

May 11, 1937.

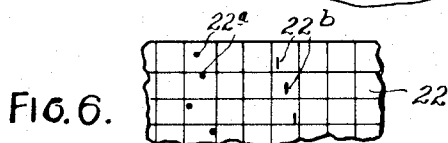
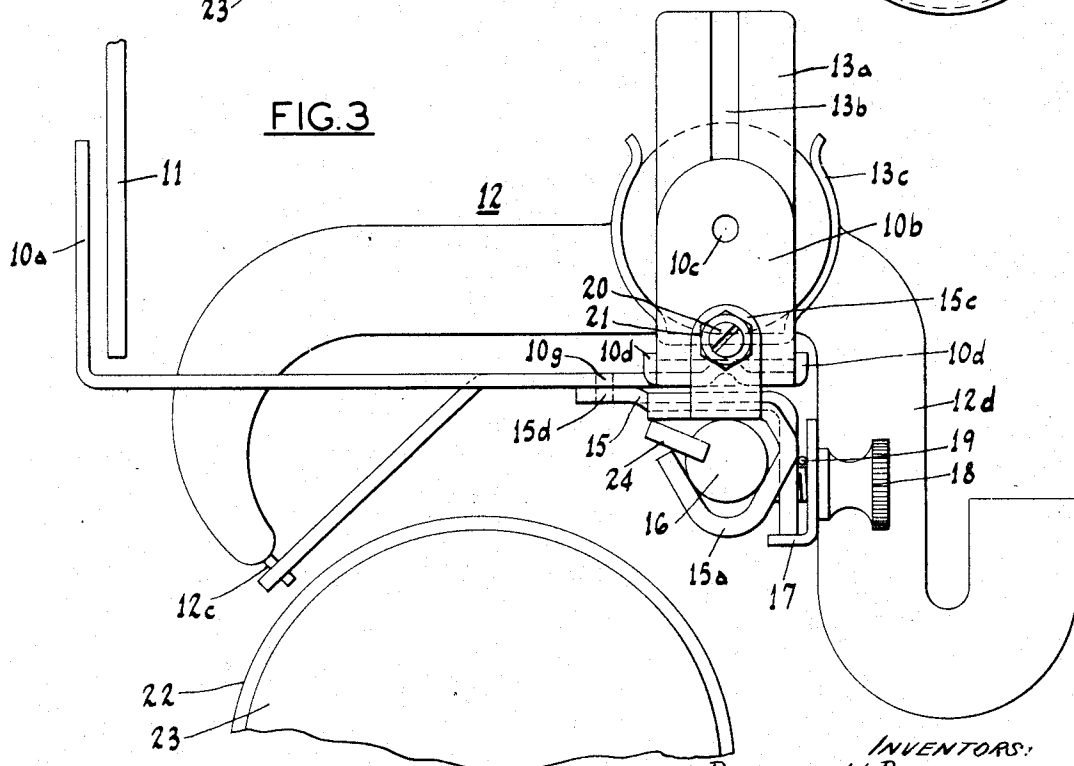
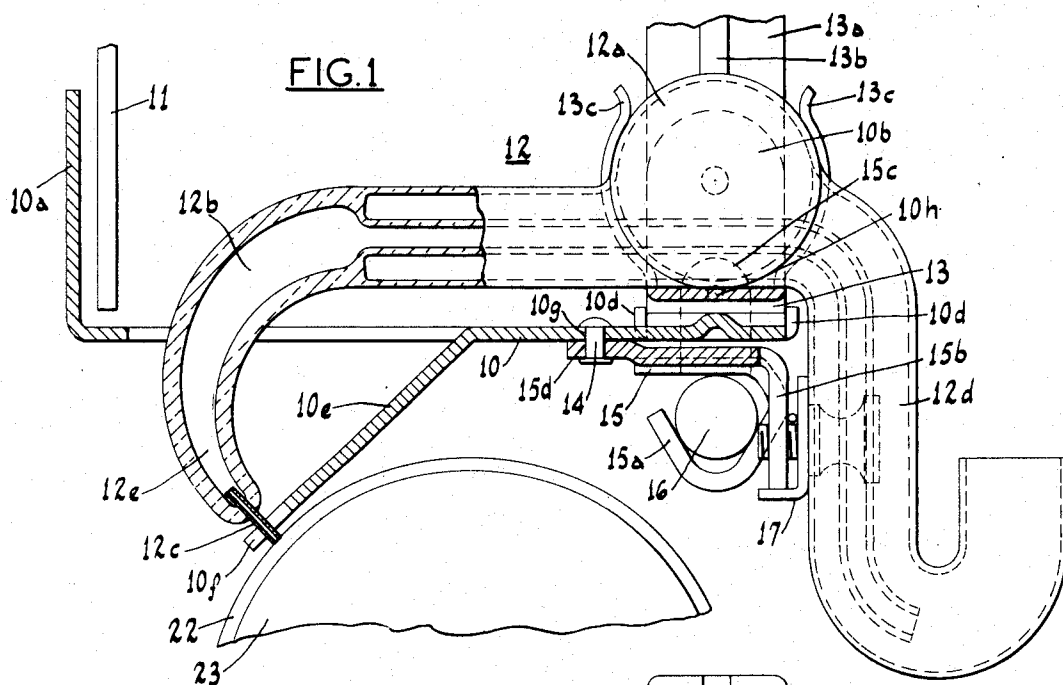
R. W. ROSS ET AL

2,080,065

UNIVERSAL RECORDER PEN ASSEMBLY

Filed Jan. 23, 1935

2 Sheets-Sheet 1



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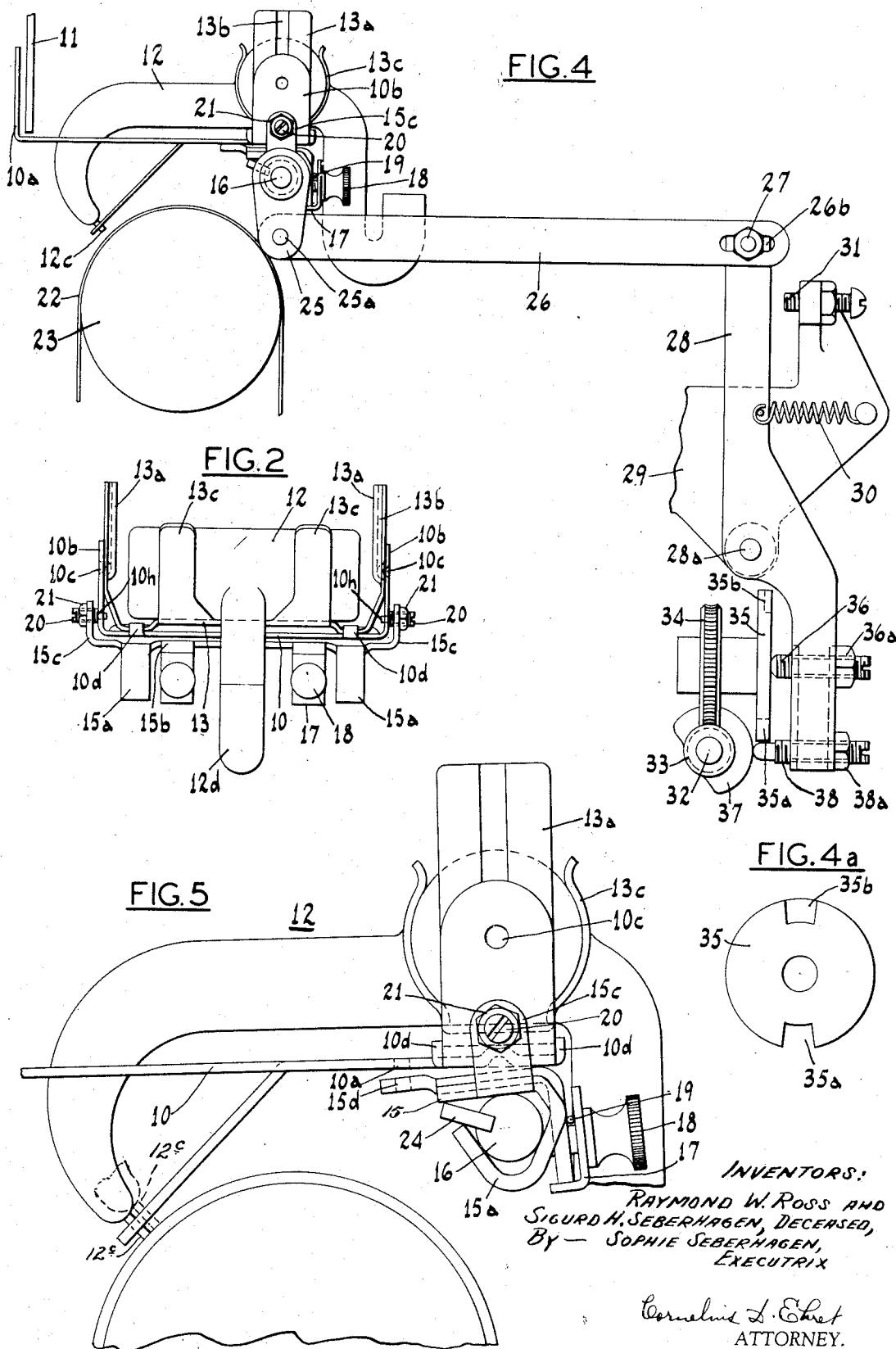
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UNITED STATES PATENT OFFICE

2,080,065

UNIVERSAL RECORDER PEN ASSEMBLY

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Application January 23, 1935, Serial No. 3,195

8 Claims. (Cl. 234—1)

This invention relates to a universal recorder pen-assembly or marker-assembly and more specifically to such an assembly suitable for application to a curve drawing recorder or to a dot-and-dash recorder and to such an assembly which may be readily adapted for application to either of these types of instruments.

While this invention is of general application, it is particularly suitable for application to indicator-recorder mechanisms of the type disclosed in United States Letters Patent No. 1,935,732, granted November 21, 1933, upon the application of L. Y. Squibb, or in the copending application, Serial No. 75,208, filed April 18, 1936.

The recorder pen-assembly of this invention comprises a frame provided with recorder pen-receiving and retaining means and a supporting member or bracket for the frame including means for slidably engaging a guide shaft or rod. The frame and its supporting member are provided with cooperating means adapted to receive an element for rigidly interconnecting them and with independent cooperating means adapted to receive an element for pivotally interconnecting the frame and its support.

More specifically, in accordance with this invention, the recorder pen, which preferably comprises a composite glass envelope or container; is provided with a resilient clip detachably supported from the frame. The supporting bracket for the frame is provided with depending arms curved or formed slidably to engage a guide rod or shaft, and the supporting bracket has a pair of upstanding arms provided with a pair of holes or apertures registering with similar holes or apertures in the frame and adapted to receive a pair of pivot pins for pivotally interconnecting the frame and its supporting bracket. The bracket is formed also with a forwardly extending arm having one or more holes or apertures registering with corresponding holes or apertures in the frame and adapted to receive one or more locking members such as rivets, bolts, or the like, for rigidly interconnecting the frame and its supporting bracket to form a unitary structure. The frame and its supporting bracket are rigidly interconnected when it is desired to utilize the assembly in a simple curve drawing recording instrument. When the instrument is to be utilized in a two-point dot-and-dash recorder, locking means rigidly connecting the frame and its bracket are omitted and pivot pins are supplied to form a pivotal interconnection therebetween. When thus utilized in a two-point dot-and-dash recorder, the supporting bracket is oscillated as

by means of its guide shaft, through a small angle, to produce a dot upon registration of the recorder pen with record chart, and is given a more extensive movement to produce a dash upon the record chart, as described in more detail hereinafter.

For a better understanding of this invention, together with other and further features thereof reference is had to the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

In the drawings, Fig. 1 is a cross-sectional view through a recorder pen assembly embodying our invention;

Fig. 2 is a view in end elevation of the assembly of Fig. 1 but including pivot pins;

Fig. 3 is a side elevation of the apparatus of Fig. 1, modified to operate in a two-point dot-and-dash instrument;

Fig. 4 is a view in elevation of a mechanism suitable for operating a recorder pen assembly in a two-point dot-and-dash instrument;

Fig. 4a is a detail of a cam element of the mechanism of Fig. 4;

Fig. 5 is a view in elevation of the apparatus of Fig. 3 in the position corresponding to the drawing of a dash on a record chart; and

Fig. 6 represents a portion of the record chart upon which have been alternately marked dots and dashes.

Referring now more particularly to Figs. 1 and 2 of the drawings, there is shown a recorder pen assembly embodying our invention comprising a supporting frame 10 having an outwardly extending arm terminating in an upwardly extending indicator or pointer 10a adapted to cooperate with a scale 11. The frame 10 is adapted to receive and retain a marker, as, a recorder pen 12 preferably comprising a composite glass container or envelope including a cylindrical reservoir 12a from which extends a neck 12b terminating in the pen element 12c. From the other side of the reservoir 12a depends a U-shaped filling tube 12d. Preferably a capillary tubing 12e extends from the neck 12b into the lower portion of the filling tube 12d, as shown, and is sealed into the neck 12b near the depending portion thereof. This serves two purposes; first, it seals the pen element 12c from the reservoir 12a and, with the seal comprising the U-shaped filling tube 12d, effectively seals the reservoir 12a; in addition, this arrangement permits feeding of ink to the pen element 12c so long as there is ink in any

portion of the envelope 12, to the lowest portion of which the capillary tubing 12e extends.

The recorder pen 12, Fig. 2, is mounted in a substantially U-shaped clip or carriage 13, the outer arms 13a of the U extending upwardly and being provided with grooves 13b resiliently engaging projections 10c, which may preferably be punched from the upstanding arms 10b of the main supporting frame 10. The base element of the U-shaped clip 13 is also received between the upstanding ears 10d of the frame 10 to insure a proper alignment of the recorder pen 12 with respect to the frame 10. Extending upwardly from the base of the U-shaped clip 13 are two pairs of arcuate spring clips 13c adapted to receive and retain the cylindrical reservoir 12a of the recorder pen 12. A guiding arm or lug 10e, Fig. 1, depends from the frame 10, and terminates in a slot 10f, which receives the pen element 12c, and thus accurately spaces the pen 12 with respect to the frame 10.

There is provided a supporting member or bracket 15 for the frame which may be rigidly secured thereto, in case the pen assembly is to be applied to a curve drawing instrument, or pivotally connected thereto, in case it is to be applied to a two-point dot-dash recorder. For example, assuming the pen assembly is to be applied to a curve drawing instrument, the frame 10 is formed with holes or apertures 10g registering with holes 15d in the bracket 15, in which are pressed one or more rivets 14, rigidly interconnecting the frame 10 and the bracket 15. The bracket 15 is provided with a pair of depending arms 15a bent to engage a guide shaft or rod 16 along which the pen carriage slides during normal operation of the recording apparatus. The supporting bracket 15 is provided also with a pair of depending lugs or arms 15b to which are secured clamps 17, as by knurled-headed thumb screws 18, to clamp the string or cord 19 driving the pen assembly.

Since in the case of the simple curving drawing instrument of Figs. 1 and 2, in which the supporting bracket 15 is rigidly riveted to the frame 10, no additional interconnection between the bracket 15 and support 10 is needed, the pivot pins 20 shown in Fig. 2 may be omitted. In the case of a two-point dot-and-dash instrument, as described hereinafter, the pivotal support provided by these pins 20 is necessary. To this end, a pair of brackets 15c are upturned from the ends of the supporting bracket 15 and are threaded to receive the pivot pins 20 extending into apertures 10h in the upstanding arms 10b of the main frame 10. Lock nuts 21 are provided suitably to secure the pivot pins in position.

It will be understood, of course, that the pen 12c is arranged for engagement with a record chart 22 mounted on a suitable chart drum 23. Thus when the rivets 14 rigidly interconnect the frame 10 and the bracket 15, the pivot pins 20 are not needed; the pen-assembly is then suitable for use with a curve-drawing instrument. By omitting the rivets 14 and pivotally interconnecting the frame 10 and bracket 15 by pivot pins 20, the pen-assembly is then suitable for drawing curves on a chart, or for marking on the chart dots and/or dashes.

It is believed the operation of the above described pen assembly will be clear from the following description. Initially, the pen envelope 12 is mounted in the spring arms 13c of the clip 13, and tilted into a substantially vertical position in which ink is dropped through the U-

shaped filling tube 12d. The clip or carriage 13 is slid down between the end brackets 10b, the groove 13b engaging the projections 10c on the brackets 10b, and the base of the clip 13 resting between the lugs 10d. It is apparent that the pen envelope 12 and its supporting clip 13 may subsequently be removed simply by squeezing together the upper ends of the arms 13a of the clip 13, allowing the projection 10c to ride over the ends of the grooves 13b. At the same time, the pen 12c registers in the slot 10f of the arm 10e, which retains it in proper alignment. The pen assembly is now ready for operation on any suitable recorder mechanism, sliding transversely on the guide rod or shaft 16, as propelled by the driving string or cord 19. The associated indicator 10a simultaneously indicates on the scale 11 the magnitude of the condition under measurement by the instrument.

In some instances, it is desirable to utilize such a recorder pen assembly in an instrument designed to provide a dot-and-dash record for recording the magnitude of conditions at two distinct locations or points. For such a purpose, it is necessary only to remove the rivets 14 of the apparatus of Fig. 1 and add the pivot pins 20 and lock nuts 21, resulting in an assembly as shown in Figs. 3, 4 and 5 of the drawings. In this instance, the guide shaft or rod 16 upon which the recorder pen assembly slides is provided with a longitudinal key or spline 24 which cooperates with the bracket 15 and the arms 15a bodily to oscillate the recorder pen assembly upon oscillation of the shaft 16.

One mechanism by means of which the recorder pen assembly of Fig. 3 may be operated to produce a dot-and-dash record for registering the magnitude of two distinct conditions is shown in Fig. 4 of the drawings. In this figure, a crank arm 25 is secured to the shaft 16 and operated by a link 26 pivoted on the end of the crank arm 25 as by a pivot pin 25a. At the other end of the link 26 is a slot 26b in which is adjustably secured a pin 27 journaled or pivoted in the end of a lever 28 pivoted intermediate its ends at 28a in a supporting frame 29. The lever 28 is biased for a clockwise movement about its pivot 28a as by a spring 30, such movement producing, obviously, a counter-clockwise movement of the crank 25 and the shaft 16. An adjustable stop 31 is provided for limiting this clockwise movement of the lever 28.

The lever 28 may be periodically oscillated by any desired mechanism at the frequency at which it is desired to place a record on the chart 22. Such mechanism, for example, may be driven by a continuously rotating shaft 32, which may correspond to the shaft 13 of the automatic indicating-recording mechanism described in our aforesaid application, or to the shaft 1 of the aforesaid Squibb patent. Secured to the shaft 32 is a worm 33, engaging a worm wheel 34, upon which is supported a cam disc 35 shown more clearly in Fig. 4a. The cam disc 35 has a peripheral notch or recess 35a extending entirely through the disc, while diametrically opposite from the recess 35a is a second recess or notch 35b, extending only partially through the disc, as shown. A cam pin or follower 36, adjustably secured in the lower arm of the lever 28, as by being threaded therein and secured by a lock nut 36a, normally engages the disc 35 near its periphery so that, upon its rotation, as the recesses 35a and 35b successively register with the pin 36, the arm 28 is released to move in a clockwise direction

under the influence of the biasing spring 30. In the case of the Squibb patent and the aforesaid copending application, the shaft 32 is often also utilized to operate intermediate mechanical relay apparatus for rebalancing the measuring circuit and adjusting the position of the recorder pen assembly along the shaft 16. Such adjustments are made at a considerably higher frequency than the periodic operation of the recorder pen into engagement with the record chart 22 in order to allow a predetermined number of cycles of operation of the rebalancing mechanism between successive engagements of the recorder pen. It is highly desirable that the operation of the recorder pen assembly to record an indication on the record chart shall be prevented during that portion of the cycle of rotation of the shaft 32 corresponding to a readjustment of the recorder pen assembly along the shaft 16, since such simultaneous operations would cause a blur or smudge on the record chart. On the other hand, it is difficult accurately to time the release of the lever 28 by means of the cam indentations 35a and 35b with the cooperating pin 36, because of the high gear ratio between the shaft 32 and the cam disc 35. To avoid such simultaneous operations, a cam 37 is secured to the shaft 32 and cooperates with pin or cam follower 38 adjustably secured in the end of the lower arm of the lever 28 as by a locknut 38a. The cam 37 is designed accurately to time the release and withdrawal of the lever 28 during the cycle of rotation of the shaft 32, and thus to prevent simultaneous transverse movement of the recorder pen assembly and oscillation thereof to place a record on the chart 22.

In the operation of the above described apparatus to produce a combined dot-and-dash record, it will be assumed that the pin 36 first registers with the cam notch 35b of the plate 35. Under these conditions, the lever 28 will move under the influence of its biasing spring 30 in a clockwise direction about its pivot 28a through a small distance corresponding only to the depth of the cam notch 35b. This movement will produce a corresponding rotation of the recorder pen assembly with the shaft 16 through the above described linkage mechanism, the angle of rotation being just sufficient to bring the marker or recorder pen 12c into contact with record chart 22 and thus record thereon a dot 22a as shown in Fig. 6. As stated above, the timing of this movement of recorder pen assembly to record an indication on the chart 22 is accurately determined by the auxiliary cam 37 and follower 38.

Substantially 180° later, referred to the cam disc 35, the cam pin or follower 36 registers with the recess 35a, again allowing the lever 28 to move in a clockwise direction under the influence of the spring 30, but this time the angle of movement is greater, being limited only by the stop 31. The result is that the recorder pen assembly occupies the position illustrated in Fig. 5. During the initial movement, corresponding to the dropping of the pin 36 into the recess 35b, the recorder pen is brought into contact with the record chart 22. Further clockwise movement of the lever 28 and the shaft 16 about their respective pivots produces a pivotal movement of the frame 10 with respect to its supporting bracket 15, about the pivot pin 20, and this movement is accompanied by a movement of the marker or recorder pen 12c along the record chart 22 in the direction of its motion, thereby forming a line, or dash, 22b on the chart. The recorder pen assembly is, after

this operation, returned to the position shown in Fig. 4 by means of the cam 37 engaging the cam follower 38. As before, the timing of the marking of the dash by the recorder pen 12c on the record chart 22 is accurately determined by the auxiliary cam 37 and the cam follower or pin 38.

Thus, it will be seen, Fig. 6, that the pen 12c alternately marks upon the record chart 22 dashes 22b, and dots 22a, it being clear each dot may represent the magnitude of a condition under measurement at a certain location or point, while each dash may represent the magnitude of the same or different condition at a different location or point, or a different condition at the same point. It is also seen that a single recorder pen-assembly may be utilized either as a curve drawing instrument, or as a two-point dot-and-dash recorder, with no change in construction other than the use of either the pivot pins 20 or the rivets 14, thus substantially minimizing the number of parts which it is necessary to carry in stock, and providing a recording pen assembly which may be readily converted from one type to the other. As a curve drawing device, Fig. 1, the spline 24 of the guide rod 16 is omitted, the pen 12c at all times engaging the chart 22 to draw thereon a curve representative of the magnitude of the condition under measurement or control.

While there has been described what at present is considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from the invention, and therefore the appended claims cover all such changes and modifications as fall within the spirit and scope of the invention.

What is claimed:—

1. A three-part marker-assembly comprising a bracket with upstanding arms, a main frame having upstanding arms nesting within said first-named arms, provisions on adjacent arms for receiving pivotal connecting means, and a marker-supporting clip having resilient arms nesting between and biased firmly into engagement with said second-named arms, said frame having a laterally extending projection, and a second projection extending laterally from said bracket beneath said first-named projection for supporting said frame in a predetermined position with respect to said bracket.

2. A multi-part marker-assembly comprising a main frame provided with upstanding arms, a marker-receiving and retaining clip provided with upstanding arms for cooperation with said first-named arms, said first and second-named arms having projections and recesses complementary to each other for connecting said clip to said main frame, a bracket having upstanding arms disposed in cooperative relation with said first-named arms and having a forwardly extending projection disposed below and in supporting engagement with said main frame, and means interconnecting said main frame and said bracket.

3. A multi-part marker-assembly comprising a main frame provided with upstanding arms, a marker-receiving and retaining clip provided with upstanding arms for cooperation with said first-named arms, said first and second-named arms having projections and recesses complementary to each other for connecting said clip to said main frame, a bracket having upstanding arms disposed in cooperative relation with said first-named arms, a forwardly extending projection disposed below and in supporting engagement with said

main frame, and depending guides formed to receive a splined guiding element, and means pivotally interconnecting said cooperating arms of said frame and of said bracket.

4. A universal mounting assembly for a marker comprising a frame having an upstanding arm at each end, a substantially U-shaped marker-receiving and retaining clip adapted to be resiliently and detachably supported between said arms, the arms of said U-shaped clip extending beyond the arms of said frame to provide a manual grip for ready detachment, and a supporting member for said frame, said frame and said supporting member having cooperating means adapted to receive means for interconnecting them.

5. In a recorder having a record chart and a marker therefor, the combination of a bracket having depending arms, means cooperating with said arms pivotally to support said bracket adjacent said chart, a frame pivotally mounted on said bracket, extending portions of said frame and of said bracket cooperating to form a driving connection therebetween upon pivotal movement of said bracket in one direction, a clip receiving and retaining said marker, said clip and said frame having cooperating portions for detachably connecting said clip to said frame and for supporting said marker in a marking position with respect to said chart, and automatic means for selectively rotating said bracket in said one direction to move said marker away from and in spaced relation to said chart, and for rotating said bracket in the other direction to move said marker toward said chart by different amounts, said marker upon engagement of said chart placing thereon a dot, and said marker responsive to further movement of said bracket and to pivotal movement between said frame and said bracket, placing on said chart a dash the length of which is dependent upon the extent of said pivotal movement.

6. In a recorder having a record chart, and a marker in cooperative relation with said chart, the combination of a pivotally mounted bracket, supporting means pivoted from said bracket for rotation toward and away from said chart, a clip receiving and retaining said marker and detachably mounting the same on said pivoted supporting means for movement therewith, said bracket and supporting means having engaging portions, and automatic means for selectively rotating said bracket by different amounts to move said marker toward said chart, said marker placing thereon a record made distinctive by the extent of movement toward said chart of said bracket

after engagement of the chart by said marker and by the presence or absence, respectively, of relative movement between said bracket and said supporting means.

7. Means for mounting a marker in cooperative relation with a record chart comprising a pivotally mounted bracket, said bracket having depending arms formed to engage a guiding element, a marker-receiving and retaining clip having upstanding arms at opposite ends thereof, a supporting frame provided with rigid upstanding projections for resilient engagement by said upstanding arms, means cooperating with said projections for pivotally supporting said frame from said bracket for rotation of said marker-retaining clip with respect to said bracket, and a forwardly extending arm rigid with said frame, one portion of which is provided with marker-guiding means disposed adjacent the record chart, and an extension rigid with said bracket and cooperating with said forwardly extending arm to move said frame in one direction upon movement of said bracket in the same direction.

8. A marker-assembly cooperatively arranged with respect to a drum having a chart, for placing on the chart distinctive records, comprising a bracket having depending arms formed to engage a guiding element, a frame provided with a pair of upwardly extending arms, pivot means mounted from said bracket for pivotally engaging said arms to provide pivotal movement of said frame, each of said arms being provided with inwardly extending projections, a marker-receiving and retaining clip having upstanding resilient arms complementary to those of said frame, each arm of said clip having a recess complementary to said inwardly extending projections, said arms when bent inwardly releasing said recesses from said projections, a marker carried by said clip, a guide extending from said frame and provided with a slot to receive and fix the position of the marker, and means for selectively rotating said bracket and said frame to move the marker into and out of engagement with said chart and for moving said bracket an additional amount over that required for said engagement, said pivotal means providing for movement of the marker with respect to said chart and said drum thereby to form on said chart, records made distinctive by the extent of movement of said bracket.

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