S. T. BOLE.

RECORDING INSTRUMENT.

APPLICATION FILED MAY 10, 1912.

1,068,213.

Patented July 22, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

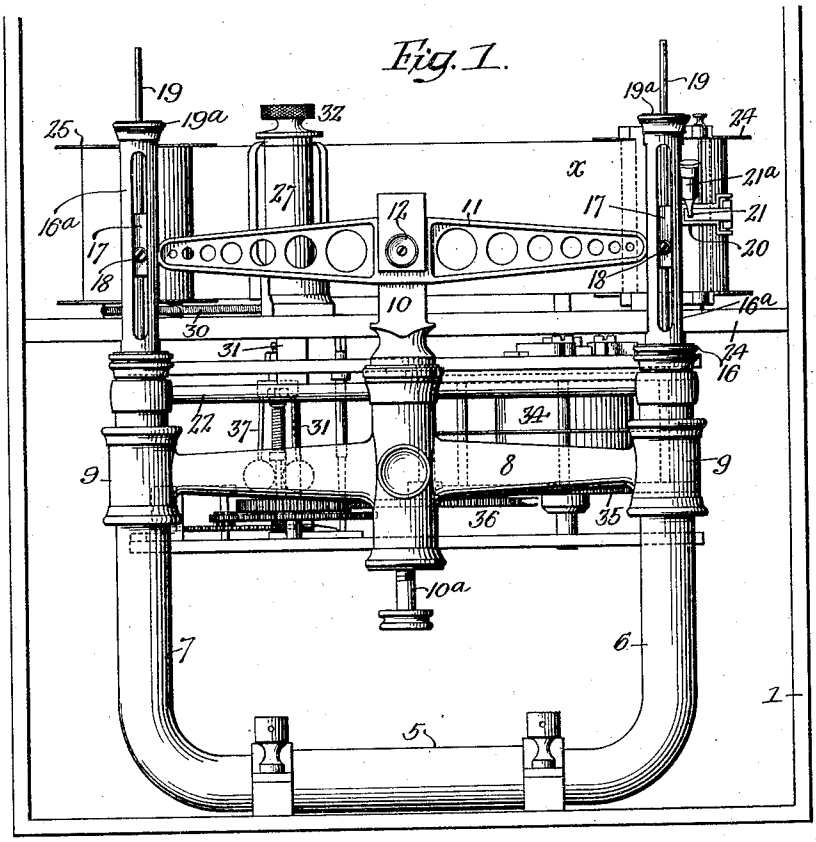


Fig. 2.

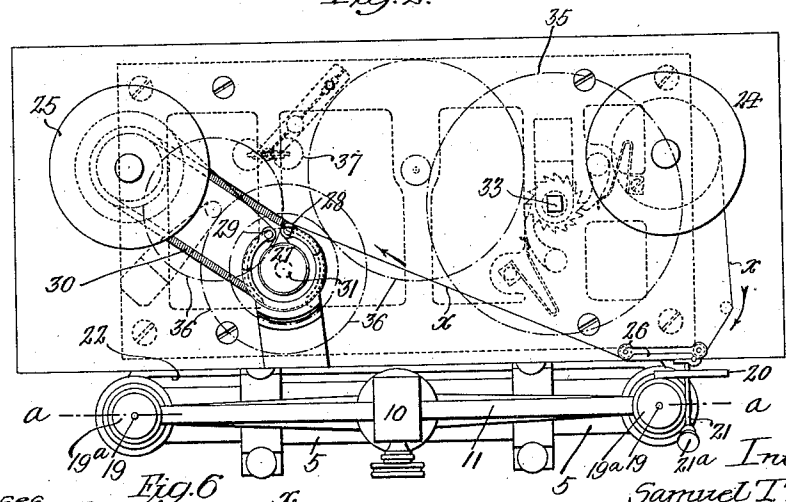


Fig. 6

Witnesses.—

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2 SHEETS—SHEET 2.

Fig. 3.

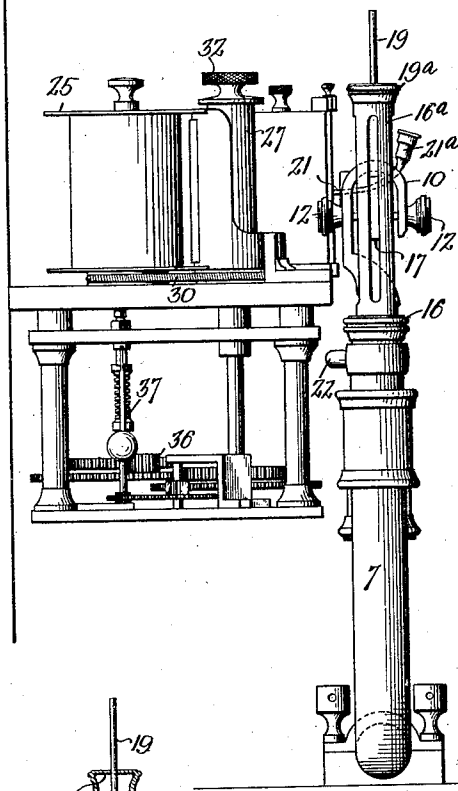


Fig. 5.

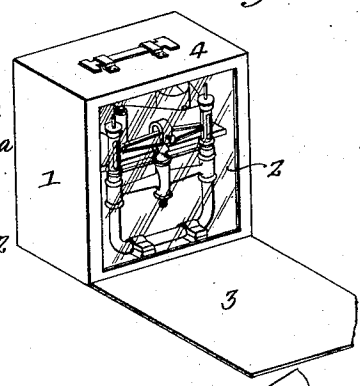


Fig. 7.

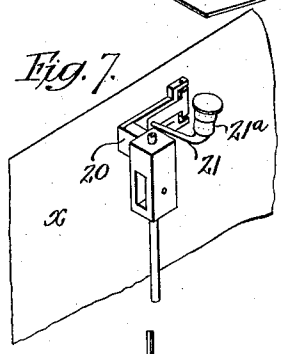
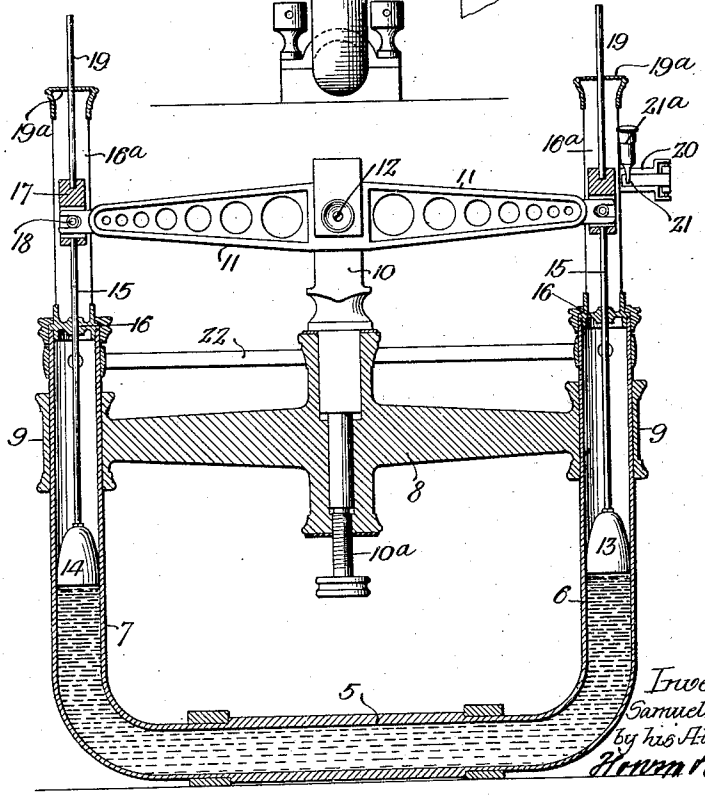


Fig. 4.



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UNITED STATES PATENT OFFICE.

SAMUEL T. BOLE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE J. G. BRILL COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

RECORDING INSTRUMENT.

1,068,213. Specification of Letters Patent. Patented July 22, 1913.

Application filed May 10, 1912. Serial No. 696,388.

To all whom it may concern:

Be it known that I, SAMUEL T. BOLE, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Recording Instruments, of which the following is a specification.

The object of my invention is to provide an instrument which will record, on a traveling sheet of paper, the acceleration, retardation, and braking effect of a railway car. The instrument will make a chart of the trip made by a car equipped with the same and will indicate the different stops made during the trip; there being visible indication as to whether the motorman made the stops properly, also whether he started with the requisite amount of power or with too much power.

The instrument can be made to record the lateral vibration of a car, if desired, and, in fact, can be used for any purpose where it is desired to record a series of movements.

In the accompanying drawings:—Figure 1, is a view in elevation illustrating my improved recording instrument; Fig. 2, is a plan view; Fig. 3, is an end view; Fig. 4, is a sectional view on the line *a*—*a*, Fig. 2; Fig. 5, is a perspective view showing the instrument located in the carrying case; Fig. 6, is a view showing a portion of the record strip illustrating the record thereon; and Fig. 7, is a perspective view of a detail.

Referring to the drawings, 1 is a case for inclosing the instrument. This case has a glazed front 2 and a cover 3, which can be raised so as to entirely inclose the instrument. When it is desired to use the instrument, the cover 3 is turned down so as to expose it. If it be necessary to gain access to the instrument, the glazed section 2 and the top cover section 4 can be opened. While only one form of case for the instrument is shown, other forms may be used without departing from the essential features of the invention.

5 is a horizontal tube having upwardly extending cylindrical sections 6 and 7 supporting a cross head 8 having bearings 9 through which pass the extensions 6 and 7, as indicated in Fig. 4. Mounted on the cross head 8 is a bearing 10, which can be vertically adjusted by means of the set screw 10^a and pivotally mounted on this bearing is a beam 11. The pivots 12 can be pin pivots, as illustrated, or can be knife-edge pivots, as in the ordinary scale beam.

13 and 14 are plungers, each connected to a rod 15 extending through a stuffing box 16 in the end of each of the upright sections 6 and 7 and attached to the rod 15 is a head 17, slotted to receive the end of the beam 11, which is forked to extend over a pin 18 in the head 17. The plungers 13 and 14 fit snugly in their respective tubes. The tube 5 and a portion of each section is filled with mercury, as indicated in Fig. 4, so that any movement of the tube and the means carried thereby will cause the mercury to flow toward one or other of the tubular extensions 6 and 7. Consequently, the beam will have a different relation with respect to the other parts of the instrument.

Projecting upwardly from the head 17 are rods 19, which pass through guides 19^a in extensions 16^a, which are slotted and act as guides for the heads 17. The pins 18 on the heads extend into the slots and are preferably provided with anti-friction rollers so as to reduce the friction as much as possible.

Carried by one of the heads 17 is a bracket 20, Fig. 6, which supports the ink tube 21, and having at each end a capped reservoir 21^a. The tube has a very small opening through which the ink can flow as the recording paper passes it.

Connecting the upper ends of the tubular sections 6 and 7 is a pipe 22, which allows the air in the upper ends of the extensions to flow from one side to the other, according to the movement of the mercury in the tube.

On a transverse partition 23 of the casing 1 is the mechanism for feeding the recording paper *x*. 24 is a spool upon which the paper *x* is wound and 25 is a spool on to which the paper is wound after passing the recording tube 21. The paper travels in the direction of the arrow, Fig. 2.

26 is a guide for the rollers at each end, over which the paper passes and the recording tube is projected so as to come in close contact with the paper upon the rollers in order that the ink within the tube may properly flow on to the paper. There will be sufficient yield to allow the paper to pass with the least amount of friction.

In order to feed the paper at a given speed, I pass the paper around a vertical feed roller 27. The paper passes first around a guide roll 28; then around the

feed roller; and then around a guide roll 29. From this guide roll it passes to take up spool 25, which is driven by a spring belt 30, which will slip when the tension becomes too great. The roller 27 is preferably faced with rubber and is mounted on the driven shaft 31 of the driving mechanism. On the tube of this shaft is a set nut 32. The shaft also has a disk below the roller 27 so that upon adjusting the nut 32, more or less friction can be applied to the roller 27. The mechanism, in the present instance, is driven through clock gearing.

33 is a spindle having a squared end to receive a key and one end of the spring is attached to this spindle; the other end being attached to a gear wheel 35. Ordinary ratchet mechanism is used to retain the standard after it is wound. A chain of gearing 36 is used to drive the spindle 31 from the spring 34 and a governor 37 is provided to control the movement of the parts, as it is essential that the paper shall be fed evenly in front of the recording tube.

It will be understood that the driving mechanism for the paper may be modified without departing from the essential features of the invention.

The operation of the instrument is as follows: If it be desired to record the acceleration; retardation and braking effect of a passenger car of the trolley type; the car being under the control of a motorman; the instrument is placed so that the two cylindrical portions 6 and 7 of the tube 5 will be arranged on the longitudinal line of the car. The mechanism can then be set in motion and any longitudinal vibration, due to stopping or starting, or applying the brakes, will cause the mercury in the cylinders to shift the operating pistons 13 and 4 and, consequently, rock the beam 11; thus moving the marking tube vertically to a greater or less extent over the face of the paper x and as the paper travels at a given speed in front of this marking tube, an indicating mark will be made on the paper.

In Fig. 7, I have illustrated a short section of the paper, showing the indicating mark thereon. If, for instance, in starting a car, the car is jolted, the jolt will be more or less extensive according to the amount of current applied by the motorman and the paper will be marked with a greater or less mark; the record corresponding with the amount of current employed and the smoothness or irregularity of the travel of the car. As the power increases, another slight jar or jolt will occur, which will be recorded on the paper, as shown in Fig. 7. If the car be running evenly, the line on the record sheet will be comparatively even. When the brakes are applied the mark will be deflected, as shown in Fig. 7, and when the car comes to a stop; a transverse line will be made, as shown, and the marking tube will be returned to its central position. Thus the actual working of the car for the entire trip is indicated. The instrument can also be used to indicate the transverse rocking motion of the car by simply placing the instrument so that the beam will rock transversely, instead of longitudinally.

The paper can be of any length desired, according to the speed of travel of the spools and the length of the portion of the road over which the car travels for which a record is to be made.

While I have shown the invention as applied to railway cars, it can be applied to machines, or used on vessels, if it be desired to record any particular movement or movements.

I claim:

1. The combination in a recording instrument, of two vertical cylinders connected at their lower ends and arranged to contain mercury; a piston in each cylinder above the mercury; a pivotally mounted beam connected to the piston and carrying a recording device; with means for feeding a recording sheet past the recording device so that when the device is placed on a car, or other moving object, the evenness or unevenness of motion will be recorded on the paper.

2. The combination in a recording instrument, of two vertical cylinders connected at their lower ends and arranged to contain mercury; a piston in each cylinder above the mercury; a pivoted beam connected to each piston; a recording device actuated on the rocking of the beam; a recording paper; means for feeding the recording paper past the recording device; and a tube connecting the air space of the cylinders above the pistons.

3. The combination in a recording instrument, of two vertical cylinders connected at their lower ends and arranged to contain mercury and also connected at their upper ends; a plunger in each cylinder above the mercury; a rod projecting upwardly from each plunger; a head carried by each rod; a beam; a frame on which the beam is pivotally mounted; the ends of said beam being connected to the heads on the rods; a recording device attached to one of said heads and paper feeding mechanism arranged to traverse the paper in front of the recording device.

4. The combination in a recording instrument, of two vertical cylinders connected together at their lower ends and arranged to contain mercury; a tube connecting the cylinders at their upper ends; a plunger in each tube above the mercury; vertical guides projecting from each tube; rods extending from the plungers; a head on each rod; a cross pin on each head extending into

the guides; a central support; a beam pivotally mounted on the support and forked on each end; the forked ends of the beam engaging the pins on the heads of the plunger; a marking device carried by one of the said heads; and means for feeding the recording paper past the cylinders so that any motion imparted to the beam will be indicated on the paper.

5. The combination in a recording instrument, of a tube turned up at each end to form vertical cylinders; the tube being of an even diameter throughout and containing mercury; a plunger in each tube resting on the mercury; a rod projecting from each tube; guides for the rods; a head on each rod; a beam pivotally mounted and connected to the heads; recording means under the control of the beam; with means for feeding paper past the recording means so that any movement of the beam will be recorded on the paper.

6. The combination in a recording instrument, of a tube bent up at each end to form cylinders; said tube being of an even diameter throughout and containing mercury at its lower portion; a cap at the upper end of each tube; a plunger in each tube resting on the mercury; a rod extending from the plunger through the cap; vertical guides carried by the cap; heads on the rods adapted to the guides; a frame; a cross head attached to the tube; a vertically adjustable bearing on the cross head; a beam pivotally mounted on the bearing and connected to the heads of the plungers; a recording device on one of said heads; means for feeding paper past the recording device; and a tube connecting the upper ends of the cylindrical portions of the mercury tube.

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

SAMUEL T. BOLE.

Witnesses:
HENRY C. ESLING,
H. F. MCKILLIP.

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