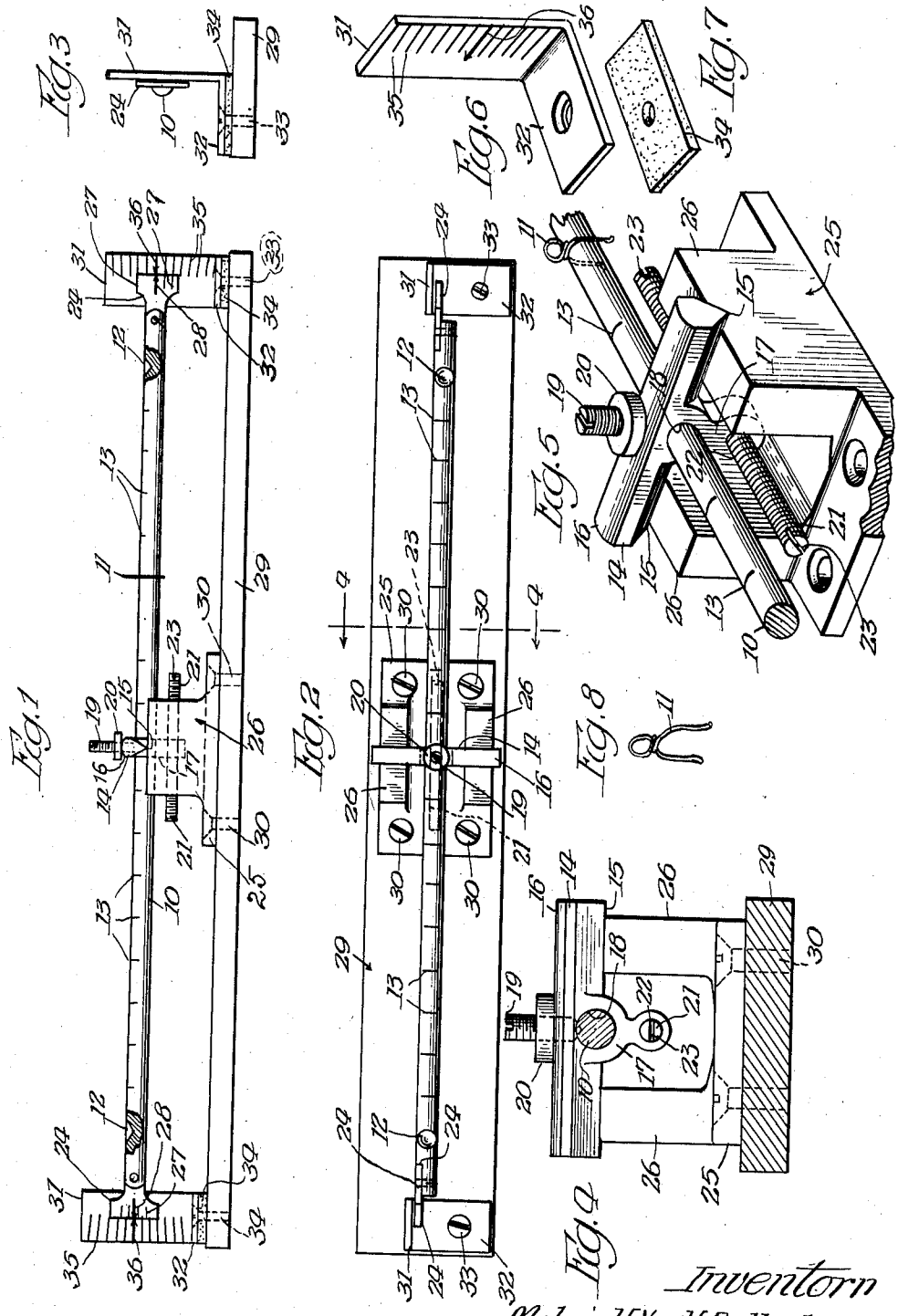
Feb. 27, 1940. M. H. VAN H. BATTENBERG 2,191,635

BALANCE

Filed May 29, 1936



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Patented Feb. 27, 1940 2,191,635

UNITED STATES PATENT OFFICE

2,191,635

BALANCE

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Application May 29, 1936, Serial No. 82,553

7 Claims. (Cl. 265—54)

This invention relates to improvements in balances for weighing, and one of the objects of the invention is to provide a conveniently portable balance, which is particularly adapted, though not necessarily limited in its use, for weighing the small beads or buttons of metal produced in blowpipe, or similar assays, and also grains or fragments of metal found in panning by prospectors, with sufficient accuracy to permit a reasonably close estimate of value in the field.

A further object is to provide in a balance of this character improved means permitting adjustment or refinement, with variations in size, for the higher accuracy desired in laboratory determinations, particularly in checking rider weights against each other or against a rider weight of standard value.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawing illustrating this invention, and in which

Figure 1 is a side elevation, partly broken away, of an improved balance of this character constructed in accordance with the principles of this invention.

Figure 2 is a top plan view of Figure 1.

Figure 3 is an end elevation of Figure 1.

Figure 4 is a view taken on line 4—4, Figure 2, on an enlarged scale.

Figure 5 is a detail perspective view, partly broken away, showing the central portion of the balance and the supporting fulcrum, on an enlarged scale.

Figure 6 is a detail perspective view of one of the vernier plates.

Figure 7 is a detail perspective view of one of the supporting blocks for the vernier plates.

Figure 8 is a detail perspective view of a rider weight.

The balance consists essentially of a beam 10 which is preferably solid and is of any desired size and configuration, but is preferably round in cross section so as to permit of an easy placement and adjustment of a rider weight 11 thereupon.

At each end of the beam there is preferably provided a depression 12 which may be of any desired depth and configuration but is preferably conical and forms a pan or receptacle to receive and automatically center the object to be weighed, other than a rider weight.

The beam 10 is marked with graduations 13 arranged any desired distance apart, but the beam is preferably graduated into tenths on either side of the center of the beam, the last graduation on each side of the center or adjacent the extremities of the beam being formed by the depression 12.

The numeral 14 designates a bearing bar which is provided with a knife edge 15 at the bottom thereof and a rounded surface 16 at the top thereof, and this construction is preferable as the distribution of weight affects the balancing, the radius of the curved top being preferably struck from the knife edge.

The bearing bar is provided with a depending portion 17 having an opening 18 therethrough and through which opening the beam 10 passes, the opening 18 being of a size that the beam will closely fit the same, and the beam and the bearing bar are secured together in any suitable manner, such as by means of a screw 19 passing through the bearing bar and contacting the beam. A nut or collar 20 is threaded upon the screw 19 and the latter projects for any desired distance above the bearing bar so that the nut or collar 20 may be adjusted vertically with respect to the screw 19 and thereby vary or control the location of the vertical center of gravity of the entire structure without changing the center of gravity of the beam itself.

The bearing bar 14 is disposed at right angles to the length of the beam and extends for any desired distance on each side thereof, the knife edges on each side of the beam being located centrally with respect to the beam and also centrally with relation to the height or diameter of the beam.

Passing also through the depending portion 17 of the bearing bar, directly below and parallel with the beam 10, is a bar or member 21 having threads thereon and this threaded bar, screw or member 21 passes through a threaded opening 22 in the depending portion 17 of the bearing bar and may be provided at one end with a seat 23 for the reception of a tool or implement for rotating the bar 21 so as to adjust the latter in the direction of its longitudinal axis and also lengthwise of the beam 10 so as to properly balance the beam, the member 21 serving as a counter-balancing screw for balancing the beam on its knife edge 15 as a check on the construction and workmanship.

When assembling the balance, the bearing bar 14 carrying the knife edge 15 is assembled first with respect to the beam 10 with the means for adjusting its balance. The set screw 19 is then

placed in position and adjusted to bind the beam and bearing bar together. The nut or collar **20** is then adjusted, after which the counter-balancing screw or member **21** is adjusted.

Connected to each of the ends of the beam **10**, in any desired or suitable manner, is a vernier plate **24**, here shown as having a portion of the plate seated in a bifurcation in the end of the beam, and a fastening device such as a rivet or other fastening means passes through the walls of the bifurcation and through the vernier plate **24**.

The numeral **25** designates a fulcrum block which is preferably provided with two laterally spaced pillars **26**, the tops of which are preferably hard and polished, and on these polished surfaces the knife edge **15** of the bearing bar **14** rests when the balance is set up for use.

On the vernier plates **24** at the ends of the beam are graduations **27** and which graduations are preferably spaced in sixteenths of an inch, and an indicating central pointer or indication **28** is provided on the vernier plates to indicate the points on either side of which the reading is to be taken.

The fulcrum block **25** is mounted upon a base **29** of any suitable construction and the two are secured together in any suitable manner as by means of fastening screws **30**.

At the end of the base **29** and in proximity to the vernier plates **24** at the ends of the beam **10**, are arranged stationary vernier plates **31**, which are preferably provided with a base **32** by means of which they may be secured to the base **29** through the medium of fastening or anchor screws **33**, and interposed between the base **32** of each of the vernier plates **31** and the base **29** is a resilient element **34**, such as rubber or the like. The purpose of these resilient elements is to permit of a little variation in the elevation of the vernier plates **31** at the ends of the base **29** and in proximity to the vernier plates **24**, to bring the indexed graduations **27** on the vernier plates **24** at the ends of the beam in line with the graduations **35** on the plates **31**, and this may be accomplished by adjusting the anchor or fastening screws **33**.

Obviously, spring metal or any other suitable means of adjustment may be provided to accomplish this result.

The graduations **35** on the stationary vernier plates **31** are disposed radially from the line of contact of the knife edge **15** of the bearing bar upon the fulcrums **26** and the spacing of the graduations **35** on the vernier plates **31** are preferably in twelfths of an inch, while the spacing of the graduations **27** on the vernier plates **24** at the ends of the beam are preferably in sixteenths of an inch, both at the contacts ends of the lines or graduations where they are read off. A central indicating mark or character **36** is also provided on each of the stationary vernier plates **31** to indicate the point from which the readings are made on one side or the other of the indication **36**.

Obviously, the vernier plates at the ends of the base may be graduated as desired, as may also the vernier plates at the ends of the beam, and the device may be made to read as closely as the workmanship will permit.

In the present exemplification of the invention, however, the vernier graduation is roughly represented as four divisions on the beam end equal to three on the stationary vernier plates, which will read to one-quarter of a division on the stationary plate. If the beam is balanced and adjusted to move one division on the stationary plate for one-tenth of a milligram, it is possible, with the vernier to read to one-quarter of the tenth, or one-fortieth of a milligram.

The adjustment for balancing the beam is made by varying the position of the counterbalance screw or member **21**, and by varying its size and weight the relations of the beam and counterbalance may be adjusted so that the beam will be deflected a given distance by a given weight in the pan or cavities **12**, or by a rider weight on the beam. Obviously, the nut or collar **20** may be adjusted upon the screw **19** to vary the center of gravity vertically of the assembled beam, after having established its center of gravity horizontally by the screw or member **21**, and thus vary the movement of the beam as delicately as workmanship will permit.

The movable vernier plates **24** at the ends of the beam, as well as the stationary vernier plates **31** are graduated to read either way respectively from the index lines **28** and **36**, and together they constitute what is termed a "folded vernier".

While the preferred form of the invention has been herein shown and described, it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:

1. A balance for weighing, embodying a beam, and vernier graduations at both ends of said beam.

2. A balance for weighing embodying an oscillatory beam, vernier graduations at each end of the beam, a stationary plate at each end of the beam, and vernier graduations on said plate adjacent which the vernier graduations at the respective ends of the beam are adapted to be read, one of the graduations on each of the plates marked as an index or pointer whereby a weight may be read by the oscillation of the beam and at each end of the beam.

3. A balance for weighing embodying a beam, a bar through which the beam passes, said bar extending for a substantial distance on opposite sides of and being disposed at right angles to the beam, knife edges in said bar, a vertical screw threaded into the bar to engage the beam and extending for a substantial distance above the beam, and a weight threaded upon said screw and vertically adjustable thereon with respect to the beam, for varying the vertical center of gravity of the assembled beam.

4. A balance for weighing embodying a beam, a bar secured to the beam for adjustment lengthwise of the beam and projecting beyond both sides of the beam and at right angles thereto, knife edges on the bar for engaging a fulcrum, vernier graduations at the ends of the beam, rider weight graduations on the beam extending lengthwise thereof on opposite sides of the knife edges, a stationary plate adjacent each end of the beam, vernier graduations on the plates against which the vernier graduations at the respective ends of the beam are adapted to be read, and recesses in the beam constituting receptacles for the article to be weighed.

5. A balance for weighing embodying a beam, a bar secured to the beam for adjustment lengthwise of the beam and projecting beyond both sides of the beam and at right angles thereto, knife edges on the bar for engaging a fulcrum, vernier graduations at the ends of the beam, rider weight

graduations on the beam extending lengthwise thereof on opposite sides of the knife edges, a stationary plate adjacent each end of the beam, vernier graduations on the plates against which the vernier graduations at the respective ends of the beam are adapted to be read, and recesses in the beam constituting receptacles for the article to be weighed, the vernier graduations on said stationary plates being disposed radially with respect to the pivot point of the beam formed by said knife edges on said fulcrums.

6. A balance for weighing embodying a beam, a bar secured to the beam for adjustment lengthwise of the beam and projecting beyond both sides of the beam and at right angles thereto, knife edges on the bar for engaging a fulcrum, vernier graduations at the ends of the beam, rider weight graduations on the beam extending lengthwise thereof on opposite sides of the knife edges, a stationary plate adjacent each end of the beam, vernier graduations on the plates against which the vernier graduations at the respective ends of the beam are adapted to be read, cushioning means beneath each of said stationary plates, and fastening means passing through the base of each of the stationary plates, said cushions, and into a support whereby the vertical position of said stationary plates may be varied at will.

7. A balance for weighing embodying a beam, a bar secured to the beam for adjustment lengthwise of the beam and projecting beyond both sides of the beam and at right angles thereto, knife edges on the bar for engaging a fulcrum, vernier graduations at the ends of the beam, rider weight graduations on the beam extending lengthwise thereof on opposite sides of the knife edges, a stationary plate adjacent each end of the beam, vernier graduations on the plates against which the vernier graduations at the respective ends of the beam are adapted to be read, and recesses in the beam constituting receptacles for the article to be weighed, the vernier graduations on said stationary plates being disposed radially with respect to the pivot point of the beam formed by said knife edges on said fulcrums, the vernier graduations at the ends of said beam being arranged on plates and said plates being secured to the ends of the beam and extending for a substantial distance above and below the beam.

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