H. Y. NORWOOD & F. W. STALKER.

AUTOMATIC RECORDING MECHANISM.

APPLICATION FILED NOV. 24, 1913.

1,129,114. **Patented Feb. 23, 1915.**

3 SHEETS—SHEET 1.

Fig. 1

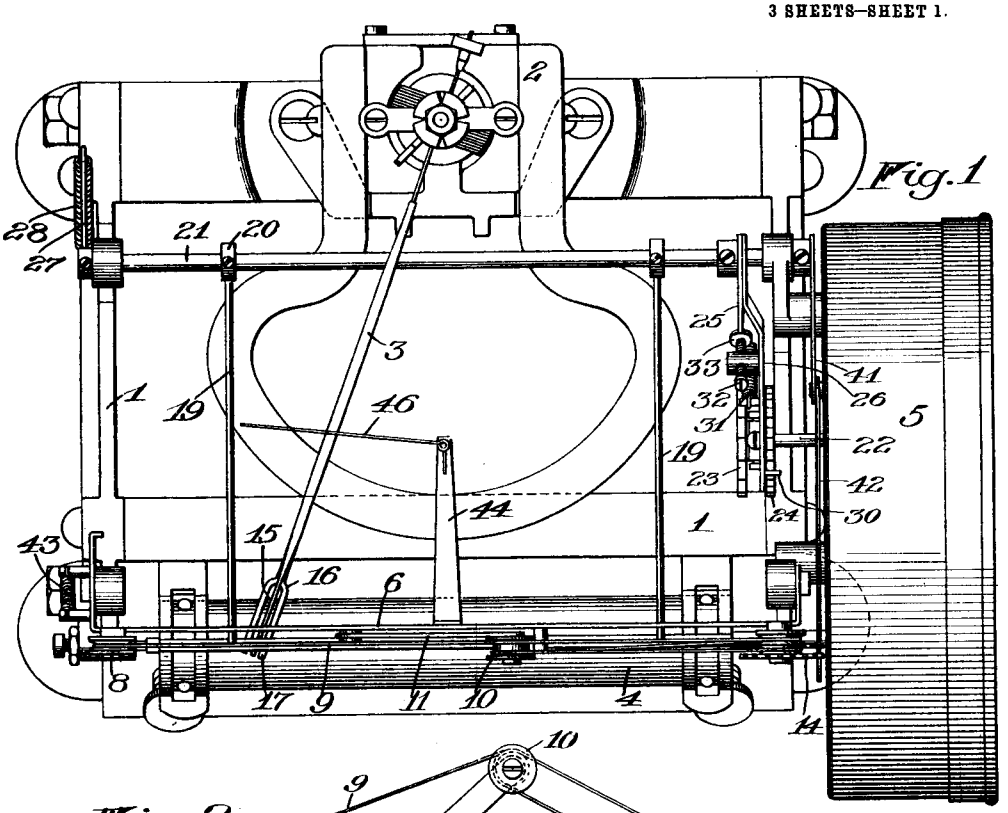
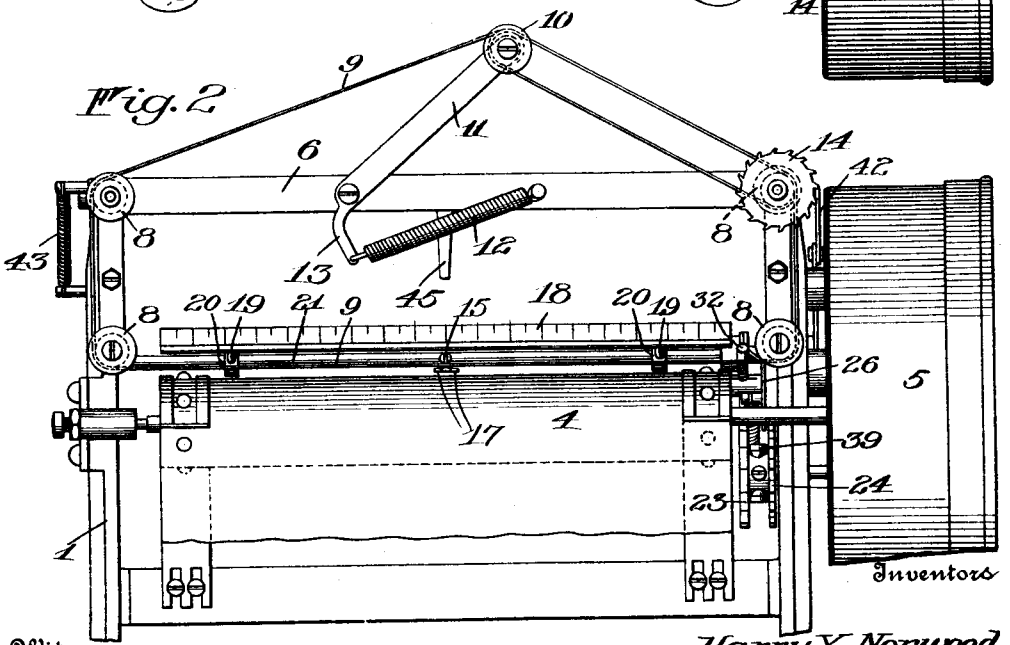


Fig. 2



Witnesses

Walter B. Payne

H. E. Stonebraker

Inventors

Harry Y. Norwood

Frederick W. Stalker

By Church & Rich

their Attorneys

H. Y. NORWOOD & F. W. STALKER.

AUTOMATIC RECORDING MECHANISM.

APPLICATION FILED NOV. 24, 1913.

1,129,114.

Patented Feb. 23, 1915.

3 SHEETS—SHEET 2.

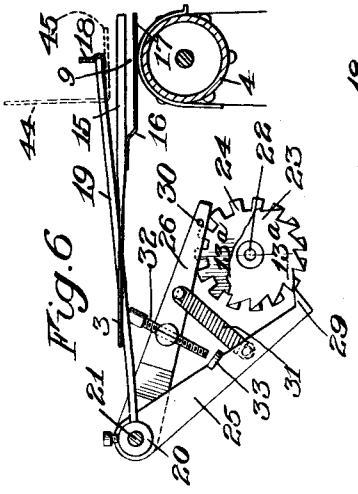


Fig. 6

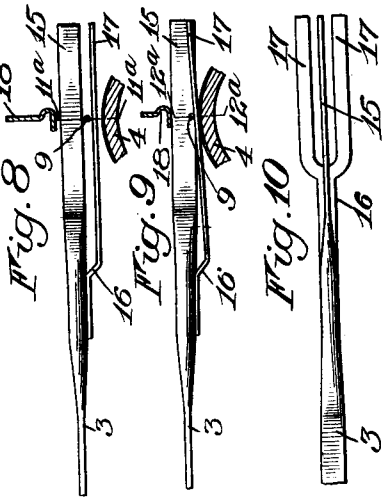


Fig. 8 Fig. 9 Fig. 10

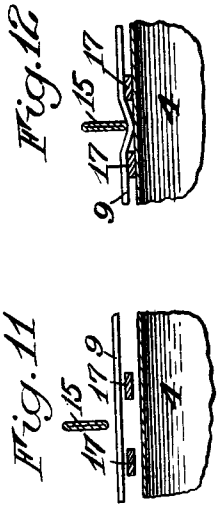


Fig. 12

Fig. 11

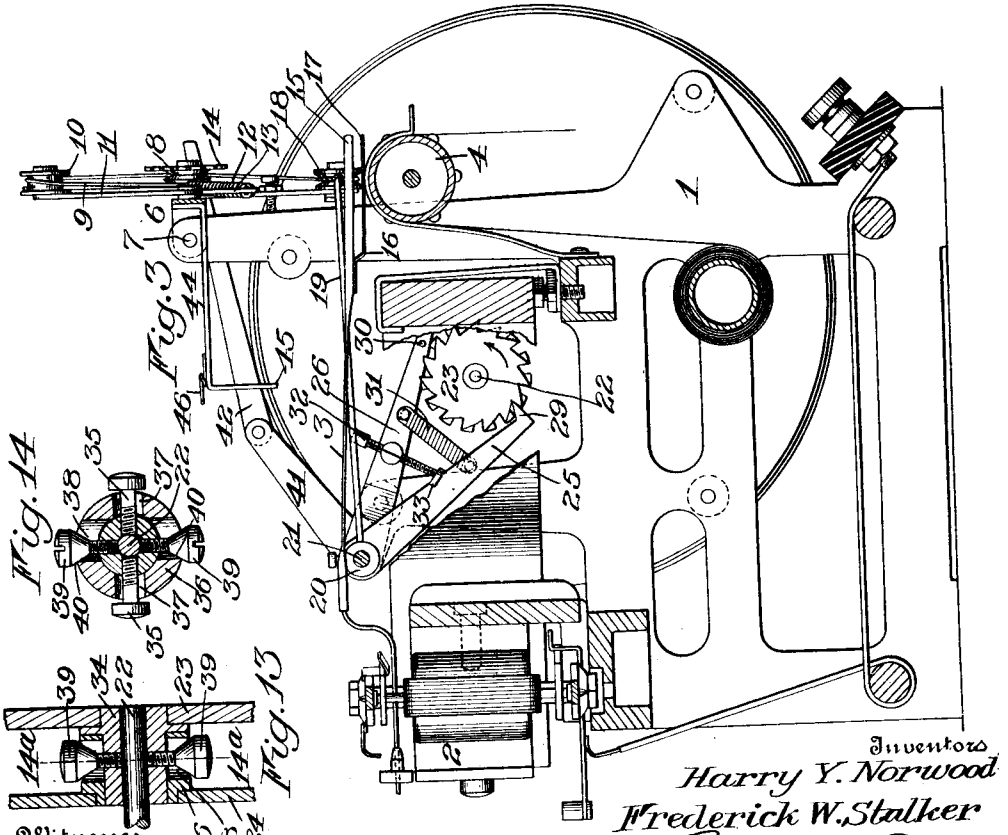


Fig. 3

Fig. 14

Fig. 13

Witnesses

Walter B. Payne

H. E. Stonebraker

Inventors

Harry Y. Norwood

Frederick W. Stalker

By Munn & Rich

their Attorneys

H. Y. NORWOOD & F. W. STALKER.

AUTOMATIC RECORDING MECHANISM.

APPLICATION FILED NOV. 24, 1913.

1,129,114. **Patented Feb. 23, 1915.**

3 SHEETS—SHEET 3

Fig. 7

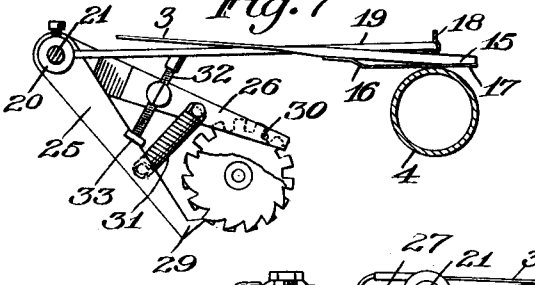
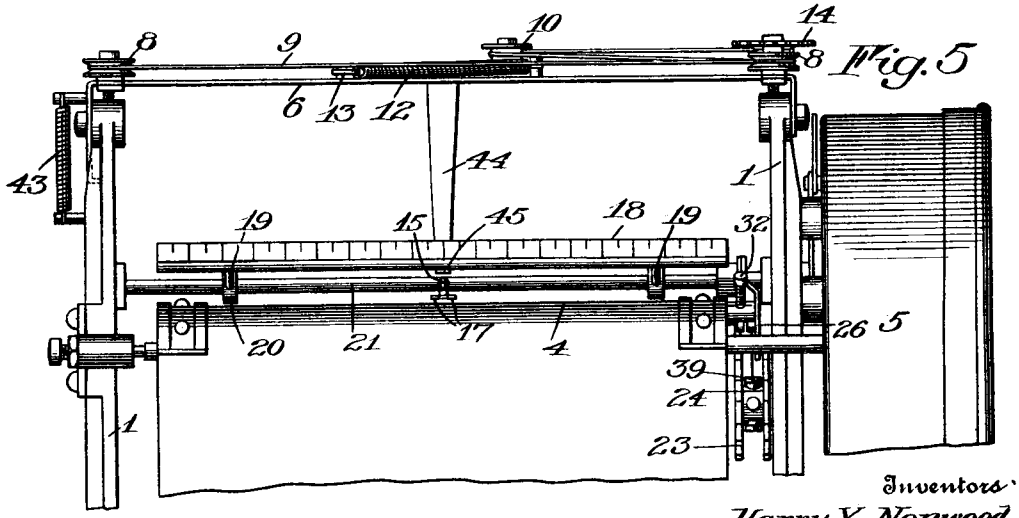


Fig. 4

Fig. 5



Witnesses

Walter B. Payne

H. E. Stonebraker

Inventors:

Harry Y. Norwood

Frederick W. Stalker

By Church & Rich

Their Attorneys

THE NORRIS PETERS CO. PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HARRY Y. NORWOOD AND FREDERICK W. STALKER, OF ROCHESTER, NEW YORK, ASSIGNORS TO TAYLOR INSTRUMENT COMPANIES, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

AUTOMATIC RECORDING MECHANISM.

1,129,114. Specification of Letters Patent. Patented Feb. 23, 1915.

Application filed November 24, 1913. Serial No. 802,636.

To all whom it may concern:

Be it known that we, HARRY Y. NORWOOD and FREDERICK W. STALKER, both of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Automatic Recording Mechanisms; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

Our invention relates to improvements in automatic recording mechanisms, and it has for its primary object to afford a construction that will improve the efficiency of such machines and increase the accuracy of the readings.

The invention is more particularly applicable to temperature recording machines in which there is a traveling arm whose movement is controlled by a temperature indicator, the arm coöperating with an inked filament or similar recording element to move the latter against a continuously operated recording surface, this operation of the traveling arm being brought about by suitable actuating devices at determinable intermittent periods, and the invention contemplates as one of its features the provision of means for preventing the recording element from coming in contact with the recording surface except at the point of record, so as to insure a distinct and clear impression that will not be blurred or obscured by having any surplus portion of the recording element in contact with the recording surface.

A further object of our invention resides in the provision of improved operating means for effecting the intermittent engagement of the recording element with the recording surface, whereby we are able to obtain a delicate adjustment to slightly vary, if necessary, the interval of time during which the recording contact is made.

A further feature of the invention resides in the improved arrangement for supporting the recording element or inked filament, whereby it is fed after each contact with the recording surface so as to constantly present a fresh portion for engagement, and also a means for shifting the recording element out of operative relation with the recording surface when it is not in use, to enable the position of the swinging arm to be readily determined when a record is not being taken.

To these and other ends the invention consists in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings: Figure 1 is a plan view of an apparatus equipped with a preferred embodiment of our improvements; Fig. 2 is a front elevation with parts broken away; Fig. 3 is a transverse vertical sectional view showing the indicating arm in raised position and its operating means in normal or first position; Fig. 4 is an end elevation, with parts broken away, showing the frame which carries the inked filament tilted upwardly to a horizontal position; Fig. 5 is a front elevation showing the parts in the same position as Fig. 4; Fig. 6 is a detail view showing the operating means for the actuating device in the position immediately previous to the operation which effects engagement between the recording element and the recording surface; Fig. 7 shows the same parts after they have moved to effect engagement of the recording element with the recording surface; Fig. 8 is a detail view showing the relative positions of the actuating device and the swinging indicating arm when disengaged; Fig. 9 is a similar view showing the actuating device in engagement with the swinging arm, and the recording element engaged with the recording surface; Fig. 10 is an enlarged plan view of a portion of the swinging arm; Fig. 11 is a sectional view on the line 11^a—11^a of Fig. 8; Fig. 12 is a similar view on the line 12^a—12^a of Fig. 9; Fig. 13 is a sectional view on the line 13^a—13^a of Fig. 6, and Fig. 14 is a sectional view on the line 14^a—14^a of Fig. 13.

Similar reference numerals in the several figures indicate the same parts.

In the present embodiment of the invention, 1 designates the frame of the machine which is provided with a measuring instrument or galvanometer 2 which operates the swinging or indicating arm 3, normally moving in a horizontal plane, but which is of sufficient flexibility to permit it to move slightly in a vertical plane to record the in-

dication. The galvanometer, it will be understood, is suitably conected to a thermocouple or electric thermometer, whereby movement of the swinging arm 3 will correspond to the variations in temperature at any given point.

The swinging indicating arm is arranged for coöperation with a recording surface, which may consist of a suitable record sheet removably secured on a cylinder 4, which is driven continuously from the clock work 5 so as to constantly present fresh portions of the recording surface to the recording element. The rate of travel of the recording surface is unimportant, as far as the present invention is concerned, although in a convenient embodiment of the device, the cylinder 4 will be rotated approximately once in every four hours.

The recording element preferably consists of a filament or cord that is saturated with ink of the desired color, the operative portion of the inked filament being held normally adjacent to the recording surface, and adapted to be brought into engagement with the recording surface at a single point for effecting the record, such engagement being preferably obtained by a knife-edge on the swinging arm that is moved downwardly into engagement with the recording element in a manner that will presently be described. To this end there is provided a swinging frame 6 which is pivotally mounted at 7 and is provided with a series of pulleys 8 around which travels an endless inked filament 9. The latter is held sufficiently taut by means of the tightening pulley 10 which is mounted on the pivoted arm 11, the latter being actuated by a spring 12 connected to the frame 6, and to the tail-piece 13 on the arm. Fixed to one of the pulleys 8 is a ratchet wheel 14 by which the recording element is given an intermittent feed as will appear more clearly presently.

The swinging arm 3 of the galvanometer is preferably constructed of thin, light flexible metal and is formed at its free end to afford a knife-edge portion 15 which extends over the operating part of the recording element and when lowered, moves the latter into contact with the recording surface, as shown in Figs. 8 to 12 inclusive. In order to protect the recording surface from the other portions of the recording element except that which is necessary to effect a dot record, and thus to prevent blurring or overrunning the record, we provide the indicating arm with means for engagement with the undersurface of the recording element so that when the arm is depressed, the inked filament will be held out of engagement with the recording surface except at the point where the record is made. This is preferably accomplished by a downwardly and forwardly extending arm 16 which is attached to the arm 3, or may be formed integral therewith, or otherwise, and embraces bifurcated portions 17 which extend on opposite sides of the knife-edge portion 15, as shown in Figs. 10 to 12 inclusive, and affords a free or open space between them within which the recording filament is moved into engagement with the recording surface, as shown clearly in Fig. 12.

The downward movement of the swinging arm to effect engagement of the recording element with the recording surface is effected by means of a suitable actuating device consisting of a bar or strip 18. The latter extends lengthwise of the recording surface and is carried by rods 19 formed upon the collars 20, fixed upon a rock-shaft 21, which is oscillated in the manner that will now be described. 22 is a continuously rotated controller shaft, driven also from the clock work 5, and at such a speed as to effect actuation of the rock-shaft 21 approximately every seven and one-half minutes. The controller shaft 22 has fixed thereon a pair of controlling wheels, consisting of a ratchet wheel 23 and a notched wheel 24 which are relatively adjustable and coöperate respectively with the levers 25 and 26 upon the rock-shaft 21. The shaft 21 has fixed thereon at one end an arm 27 to which is connected a spring 28, the other end of the spring being secured to the frame 1, thus exerting continuously a tendency to move the shaft in one direction. The lever 25 before referred to is loosely mounted on the shaft 21 and carries a pawl 29 which cooperates with the ratchet wheel 23 while the lever 26 is fixed upon the shaft 21 and carries a pin 30 which coöperates with the recesses in the notched wheel 24. The levers 25 and 26 are connected by a spring 31 which is somewhat stronger than the spring 28 referred to above. The lever 26 also carries an adjustable pin or stop 32 arranged for engagement with a lug 33 upon the lever 25.

The operation of this part of the apparatus is as follows: The normal position before movement of the actuating device 18 is shown in Fig. 3, where the pawl 29 is at the base of a recess in the ratchet wheel and the pin 30 is out of engagement with the notched wheel. As the shaft 22 travels in the direction indicated by the arrow, the pawl 29 will be moved outwardly by coming in contact with the inclined portion of the adjacent tooth of the ratchet wheel. Since the levers 25 and 26 are connected by the spring 31, the lever 26 moves in the same direction also and contacts with one of the teeth of the notched wheel 24. The parts remain in this position, as shown in Fig. 6, until the shaft 22 travels far enough to bring the pin 30 to a point where it falls into one of the recesses in the notched

wheel 24 taking the position shown in Fig. 7. This movement of the pin 30 and lever 26 is effected by the spring 31, which as before stated is stronger than the spring 28, and the pawl 29 at this stage of the operation is very nearly at the outermost point of the inclined surface on which it is riding. When the lever 26 falls, as just described, the shaft 21 is rocked correspondingly, and moves the actuating device 18 downwardly, causing it to engage the swinging arm 3 at whatever position it may have assumed the recording surface, and to effect engagement between the recording filament and the recording surface. This engagement continues until the pawl 29 rides off of its tooth, and drops into the next recess of the ratchet wheel 23, whereupon the lug 33 strikes the pin 32, as shown in Fig. 3, and with the levers in this position the spring 28 acts to turn the rock-shaft back to its normal position, and the operation just described is thereupon repeated.

It is somewhat desirable to provide for adjusting the relative positions of the notched wheel 24 and the ratchet wheel 23, so as to vary the period during which the recording filament is held against the recording surface. To this end, the ratchet wheel 23 is carried by a sleeve 34 which is fixed upon the shaft 22 by means of set screws 35, while the notched wheel 24 is carried by a collar 36, recessed at 37 to accommodate the set screws 35. Enlarged recesses 38 are also afforded in the collar 36, and 39 are adjusting screws which engage threaded openings in the sleeve 34, and have beveled faces 40 arranged for engagement with the adjacent edges of the collar 36, as shown in Fig. 14. It will be seen that by loosening one of the adjusting screws 39 and tightening the other, a slight rotation of the collar 36 upon the sleeve 34 will be obtained, and when once adjusted the respective controlling wheels are held rigidly in their proper relationship.

The feed of the recording element or filament is effected at each oscillation of the rock-shaft 21 by means of an arm 41 fixed upon said shaft 21 and carrying the lever 42, which is frictionally engaged with the arm 41 so as to move therewith under ordinary conditions but to permit relative movement if sufficient pressure is exerted. The lever 42 extends forwardly and is arranged for engagement with the ratchet wheel 14, hereinbefore referred to. The swinging frame 6 which carries the inked filament is normally in the position shown in Figs. 2 and 3, being retained by the spring 43 connected at one end to the stationary frame 1 and at the opposite end to the swinging frame 6. When the recording means is not in operation, the frame 6 may be swung from its normal vertical position to a horizontal position, as shown in Figs. 4 and 5, the spring 43 being so positioned relatively to the pivot 7 that it serves to retain the frame in either position. It is desirable to move the recording element to this position when it is not being used, since it leaves the swaying indicating arm free to be observed without any obstruction, and its position can be readily determined and a reading taken, if desirable, by means of a scale on the bar 18. In order to lock the latter against movement when the swinging arm is raised, there is provided an extension 44 having an arm 45 which engages under the actuating device as shown in Fig. 5, when the swinging frame is moved upwardly.

46 is a spring member carried by the extension 44 and arranged to engage the swinging arm 3 when the parts are in normal position, by bending the member 46 slightly, the purpose of this being to hold the swinging arm against movement when the machine is to be packed or shipped.

We claim as our invention:

1. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, recording means arranged adjacent to the recording surface, a rock-shaft, an actuating device carried by said shaft and coöperating with the arm to move the latter against the recording means, means operating to intermittently oscillate said shaft to cause the actuating device to move the recording means into engagement with the recording surface, and means for varying the period during which the recording means is engaged with the recording surface.

2. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, recording means arranged adjacent to the recording surface, an actuating device, means operating to intermittently move the actuating device into engagement with the recording means to bring the latter against the recording surface, and means for varying the period during which the recording means is engaged with the recording surface.

3. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, recording means arranged adjacent to the recording surface, a rock-shaft, an actuating device carried by said shaft and coöperating with the arm to move the latter against the re-

cording means, devices operating said shaft alternately in opposite directions to move the recording means into engagement with and away from the recording surface, and means for varying the period between the oppositely directed movements of the shaft.

4. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, recording means arranged adjacent to the recording surface, a rock-shaft, an actuating device carried by said shaft and coöperating with the arm to move the latter against the recording means, devices operating said shaft alternately in opposite directions comprising a pair of levers which are respectively fixed and loosely mounted on the shaft, a yieldable connection between the arms, a spring connected to the shaft acting to turn it in one direction, a controller shaft, a pair of controlling wheels mounted on the controller shaft and coöperating with said levers, and means for adjusting the relative positions of the controlling wheels on the shaft.

5. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, a recording element arranged adjacent to the recording surface, said arm including a depressing portion for engagement with the upper surface of the recording element, and a supporting portion for engagement with the lower surface of the recording element, an actuating device coöperating with said arm, and means for intermittently moving said actuating device to bring the recording element into engagement with the recording surface.

6. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, a recording element arranged adjacent to the recording surface, said arm including a depressing portion for engagement with the upper surface of the recording element, and a yieldably carried supporting portion arranged in a plane beneath the depressing portion for engagement with the recording surface, an actuating device coöperating with said arm, and means for intermittently moving said actuating device to bring the recording element into engagement with the recording surface.

7. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, a recording element arranged adjacent to the recording surface, said arm including a knife-blade portion for engagement with the recording element, and a bifurcated supporting portion yieldably supported on the arm and extending beneath the recording element for engagement with the recording surface, an actuating device coöperating with the arm, and means for intermittently moving said actuating device to bring the recording element into engagement with the recording surface.

8. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, a recording element arranged adjacent to the recording surface, an actuating device coöperating with the arm to move the recording element into engagement with the recording surface, means carried by said arm and operating to prevent the recording element from touching the recording surface except at the point where the record is made, and means for intermittently moving the actuating device to bring the recording element against the recording surface.

9. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, a movable recording element arranged adjacent to the recording surface, an actuating device cooperating with said arm, means for intermittently moving the actuating device to bring the recording element against the recording surface, and devices coöperating with the recording element and imparting feeding movement thereto at each operation of the actuating device.

10. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, a pivotally mounted frame, a recording element arranged on the frame and normally adjacent to the recording surface, said frame being movable from a vertical to an approximately horizontal position to carry the recording element away from the recording surface, an actuating device coöperating with said arm, and means for intermittently moving the actuating device to bring the recording element against the recording surface.

11. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, a pivotally mounted frame, a recording element arranged on the frame and normally adjacent to the recording surface, said frame being movable from a vertical to an approximately horizontal position to carry the recording element away from the recording surface, an actuating device coöperating wth said arm, means for intermittently moving the actuating device to bring the recording element against the recording surface, and devices coöperating with the recording element when in normal position and imparting feeding movement thereto, at each operation of the actuating device.

12. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, a pivotally mounted frame, a recording element arranged on the frame and normally adjacent to the recording surface, said frame being movable from a vertical to an approximately horizontal position to carry the recording element away from the recording surface, an actuating device coöperating with said arm, means for intermittently moving the actuating device to bring the recording element against the recording surface, and means carried by the pivoted frame and engaging the actuating device when the frame is swung upward to hold the actuating device against movement.

13. In an automatic recording mechanism, the combination with a movable recording surface, of a measuring instrument, an arm operated by the measuring instrument and movable normally in a plane in spaced relation to the recording surface, a pivotally mounted frame, a recording element arranged on the frame and normally adjacent to the recording surface, said frame being movable from a vertical to an approximately horizontal position to carry the recording element away from the recording surface, an actuating device coöperating with said arm, and means for intermittently moving the actuating device to bring the recording element against the recording surface, devices coöperating with the recording element when in normal position and imparting movement thereto at each operation of the actuating device, and means carried by the pivoted frame and engaging the actuating device when the frame is swung upward to hold the actuating device against movement.

HARRY Y. NORWOOD.
FREDERICK W. STALKER.

Witnesses:
JOHN A. THOMPSON,
GEO. B. IRELAND.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."