C. B. THWING.

GRAPHIC RECORDER.

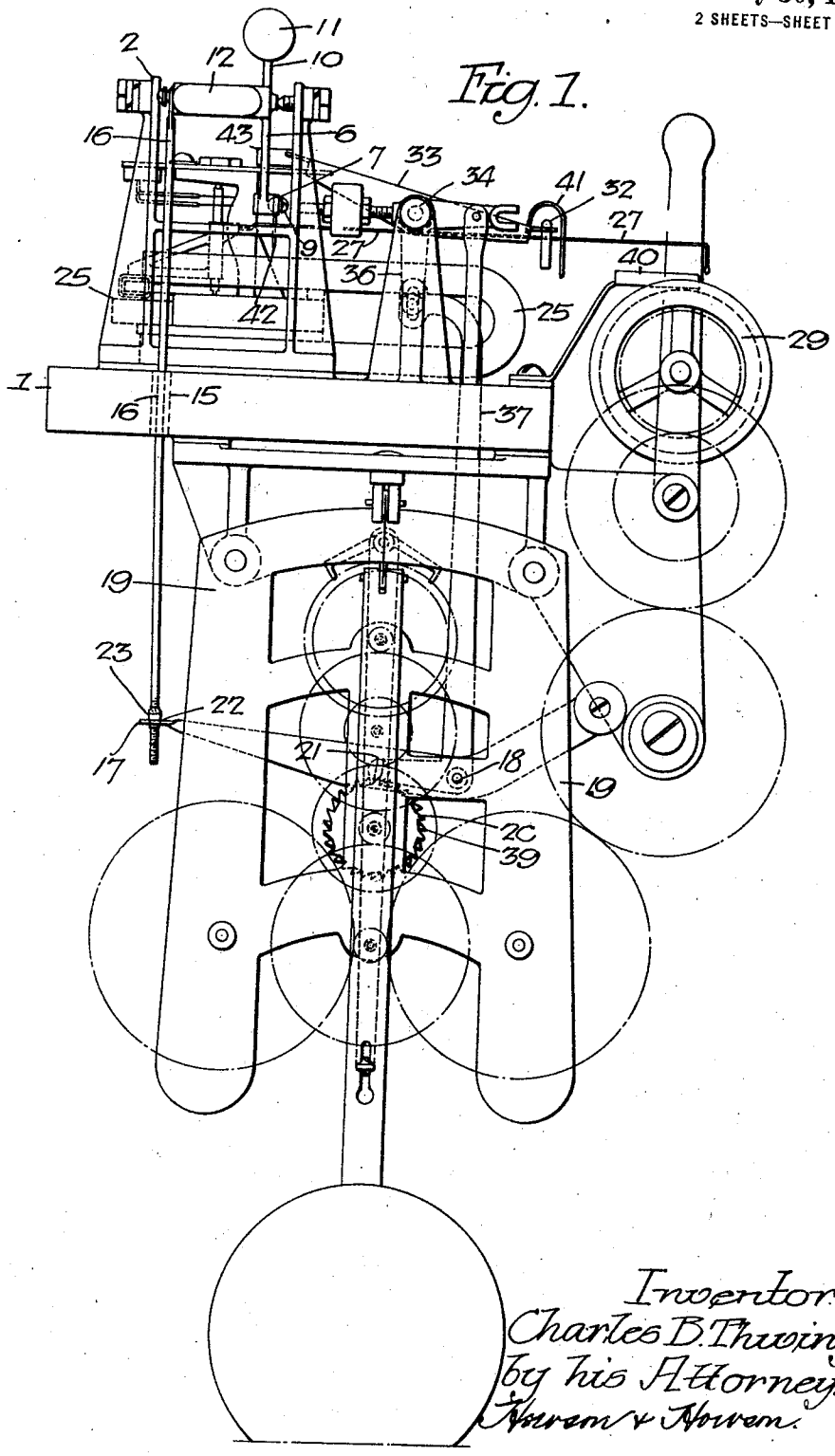
APPLICATION FILED MAR. 11, 1921.

1,418,183.

Patented May 30, 1922.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

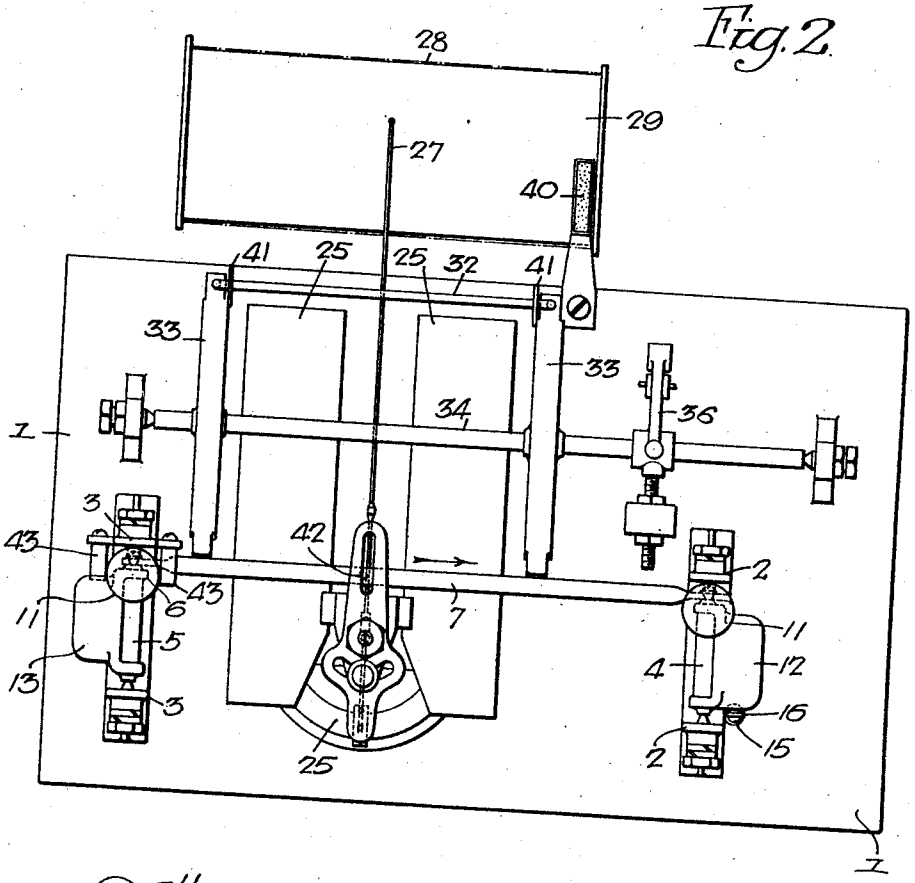
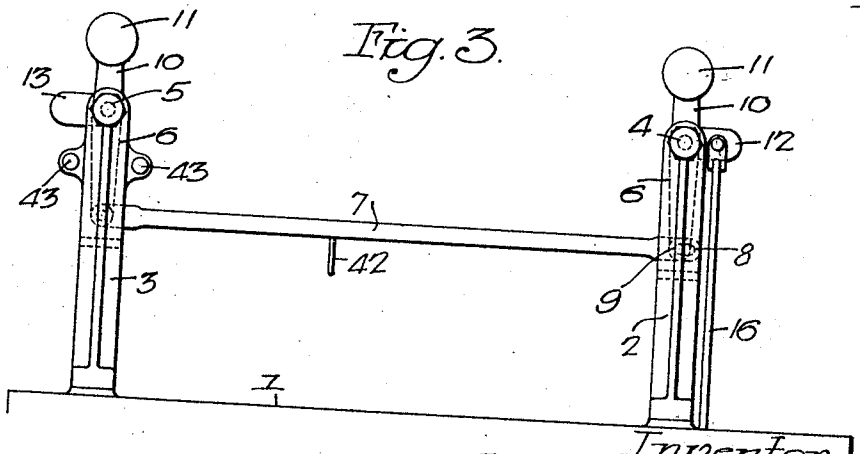


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES B. THWING, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THWING INSTRUMENT COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

GRAPHIC RECORDER.

Specification of Letters Patent. **Patented May 30, 1922.**

1,418,183.

Application filed March 11, 1921. Serial No. 451,445.

To all whom it may concern:

Be it known that I, CHARLES B. THWING, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Graphic Recorders, of which the following is a specification.

This invention relates to improvements in graphic recorders of the general type constituting the subject of my former United States Patent, Number 1,119,665, dated December 1, 1914.

In instruments of this type employing an ink carrying marking element or needle whose position relative to a chart or other sheet with which the said needle cooperates in forming the graphic record is determined electrically, as by the amount of current flowing through an associated electrical circuit, it has been customary in periodically renewing the supply of ink carried by the needle to break the said associated circuit, thereby releasing the needle and permitting it to return to a position of rest overlying a suitable inked pad or reservoir from which position it had originally been shifted by the effect of the influencing current and from which it is again shifted when the circuit is re-made. This method under certain conditions of use of the instrument has been found to have certain disadvantages, and it is the object of the present invention to provide means for mechanically shifting the needle from the marking to the ink receiving position against the force of the electrical influence and for retaining it in the ink receiving position during the ink renewing process.

The mechanism by means of which the desired object is effected, I have illustrated in the attached drawings, in which:

Figure 1, is a side elevation of sufficient of an instrument to illustrate the essential features of my invention;

Fig. 2, is a plan view showing the relative dispositions of the needle, ink reservoir, and chart cylinder, and

Fig. 3, is a rear elevation of the parts constituting my present invention.

With reference to the drawings, 1 indicates a platform or other suitable support upon which are mounted in suitable bearings in upright standards or brackets 2, 2 and 3, 3, spindles 4 and 5, the axes of said spindles being substantially parallel. Each of the spindles 4 and 5 has a downwardly extending arm 6, to the lower ends of which is pivotally secured a connecting rod 7, the said pivotal connection of the rod with one of the arms 6 being accomplished by means of a longitudinal slot 8 in the said rod and a pin 9 upon the arm 6 extending through the said slot, whereby a limited amount of relative movement between the two arms 6 is permitted. Each of the spindles comprises also an upwardly extending arm 10 having at the top a weight 11, while weighted extensions 12 and 13 extend laterally and respectively from the spindles 4 and 5 in opposite directions. Suitably attached in the present instance to the outer end of the extension 12 and extending downwardly through an aperture 15 in the platform 1 is a rod 16 operatively connected at its lower extremity with the free end of a lever 17 which is pivotally secured at 18 to the frame 19 of a clockwork mechanism, said clockwork mechanism including an intermittently actuated cam disc 20 adapted to operate in conjunction with an extension 21 on the lever 17, which extension rests upon the periphery of the cam at the top thereof to periodically elevate the said free end of the lever and thereafter permit it to drop to a normal depressed position. The connection between the rod 16 and lever 17 is effected by means of an aperture 22 in the said lever through which the said rod projects, there being upon the rod a suitable collar or enlargement 23 against the under side of which the lever bears when the latter is elevated by action of the cam 20.

Extending forwardly over the platform from a galvanometer 25 with which it is associated in the usual manner, is a marking element or needle 27, the forward end of the needle being turned downwardly and being adapted to contact with a chart or other sheet 28 supported in the present instance upon a cylinder 29 revolvably mounted adjacent the front of the platform, and to register markings thereon, the said downturned end of the needle for the purpose of said markings being adapted to carry ink and to function in the manner of the point of a pen. The needle is so mounted that normally the end thereof is elevated slightly above the cylinder, and means of the usual type is provided for depressing the said end into contact with the chart, said means consisting in the present instance of a rod 32

extending between and carried by spaced arms 33, 33, upon a shaft 34, which latter is mounted in suitable bearings in upright standards 35, 35, upon the platform 1. The shaft 34 is operatively connected through an arm 36 thereon, and a rock lever 37 which is pivotally attached at 18 to the clock frame 19 with a cam disc 39 actuated by the said clock mechanism, said cam acting to intermittently oscillate the shaft 34. The rod 32 overlies the needle 27 and adapted with the oscillation of the shaft 34 to alternately depress the end of the needle, thereby bringing it into contact with the chart, and to permit the return of the needle to the normal elevated position. The vertical movement of the end of the needle may be provided for either in the flexibility and resiliency of, or in the mounting of the needle.

The needle 27 is adapted also to oscillate in a substantially horizontal plane, and at the extreme right-hand side of the cylinder 29 is a suitable ink reservoir or pad 40 supported by the platform 1 or any other portion of the fixed frame of the instrument, said pad overlying the cylinder being positioned to directly underlie the down-turned end of the needle when the latter is swung to an extreme position in that direction. The same depressing means employed for bringing the needle into contact with the chart is employed in the present instance to carry the end of the needle downwardly into the said reservoir 40. Stops 41, 41, at the ends of the arms 33 are adapted to limit the lateral movement of the needle.

Extending downwardly from the rod 7 is a pin 42, said pin being adapted, when the rod 7 is shifted in the manner previously described and in the direction of the arrow, Fig. 1, to engage the said needle and thereby to shift it into a position such that the marking end overlies the reservoir 40. Stops 43, 43, extending from one of the standards 3, lie one on each side of the arm 6 and limit the movement of the rod 7, any excess movement of the spindle 4 beyond the limits thus established being provided for in the loose connection 8—9 previously described.

The operation of the device is as follows: The marking position of the needle 27 is determined by the amount of current in the galvanometer 25, and at certain specified intervals of time the needle is brought into contact with the chart in the specified manner. Since the cylinder 29 is rotated by said clock mechanism at a given known angular velocity, a diagram may thus be obtained giving an accurate record of the variations of the current in the galvanometer over any desired period of time. Between the successive markings upon the chart, the needle, in the manner described, is shifted into the ink receiving position, is depressed to receive the ink, and is returned by the action of the galvanometer to the recording position. It will be noted that the shifting of the needle is effected against the action of the galvanometer, and that accordingly as soon as released the needle assumes the recording position.

In the present instance the needle is re-inked after each marking, but it will be understood that the re-inking operation may be effected by proper adjustment at any desired interval or whenever required.

I claim:

1. In a graphic recorder, the combination of a record-receiving element, a marking element, electrical means normally determining the position of said marking element relative to the receiving element, and mechanical means for shifting the marking element to a specified position against the force exerted thereupon by the said normal position-determining means.

2. In a graphic recorder, the combination of a record-receiving element, a marking element, electrical means tending to control the movement of said marking element and normally determining the position thereof relative to the receiving element, and mechanically actuated means for shifting the marking element to a predetermined position against the force exerted thereon by said electrical means and thereafter releasing said element to permit a return movement thereof by said electrical controlling means.

3. In a graphic recorder, the combination of a record-receiving element, a container, a marking element, electricity actuated means tending to retain the marking element in a position over the said receiving element, mechanical means for periodically shifting the marking element to a position over the container against the force of said retaining means, and means for depressing the marking element to effect contact thereof with the receiving element and entrance thereby of said container.

4. The combination in a graphic recorder of a chart; an instrument having a stylus for making said chart; a source of ink for said stylus; and mechanism for periodically moving the stylus to the ink source against the deflecting force of said instrument.

5. The combination in a graphic recorder of a chart; an instrument having a stylus; a source of ink for said stylus; mechanism for periodically moving the stylus independently of the instrument to cause it to mark the chart at predetermined times; with a device for moving the stylus against the deflecting force of the instrument into a position to cause it to receive ink from said source when it is acted on by said mechanism at other predetermined times.

6. The combination in a graphic recorder of a chart; an instrument having an oscillatory stylus for marking said chart; a source of ink mounted adjacent the path of movement of said stylus; a device for periodically depressing the stylus out of its normal path of movement to cause it to mark the chart when it is adjacent the same; and automatic mechanism for periodically moving the stylus against the force exerted by the instrument, into such a position that the succeeding operation of the depressing mechanism will cause it to receive ink from the ink source.

7. The combination in a graphic recorder of a chart; a movable stylus; a source of ink for the stylus; an instrument connected to move the stylus adjacent the chart; a device operative to move the stylus adjacent the ink source and in opposition to the instrument; and an intermittently acting device operative on the stylus to cause it to engage the chart at certain times and to be moved into a position to receive ink from the source at other times.

8. The combination in a graphic recorder of a chart; a stylus for marking said chart; a source of ink adjacent the chart; an instrument operative on the stylus to deflect the same over the chart; means for forcibly deflecting the stylus while the instrument is operative upon it, into a position immediately adjacent the ink source; with means for periodically actuating the stylus to cause it to engage the chart at certain times and to engage the ink source at other times.

9. The combination in a graphic recorder of an instrument having an oscillatory stylus; a chart; an ink source for the stylus; time controlled mechanism operative on the stylus for forcibly moving it to a position adjacent the ink source at predetermined intervals; and other time controlled mechanism for periodically moving the stylus into position to engage either the chart or receive ink from the stylus.

10. The combination in a graphic recorder of a chart; an instrument having a stylus; a reciprocatory bar connected to the stylus; time controlled mechanism for periodically actuating said bar against the action of the instrument to move the stylus into a predetermined position; with means for periodically deflecting said stylus when it is in said position and also when it is adjacent said chart.

CHARLES B. THWING.