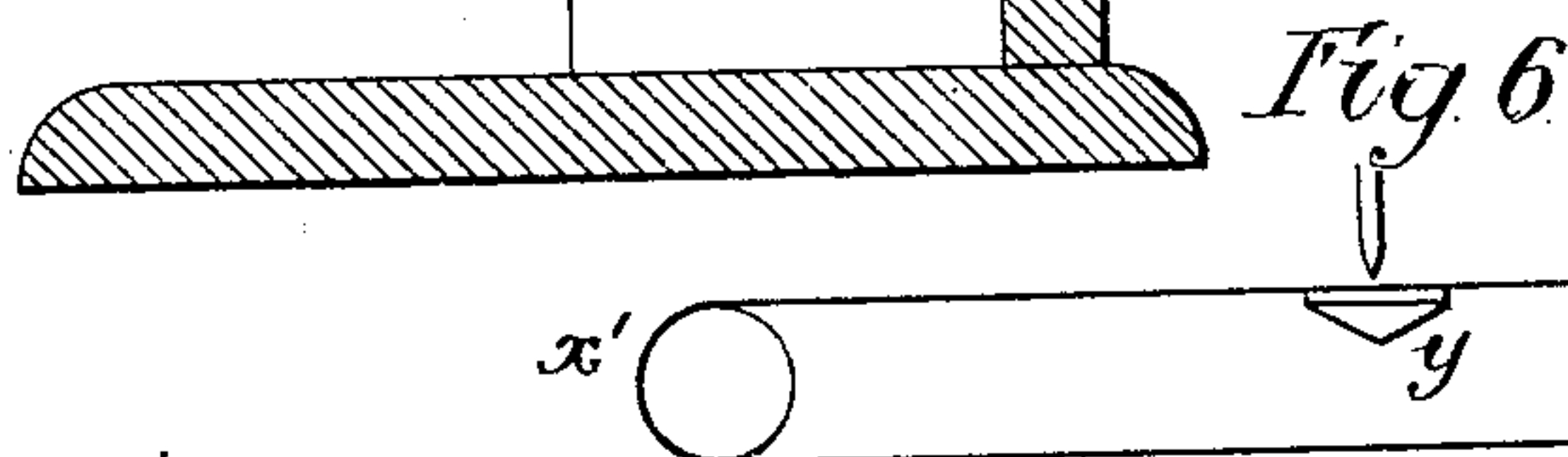
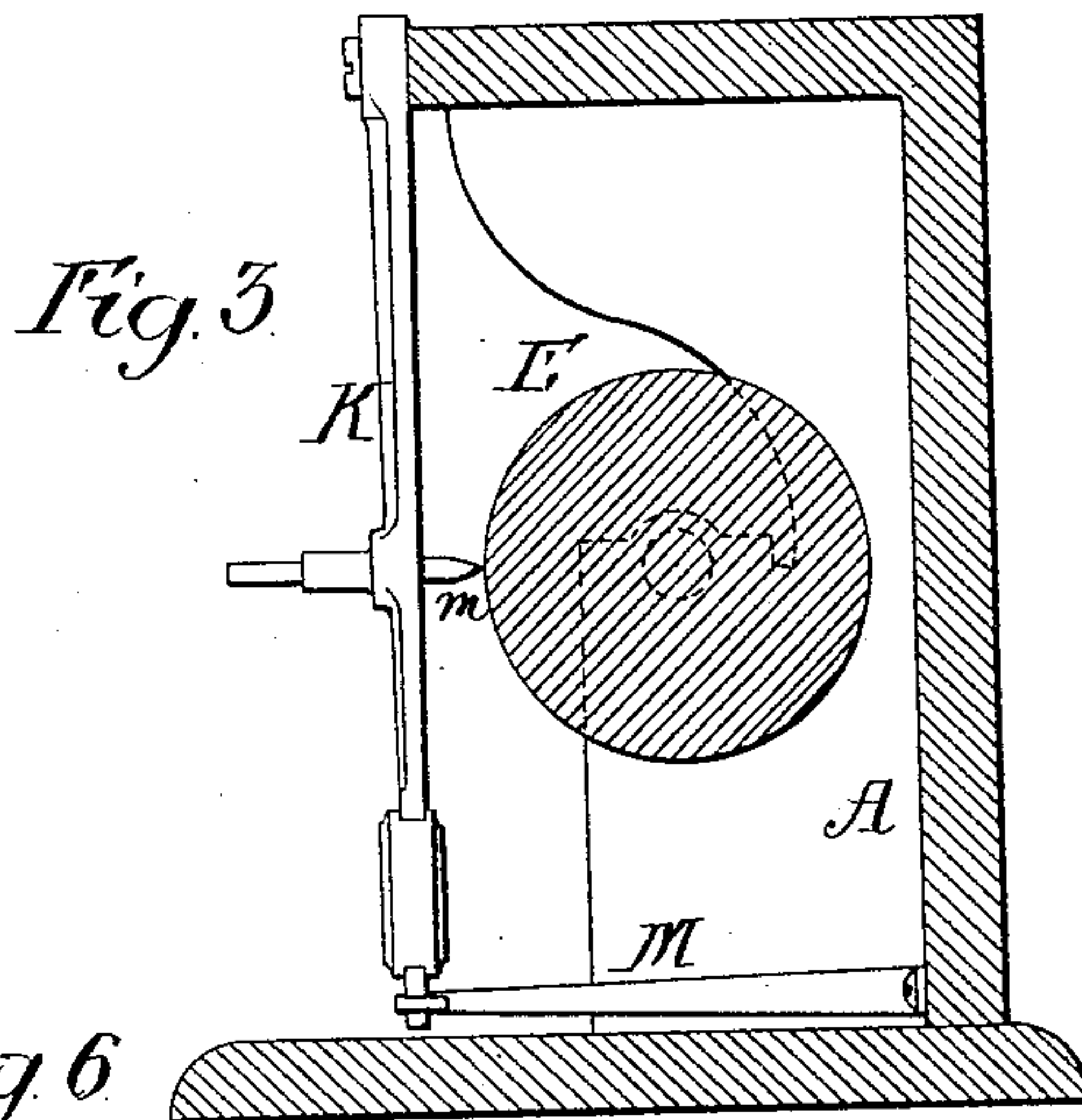
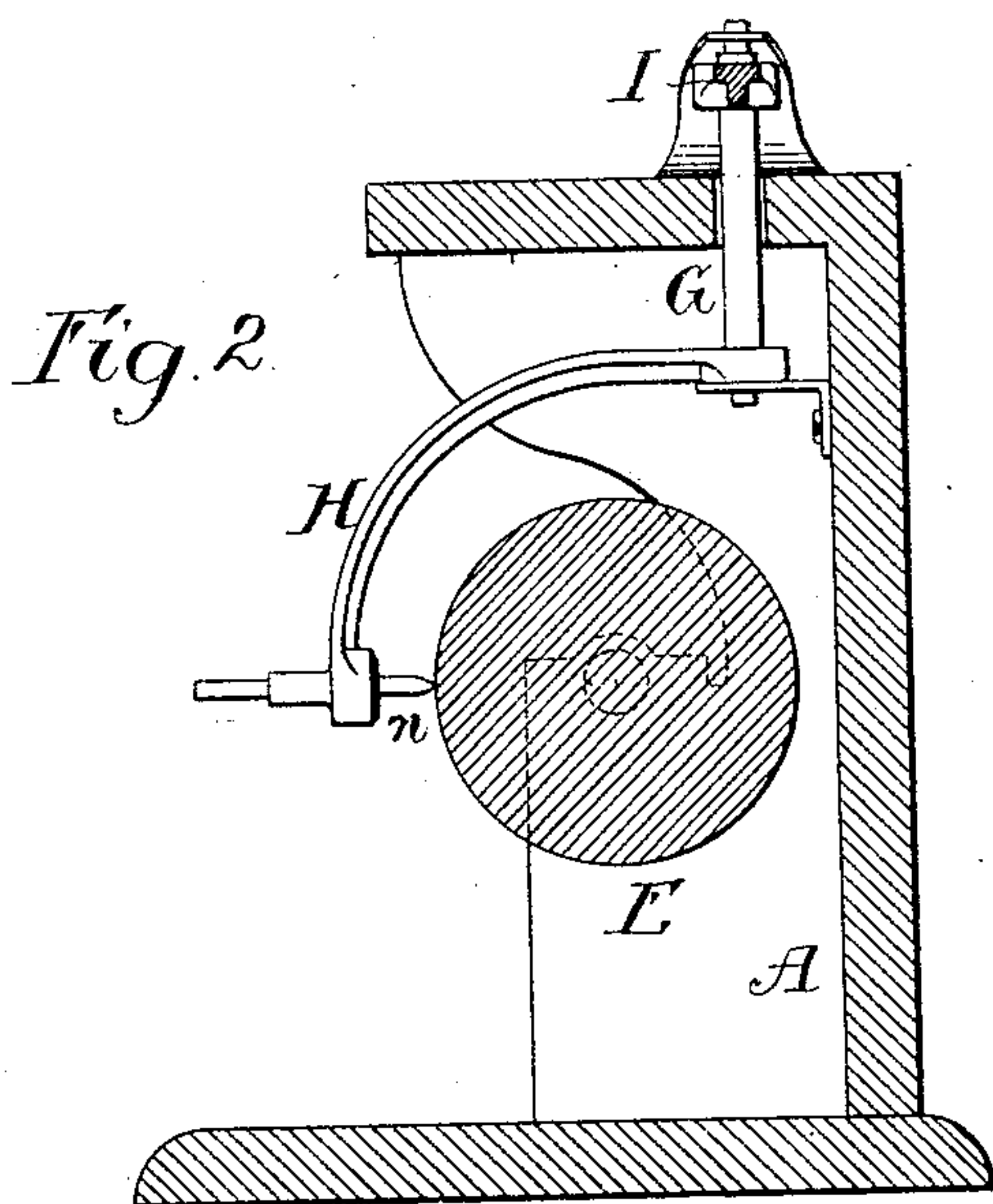
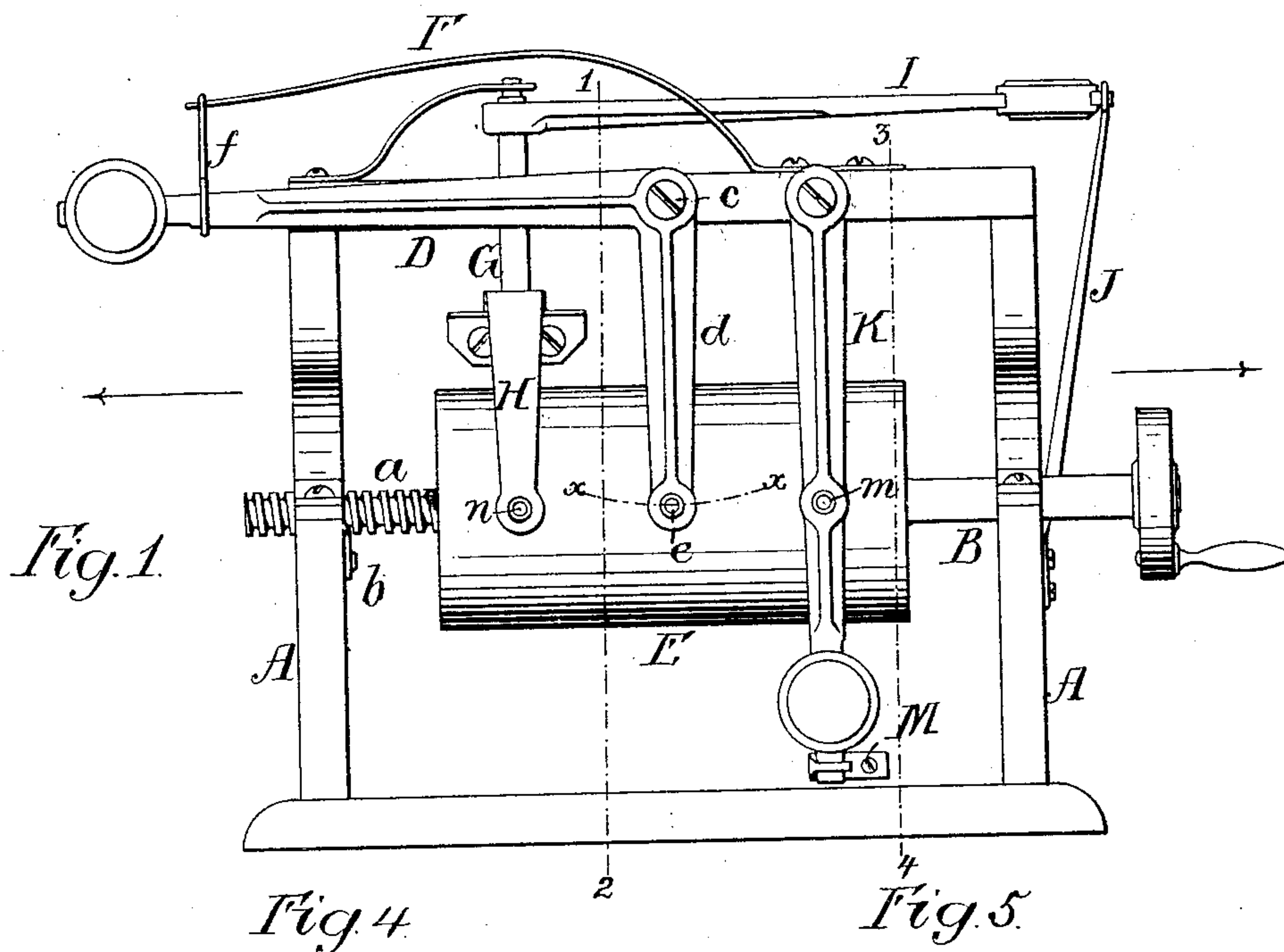


T. L. LUDERS.  
Shock or Jar Recorder.

No. 222,292.

Patented Dec. 2, 1879.



Witnesses  
Henry Howson Jr.  
Harry Smith

Inventor  
Thomas L. Luders  
by his Attorneys  
Howson & Co.



# UNITED STATES PATENT OFFICE.

THOMAS L. LUDERS, OF PHILADELPHIA, PA., ASSIGNOR OF ONE-HALF OF HIS RIGHT TO CHARLES J. A. DICK, OF LEE, ENGLAND.

## IMPROVEMENT IN SHOCK OR JAR RECORDERS.

Specification forming part of Letters Patent No. **222,292**, dated December 2, 1879; application filed August 2, 1879.

*To all whom it may concern:*

Be it known that I, THOMAS L. LUDERS, of Philadelphia, Pennsylvania, have invented a new and useful Instrument for Recording Shocks and Jars, of which the following is a specification.

My invention relates to an instrument for determining the causes of and suggesting the remedies for undue shocks and jars to which a railway-car may be subjected, my invention consisting, mainly, of the following elements—namely, a suitable frame, a spring-controlled arm or arms pivoted to the frame and having pencil attachments, and a device for traversing a strip of paper in contact with the pencil or pencils, the lines drawn by which will, owing to the vibration of the arms, have irregularities of a character which will determine that of the shocks which cause the irregularities.

In the accompanying drawings, Figure 1 is a side view of the jar-recording instrument; Fig. 2, a transverse section on the line 1 2; Fig. 3, a transverse section on the line 3 4; Figs. 4 and 5, lines produced by the instrument, and Fig. 6 a modification of part of my invention.

In Figs. 1, 2, and 3, A is a suitable frame, in the opposite ends of which the shaft B has its bearings, one portion, *a*, of this shaft being threaded, and a plate, *b*, attached to the frame engaging in the thread, so that as the shaft is turned it will traverse longitudinally. A bell-crank lever, D, is pivoted to the frame A by a pin, *c*, the short arm *d* of this lever carrying a pencil, *e*, which bears against a paper wrapped round a drum, E, on the shaft B. The long arm of the lever, which is properly weighted, is connected by a link, *f*, to a somewhat delicate spring, F, which is secured to the frame. The tendency of the spring is to maintain the lever in a given vertical position; but any vertical movement imparted to the instrument will result in the vibration of the lever and the movement of the point of the pencil *e* in the arc *x* of a circle, as shown in Fig. 1.

If the instrument be placed on the floor of a railway-car the lever D will be influenced by every abrupt vertical movement of the car-body.

A vertical spindle, G, is adapted to bearings

on the frame, a curved lever, H, secured to this spindle, carrying a pencil, *n*, the point of which also bears against the paper wrapped round the drum.

A horizontal weighted lever, I, is secured to the spindle, and the outer end of this lever is connected to the frame by a spring, J, which retains the lever in a given position as long as the instrument is quiescent, the lever vibrating in a horizontal plane and the pencil moving to and fro in the arc of a circle when the instrument is subjected to lateral jars.

A third lever, K, is suspended from a pivot-pin on the frame, and is connected to the latter at its lower end by a spring, M, the lever also carrying a pencil, *m*, the point of which bears on the paper wrapped round the drum. This lever vibrates in a vertical plane when the instrument is subjected to longitudinal shocks.

When the instrument is placed longitudinally in respect to the car of a train moving in either of the directions pointed out by the arrows in Fig. 1, and the shaft B is slowly turned by clock-work, or from the axle of the car through the medium of suitable gearing, three spiral lines will be drawn on the paper, one by each pencil.

When the car has traveled any desired distance the paper on the drum may be severed longitudinally and flattened out for examination.

There will be three sets of lines on the paper—one set due to the pencil *e*, carried by the lever D, another set to the pencil *n*, carried by the lever H, and a third set to the pencil *m* of the pendulous arm K.

The character of the lines drawn by the pencil *e* will show the condition of the bolster-springs and the track. Should these bolster-springs be so imperfect or so deteriorated as to cause abrupt vertical shocks, the irregularities in the line drawn by the pencil *e* will be continuous, or nearly so, as shown in Fig. 4, and they will be of a character clearly indicating the fact that the irregularities are due to the springs. An imperfection in the track causing a sudden vertical shock would cause the production of a line something like that shown in Fig. 5.

Lateral shocks imparted to the car by irregu-



larities in the gaging of the track or other imperfections will disturb the lever I, and this disturbance would be indicated on the paper by irregularities of the lines drawn by the pencil *n*. The undue lateral rolling of the car, owing to badly-balanced springs, will also disturb the lever I, and the disturbance would be indicated by the said pencil *n*.

Longitudinal shocks resulting from the stopping, starting, and backing of the train must always take place, and these will be indicated by the irregularities of the lines drawn by the pencil *m* of the pendulous lever K; but the character of these shocks, as regards gentleness or abruptness, will depend mainly on the condition and character of the bumper-springs, and will be indicated by the irregularities of the lines drawn by the pencil *m*.

A close observer of these lines and of the shocks imparted to a car will soon be able to distinguish, by the character of the irregularities of the lines, the cause of such irregularities.

An instrument may be made with a single weighted arm. The pendulous arm K, for instance, may be combined with the drum carrying the paper and suitable clock-work to drive the drum, and this instrument may be placed on the floor of the car in different positions. It may occupy the position shown in Fig. 1, for instance, when the arm has to be influenced by longitudinal shocks, or the instrument may be so turned that the same arm will be influenced by vertical shocks, or turned to a position where it will be vibrated by lateral shocks.

A machine like this, however, would be of limited capacity compared with that described above, which records the vertical, lateral, and longitudinal shocks, imparts to the observer their true cause, and suggests the proper remedies.

It is not essential, in carrying my invention into effect, that a drum having a combined rotating and longitudinal movement should be used for traversing paper in contact with points of pencils.

The instrument may have two drums, *x' x'*, as shown in Fig. 6, and an endless strip of paper may be traversed continuously over these

drums, the paper passing over and in contact with a support, *y*, beneath the points of pencils carried by the arms, or a long strip of paper may be wound from one drum onto another.

Should the speed at which the paper is traversed bear a relation to the speed of the train, and should the paper have cross-lines indicating given stations on the line, the point on the track where there is any imperfection in the rails, as indicated by the pencil *e*, can be approximately determined by noting the position of the imperfections indicated on the paper in respect to the cross-lines.

I am aware that a pencil bearing on a traversing strip of paper has been used for determining when and during what periods the object carrying the pencil and paper has been in motion or quiescent; also, that a pendulous arm carried by a vehicle has been used for recording the different inclinations assumed by the vehicle. I therefore do not claim, broadly, either of these devices; but

I claim as my invention—

1. A jar-recording instrument in which are combined the following elements, namely: first, a suitable frame; second, an arm pivoted to the said frame and having an attachment for receiving a pencil; third, a spring attached at one end to the frame and at the other end to the arm; and, fourth, a device for traversing a strip of paper in contact with the pencil, all substantially as set forth.

2. The combination, in a jar-recording instrument, of a pivoted pendulous arm, K, a lever, D, arranged to vibrate in a vertical plane, and a pivoted arm, I, arranged to move in a horizontal plane, each lever being controlled by a spring and having an attachment for receiving a pencil, with a device for traversing a strip or strips of paper in contact with the pencils, all substantially as set forth.

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

THOS. L. LUDERS.

Witnesses:

ALEXANDER PATTERSON,  
HARRY SMITH.