

Dec. 21, 1937.

C. A. BECKER ET AL

2,102,938

KEYBOARD BALANCE

Filed Oct. 24, 1936

3 Sheets-Sheet 1

Fig. 1.

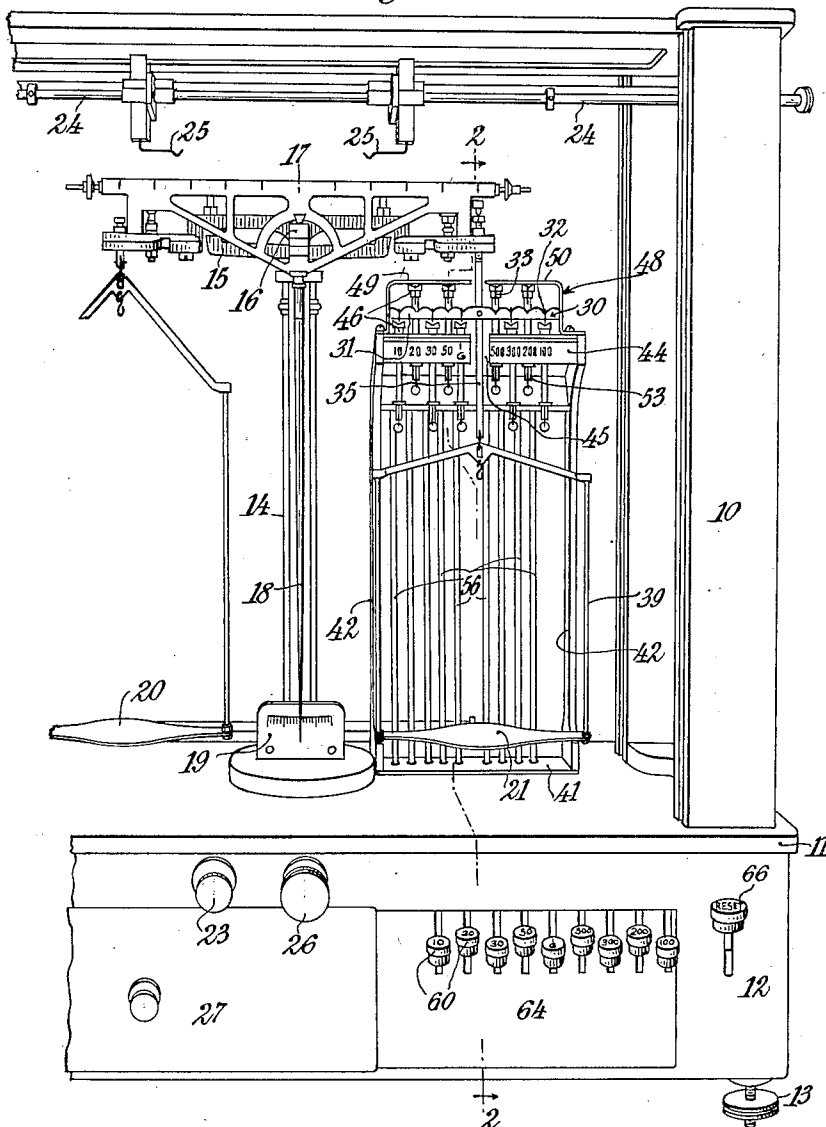
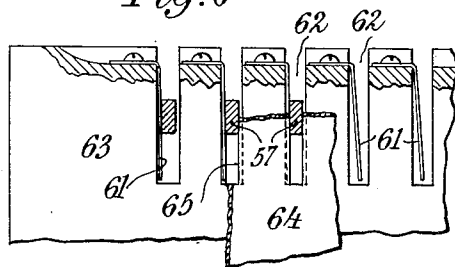


Fig. 6



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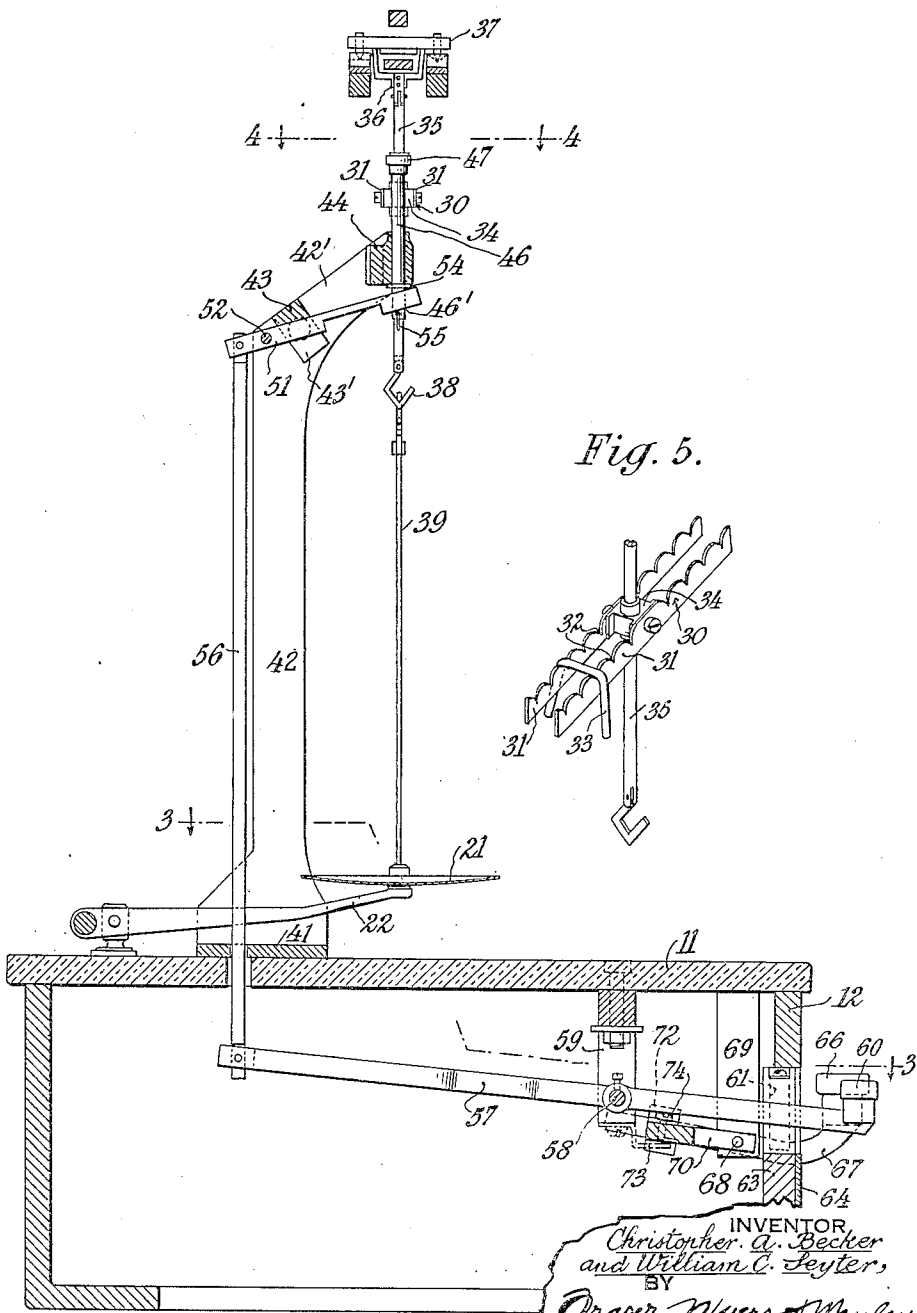
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3 Sheets-Sheet 2

Fig. 2.



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KEYBOARD BALANCE

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3 Sheets-Sheet 3

Fig. 4.

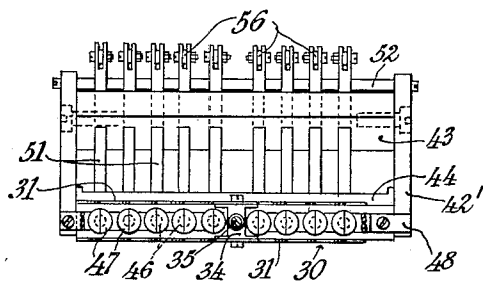
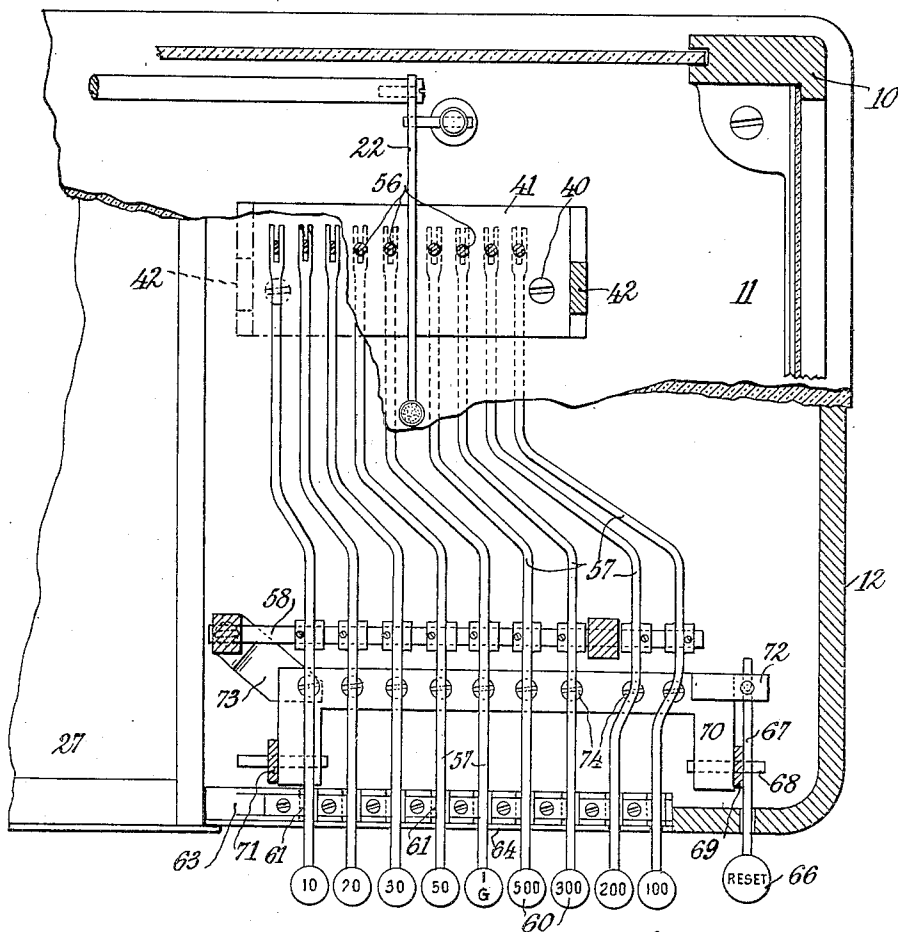


Fig. 3.



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2,102,938

KEYBOARD BALANCE

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Application October 24, 1936, Serial No. 107,310

10 Claims. (Cl. 265—54)

Our present invention relates to balances adapted for laboratory, analytical and assay work, and more particularly to such balances of the keyboard type having a rider-supporting member and means operable by depressible keys on the exterior of the balance for independently depositing a plurality of riders onto and removing them from said rider carrier.

Among the objects of the invention are the following: (1) to provide a keyboard balance wherein the riders are supported directly under the beam and in the central plane thereof; (2) wherein the rider support is so mounted as to permit depositing and removing riders while the beam is in swinging motion; (3) wherein the riders are deposited onto and removable from the support by vertically movable plungers; (4) wherein the riders can be deposited onto and removed from the rider support independently of each other and wherein said riders can be removed from the support simultaneously; (5) wherein a guard is provided for preventing the riders from accidentally falling off the rider plungers; (6) wherein the rider-operating mechanism is associated with frictional means for holding any rider plunger in the position to which it is moved; (7) wherein the rider support is carried by a rod having a pivotal connection with the stirrup and the balance pan so that the depositing and removal of weights on the pan will not cause tilting of the stirrup; (8) wherein the rider plungers are adjustable to insure simultaneous removal of the riders; and (9) to generally improve and simplify the construction and operation of such balances.

The manner in which we accomplish the foregoing and other objects not specifically enumerated will be apparent from the detailed description which follows, when considered in conjunction with the accompanying drawings, which show a preferred embodiment of our invention, and wherein:

Figure 1 is a fractional perspective front view of a keyboard balance embodying our invention, the front sliding panel of the enclosing case being omitted.

Fig. 2 is a section taken substantially along the planes of the broken line 2—2 of Fig. 1.

Fig. 3 is a section taken substantially along the planes of the broken line 3—3 of Fig. 2.

Fig. 4 is a section taken substantially along the plane of the line 4—4 of Fig. 2.

Fig. 5 is a perspective view on an enlarged scale of the rider-supporting member and its associated carrying link.

Fig. 6 is an enlarged detail, partly broken away, showing the frictional means for holding the rider plungers in any position.

Referring to the drawings, in the several figures of which the same reference character is employed to designate corresponding parts, let 10 indicate an enclosing case within which the balance mechanism is housed, said case resting upon a glass or equivalent plate 11 surmounting a base 12 which is provided with the customary leveling screws 13, only one of which is shown. Mounted on the plate 11 is a column 14 which supports a beam arrest 15 provided with a central agate bearing 16 upon which the central knife edge of a balance beam 17 is mounted. Depending from the beam 17 is an indicator or needle 18 adapted to swing past an index plate 19. Dependingly supported from the ends of the balance beam 17 when the beam arrest is lowered are a pair of balance pans 20 and 21, and cooperating therewith are the usual pan arrests 22 controlled by a push button 23 projecting from the front of the base. Extending through the side panels of the enclosing case are slide rods 24 upon which are mounted rider hooks 25. At the front of the base is a key 26 for controlling the beam arrest, and mounted in the base 12 is a slide drawer 27. The balance parts as thus far described are conventional and are merely illustrative of a type of balance to which the present invention may be applied.

According to the present invention we provide a novel key-operated mechanism for independently depositing a plurality of riders onto and removing them from a rider-supporting member for facilitating more rapid and accurate weighing operations. As herein disclosed, this novel construction comprises a rider-supporting member 30 consisting of a pair of spaced parallel walls 31, the top edges of which are scalloped to provide recesses 32 for supporting U-shaped riders 33. The spaced walls 31 are secured in parallel relation upon the opposite faces of a supporting block 34 which is mounted upon a link 35. The upper end of said link is pivotally connected to a depending arm 36 of a stirrup 37, while the lower end thereof is pivotally connected to a hook 38, which, in turn, supports the balance pan 21 by engaging in an opening in the top of the pan frame 39. The link 35 and the arm 36 on the stirrup are disposed to lie in the central plane of the balance beam 17, and the rider-supporting member which flanks or embraces the supporting block of the link 35 is thus mounted

to embrace said central plane and may be said to lie in said central plane.

Mounted on the plate 11 rearwardly of the scale pan 21 by fastening elements 40 is an upright frame comprising a base 41, a pair of standards or uprights 42 which, at their upper ends, have forwardly-extending components 42', the latter being connected together by spaced cross-bars 43 and 44, the latter centrally thereof being partially cut away to provide a clearance groove 45 for the link 35.

The cross-bar 44 has formed therein a plurality of vertical openings within which are mounted slidable plungers 46, the said openings being in alignment with the space between the walls of the rider-supporting member so that the plungers may move vertically through said space. Each of said plungers is provided with an enlarged head 47 which is longitudinally adjustable upon the plunger, and each head has a V-shaped recess therein, the bottom of which is in vertical alignment or in a common plane with a pair of aligned recesses 32 in the top edges of the rider-supporting member. These recesses are designed to support the U-shaped riders 33; the recesses in the tops of the plungers being adapted to pick up and support said riders when it is desired to remove them from the rider-carrying member, while the recesses in the rider-carrying member are designed to have said riders deposited therein when the plungers are lowered. The downward movement of the plungers is limited by the engagement of a shoulder on the enlarged head thereof with the top of the cross-bar 44, while the upper movement thereof is limited by overhanging bars 49 and 50 of cantilever construction which are mounted on the top of the cross-bar 44.

To deposit or remove riders and to control such action from the exterior of the balance case we provide a novel arrangement of links and levers, one operative unit of which is illustrated in Fig. 2 of the drawings, and a description thereof, it will be understood, will apply to each of said units. Each of these units consists of a lever or arm 51 pivotally mounted upon a fulcrum rod 52 supported in the standards 42, the forward end of said lever being bifurcated, as indicated at 53, to engage a flattened end 46' of the plunger 46, a pivotal connection between the lever and the plunger being obtained by providing operating shoulders on the plunger by the use of a washer 54 and a split ring 55.

The opposite or rear end of each lever 51 is pivotally connected to the upper end of a link or arm 56, the lower end of which, in turn, is pivotally connected to a lever 57 which is fulcrumed intermediate its ends upon a pin 58 supported in brackets 59 depending from the plate 11, the forward end of said lever 57 extending through the front of the base and being provided therewith with a key or button 60. For guiding the levers 51 in their movements the cross-bar 43 is provided with a plurality of parallel slots 43' through which said levers extend.

The plunger operating units are suitably laterally spaced and in construction are nicely balanced so as not to impose undue weight tending to hold the lever in any predetermined position, with the objective in view that the slightest pressure upon the key or button 60 will serve to move the plunger controlled thereby. However, to insure the plunger remaining in the position to which it has been moved, suitable friction means are provided. As herein shown, these

consist of resilient leaf spring elements 61 disposed in slots 62 in a block or plate 63 mounted in the front wall of the base of the balance and through which slots the forward ends of the levers 57 project. Covering this block 63 is a cover plate 64 having complementary slots therein of slightly narrower width than the slots 62, so that the pressure of the spring elements 61 upon the levers 57 pressing them into engagement with a wall of the slots 65 will function to hold said levers and the plungers controlled thereby in any adjusted position until intentionally displaced.

Movement of the buttons 60 downwardly or upwardly will correspondingly move the plunger controlled by said buttons. As each lever 57 is independently controlled it will be apparent that each plunger, which, in turn, controls the depositing or removal of a rider, will be thus independently controlled. The riders 33, it will be understood, will be of different weights, and to facilitate the reading of the weights thus added to the balance during a weighing operation, the front face of the cross-bar 44 may be suitably provided with value indicia of the respective riders beneath their respective positions, and the keys or buttons 60 may likewise be provided with such indicia so as to facilitate the weighing operation.

In practice, when commencing a weighing operation, it is desirable to start with all the riders free from the rider-carrying member, and to facilitate the removal of the riders from the rider-carrying member we have provided a reset key 66. This key is mounted on the end of a lever 67 which is pivoted intermediate its ends upon a pin 68 mounted in a bracket 69. The pin 68 also pivotally supports one end of a U-shaped reset bar 70, the opposite end of which is pivotally mounted in a pin upon a complementary bracket 71. The U-shaped reset bar at its end adjacent the lever 67 has an overhanging lip 72 which bears upon the end of the lever 67, which, in view of the weight of the reset bar, will hold the reset key 66 in its uppermost position. The reset bar 70 normally rests upon a pair of brackets 73 connected to the bottom of the depending brackets 59 which normally holds said bar in proximity to the under side of the levers 57 so that by depressing the reset key 66 the reset bar will be slightly raised to engage the levers 57 to move them upwardly, and, in turn, will move the plungers 46 controlled thereby upwardly to remove the riders from the rider-carrying member. To insure simultaneous engagement of the reset bar 70 with each of the levers 67, the bar is provided with an adjustable screw 74 directly under each of the levers 57.

From the foregoing detailed description the construction and operation of the balance should be apparent. However, a few additional words of explanation might be helpful. Accordingly, in beginning a weighing operation, after the balance is leveled and adjusted to equilibrium, the article or substance to be weighed is placed upon the left hand balance pan and the major weights to counterbalance the object are added to the right hand balance pan. When the swing of the needle indicates that an approximate counterpoise has been added, the front panel of the balance is closed and the weighing operation is proceeded with by depositing the riders 33 upon the rider-carrying member 30 by depressing the appropriate keys 60 and testing for equilibrium. Should perchance too great an amount of rider

weights have been added, one or more of the riders may be independently removed from the rider-carrying member by moving the appropriate key 60 upwardly. When close balance has been obtained, the final accurate balancing will be consummated by moving the rider along the beam with the aid of the rider rods 24 and rider hooks 25. The total counterpoise weight will thus consist of the major weights on the balance pan, the rider weights on the rider-carrying member and the weight designated by the rider on the beam. These various weights can be readily read off and recorded. To place the balance in condition for a succeeding weighing operation the reset key may be depressed to remove all the riders from the rider-carrying member. The overhanging bars 49 and 50 will act as guards to prevent the riders from falling off of the plungers upon which they are supported and from being thrown from said plungers by the sudden or violent movement of the keys controlling the movement of the plungers. The vertical movement of the plungers will also insure against the riders accidentally falling off their supports. The disposition of the rider-carrying member in a plane common with the central plane of the balance beam is conducive to accurate weighing, while the pivoted connection between the link depending from the balance beam stirrup and connected to the balance pan will insure against tilting of the stirrup upon the depositing and removal of weights from the pan.

It will thus be seen that we have provided a keyboard type balance capable of accomplishing the various objects set forth in the opening statement of this specification, and while we have shown and described a preferred embodiment of our invention it is to be understood that we do not wish to be limited to the precise details of construction, since the same may be modified within the range of engineering skill without departing from the spirit of our invention as defined in the appended claims.

What we claim is:

1. A balance of the character described, comprising a beam, a rider-supporting member depending from said beam, plungers vertically movable in the central plane of the rider-supporting member for depositing riders onto and removing them from the rider-supporting member, and means for independently moving the plungers.

2. A balance according to claim 1, wherein the rider-supporting member is disposed within the central plane of the beam.

3. A balance according to claim 1, wherein a stirrup is carried on the beam adjacent one end thereof, and the rider-supporting member is dependingly supported by the stirrup in the central plane of the beam.

4. A balance according to claim 1, wherein the rider-supporting member consists of an open frame through which the plungers are movable, said frame having spaced recesses for supporting riders thereon, and each of said plungers having a recess in its top in alignment with a recess in the frame.

5. A balance according to claim 1, wherein each plunger at its top has a rider-supporting head which is longitudinally adjustable on the plunger.

6. A balance according to claim 1, wherein means are provided for limiting the vertical movements of the plungers.

7. A balance according to claim 1, wherein there is a stirrup carried on the beam adjacent one end thereof, a link depending from the stirrup and a balance pan dependingly supported by the link, the rider-supporting member being connected to the link intermediate its ends, and the link being pivotally connected at its opposite ends to the stirrup and to the balance pan respectively.

8. A balance of the character described comprising a beam, a rider supporting member dependingly supported by said beam, plungers vertically movable through said rider supporting member while it is at rest or while swinging with the beam, for depositing riders onto and removing them from the rider supporting member, and means for independently moving the plungers.

9. A balance according to claim 8 wherein the rider supporting member consists of an open frame having spaced recesses for supporting riders in definite position thereon and where each of the plungers has a recess in its top in alignment with a recess in the frame.

10. A balance according to claim 8 wherein the rider supporting member consists of an open frame having spaced recesses for supporting riders in definite position thereon, where each of the plungers has a recess in its top in alignment with a recess in the frame and fixed means in spaced relation above the rider supporting member for limiting the upward movement of the plungers and preventing the riders from being thrown off from the plungers.

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