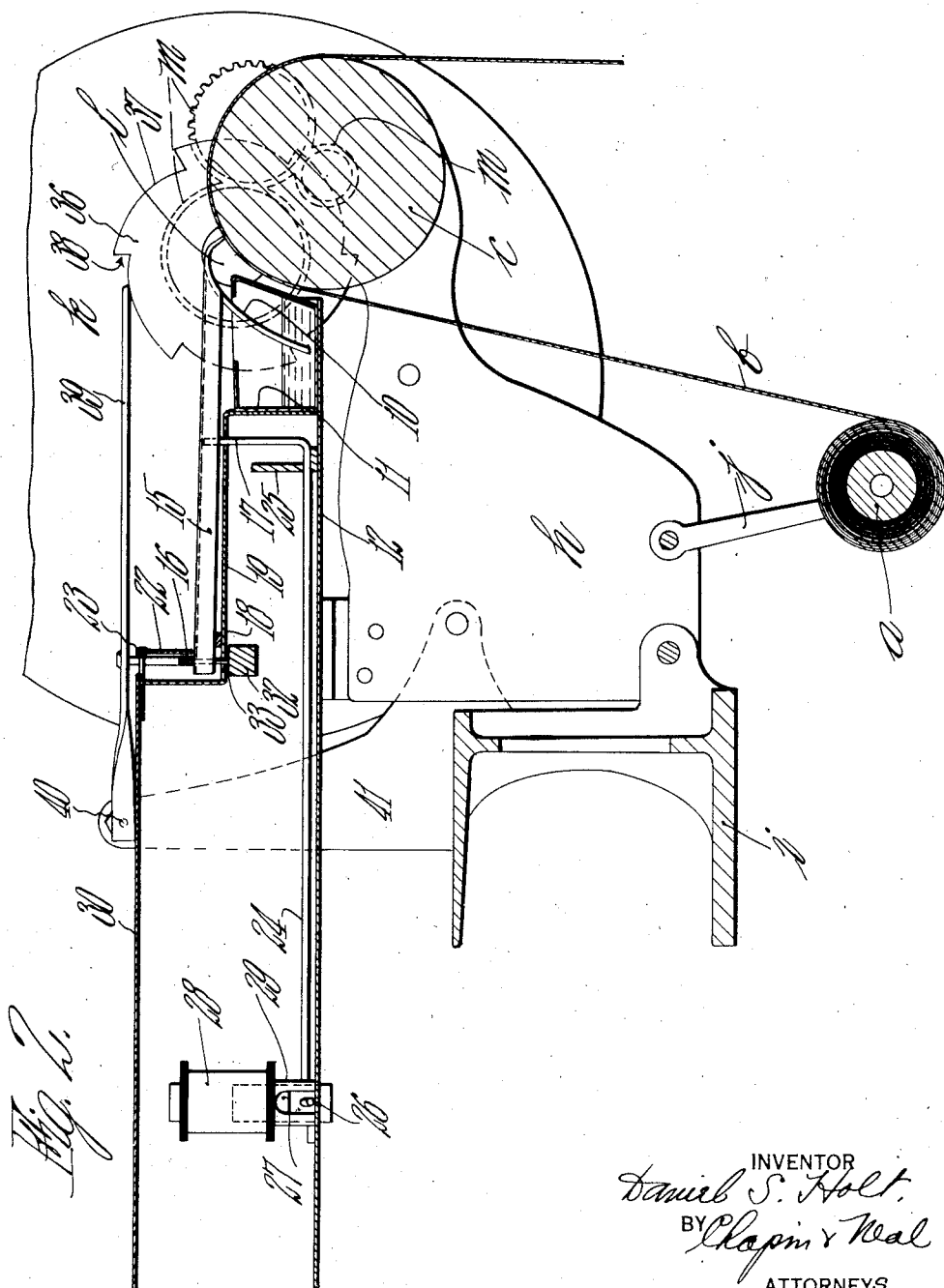
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Fig. 3.

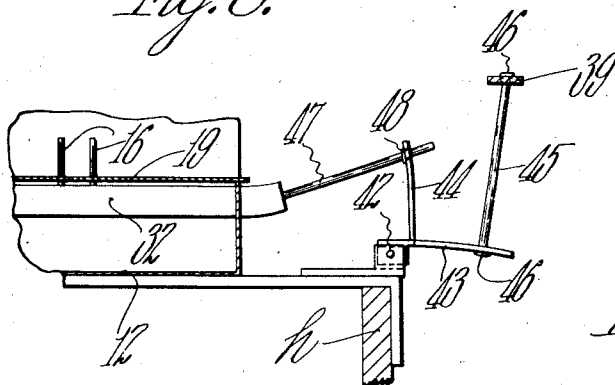
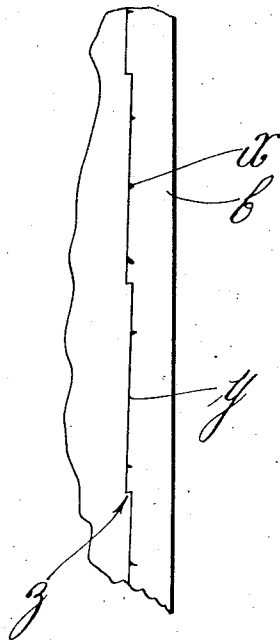
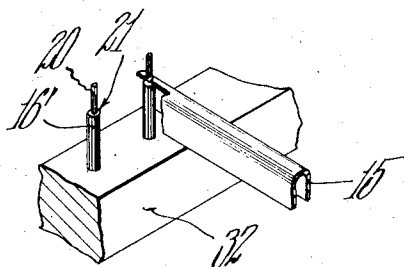


Fig. 5.

Fig. 4.



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RECORDING MECHANISM.

Application filed October 13, 1921. Serial No. 507,503.

To all whom it may concern:

Be it known that I, DANIEL S. HOLT, a citizen of the United States, residing at Mittineague, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Recording Mechanism, of which the following is a specification.

This invention relates to recording mechanism and more particularly to improvements in the construction of the marking devices thereof and in the manner of mounting and actuating them.

Most frequently, the marking devices are pens provided with small passages through which ink is drawn from a reservoir by capillary attraction. These passages are of exceedingly small diameter and liable to become clogged, in consequence of which they frequently require cleaning. Generally, however, these marking devices are mounted in a rather delicate manner and are not conveniently removable. That is, while they are removable, their removal cannot be accomplished quickly and it must be done with considerable care in order to avoid injury to delicate mechanism and in order not to destroy the adjustment thereof. In other words, the removal of such pens is work for the expert rather than the layman. Consequently, it has been the practice to apply a small suction tube to the end of the pen and clean it in this manner without removing the pen from the instrument. Even this operation, however, requires a lifting of the pen from the record strip and unless care is exercised some delicate part may be bent or thrown out of adjustment.

This invention is concerned with, and has for an object to provide a recording instrument in which the marking devices are mounted in a simple and fool-proof manner and for instant and convenient removal when desired, there being no delicately constructed parts, or parts requiring delicate adjustment, so that the layman may mount or dismount the marking devices without likelihood of injury to the machine.

The invention also has for an object to provide, in a recording apparatus, means for driving a record strip, preferably solely by frictional engagement therewith, the strip being preferably free from the usual graduations or rulings designating time, and means being provided to cause the marking devices to plot time graduations as well as

to plot the other desired function or factor which is to be compared with time.

Another object of the invention is to provide, in a recording mechanism, a marking device consisting of a relatively short capillary tube one end of which rests on the record strip and the other end of which extends into an ink reservoir located in close proximity thereto, the tube being made as short as possible to minimize clogging and the tube and reservoir preferably being removable quickly and conveniently to permit cleaning.

Another object of the invention is to provide, in a recording instrument, a marking device and a mounting therefor involving generally improved mechanical structure.

Other objects and advantages will appear in the following description and in the illustrative embodiment of the invention in the accompanying drawings, in which,—

Fig. 1 is a top plan view, with parts broken away, of a recording mechanism embodying the invention;

Fig. 2 is a sectional elevation thereof taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary cross-sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary perspective view of a modification in the mounting of the recording pens; and

Fig. 5 is a fragmentary plan view of a chart showing a specimen of a curve traced by the recording mechanism.

Referring to these drawings: the recording mechanism includes a supply roll *a* to receive the record strip *b* in roll form and a roll *c* for driving the record strip, as by frictional engagement therewith. The strip *b* extends upwardly from roll *a* to and around the upper portion of roll *c* and then is led downwardly therefrom, being held in engagement therewith by suitable means, such as a roll *d* rotatably mounted in an arm *e* pivoted at *f* and yieldingly urged toward roll *c* as by a spring *g*. The roll *c* is rotatably supported near its ends in spaced side frames *h* suitably secured to a base *i* and roll *a* is also supported from such frames, although through the intermediary of two arms *j* pivoted thereto. The arm *e*, described, is also pivotally supported from one side frame *h*. The driving roll *c* may be driven in any suitable manner and, as an illustrative example, a clockwork mechanism, conventionally indicated at *k*, may be

employed. Such mechanism has a driving shaft *l*, which by gearing *m* drives the shaft *n* of roll *c*.

The mechanism, thus far described, is given merely as an illustrative example of one suitable type in which the invention may be embodied. Various other types of similar mechanisms and variations in the one type herein described will occur to those skilled in the art and the invention is independent of the particular type and constructional details of the mechanism above-described.

This invention is more particularly concerned with the construction and mounting of the marking devices, usually pens, although not necessarily so according to all features of the invention. As shown, a series of pens are provided, each consisting of a relatively short capillary tube 10, one end of which rests upon the strip *b* while it travels over roll *c* and the other end of which depends into a reservoir 11 containing ink or the like. The reservoir 11 is desirably located in close proximity to roll *c* and, as shown, is supported on a shelf 12 suitably secured to the brackets *h*. The reservoir 11 preferably is mounted on this shelf for convenient removal and, as shown, is held by gravity to the shelf and is positioned thereon by two pins 13, which are secured to the shelf in upstanding relation and pass through suitable apertures in ears 14 on reservoir 11.

The pens 10 are also mounted for convenient removal. Each pen 10 is suitably attached to a holder 15, which, as shown in Fig. 4, has the cross-sectional shape of an inverted U. The parallel and upstanding side walls of the holder 15 are spaced apart just sufficiently to receive between them a pair of upstanding pins 16 and 17, which are mounted in a manner to be later described, but for present purposes may be considered stationary. The holder 15 is slipped over the two pins 16 and 17 and is thereby held against sideways displacement, one of these pins, as 16, extending through a perforation in the holder to restrain the latter from longitudinal displacement. It has been seen that the pen 10 is supported at one end by resting on roll *c* or the strip *b* thereon. The other end thereof may be supported in various ways, as by the holder 15 resting on a narrow strip 18 fixed to a member 19, suitably secured to shelf 12 and cooperating with the latter to form an enclosure beneath the holders 15. The holders 15 may also be supported without the use of strip 18, as by using special pins, shown at 16' in Fig. 4, each of which has an upper portion 20 of reduced diameter to pass through the aperture in holder 15 and consequently a shoulder 21 at the intersection of the pin 16' and this reduced portion.

Thus the shoulder 21 may support the holder 15.

The characteristic feature of the pen-holders 15 is that they are supported and held in place by the action of gravity and consequently they may be quickly and readily removed merely by lifting them from the pins 16 and 17, and as readily replaced. Where there is any likelihood of the holders 15 being displaced, as by jolts and jars which might dislodge them from pin 16, a stop, in the shape of a plate 22 pivoted at 23 to member 19, is provided to limit the upthrow of all the holders 15.

For the purpose of tracing record curves on strip *b*, the pens 10 must be moved transversely and to accomplish this result either of pins 16 or 17 may be moved. As shown, each pin 17 is constituted by the vertically upturned end of a horizontal rod 24 which is supported for oscillation in suitable brackets 25 on shelf 12 and extends rearwardly thereof. The rearward end of rod 24 is provided with a right-angularly bent portion 26, which is disposed horizontally and extends through the lower end of a plunger 27 of a solenoid 28. The latter is supported in upstanding relation from shelf 12 by a sleeve 29, suitably apertured to receive the member 26. A cover 30 is provided to complete the partial enclosure accorded by the member 19.

The solenoids 28 are connected electrically to suitable apparatus whereby it is periodically energized and the invention is independent of such apparatus, which may take many widely varying forms. For the present purposes, it will suffice to state that from time to time the solenoid 28 is energized, whereupon plunger 27 will be lifted, causing an oscillation of rod 24 and moving pin 17 transversely. The pin 16 then acts as a pivot or fulcrum and pen 10 is moved about this fulcrum to make an offset line *x* on chart *b*. The pen 10 may of course be held in its offset position for various intervals depending on the length of time during which solenoid 28 is energized. The marks *x* on chart *b*, as exemplified in Fig. 5, are those made merely by a momentary energization of the solenoid, which results in the pen 10 returning immediately to its original position. The pen is returned to such position by the action of gravity, the plunger 27 dropping and carrying with it the portion 26, which turns pin 17 back to its normal position, defined by the abutment of the portion 26 with the shelf 12 as a stop (Fig. 2). It is also noted that gravity acts to take up all lost motion in the various connections to holder 15.

As thus far described, the pens 10 might be used to plot curves on charts *b* which have been already graduated or ruled to indicate time or some other factor. Pref-

erably, however, the charts *b* have no such graduations and the pen 10 is made to place on the chart *b* suitable indications to designate some other factor, such as time. To

do this, one pin, as 16, may be moved transversely and the other pin, as 17, made to function as the pivot for this transverse rocking movement. Thus, the pins 16, or 16', may be secured in vertically upstanding relation in a bar 32, which is located within the enclosure afforded by member 19, suitable openings 33 being provided in the latter to permit the upward passage of pins 16, or 16', and to permit the desired limits of transverse movement thereof. As shown in Fig. 1, bar 32 is mounted for transverse sliding movement, being supported at one end in one side wall of housing 19 and at the other end by a pin 34 which extends into an opening in the free end of a flat spring 35 which is secured at the other end to the opposite side wall of member 19. The spring 35 also functions to hold the bar 32 and pins 16, or 16', in their normal positions.

In the present case, bar 32 is arranged to be moved transversely at a definite time rate to plot suitable indications of time. To this end, a cam 36 is fixed to the driving shaft *l* of the clock mechanism *k* and this cam has, angularly spaced about its periphery, a series of gradual "rise" portions 37, each followed by a sharp let-off portion 38 leading to the low point of the succeeding rise portion. An arm 39, pivoted at one end at 40 to a bracket 41 on base *i*, rests at its other end on the periphery of cam 36 and is gradually lifted thereby and periodically allowed to suddenly drop. To communicate this motion to bar 32, a bell crank, pivoted at 42 to bracket *h* and having two substantially right-angularly disposed arms 43 and 44, is utilized. The outer end of arm 43 is connected to the overlying portion of arm 39 by a link 45 which passes loosely through each arm and has a head 46 on each end thereof. A suitably bent rod 47, fixed to the end of bar 32, passes through an opening in arm 44 and has a shoulder 48 to abut therewith. Thus, as arm 39 lifts, it raises link 45 by means of the upper shoulder 46 and the latter, by means of the lower shoulder 46, raises arm 43, swinging arm 44 to the left (as viewed in Fig. 3). Thus, arm 44, pushing against shoulder 48, moves rod 47 and bar 32 against the tension of spring 32. Thus, the pins 16 are moved gradually to the left, and pens 10 are caused to trace straight lines, such as *y* (Fig. 5), which lie at an acute angle to the direction of movement of chart *b*. After the elapse of a definite time interval, the member 39 drops off a rise portion 37 and is released by the let-off portion 38 so that spring 35 may return bar 32, pins 16 and pens 10 to

their normal positions. This causes the pens to trace short transverse lines, such as *z*, and the distance between successive lines *z* indicates a suitable and definite time interval.

It is to be noted that spring 35 acts to take up all the lost motion in the various connections between bar 32 and the cam-following arm 39.

In operation, the clockwork mechanism *l* or any other suitable mechanism is set in motion to drive roll *c* and the record strip *b* is thereby continuously driven. It is to be noted that roll *c* need not necessarily be uniformly driven since the time indications are applied by the marking devices. The latter, as above explained, are moved gradually in a transverse direction a predetermined distance during a definite time interval and are then suddenly returned to their initial positions. This results in the tracing by each marking device of a zig-zag line of similar contour to the teeth of a ratchet wheel. The marking devices, however, from time to time depart from the normal zig-zag path, when their solenoids are energized, to make indications of some other factor, which for illustrative purposes may be considered as distance. According to the preferred operation, the marking devices are made to move quickly in a transverse direction out of their normal path and return immediately to such path, so that the zig-zag line is punctuated with occasional short and substantially right-angularly disposed offsets.

It is to be particularly noted that the marking devices are mounted in a very simple and practically fool-proof manner. There is no delicate mechanism associated with these devices and no fine and careful adjustments to make. In fact, the mechanism associated with these devices may readily consist, as shown, of a chain of parts which are connected together in a rather loose manner as compared to the usual connections which involve jewel bearings, knife edges and so forth. The connections shown effect the desired work with sufficient accuracy because they are so arranged that all lost motion is taken up in one direction, either by gravity action or the spring 35. In removing a marking device, the member 22 is swung upwardly and the desired device is merely lifted off its pins 16 and 17. The marking device can then be cleaned by holding the capillary tube under a faucet, which is far easier than the method usually employed and above set forth. There is nothing which is liable to get out of order. Even a bending of one of the pins 16 and 17 to a certain degree will do no harm and, if bent beyond such degree, it is simple to remedy merely by bending it back. Moreover, the construction is so simple that the

instrument may be produced at a relatively low cost.

The arrangement whereby a non-ruled record strip is used and driven merely by frictional engagement is desirable, in that the expense of specially prepared record strips, having rulings or graduations and perforations along its edge to engage pins on the driving roll, is avoided. Slip between the driving roll and the paper and the driving of the roll within close limits at a uniform rate, become unimportant because the instrument itself makes its own time markings. Moreover, the indications of the other factor, such as distance, being applied merely by making jogs in the line at intervals, is desirable because little energy is required inasmuch as the solenoids are intermittently and instantaneously energized rather than continuously.

The invention has been disclosed herein, in an embodiment at present preferred, for illustrative purposes, but the scope of the invention is defined by the appended claims rather than by the foregoing description.

What I claim is—

1. In recording apparatus, means for driving a record strip, a marking device to cooperate with the strip, a holder for said device consisting of a member having substantially the cross-sectional shape of an inverted U, and two pins mounted in longitudinally spaced relation and each having a portion received between the parallel sides of said member to restrain the latter from transverse displacement.

2. In recording apparatus, means for driving a record strip, a marking device to cooperate with the strip, a holder for said device consisting of a member having substantially the cross-sectional shape of an inverted U, two pins mounted in longitudinally spaced relation and each having a portion received between the parallel sides of said member to restrain the latter from transverse displacement, and means to move one of said pins transversely when desired.

3. In recording apparatus, means for driving a record strip, a marking device to cooperate with the strip, a holder for said device consisting of a member having substantially the cross-sectional shape of an inverted U, two pins mounted in longitudinally spaced relation and each having a portion received between the parallel sides of said member to restrain the latter from transverse displacement, means operable at predetermined time intervals to move one of said pins transversely, and means operable intermittently to move the other pin transversely.

4. In recording apparatus, means for driving a record strip, a marking device to cooperate with the strip, a holder for said device consisting of a member having sub-

stantially the cross-sectional shape of an inverted U, two pins mounted in longitudinally spaced relation and each having a portion received between the parallel sides of said member to restrain the latter from transverse displacement, means for gradually moving one of said pins transversely a predetermined distance during a definite time interval and then releasing it for return movement, means for effecting such movement, and means for moving the other pin transversely as and when desired.

5. In recording apparatus, means for driving a record strip, a marking device to cooperate with the strip, means for gradually moving said device transversely a predetermined distance during a definite time interval and then suddenly returning it to its original position, and means operable intermittently as and when desired for moving said device transversely.

6. In recording apparatus, means for driving a record strip, a marking device to cooperate with the strip, means for gradually moving said device transversely a predetermined distance during a definite time interval and then suddenly returning it to its original position, and means operable intermittently as and when desired for moving said device transversely out of its path and then immediately returning it thereto.

7. In recording apparatus, means for driving a record strip, a marking device to cooperate with the strip, a holder for said device consisting of a member having substantially the cross-sectional shape of an inverted U, and two pins mounted in longitudinally spaced relation and each having a portion received between the parallel sides of said member to restrain the latter from transverse displacement, one of said pins extending through the upper wall of said member to restrain it against longitudinal displacement.

8. In recording apparatus, means for driving a record strip, a marking device to cooperate with the strip, a holder for said device consisting of a member having substantially the cross-sectional shape of an inverted U, two pins mounted in longitudinally spaced relation and each having a portion received between the parallel sides of said member to restrain the latter from transverse displacement, one of said pins extending through the upper wall of said member to restrain it against longitudinal displacement and having a shoulder intermediate its ends to engage said wall of said member.

9. In a recording device, means for driving a record strip, a series of marking devices to engage said strip, a holder for each device having the cross-sectional shape of an inverted U, a series of pins one for each holder, a common support for said pins, a second series of pins one for each holder,

and means for moving any one pin of the last-named series independently of the other, each holder arranged to fit over one pin of each series and being held in place by its weight, whereby any one holder may be readily removed when desired.

10. In a recording device, means for driving a record strip, a series of marking devices to engage said strip, a holder for each device having the cross-sectional shape of an inverted U, a series of pins one for each holder, a common support for said pins, means for moving said common support, a second series of pins one for each holder, and means for moving any pin of the last-named series independently of the other, each holder arranged to fit over one pin of each series and being held in place by its weight, whereby any one holder may be readily removed when desired.

11. In a recording device, means for driving a record strip, a series of marking devices to engage said strip, a holder for each device having the cross-sectional shape of an inverted U, a series of pins one for each holder, a common support for said pins, means for gradually moving said common support a predetermined distance during a definite time interval and then suddenly returning it, a second series of pins one for each holder, and means for moving any pin of the last-named series independently of the other, each holder arranged to fit over one pin of each series and being held in place by its weight, whereby any one holder may be readily removed when desired.

12. In recording apparatus, a driving roll, an unruled record driven thereby by frictional engagement therewith, a marking device to cooperate with said record, means for actuating said device at definite time in-

tervals to cause it to make time designations on the unruled record, and means for actuating said devices at various times when and as desired to make designations to indicate some other factor.

13. In recording apparatus, means for driving the record strip, a marking device to cooperate therewith and having a holder having substantially the cross-sectional shape of an inverted U, a solenoid, a bell-crank one arm of which is connected to the plunger of the solenoid and the other end of which forms an upstanding pin to enter between the parallel walls of said member, a second upright pin entering between said walls and through the upper wall of said member to form a pivot for the latter when the other pin is moved by said solenoid.

14. In a recording apparatus, means for driving a record strip, a marking device to cooperate therewith, two spaced upstanding pins, a holder for said device suitably recessed to slip over said pins, and means for moving one of said pins transversely of the holder.

15. In a recording apparatus, means for driving a record strip, a series of marking devices to cooperate therewith, a holder for each device, two spaced upstanding pins for each holder, the latter being suitably recessed to slip over said pins and arranged to be held in place by its weight, whereby any holder may be conveniently removed when desired, and means normally overlying all said holders to prevent their removal, such means being movable to another position to permit removal of the holders.

In testimony whereof I have affixed my signature.

DANIEL S. HOLT.