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WEIGHING SCALE

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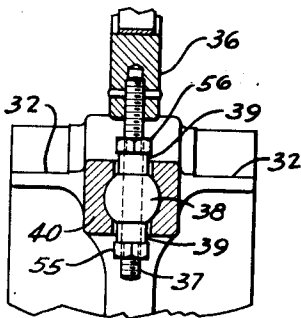


Fig. III

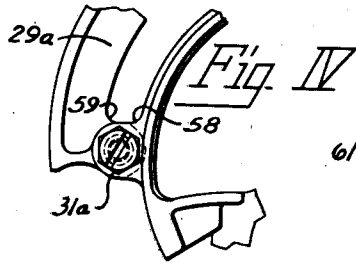
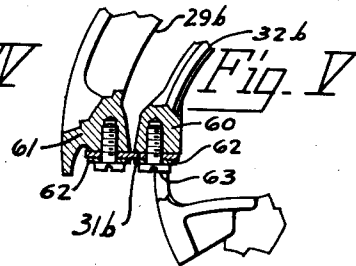
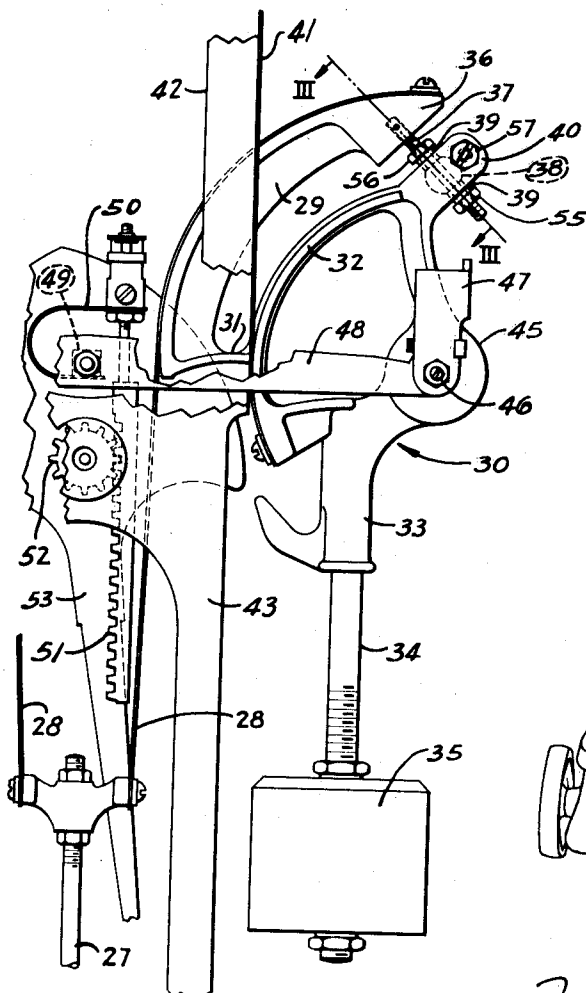


Fig. II

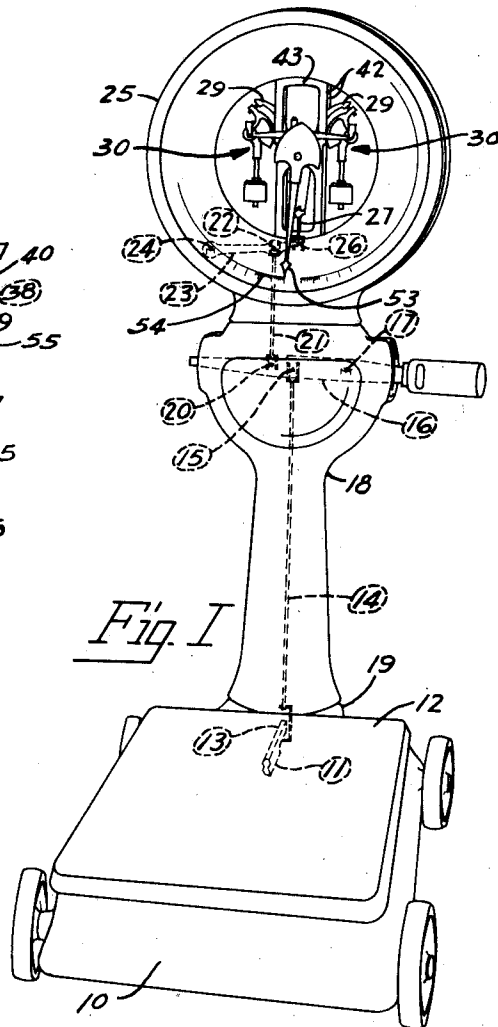


Fig. I

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## UNITED STATES PATENT OFFICE

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## WEIGHING SCALE

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8 Claims. (Cl. 265—62)

This invention relates generally to improvements in weighing scales, and more particularly to improvements in scales employing one or more so-called "floating" pendulums. In fact, the principal object of this invention is the provision of an improved pendulum construction.

Another object is the provision of an improved pendulum construction comprising a plurality of integral fulcrum sectors and a power sector pivotally connected to said fulcrum sectors.

A still further object is the provision of an improved pivot for said power sector; and,

Still another object is the provision of improved adjusting and locking means for said power sector.

These, and other objects and advantages will be apparent from the following description in which reference is had to the accompanying drawings, illustrating a preferred embodiment of the invention and wherein similar reference numerals refer to similar parts throughout the several views.

In the drawing:

Fig. I is a perspective view of the scale embodying the invention.

Fig. II is an enlarged front elevational view of a pendulum according to the invention and showing fragments of its suspension and connection means.

Fig. III is an enlarged sectional view through the sector adjustment substantially along the line III—III of Figure II; and,

Figures IV and V are enlarged fragmentary views of modified means for pivotally mounting the power sector.

Referring to the drawing in detail:

The scale in which the invention is shown embodied is one that is well known and fully described in U. S. Patent 1,543,768 to H. O. Hem and, therefore, it is described herein only so far as is necessary to properly disclose the present invention.

A base 10 houses the usual load supporting lever system 11 which in turn supports a load receiver or platform 12. A nose 13 of the lever system 11 transmits, by means of a connecting rod 14 equipped with the necessary stirrups, the "pull" of the load to a load pivot 15 in a so-called bench lever 16 fulcrumed at 17 in a hollow column 18 which is bolted to an extending portion 19 of the base 10. A power pivot 20, fixed in spaced relation to the pivot 15 in the lever 16, engages a stirrup on a connecting rod 21. The upper end of this connecting rod 21, equipped with a suitable stirrup, transmits this pull to a

load pivot 22 stationed in a short lever 23 fulcrumed at 24 in the interior of a substantially watchcase-shaped housing 25 surmounting the column 18. By means of a power pivot 26 in the free end of the lever 23 and a connecting rod 27 a proportionate amount of the original pull is transmitted to a pair of flexible metallic ribbons 28, which overlie and are fastened to the upper ends of arcuate faces of power sectors 29 of load counterbalancing pendulums 30.

In the embodiment of the invention illustrated in Figure II each of the power sectors 29 is an integral part of the pendulum 30, it being connected by means of a thin section 31 of metal to a pair of smaller concentric fulcrum sectors 32. These fulcrum sectors 32 are also integral with a body portion 33 into which a stem 34 is studded in a vertically depending position and upon which a pendulum weight 35 is adjustably threaded. Into the upper free end 36 of the power sector is studded a threaded adjusting stem 37 which passes through a member 38 having a spherical body and opposed cylindrical extensions 39. The spherical body 38 of this member is positioned in a cylindrical hole drilled in the end of a boss 40 projecting from the upper portion of the pendulum immediately adjacent and between the two fulcrum sectors 32. The cylindrical extensions 39 are positioned in a slot milled through the boss 40. A screw 57 passing freely through one of the arms formed by the milling operation and threaded into the other arm is provided to securely clamp the spherical body 38 in adjusted position. Each of the pendulums 30 is suspended by ribbons 41 from vertically positioned parallel pillars 42 of a sector guide 43 fixedly positioned in the interior of the housing 25 surmounting the column 18. The lower end of these ribbons 41 overlie and are fastened to the lower ends of the arcuate faces of the concentric fulcrum sectors 32.

The places where the flexible metallic ribbons 41 take off from the fulcrum sectors 32 and the place where the flexible metallic ribbon 28 takes off from the power sector 29 lie substantially in the same horizontal plane whether the pendulum 30 be in zero position or in any of its various load-counterbalancing positions, the fulcrum at which the pendulum is supported being at the place where the ribbons 41 take off from the fulcrum sectors 32, and the load being applied to the pendulum at the place where the ribbon 28 takes off from the power sector 29. The thin section 31 is located between the place where the ribbons 41 take off from the fulcrum sectors

and the ribbon 28 takes off from the power sector, when the pendulum 30 is in zero position, so that the distance between the places where the ribbons take off from the sectors when the pendulum is in zero position is not appreciably altered when the thin section 31 is bent. The thin section 31 thus constitutes a bendable connection by means of which the power sector 29 is pivoted at its lower end to the fulcrum sectors 32. A plane perpendicular to the pendulum stem 34, and passing through the pivot formed by the thin section 31, also passes through the places where the ribbons take off from the fulcrum sectors and power sector when the pendulum is in zero position.

A hub 45 which is concentric with the center of curvature of the fulcrum sectors 32 is provided with a steel shaft passing therethrough (not shown). In each of the ends of this shaft a recess is bored and adapted to receive the conical end of a screw 46. These screws 46 are threaded into yokes 47 and pass through compensating bars 48 into the afore-mentioned recess. These yokes and compensating bars thus constitute a slightly deformable frame pivotally connected to the pendulums.

From the foregoing it is evident that when a load is placed upon the platform 12 the connecting rod 14 is pulled downwardly and the pull is transmitted through the levers 16 and 23 to the ribbons 28 thus drawing the power sectors downward and causing the pendulums to swing outwardly and upwardly until the load is offset. As the pendulums swing outwardly the fulcrum sectors 32 roll upwardly upon the ribbons 41 and the afore-mentioned hubs 45 with the therein positioned shafts move vertically upward. This upward movement of the pendulums is utilized to operate the indicating means of the scale. In the illustrated embodiment a cross bar 49 is pivotally mounted between the compensating bars 48 and carries a resilient C shaped member 50 to which is adjustably secured a rack bar 51 whose teeth mesh with the teeth of a pinion 52, on the shaft of which is secured an indicator 53 adapted to pass over a graduated chart 54 suitably secured in the housing 25. When the load offsetting pendulums 30 move upwardly in the load offsetting operation the rack bar 51 is moved upwardly to the same extent thus rotating the pinion 52 and indicator 53 to indicate upon the chart 54 the weight of the load on the platform.

Heretofore pendulums of the type described herein were constructed by assembling two fulcrum sectors, a power sector and a pendulum body on a shaft extending through the hubs of these parts and securing the several sectors into a unit in such a manner that the position of the pendulum body could be adjusted relative thereto. This construction is well adapted to perform all its intended functions but the relatively large amount of accurate machine work and care required in assembling entails considerable expense. Since the amount of adjustment that can be had in the old construction is limited it also requires the interchangeable use of several power sectors for different capacities even when the scales otherwise are identical. Furthermore, the method of adjustment by rocking the entire sector assembly in respect to the body portion changes the location of the center of mass considerably thus requiring a larger number of adjusting operations to bring the scale into weighing condition.

In the present invention the fulcrum sector 29

is integrally connected to the remaining portions of the pendulum by means of the thin metallic section 31 which, in this case, constitutes a bendable connection about which the arcuate face of the sector may be adjusted. It is obvious that the cross section of this bendable connection 31 must be calculated and designed so as to permit bending without distorting other portions of the pendulum.

When it is desired to increase the power arm of the pendulum this is accomplished by first loosening the clamping screw 57 so that the spherical body 38 through which the threaded adjustment stem 37 passes is free to turn in its seat, backing off a lock nut 55 threaded on the end of the stem 37 and normally in engagement with one of the cylindrical extensions 39 and then turning a lock nut 56, also threaded on the stem 37 but in engagement with the end of the opposite cylindrical portion 39. Turning the lock nut 56 when it is engaging the end of the cylindrical portion 39 causes an upward pressure against the free end of the sector 29 turning this about the bendable connection at 31. It will be seen that this adjusting operation does not materially change the length of the lever arm in the unloaded position of the scale as shown in Fig. II, and therefore, does not require an extra adjustment of the pendulum weight to maintain the zero position of the indicators; neither is the center of mass of the pendulum shifted to any great extent. It will also be observed that the greatest change in the lever arm is had at the full capacity position where as a rule the greatest amount of adjustment is required. After the power sector has been adjusted to correct an error in the indication of the scale tightening the screw 57, as well as the lock nuts 55 and 56, secures the power sector in proper adjustment.

From the foregoing it will be seen that since the adjusting stem 37 is studded into the end of the power sector 29 any adjustment of this sector about the bendable pivot 31 requires the member 38 to be free so as to align itself to the varying positions of the adjusting stem and yet form an anchor for the adjusting and lock nuts.

In the modification shown in Fig. IV the pivot for the power sector 29a is shown as a shoulder screw 31a which passes through carefully machined holes in a pair of ears 58 extending outwardly from the integral fulcrum sectors and through an ear 59 of the power sector extending between the ears 58. In certain types of scales a fulcrum of this type for the power sector may be preferable since it permits a wide range of adjustment. It is evident that an integral, bendable connection of the type described and shown in Fig. II when made of nonferrous material such as bronze, from which material pendulums are usually constructed, is not adapted for extensive bending.

In the modification shown in Figure V a flexure plate 31b, made from a material having high elasticity, such as steel, is securely clamped to bosses 60 and 61 on the fulcrum sectors 32b and power sectors 29b respectively by suitable clips 62 and screws 63.

In both of the modifications shown adjusting and locking means are those shown in Figure II.

Although herein the invention is only shown and described in connection with a pendulum of the "floating" type, so-called because there is no fixed fulcrum, it should be obvious that it

may be used in connection with pendulums mounted on knife edge pivots with equal facility; in fact, the embodiments of the invention herein shown and described are to be regarded as illustrative only, and the invention is susceptible to variation, modification and change within the spirit and scope of the subjoined claims.

Having described the invention, I claim:

1. In a weighing scale, in combination, a pendulum having a fulcrum sector and a power sector, said fulcrum sector and said power sector being radially spaced, a flexible pull member partially wound upon said fulcrum sector and supporting said pendulum, another flexible pull member partially wound upon said power sector for the application of loads to said pendulum, said power sector having a pivotal connection with said fulcrum sector, said pivotal connection being between the place where said flexible pull member takes off from said fulcrum sector and the place where said other flexible pull member takes off from said power sector when said pendulum is in a neutral or zero position in said scale, and means engaging said power sector and said fulcrum sector for adjusting the distance between said fulcrum sector and said power sector and locking said sectors in adjusted position, said adjusting and locking means comprising a universally adjustable member having a spherical portion, shaped arms for receiving said spherical portion, means for acting upon said shaped arms for frictionally engaging said spherical portion and means acting upon said shaped arms comprising a screw freely passing through one of said arms and threaded into another of said arms.

2. In a weighing scale, in combination, a pendulum having a fulcrum sector and a power sector, said fulcrum sector and said power sector being radially spaced, a flexible supporting pull member partially wound upon said fulcrum sector, a flexible force-applying pull member partially wound upon said power sector, said power sector having a pivotal connection with said fulcrum sector, said pivotal connection being located between the place where said flexible supporting pull member takes off from said fulcrum sector and the place where said flexible force-applying pull member takes off from said power sector when said pendulum is in a neutral or zero position in said scale, and means engaging said power sector and said fulcrum sector for adjusting the distance between said fulcrum sector and said power sector and locking said sectors in adjusted position, said adjusting and locking means comprising a universally adjustable member having a spherical portion, shaped arms for receiving said spherical portion and means for acting upon said shaped arms for frictionally engaging said spherical portion.

3. In a weighing scale, in combination, a pendulum having a plurality of fulcrum sectors and a power sector, said fulcrum sectors and said power sector being radially spaced, flexible supporting pull members partially wound upon said

fulcrum sectors, a flexible force-applying pull member partially wound upon said power sector, said power sector being pivotally connected at one end to said fulcrum sectors between and in the same horizontal plane with the places where said flexible pull members take off from said fulcrum and power sectors when said pendulum is in a neutral or zero position in said scale and adjusting and locking means engaging said power sector and said fulcrum sectors for varying the distance between said fulcrum sector and said power sector, said adjusting and locking means including a universally adjustable member.

4. In a weighing scale, in combination, a pendulum having a fulcrum sector and a power sector, a flexible supporting pull member partially wound upon said fulcrum sector, a flexible force-applying pull member partially wound upon said power sector, said power sector being pivotally connected at one end to said fulcrum sector in the same horizontal plane with the places where said flexible pull members take off from said fulcrum and power sectors when said pendulum is in a neutral or zero position in said scale and means engaging said power sector and said fulcrum sector for varying the distance between said fulcrum sector and said power sector.

5. In a device of the class described, in combination, weighing mechanism including a pendulum, said pendulum comprising a pendulum body, a depending stem fixed in said body, a pair of fulcrum sectors integral with said pendulum body, a power sector having one of its ends pivoted to said pendulum body intermediate said fulcrum sectors and about an axis parallel to the pivotal axis of said pendulum.

6. In a device of the class described, in combination, weighing mechanism including a load counterbalancing pendulum comprising a pendulum body, a fulcrum, a power sector located at one side of said fulcrum, said power sector being connected to said body by means of a bendable connection, said bendable connection comprising a thin strip of metal and the ends of said thin strip of metal being in nonslipping relation to said power sector and to said pendulum body.

7. In a device of the class described, in combination, weighing mechanism including a load counterbalancing pendulum comprising a pendulum body, a fulcrum, a power sector located at one side of said fulcrum, said power sector being connected to said body by means of a bendable connection and said bendable connection comprising a thin strip of metal.

8. In a device of the class described, in combination, weighing mechanism including a load counterbalancing pendulum comprising a pendulum body, a fulcrum, a power sector located at one side of said fulcrum and said power sector being connected to said body by means of a bendable connection, said bendable connection being integral with said power sector.

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