(No Model.)

L. M. HOSEA & A. SPRINGER.

MOLECULAR PIVOT BALANCE.

No. 352,753. Patented Nov. 16, 1886.

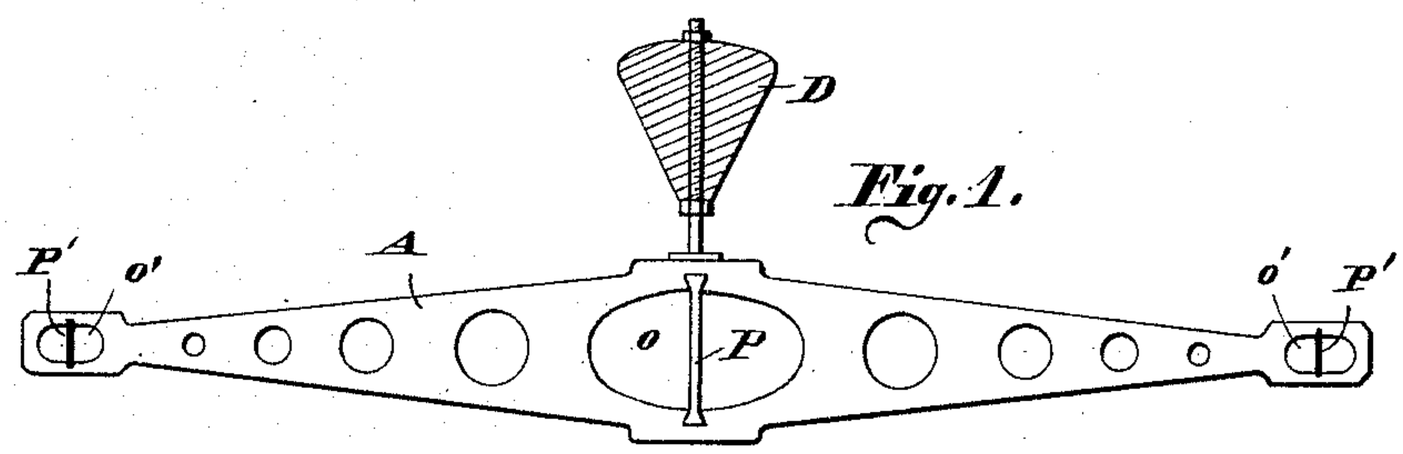

Fig. 1.

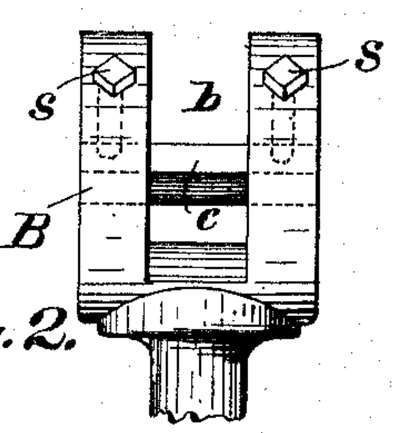

Fig. 2.

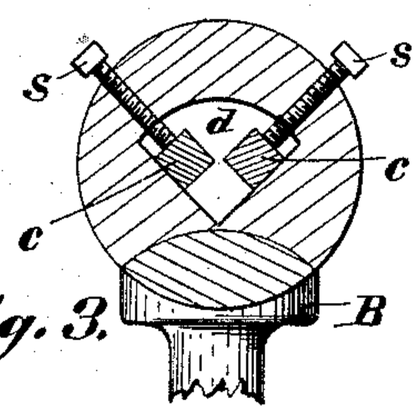

Fig. 3.

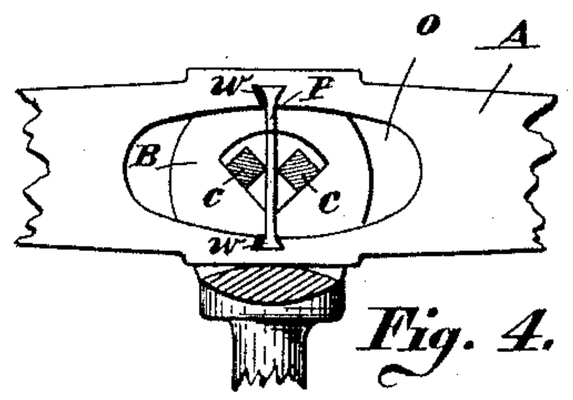

Fig. 4.

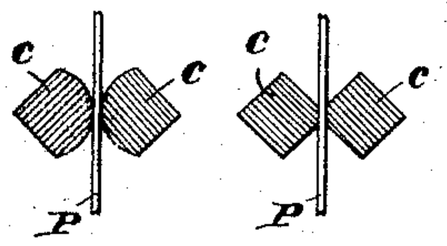

Fig. 6.

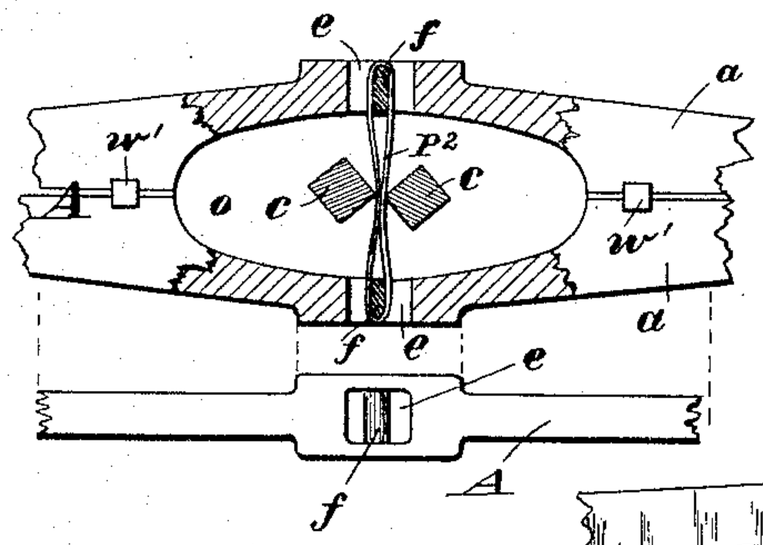

Fig. 7.

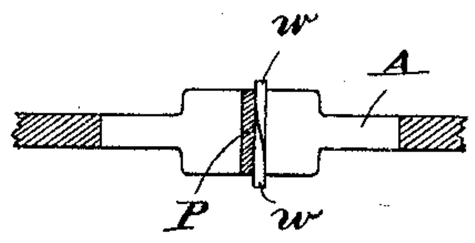

Fig. 5.

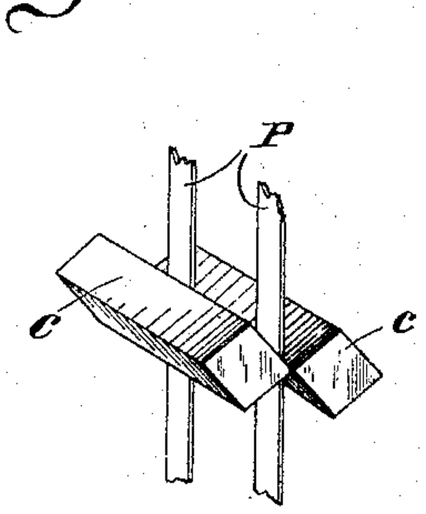

Fig. 10.

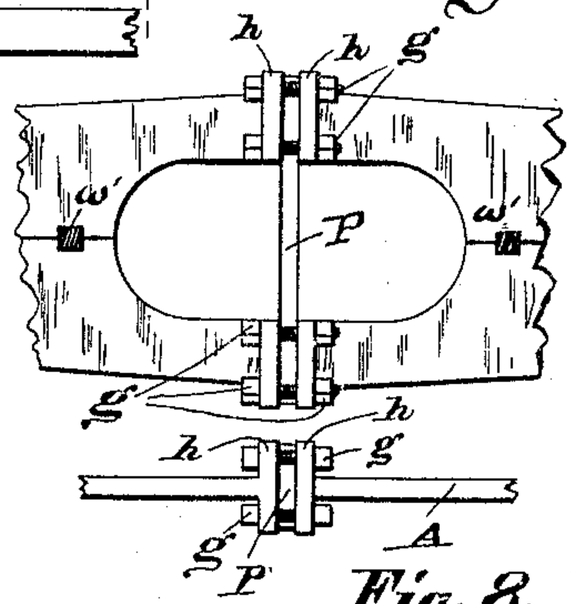

Fig. 8.

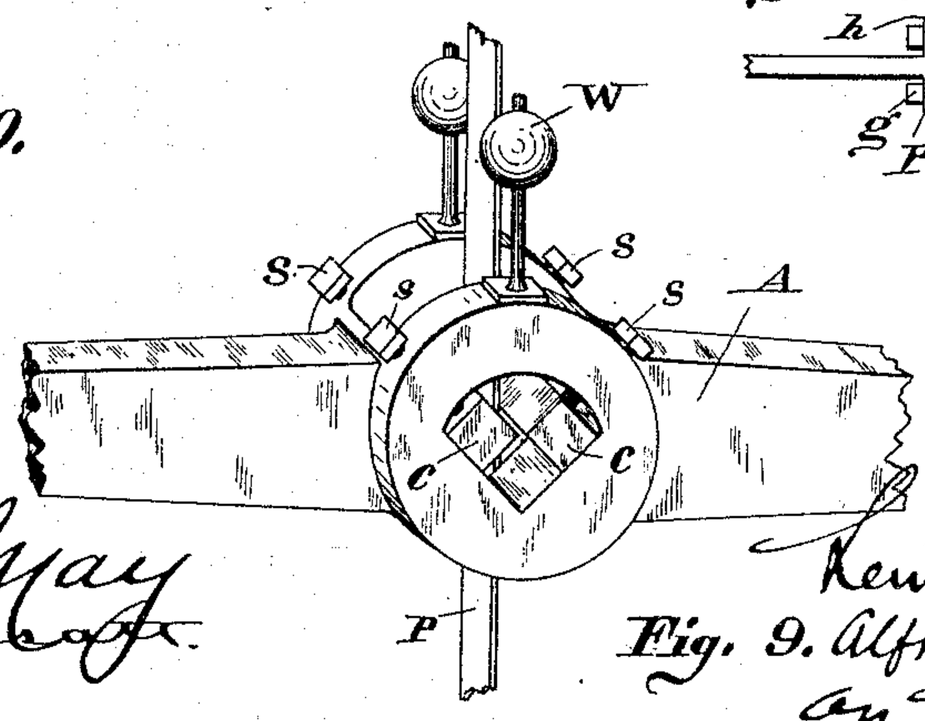

Fig. 9.

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UNITED STATES PATENT OFFICE.

LEWIS M. HOSEA AND ALFRED SPRINGER, OF CINCINNATI, OHIO, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE UNITED STATES TORSION BALANCE AND SCALE COMPANY, OF JERSEY CITY, NEW JERSEY.

MOLECULAR PIVOT-BALANCE.

SPECIFICATION forming part of Letters Patent No. 352,753, dated November 16, 1886.

Application filed May 1, 1885. Serial No. 164,118. (No model.)

To all whom it may concern:

Be it known that we, LEWIS M. HOSEA and ALFRED SPRINGER, citizens of the United States, residing at Cincinnati, Ohio, have invented new and useful Improvements in Molecular Pivot-Balances, of which the following is a specification.

Our invention relates to molecular pivot-balances, having reference particularly to that class wherein the principle of flexion is employed, its object being, primarily, to produce a flexion joint or bearing for such balances by which the oscillation of the beam shall be concentric with the axis of the fulcrum-pivot and avoid the difficulty inherent in such balances as heretofore constructed, in which the balance-beam, whether the flexion-pivot be used compressionally or torsionally, oscillates eccentrically to the fulcrum and involves a varying lineal relation between the fulcrum and load-suspension pivots.

To this end it consists, primarily, in an elastic fulcrum-bearing for balances and other oscillating beam structures embodying one or more elastic plates, wires, or strips constituting a pivot secured between holding-abutments perpendicularly to the linear axis of the beam at opposite sides of the axis of rotation, and clamped at such axis of rotation between blocks or abutments, whereby the rotation of the beam is directly opposed by the flexion and lineal tension of the pivot; and it consists, further, in certain details of construction and adjustment whereby the principle of the invention may be more practically and efficiently utilized, all as more fully hereinafter set forth.

Mechanism embodying a preferred mode or modes of applying our invention is illustrated in the accompanying drawings, in which—

Figure 1 is a general side view of a scale-beam with the flexion-pivots applied thereto according to our improvement; Fig. 2, an end view (partial) of the beam-pedestal; Fig. 3, a side view, vertically sectioned, of the beam-pedestal showing the adjustable holding-clamp for the fulcrum-pivot; Fig. 4, a partial side elevation of the beam mounted on its pedestal; Fig. 5, a partial plan section of the beam, showing one mode of securing the fulcrum-pivot thereto; Fig. 6, vertical cross-sections of the pivot-holding clamps, showing variations of form of the clamping-surfaces; Fig. 7, a side elevation, partially sectioned, of the beam, showing a modified construction and mode of mounting the pivot thereon, and a plan view of the same; Fig. 8, side elevation and plan views of the beam, showing a further modification in the mode of securing the pivot thereto; Fig. 9, a perspective partial view of a beam in which the arrangement of the pivot is reversed—that is, the pivot is fixed by its end to the pedestal and the beam attached intermedially; and Fig. 10, a perspective of a pivot of double strips arranged in a common plane.

Referring now to the drawings, A designates the balance-beam to which our invention is applied. The beam is widened centrally in the plane of its oscillation, and there provided with an opening, *o*, between holding-abutments, constituted by the upper and lower walls of which aperture, the pivot P is secured perpendicularly to the linear axis of the beam. In the simplest form of our invention the pivot P is a thin plate of steel, or other highly-elastic metal, of substantially rectangular lineal dimensions, or may be composed of two or more strips arranged side by side with greater or less intervals between, (as indicated in Fig. 10,) the ends of which plate or strips may be fitted in shallow cross-grooves of the beam and held by wedges *w w*, as indicated in Figs. 4 and 5, and for greater security the ends of the pivot plate or plates may be thickened in wedge form and the grooves cut to correspond, as shown. The outer ends of the beams may be also similarly apertured, as at *o'*, and similarly provided with pivots P'; or our improvement may be confined to the fulcrum-pivot, or applied to the load-suspension pivots, either exclusively. In either case the description as to construction will apply.

A convenient construction of the beam-pedestal is indicated in Figs. 2 and 3, in which the head of the pedestal B, recessed from side to side, longitudinally, as at *b*, to admit the beam, and perforated centrally through the

sides, as at *d*, to admit the bars or blocks *c* constituting clamping-abutments. The latter rest upon the inclined lower surfaces of the perforations *d*, exteriorly between the two sides of the pedestal from outside to outside and through the recess *b*. These bars or blocks *c* are preferably of steel, gun-metal, or other hard metal, and may be of square section, as shown in Fig. 3, or rounded or flattened at the clamping edges, as shown in Fig. 6, the form first shown being preferred. Set-screws *s s*, threaded in the sides of the pedestal-head, impinge against the bars, near each outer end, and move the bars downward upon the inclined lower surfaces of the opening *d*, by which they are adjusted toward each other, and clamp the plate or plates P firmly between them. By suitable manipulations of the set-screws, as will be obvious, the beam may be exactly adjusted in its proper vertical longitudinal plane, and also (with reference to the neutral plane of its pivot) in a truly-balanced position horizontally. The pivot thus mounted is, when at rest, subjected, by the weight of the beam, to both compressive and tensional strain, and when the beam is deflected the minor resistance of the pivot, due to deflection, is merged in and absorbed by the resistance caused by the enforced lineal expansion of the pivot, provided the latter is secured at its ends immovably. This circumstance renders it possible to employ much lighter, and, consequently, more elastic, material for the pivot than in ordinary flexion-balances, and in delicate scales the pivot may be so lengthened as to secure an exceedingly delicate action. The molecular resistance of the pivot to the oscillation of the beam is counteracted by a poise-weight, D, mounted upon a standard rising from the beam.

In some cases, especially in smaller balances, the pivot may be composed of an elongated plate, P^2, or band, formed, preferably, as an endless loop, (shown in Fig. 7,) for which purpose the beam A may be perforated vertically, as at *e e*, with horizontal bridges *f* inserted across the openings, on which the band is stretched and suitably tensioned. The tensioning may be accomplished by dividing the beam horizontally into two parts, *a a*, Fig. 7, held apart by wedges *w'*, thus stretching the band P^2 upon its holding-bars. Instead of doubling the band in this manner a single band may be employed, secured by its ends by wrapping upon the holding-bars *f*, and similarly tensioned.

A modification in the means for securing the pivot is shown in Fig. 8, in which the beam is divided vertically in a plane perpendicular to its linear axis, into two equal parts, each meeting face being flanked laterally by flanges *h h*, for the insertion of holding screws or bolts *g*, by which the two parts of the beam are united, clamping the pivot plate or strips P between them.

It is possible to reverse the order of connection herein described, and attach the pivot to the pedestal and the beam to the pivot between its ends, as illustrated in Fig. 9, and such we deem within the spirit of our invention, and is, perhaps, preferable in delicate balances; but for balances constructed for commercial uses the construction first described is preferred.

Among the prominent advantages secured by our invention are, that the abnormal depression, commonly called "sagging," of the fulcrum-pivot is practically avoided. The strain of weight upon the pivot, caused by loading the beam, is thus borne by the pivot in the direction of its length, instead of perpendicular thereto, as in the case of torsion pivots, this being at all times so far within the limits of elastic tension as to cause no appreciable lengthening of the pivot from this source, while the flexing and consequent forced expansion of the pivot by the oscillations of the beam under load is accomplished by so great a leverage as to afford comparatively little molecular resistance to such oscillation, and as renders the action of the poise as efficient as in the case of torsional balances. Thus it becomes particularly useful in the cases of balances employing a multiplied leverage in which the accurate linear relations between the several fulcrums remain thereby unimpaired.

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

1. In a weighing-balance or other structure, in combination with a vertically-oscillating beam, an elastic fulcrum-pivot (such as a band or strip of metal) tensioned vertically between holding-abutments arranged at opposite sides of the axis of beam-rotation, substantially as set forth.

2. In combination with the vertically-oscillating beam of a weighing-balance or other beam structure, an elastic pivot (such as a band or strip of metal) secured vertically in lineal tension upon the beam across the axis of beam-rotation, and a beam-support clamping the pivot at the axis of rotation, substantially as set forth.

3. In a weighing-balance or other beam structure, the combination of a balance-beam, holding-abutments arranged vertically at opposite sides of the axis of rotation upon said beam, an elastic fulcrum-pivot secured between such abutments, and a supporting-standard engaging said pivot between such holding-abutments, as set forth.

4. In a weighing-balance or other beam structure, the combination of two vertically-arranged holding-abutments, an elastic pivot held in tension between such holding-abutments, and a balance-beam secured to and oscillating upon such pivot, the connection being such as to oppose the combined pivoted resistances of flexion and tension to oscillations of the beam, substantially as set forth.

5. In a flexion pivot-balance, in combination with the beam and a pivot arranged perpendicularly thereto, a pivot-clamping device embodying, essentially, two holding-

blocks, adjustable vertically in relation to and at opposite sides of the pivot to regulate the neutral relation of the pivot to the beam, substantially as set forth.

6. In a flexion pivot-balance, the adjustable clamping device for the pivot or pivots, embodying a holding-head, B, clamping bars or blocks *c*, and set-screws *s*, combined and arranged as set forth.

7. A pedestal-support for flexion balance-beams, consisting of a head, B, recessed, as at *b*, laterally perforated, as at *d*, and provided with holding-blocks *c*, substantially as set forth.

8. In a flexion-balance, the combination of an elastic pivot, *p*, secured at each end to the beam, and a beam in two parts, divided longitudinally and adjustable apart, to tension the pivot, substantially as set forth.

9. In combination with the beam A, longitudinally divided, as shown, an elastic pivot, P, and adjusting-wedges *w*, substantially as set forth.

10. In a flexion-balance, a perforated beam divided into two parts perpendicularly across its linear axis, in combination with an elastic pivot secured across the perforation and between the two parts of the beam, and means, substantially as described, uniting the parts of the beam, substantially as set forth.

11. A beam for flexion pivot-balances, perforated laterally, in combination with an elastic plate or pivot secured to the beam across the perforation perpendicularly to the linear axis of the beam, substantially as set forth.

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

LEWIS M. HOSEA.
ALFRED SPRINGER.

Witnesses:
ABRAM MAY,
JOSEPH COX, Jr.