No. 789,781. PATENTED MAY 16, 1905.

P. H. WYNNE.

BALANCE.

APPLICATION FILED NOV. 4, 1904.

Fig. 1.

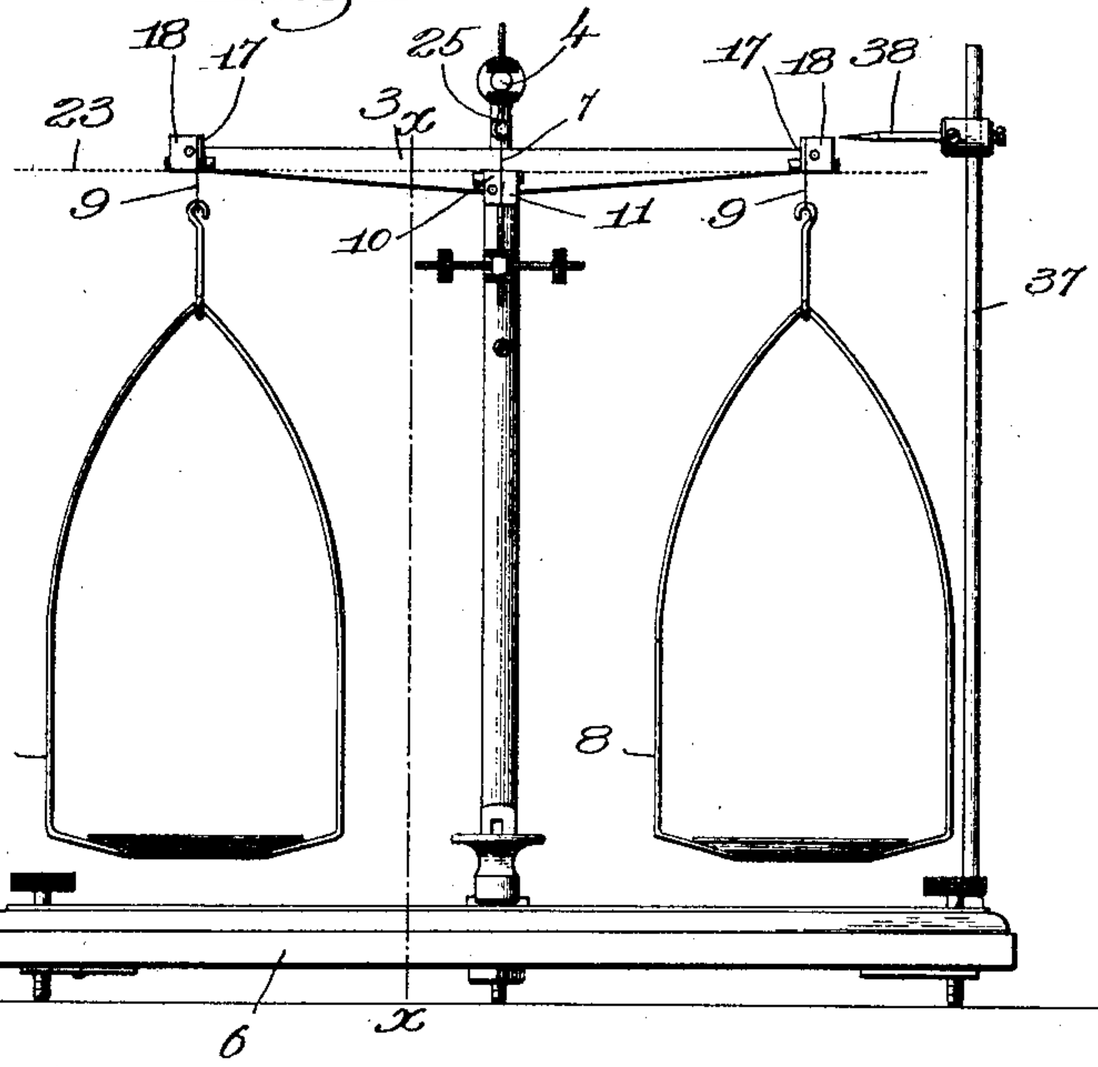


Fig. 2.

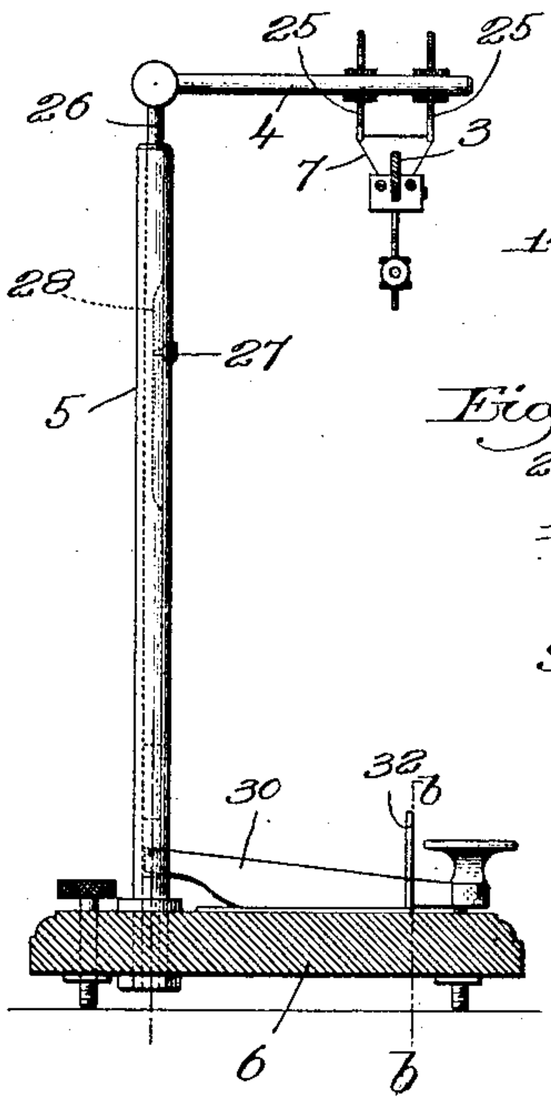


Fig. 7.

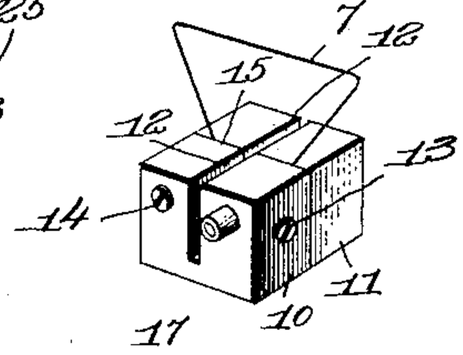


Fig. 8.

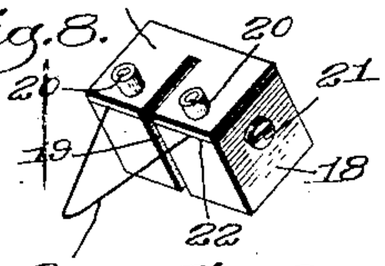


Fig. 9.

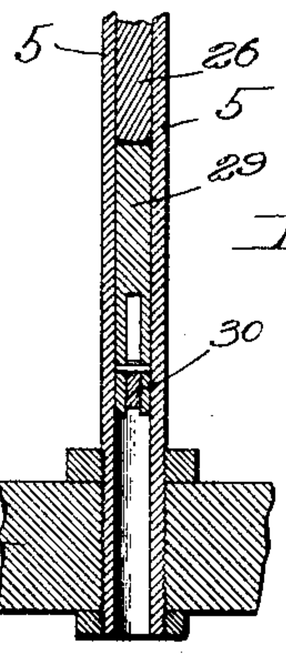


Fig. 3.

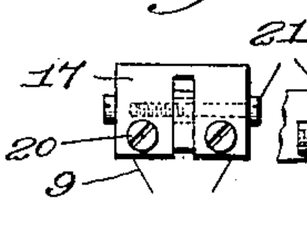


Fig. 4.

Fig. 5.

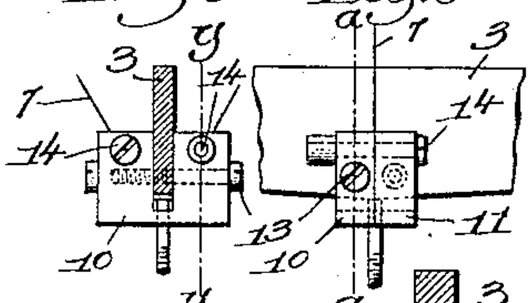


Fig. 6.

Fig. 11.

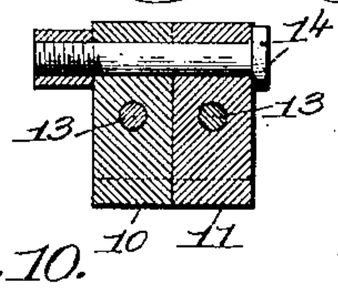


Fig. 12.

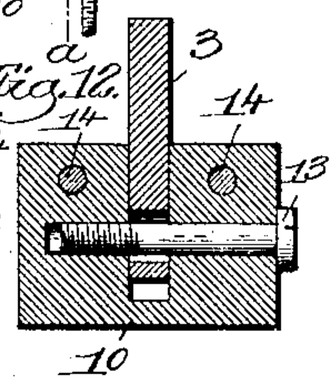
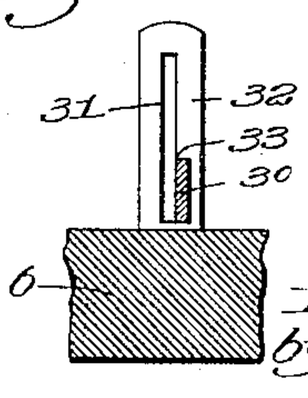


Fig. 10.



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S. Wm. Lutton

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by Crosby Gregory.
Attys.

No. 789,781. Patented May 16, 1905.

UNITED STATES PATENT OFFICE.

PHILIP HENRY WYNNE, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO L. E. KNOTT APPARATUS COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS, AND ONE-HALF TO AGNES WYNNE, OF BOSTON, MASSACHUSETTS.

BALANCE.

SPECIFICATION forming part of Letters Patent No. 789,781, dated May 16, 1905.

Application filed November 4, 1904. Serial No. 231,330.

To all whom it may concern:

Be it known that I, PHILIP HENRY WYNNE, a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Balances, of which the following description, in connection with the accompanying drawings, is a specification, like numerals on the drawings representing like parts.

This invention relates to balances, and has for its object to provide a simple and inexpensive balance which will be extremely sensitive in operation and which is so constructed that there is practically no possibility of its losing its sensitiveness through rough handling.

Most balances or scales as now constructed are provided with knife-edges at the fulcrum-points, and to insure the necessary degree of sensitiveness it is important that the center knife-edge about which the beam turns should be in the same plane as the knife-edges at the end of the beam upon which the weight-supporting devices are suspended and that each of the latter knife-edges should be exactly the same distance from the center knife-edge. To obtain this necessary precision in the relative position of the knife-edges entails considerable labor and skill in manufacture, and as a consequence scales or balances which are at all sensitive are more or less expensive. Moreover, unless these implements are used with extreme care the knife-edges are apt to become chipped and broken, and when this occurs the sensitiveness of the implement is destroyed and it is rendered of practically no value.

It is the purpose of my present invention to provide a novel balance in which no knife-edges are used and which is as sensitive if not more sensitive than any knife-edge balance. I accomplish this object by suspending the beam centrally of its length by means of a flexible cord and by supporting the weights and the articles to be weighed from the ends of the beam by means of similar cords, which are secured to the beam ends. I find that a satisfactory way of securing the cords to the beam is to employ clamping members which are carried by the beam and between which the cords are clamped. One pair of clamping members is secured to the beam at its central portion and other pairs at the ends thereof. The flexibility of the various cords permits the beam to tip, and by properly locating these clamping-surfaces with relation to each other and by employing a cord of the proper construction it is possible to construct a balance which is as sensitive as the most nicely constructed knife-edge balance, but which is very much less expensive and which will withstand comparatively rough handling without any danger of injury.

Referring to the drawings, Figure 1 is a front view showing one form of my improved balance. Fig. 2 is a section on line *x x*, Fig. 1. Fig. 3 is an end view of the beam. Fig. 4 is a side view of Fig. 3. Fig. 5 is an enlarged section through the beam on line *x x*, Fig. 1. Fig. 6 is a side view of Fig. 5. Fig. 7 is a perspective view of the pair of centrally-located clamping members. Fig. 8 is a perspective view of one of the pairs of clamping members at the ends of the beam. Fig. 9 is a vertical section through the lower end of the standard. Fig. 10 is an enlarged section on the line *b b*, Fig. 2. Fig. 11 is a section on the line *y y*, Fig. 5. Fig. 12 is a section on the line *a a*, Fig. 6.

3 designates the beam of my improved balance, and it is shown as suspended from an overhanging arm 4, carried by a suitable standard 5, which rises from a base 6 of any suitable or usual construction. Said beam is suspended from the arm 4 by means of a cord 7, and the scale-pans 8 are suspended from the ends of the beam by other cords, 9. These cords may be secured to the beam in any suitable way; but I prefer to clamp each cord between a pair of clamping members which are carried by the beam. Said clamping members may be made of various shapes and attached to the beam in various ways without departing from my invention. I have found,

however, that the clamping members such as shown in the accompanying drawings make a very satisfactory means for thus securing the cords to the beam. In the scales herein illustrated the cord 7, by which the beam is suspended, is clamped between two clamping members 10 and 11, which are secured to the beam at its central portion. Said clamping members are best shown in Fig. 7, and each comprises a block having a slot 12 formed therein, in which slot the beam is received. These clamping members are secured to the beam by clamping-screws 13, and the two members are clamped together for clamping the cord 7 therebetween by means of other clamping-screws, 14. At the point where the cord 7 leaves the beam I have provided two meeting edges between which the cord is held, the line in which said edges meet constituting what I have called a "fulcrum edge." For convenience of construction I have used the two edges of the clamping-faces as the fulcrum edge; but this construction is not essential to the invention. The clamping members of each pair at the ends of the beam are designated by 17 and 18, respectively, the member 17 preferably being in the form of a thin plate, while the member 18 is more in the nature of a block. Each member is provided on its under side with a slot 19, in which the beam is received, and the two members are clamped together, thereby to clamp the weight-suspending cord 9 therebetween by means of clamping-screws 20. The member 18 is clamped to the beam by means of any suitable clamping-screw 21. The edges 22 of the clamping members where the weight-suspending cord leaves the clamping-faces of said members coincide with each other and form a fulcrum edge about which the cord 9 flexes as the beam tips. In order to make the balance extremely sensitive and accurate, it is important that the two fulcrum edges 22 should be in the same plane as the fulcrum edge 15, so that a right line, such as the dotted line 23, will pass through all of said edges. I will preferably make the holes in the beam through which the clamping-screws 13 and 21 pass slightly larger than said screws, thereby enabling the various clamping-blocks to be adjusted sufficiently on the beam to meet the above conditions. It is also necessary that both the fulcrum edges 22 should be the same distance from the fulcrum edge 15. Where these conditions are met and a cord of the proper construction is used, the scales will be fully as sensitive and accurate as the most perfectly-constructed knife-edge scales.

In the above description and in the claims I have used the term "fulcrum edge" to designate the edges or lines in which the cords leave the beam and about which edges the cords flex as the beam turns. To simplify the construction, I employ the meeting edges of each pair of clamping-surfaces as a fulcrum edge; but such construction is not essential to the invention. It will be noted that the fulcrum edges have a function quite distinct from that of the clamping-surfaces. The cord which I prefer to use is one which flexes easily, but is non-resilient.

It will be noted that the cords 7 and 9 are bent to form loops, the ends of each cord being clamped between the corresponding clamping members. For steadying the beam I prefer to suspend the cords 7 upon two hooks 25, as best seen in Fig. 2, although this is not essential to the invention.

I have herein illustrated the arm 4 as having integral therewith a vertical arm 26, which is slidably mounted in the standard 5, said arm 26 being held from turning by a suitable pin or screw 27, which plays in a slot 28 in said arm. The lower end of the arm rests upon a thrust-pin 29, situated within the standard 5. The lower end of the thrust-pin is forked, and between the branches of the fork thereof is received one end of a key-lever 30, the other end of which is received in a slot 31 in a guide member 32. When the scales are not in use, the arm 4 is lowered sufficiently so that the weight of the scale-pans is taken from the weight-suspending cords 9. To raise the beam, the key end of the lever 30 is depressed and caught under a retaining-shoulder 33, the rocking movement of such lever elevating a thrust-pin 29, and consequently the arm 26, thereby lifting the beam sufficiently to carry the scale-pans off from the plate 6.

38 designates a gage or pointer for use in determining when the beam is exactly level. Said gage is illustrated as being adjustably carried by a standard 37.

While I have illustrated herein one simple embodiment of my invention, I do not wish to be limited to the construction shown, as it will be obvious that the principle underlying the invention may be embodied in balances constructed differently from that herein illustrated.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In balances, a beam having between its ends a pair of opposed clamping-surfaces and two alined edges, a pair of clamping-surfaces and two alined edges either side of said first-named clamping-surfaces, a cord by which the beam is suspended, said cord being clamped between the first-mentioned pair of clamping-surfaces and passing between the corresponding alined edges, and a weight-supporting cord secured between the clamping-surfaces of each of the other pairs and passing between the corresponding alined edges, each pair of alined edges constituting a fulcrum edge over which the corresponding cord flexes.

2. In a balance, a beam having between its ends a pair of opposed clamping-surfaces and a fulcrum edge, and adjacent each end another

pair of opposed clamping-surfaces and a fulcrum edge, a non-resilient cord clamped between the first-named clamping-surfaces and by which the beam is suspended, and a non-resilient weight-supporting cord secured between the clamping-surfaces adjacent each end of the beam, all the cords flexing over the fulcrum edges as the beam oscillates.

3. In a balance, a beam having centrally thereof and at each end a pair of opposed clamping-surfaces, the central pair of clamping-surfaces terminating at their upper side in a fulcrum edge, and the clamping members of each pair at the end of the beam terminating at their lower sides in a fulcrum edge, a cord secured between the centrally-located clamping-surfaces and by which the beam is suspended, and a weight-supporting cord secured between each of the pairs of clamping-surfaces at the ends of said beam.

4. In a balance, a beam having centrally thereof and at each end a pair of opposed clamping-surfaces, the central pair of clamping-surfaces terminating at their upper side in a fulcrum edge, and the clamping-surfaces of each pair at the ends of the beam terminating at their lower sides in a fulcrum edge, a cord secured between the centrally-located clamping-surfaces and by which the beam is suspended, and a weight-supporting cord secured between each of the pairs of clamping-surfaces at the ends of said beam, said fulcrum edges all being in the same plane.

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

PHILIP HENRY WYNNE.

Witnesses:

LOUIS C. SMITH,

ELIZABETH R. MORRISON.