(No Model.)

A. SPRINGER & F. A. ROEDER.

F. DAVIS, administrator of F. A. ROEDER, deceased.

TORSIONAL PIVOT BALANCE.

No. 339,946. Patented Apr. 13, 1886.

Fig. 1.

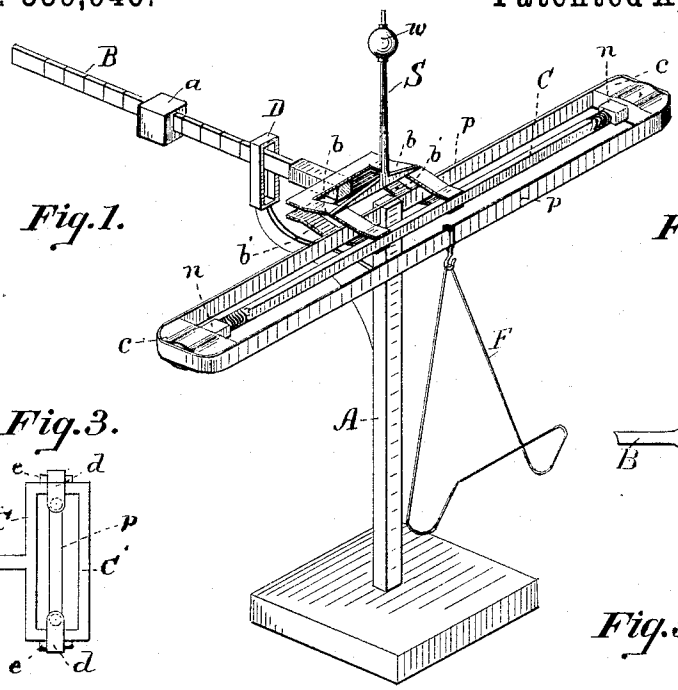


Fig. 4.

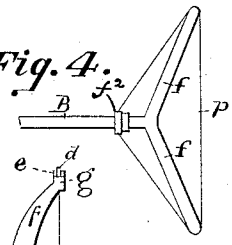


Fig. 7.

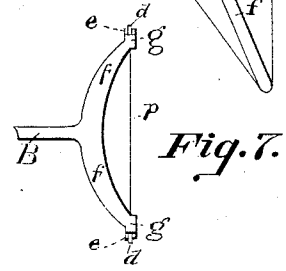


Fig. 3.

Fig. 5.

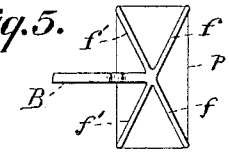


Fig. 2.

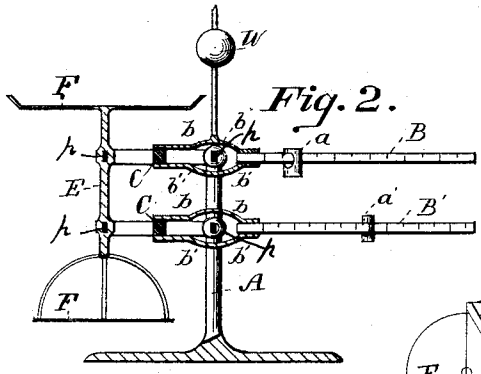


Fig. 6.

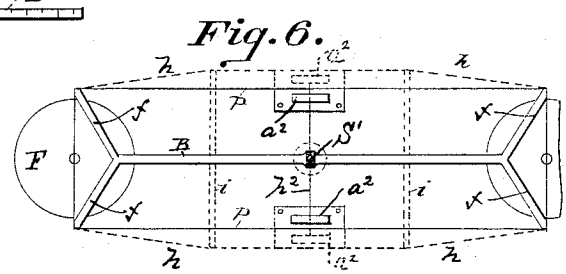
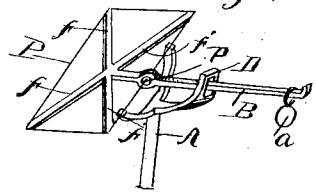


Fig. 8.



Attest:

R. M. Hosea

C. D. Shappell

Inventor:

Alfred Springer and

Frederick A. Roeder

by R. M. Hosea, atty

N. PETERS. Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

ALFRED SPRINGER AND FREDERICK A. ROEDER, OF CINCINNATI, OHIO, FRANK DAVIS ADMINISTRATOR OF SAID ROEDER, DECEASED, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE UNITED STATES TORSION BALANCE AND SCALE COMPANY, OF JERSEY CITY, NEW JERSEY.

TORSIONAL PIVOT-BALANCE.

SPECIFICATION forming part of Letters Patent No. 339,946, dated April 13, 1886.

Application filed June 14, 1884. Serial No. 134,835. (No model.)

To all whom it may concern:

Be it known that we, ALFRED SPRINGER and FREDERICK A. ROEDER, citizens of the United States, residing at Cincinnati, Ohio, have invented new and useful Improvements in Torsional Balances, of which the following is a specification.

Our invention relates to that class of balances in which elastic bodies are employed as pivots in contradistinction to those having resting-supports—such as "knife-edges"—its object being the production of a cheap and efficient balance for ordinary uses, embodying the "torsional" principle.

Heretofore in the construction of such balances the torsional pivot has been mounted separately from the beam—that is, upon a separate frame—by or upon which it was held in necessary tension; but in our present invention we combine the torsional pivot with the beam as part of its structure, and are thus enabled to introduce certain mechanical advantages of structure applicable to a variety of forms of scales in which the torsion principle has not heretofore been applied.

The difficulty heretofore existing in the way of such combination of the beam and pivot has been the fact that the pivot, in order to be effective, must be highly elastic, and to this end maintained in a state of tension, thus requiring a strong resisting structure involving so great an excess of weight in the beam as to practically overload the pivots and destroy the sensitiveness of the balance. In our present invention this difficulty is overcome by extension of the beam laterally to form one or more struts opposing compressive resistance of the same to the tensile strains of the pivot, this construction being supplemented in some cases by securing the elongated pivot around the struts as abutments in such manner that its strain in one direction is counterbalanced by the strain in another.

Our invention may be said, therefore, to consist in a weighing-balance embodying a torsional pivot combined directly with the beam in a state of tension, and in certain details of construction hereinafter more fully described and claimed.

In the accompanying drawings illustrating our invention, Figure 1 is perspective view of a "steelyard" balance in which a single beam with sliding weight is employed, and in which the fulcrum and terminal pivots are combined with the beam. Fig. 2 is a view, partly in side elevation and partly in vertical section, of a similar balance having two beams with differential sliding weights; Fig. 3, a partial plan of a beam, showing a slight variation in the attachment of the pivots to the beam; Figs. 4, 5, and 6, plans showing variations in the manner of attaching terminal pivots to the beam; and Fig. 7 is a plan view of a scale in which the terminal pivots are formed by a single wire stretched around the beam. Fig. 8 is a partial perspective of a beam such as is illustrated in Fig. 5, in which the fulcrum and terminal pivots are formed by the same wire or band stretched around the lateral projections and passing through a suitable opening in the beam.

Referring now to the drawings, Figs. 1 and 2, A designates the supporting-pedestal, and B the beam of the steelyard-balance to which our invention is applied. In the case shown the beam is extended laterally at one end into a bar, C, in the same horizontal plane, at the ends of which are fitted two semicircular blocks, *c c*, arranged to be forced outward apart by nuts *n*, threaded upon the bar. Around the outside of the blocks and from end to end of the bar at opposite sides is stretched a band or ribbon, *p*, of steel or other elastic metal, (or a wire of similar material,) the beam B being bifurcated horizontally at and near the junction of the bar C, to permit the band or wire *p* to pass uninterruptedly, and the beam also being bifurcated vertically at said junction to permit the band or wire *p* to be securely seated in the upper end of the supporting-column A in the plane of the beam B without contact with any other part, to constitute the supporting-fulcrum of the beam. The four arms of the beam necessitated by the double bifurca-

tion referred to are shown at *b b b' b'*, the two former passing above and the two latter below the pivot *p*.

To the upper pair of arms, *b*, is attached the standard S, rising centrally above the supporting-column A, and carrying the "poise" *w*, essential to balances employing elastic pivots, as set forth in the application of Frederick A. Roeder, No. 137,293, filed July 10, 1884.

The scale-pan—or, as in the case shown, the carrier F—for the letter or parcel to be weighed is attached to the front section of the pivot band or wire *p* in the vertical plane (extended) of the beam B. A guide-yoke, D, extending rearward and upward from the column A, surrounds the beam B and prevents undue oscillation of the latter. The beam B is graduated in the usual manner, and provided with a sliding weight, *a*.

In the scale shown in Fig. 2, in addition to the parts above described, an additional beam, B', is employed, of the same construction, mounted upon the column A below and parallel to the first, the two being connected through their fulcrum-pivots by the column on which the fulcrum-pivots are mounted, and by a vertical bar or standard, E, rigidly connecting the terminal pivots in the vertical plane of the beams, and carrying a scale-pan supported above or suspended below, as may be desired, the principle of combination and operation of the two beams being identical with that exhibited in the double-beam balance patented to us in Letters Patent No. 262,905, dated August 15, 1882, with only the slight modification in construction necessitated by the present construction of the beams. In the present case the two beams are employed with differential sliding weights *a a'*, indicating whole and fractional units of measurement for convenience in obtaining longer graduations on the beam for minute fractions of the unit of weight. The arrangement of the pivot in the illustrations given opposes the strain on one side of the bar C to the corresponding strain on the other, thus bringing a compressive strain only upon the bar, and rendering a very light structure possible. The tightening-nuts *n* may be omitted altogether, and the band or wire stretched upon the blocks in the process of securing it thereupon, and where the latter plan is employed the blocks may constitute integral portions of the bar.

In some forms of scales, particularly those employing a multiplied leverage, as in platform-scales for heavy bodies, it is desirable that the fulcrum and terminal pivots should be placed in closer proximity, and in such cases the lateral bar C of the beam may be supplemented by a similar bar arranged outside of and parallel to it, the ends of the bars being connected to form a rectangular frame, C C', Fig. 3, within which, between the short ends, the pivot band or wire is stretched and held in tension by yokes *d d*, surrounding the short sides of the rectangle and set out by wedges *e e*, driven between the yokes and the outside of the containing-frame C C', as shown. Where the terminal pivot only is to be attached to the beam, the construction may be as shown in Figs. 4, 5, and 7.

In Fig. 4 the beam is extended laterally at the end into two struts, *f f*, between whose ends the pivot is stretched and carried back to a fastening, f^2, upon the beam. In Fig. 5 two additional struts, *f' f'*, are provided, the pivot being carried around the system in a rectangular course and fastened to the beam, the four struts forming diagonal braces. The beam may, however, be perforated, as shown in Fig. 8, to allow the rear section of the pivot free passage, in which case the rear section of the pivot may be used as the supporting-fulcrum of the beam, in the manner shown in Fig. 8.

In Fig. 6 is exhibited a beam with single bifurcations, as shown in Fig. 4, but in which the pivotal wire is carried around the ends of the struts, and from end to end of the main beam, an arrangement securing a perfectly uniform and delicate tension of the terminal pivots and very light beam, these being essential conditions in the minutely-sensitive balances required in assaying and in chemical manipulations and similar operations at the minimum of simplicity and cost of construction and maintenance. In this form of balance the main beam B is supported upon a torsion pivot, p^2, stretched between supports a^2 a^2, and has a standard at the point S' to receive a counterpoise, substantially as shown in Fig. 1.

In Fig. 7 is shown a form of bifurcated beam adapted to the attachment of a single pivot between the ends of the bifurcated arms. In such case the lateral extensions of the beam are preferably formed as a shallow crescent, *f f*, in the horizontal plane of the beam, thickened toward the junction with the beam, and provided with slots or apertures at the ends *g*, through which the pivot passes. In such case it is desirable to use for the pivot a band or wire with thickened ends—as, for instance, a band doubled over upon itself—which may be pierced with slots, through which wedges *e e* may be driven to secure the requisite tension by stretching the band upon the outer end of the crescent as abutments. The disposition of the beam metal in crescent form, while in some degree the equivalent of the struts *f f*, secures a nearer approximation to the direct compressive resistance exhibited in the case first illustrated, and forms a desirable construction for beams such as used in platform-scales for heavy weighing where the weight of the beam is not of so serious moment, and a pivot of extremely delicate tension is not required. Thus constructed they may be used either as the weighing-beams supporting the platform or as the levers connecting with the final indicators.

It will be obvious that a steelyard-balance embodying substantially the principles of that

first described may be constructed, using a beam such as indicated in Figs. 4, 5, and 7, the fulcrum-pivot being mounted upon a separate frame, as shown in Letters Patent No. 262,905, before referred to, or a knife-edge support may be used for the fulcrum.

We have indicated in dotted lines in Fig. 6 two additional braces, *i i*, around which the pivot-wire *h*, may be carried, giving the structure an increased width laterally, in order to obtain a greater length of the fulcrum-pivot without interference and without increasing the end weight of the beam. In such case we may place the supports a^2 a^2 farther apart, as indicated in dotted lines.

We claim as our invention and desire to secure by Letters Patent of the United States—

1. In a weighing-balance, a weight-beam having lateral extensions, in combination with one or more elongated elastic pivots held in tension between such extensions, substantially as set forth.

2. In a weighing-balance, in combination with a torsional pivot or pivots, as bands or wires of metal or other suitable elastic material, a beam provided with lateral projections between and upon which as struts the pivots are stretched and held in tension, as set forth.

3. In a torsional balance, in combination with a beam having lateral projections, a pivot or pivots held between said extensions, and means, substantially as described, for holding the pivot or pivots in tension, substantially as set forth.

4. A weighing-balance embodying one or more steelyard-beams suitably fulcrumed and provided with sliding weight-indicators, one or more torsional terminal pivots maintained in tension upon said beam or beams, and a scale-pan or equivalent support for the weighed body, in combination, substantially as set forth.

5. In a weighing-balance, the combination of two pivoted beams or levers fulcrumed in the same vertical plane, carrying terminal torsional pivots maintained in tension upon the beams or levers in horizontal planes, and a vertical standard or support for the scale-pan or weight-support secured firmly to said terminal pivots, substantially as set forth.

6. In a weighing-balance, the combination of a pivoted beam, a torsional pivot secured to said beam at its end across its axis in a horizontal plane, and a scale-pan support secured directly and rigidly to said end torsional pivot, substantially as set forth.

7. In a weighing-balance, the combination of a beam having its supporting-fulcrum acting torsionally and provided with a terminal torsion-pivot secured rigidly to said beam, and a platform secured to and suspended from said terminal torsion pivot, essentially as set forth.

8. In a weighing-balance, the combination of a beam supported on a torsional pivot and having a terminal torsional pivot on one side of the fulcrum-pivot and a sliding weight on the other side, a parallel beam supported on a torsional pivot in the same vertical plane as the first-named, and having also a torsional terminal pivot, and a pan-support rigidly attached to the terminal torsional pivots of both beams, essentially as set forth.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

ALFRED SPRINGER.
FREDERICK A. ROEDER.

Witnesses:
L. M. HOSEA,
R. M. HOSEA.