

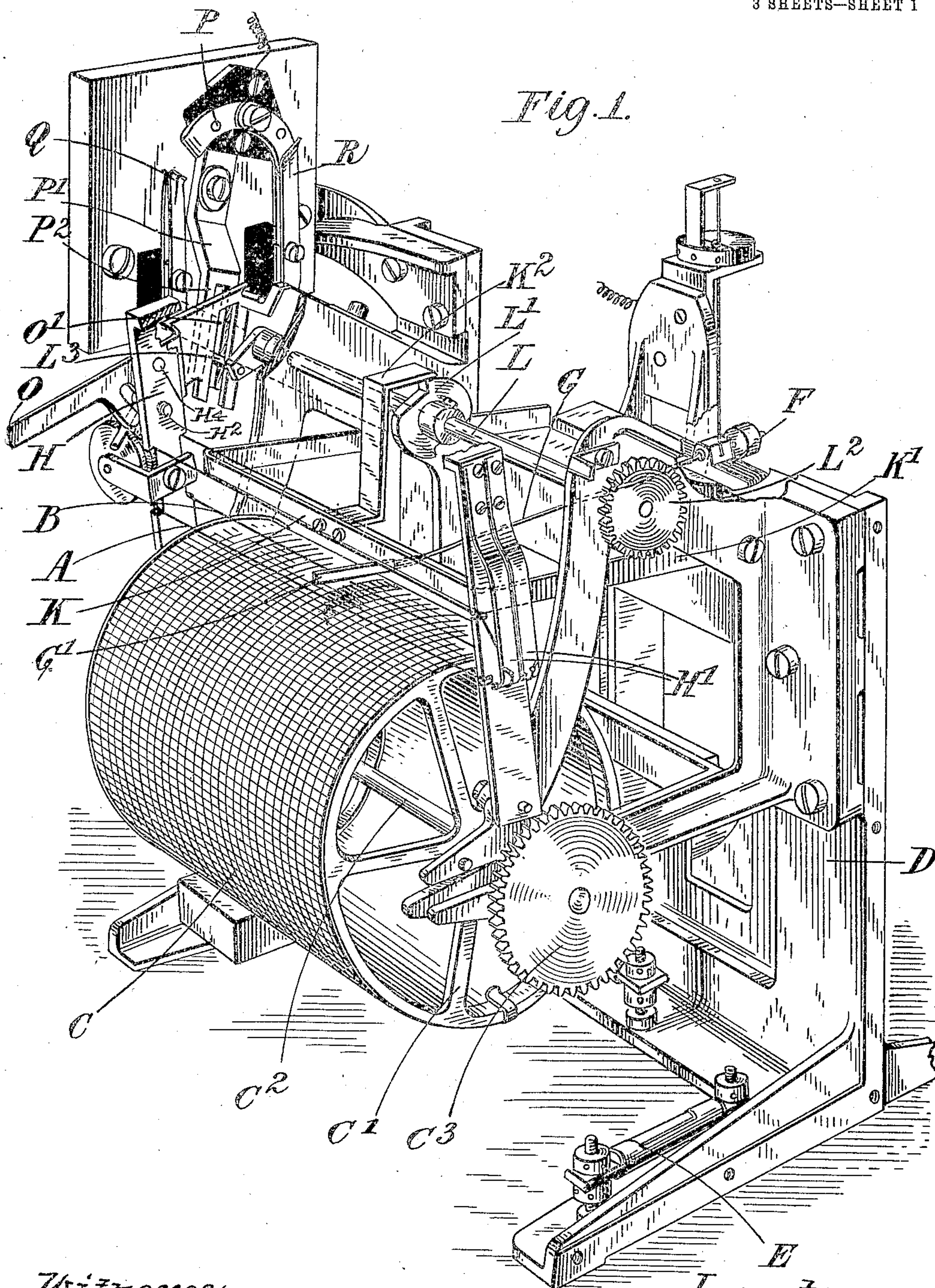
No. 827,086.

PATENTED JULY 31, 1906.

H. DARWIN.
AUTOMATIC RECORDING MECHANISM.

APPLICATION FILED AUG. 28, 1905.

3 SHEETS—SHEET 1



Witnesses:
E. C. Alexander,
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Inventor:
Horace Darwin
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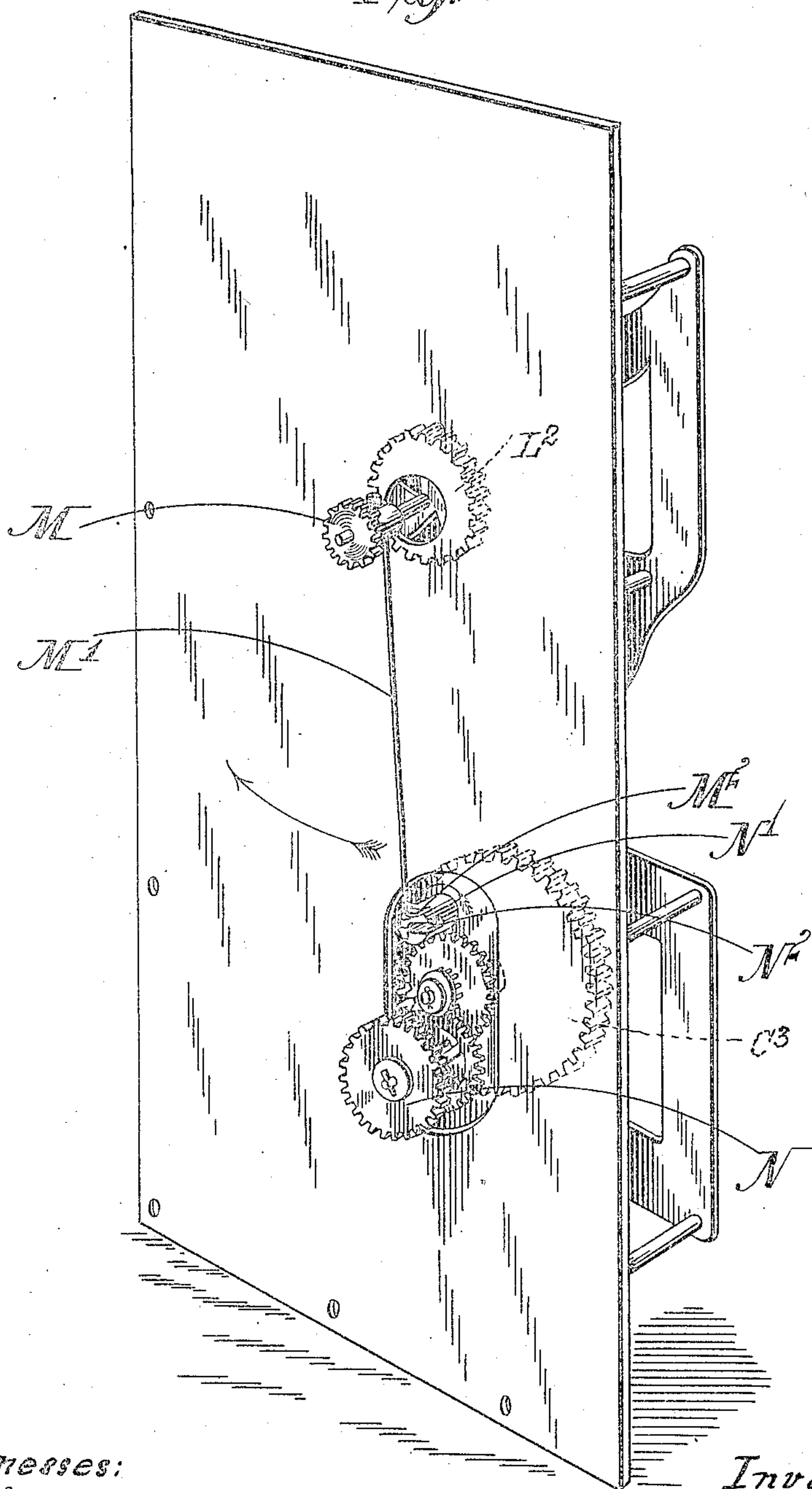
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Fig. 2.



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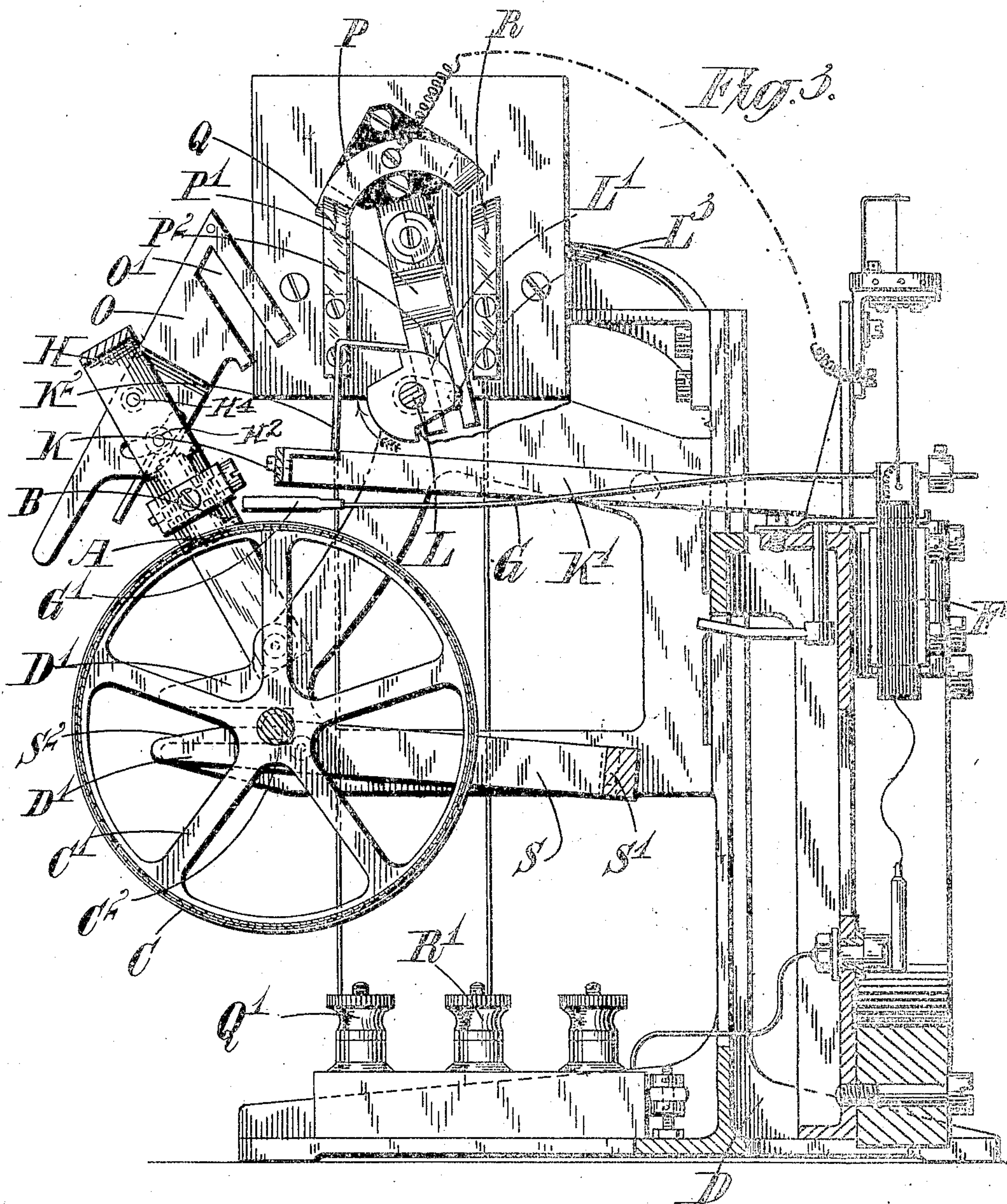
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UNITED STATES PATENT OFFICE.

HORACE DARWIN, OF CHESTERTON, ENGLAND.

AUTOMATIC RECORDING MECHANISM.

No. 827,086.

Specification of Letters Patent.

Patented July 31, 1906.

Application filed August 28, 1905. Serial No. 278,097.

To all whom it may concern:

Be it known that I, HORACE DARWIN, a subject of the King of England; residing at Chesterton, England, have invented certain new and useful Improvements in Automatic Recording Mechanism, of which the following is a specification.

This invention relates to automatic recording mechanism, and is designed to accomplish the following results: to enable accurate records to be obtained without photography, avoiding pen friction and at the same time avoiding the trouble which arises from the drying of the ink upon the pen when a pen is carried by the indicator-arm; to produce records whose coördinates are rectangular; to enable two or more records, each distinctively colored, to be registered simultaneously upon a single recording-surface by a single instrument.

According to this invention a filament which is charged with ink or some other suitable recording medium is disposed parallel to but normally out of contact with a recording-surface. The recording-surface is conveniently in the form of ruled paper mounted upon a drum driven by clockwork and the filament is held in a direction at right angles to that of the motion of the recording-surface.

The indicating-arm whose deflections are to be recorded is arranged at right angles to the filament and above it and the recording-surface, so that the filament lies between the end of the arm and the recording-surface.

The movement of this part of the indicating-arm is substantially lengthwise of the filament. The end of the arm above the filament is provided with a knife-edge, so that when the arm is depressed it causes the filament to touch the recording-surface only at the point at which it intersects the filament, and thus causes a dot to be recorded upon the surface.

By employing two or more filaments and providing a switch by means of which the measuring instrument may be connected with the indicating-arm and with a device for shifting the filaments it is possible to obtain two or more simultaneous records upon the same paper from a single indicating-arm.

In the accompanying drawings, which illustrate the application of this invention to an electric measuring instrument arranged to measure current from two different sources alternately, such as from two pyrometers,

Figure 1 is a perspective view of a portion of the instrument with the clockwork removed. Fig. 2 shows a side plate as removed from the instrument with the driving-spindles passing through it. Fig. 3 is a central transverse section of the instrument.

Like letters indicate like parts throughout the drawings.

The recording-surface consists of a sheet of recording-paper C, having rectangular coördinates and carried on a drum C', having a spindle C², carrying a driving-pinion C³ and supported in the main frame D, which may be provided with spirit-levels E to enable the instrument to be fixed or adjusted to the proper position. The frame D carries at the back a galvanometer F, which may be of any convenient form. The moving member of the galvanometer carries an indicating-arm G, terminating in a knife-edge G', which extends over the highest part of the drum C'.

Two filaments A and B, each charged with ink of a distinctive color, are carried on a frame H, which is pivoted in the main frame D. The filaments may be maintained at a suitable degree of tension by resilient supports H'. The filaments A and B are parallel to but not in contact with the recording-surface C and lie in a direction at right angles to the direction of motion of the recording-surface—that is, parallel to the axis of the recording-drum. The indicating-arm G, whose deflections are to be registered upon the recording-surface, is so disposed that one filament normally lies between the knife-edge G' and the recording-surface, the excursions of the knife-edge being approximately lengthwise of the filament.

Extending across the instrument above the knife-edge is a bar K, having side arms K', pivoted to the main frame D, and a bent tappet K² projects upward from the bar K and engages a cam L' on a driven shaft L, rotatably mounted at the top of the instrument, the cam being of such a shape that at each half-rotation of the shaft L the tappet K² is allowed to fall suddenly and is then gradually raised again. By this means the indicating-arm and the recording-surface are intermittently approximated, so that the filament is nipped between the knife-edge and the recording-surface in such a manner that the mark left by the filament upon the recording-surface is limited to a dot.

Mounted on the cam-shaft L is a pinion L², which engages a driving-pinion M, which is

intermittently rotated, as hereinafter described. The pinion C³ engages and is driven by a pinion N, actuated by clockwork, which also rotates a boss N', having a slot N² on one side thereof. The pinion M carries an arm M', having a bent end M². The pinion M under the action of an independent driving-spring tends to rotate and carry the arm M' round in the direction of the arrow in Fig. 2, and this movement is normally prevented by the boss N', which engages the end M² of the arm M'. As the boss N' rotates the end M² enters the slot N² and is later released from the slot and allowed to make one rotation. The pinion M being half the diameter of the pinion L² causes the shaft L to make one half-rotation.

The shaft L at the opposite end carries a crank-pin L², which engages a slot O' in a bracket O, attached to the frame H. Conveniently the bracket O is pivoted to the frame H at H¹ and is clamped thereon by means of a set-screw H². By unclamping the said set-screw the bracket O can be disengaged from the crank-pin L², and the frame H may be caused to swing away from the knife-edge, as shown in Fig. 3. As the shaft L makes successive half-rotations it moves the frame H and brings the filaments A and B alternately between the knife-edge G' and the recording-surface C.

A switch P is mounted on the main frame D and is adapted to connect the galvanometer F, through the contacts Q and R, with the terminals Q' and R' alternately. The switch P is carried on a pivoted arm P', having a slot P², which engages the crank-pin L², so that the switch P is alternately shifted between the contacts Q and R as the shaft L makes successive half-rotations.

The sequence of operations is then as follows: The filament A being in position between the recording-surface C and the knife-edge G' and the switch P being so set as to connect the galvanometer F, through the contact Q and terminal Q', to one circuit, a half-rotation of the shaft L is automatically effected, and the bar K is dropped and causes the knife-edge G' to press the filament A onto the recording-surface C, and a dot is made on the recording-surface of a color corresponding to the ink carried by the filament A. During the remainder of the half-revolution of the shaft L the bar K is raised, and the knife-edge is left free to return to its original distance from the recording-surface, the indicating-arm G being thus left free to take up a position of equilibrium. At the same time as the indicating-arm is so freed the switch P is set over from the contact Q to the contact R, so as to connect the galvanometer to the other circuit through terminal R'. Moreover, as soon as the indicating-arm G has been freed as aforesaid the filament B is substituted for the filament A under the op-

erative part of the knife-edge G', and after an interval of time sufficient to allow the indicating-arm to come to a position of equilibrium under the influence of the current in the circuit connected with the terminal R' the knife G' and the recording-surface are again approximated by the descent of the bar K, and a dot is thus made upon the recording-surface of a color corresponding to the ink carried by the filament B. These alternate operations are repeated, so that two simultaneous records distinguishable from one another by their colors are traced upon the recording-surface.

As shown in Figs. 1 and 3, the shaft C² will conveniently be placed between jaws D' on the main frame and may be retained in place by a pivoted detent-arm S, having a weight S' at the back and a sloping portion S² at the front, so that the drum may be readily slipped into position.

It is to be understood that the above construction has been described and illustrated merely as an example of the application of this invention, which may be embodied in many different forms of apparatus—for example, the recording mechanism with a single filament is applicable to many instruments. In operating a single-thread apparatus a separate clockwork mechanism may be employed for operating the cam-shaft, which may be freed at suitable intervals of time by an escapement controlled by the main clockwork, so that the work which the main clockwork has to do is minimized and the chance of inaccuracy reduced.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an automatic recording device the combination of means for imparting regular motion to a recording-surface a measuring instrument a deflectable indicating-arm operated thereby and freely movable clear of the recording-surface in a direction approximately at right angles to the direction of motion of the said surface, a filament between the indicating-arm and the surface extending at right angles to the direction of motion of the recording-surface, a support for said surface and means for intermittently forcing the indicating-arm to press the filament at some point in its length against the recording-surface upon said support and produce a dot thereon.

2. In an automatic device for producing simultaneous records from a measuring instrument alternately actuated by a plurality of different agencies, the combination of a support for a recording-surface means for imparting motion to said surface in one direction, a measuring instrument, a deflectable indicating-arm operated thereby and freely movable clear of the surface and in a direction approximately at right angles to the direction of motion of the surface a plurality of

filaments adapted to produce distinctive marks on the surface, each of which filaments lies near the surface and extends at right angles to its direction of motion, means for bringing the filaments successively between the indicating-arm and the surface, means for operatively connecting the instrument successively with different agencies and meant for intermittently forcing the indicating-arm to press a filament against the surface upon said support and mark it.

3. In an automatic device for producing simultaneous records from a measuring instrument alternately actuated by a plurality of different agencies, the combination of a support for a recording-surface means for imparting motion to the surface in one direction a measuring instrument, a deflectable indicating-arm operated thereby and freely movable clear of the surface and in a direction approximately at right angles to the direction of motion of the surface, a plurality of filaments adapted to produce distinctive marks upon the surface, each of which filaments lies near the surface and extends at right angles to its direction of motion, an operating-shaft rotatable in the device, means for causing the shaft to rotate intermittently, means actuated by the shaft for bringing the filaments successively between the indicating-arm and the surface, means actuated by the shaft for operatively connecting the instrument successively with different agencies, and means actuated by the shaft for intermittently forcing the indicating-arm to press a filament against the surface upon the support and mark it.

4. In an automatic recording device the combination of a rotatable drum having a cylindrical surface supporting a recording-sheet, means for imparting rotation to the drum, a measuring instrument, a deflectable indicating-arm operated thereby and normally out of contact with the recording-sheet a knife-edge on the arm so arranged that the measuring instrument moves the knife-edge in a direction approximately at right angles to the direction of motion of the surface of the drum, a marking-filament situated between the knife-edge and the recording-sheet a presser-bar over the knife-edge and means for intermittently lowering the presser-bar to force the knife-edge against the filament at some point in its length and make a dot-mark on the sheet.

5. In an automatic recording device the combination of a rotatable drum, supporting a recording-sheet a measuring instrument, a deflectable indicating-arm operated thereby and normally out of contact with the sheet, a knife-edge on the arm near the sheet and so arranged that the measuring instrument moves the knife-edge in a direction approximately at right angles to the direction of motion of the sheet, a marking-filament between

the knife-edge and the sheet, a presser-bar over the knife-edge, a rotatable shaft, a cam on the shaft arranged to cause the presser-bar to force the knife-edge intermittently against the filament and make a dot on the sheet, clockwork mechanism tending to rotate the shaft, an escapement device operatively connected with the drum to permit the shaft to rotate intermittently.

6. In an automatic recording device for producing simultaneous records from a measuring instrument alternately actuated by two different agencies, the combination of a rotatable drum, supporting a recording-sheet, a measuring instrument, a deflectable indicating-arm operated thereby and normally out of contact with the sheet, a knife-edge on the arm near the sheet and so arranged that the measuring instrument moves the knife-edge in a direction approximately at right angles to the direction of motion of the sheet, a pivoted frame carrying two filaments charged with inks of different colors each of which filaments lies near the sheet and extends at right angles to its direction of motion and can be brought between the knife-edge and the sheet by rocking the frame, a slotted member attached to the frame, a presser-bar over the knife-edge, means for operatively connecting the measuring instrument alternately with two different agencies, a rotatable operating-shaft, a crank on the shaft engaging the slotted member so as to rock the filament-frame to one side or the other alternately, a cam on the shaft arranged to cause the presser-bar to force the knife-edge intermittently against one filament and make a dot on the sheet, a clockwork mechanism tending to rotate the shaft, an escapement device operatively connected with the drum to permit the shaft to rotate intermittently.

7. In an automatic device for producing simultaneous records from an electric measuring instrument alternately connected with two different sources of current, the combination of a rotatable drum carrying a recording-sheet, an electric measuring instrument, a deflectable indicating-arm operated thereby and normally out of contact with the sheet, a knife-edge on the arm near the sheet and so arranged that the instrument moves the knife-edge in a direction approximately at right angles to the direction of motion of the sheet, a pivoted frame carrying two filaments charged with inks of different colors each of which filaments lies near the sheet and extends at right angles to its direction of motion and can be brought between the knife-edge and the sheet by rocking the frame, a slotted member attached to the frame, a presser-bar over the knife-edge, a switch arranged to connect the instrument alternately with the two different sources, a slotted lever operatively connected with the

switch, a rotatable operating-shaft, a crank
on the shaft engaging the slotted lever and
the slotted member so as to shift the switch
and to rock the filament-frame to one side or
5 the other alternately, a cam on the shaft ar-
ranged to cause the presser-bar to force the
knife-edge intermittently against one fila-
ment and to make a dot on the sheet, clock-
work mechanism tending to rotate the shaft
10 and an escapement device operatively con-

nected with the drum to permit the shaft to
rotate intermittently.

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

HORACE DARWIN.

Witnesses:

H. C. MELTON,

T. A. G. COCKERTON.