No. 684,425. Patented Oct. 15, 1901.

L. HACHENBERG.

WEIGHING SCALE.

(Application filed Dec. 7, 1899.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

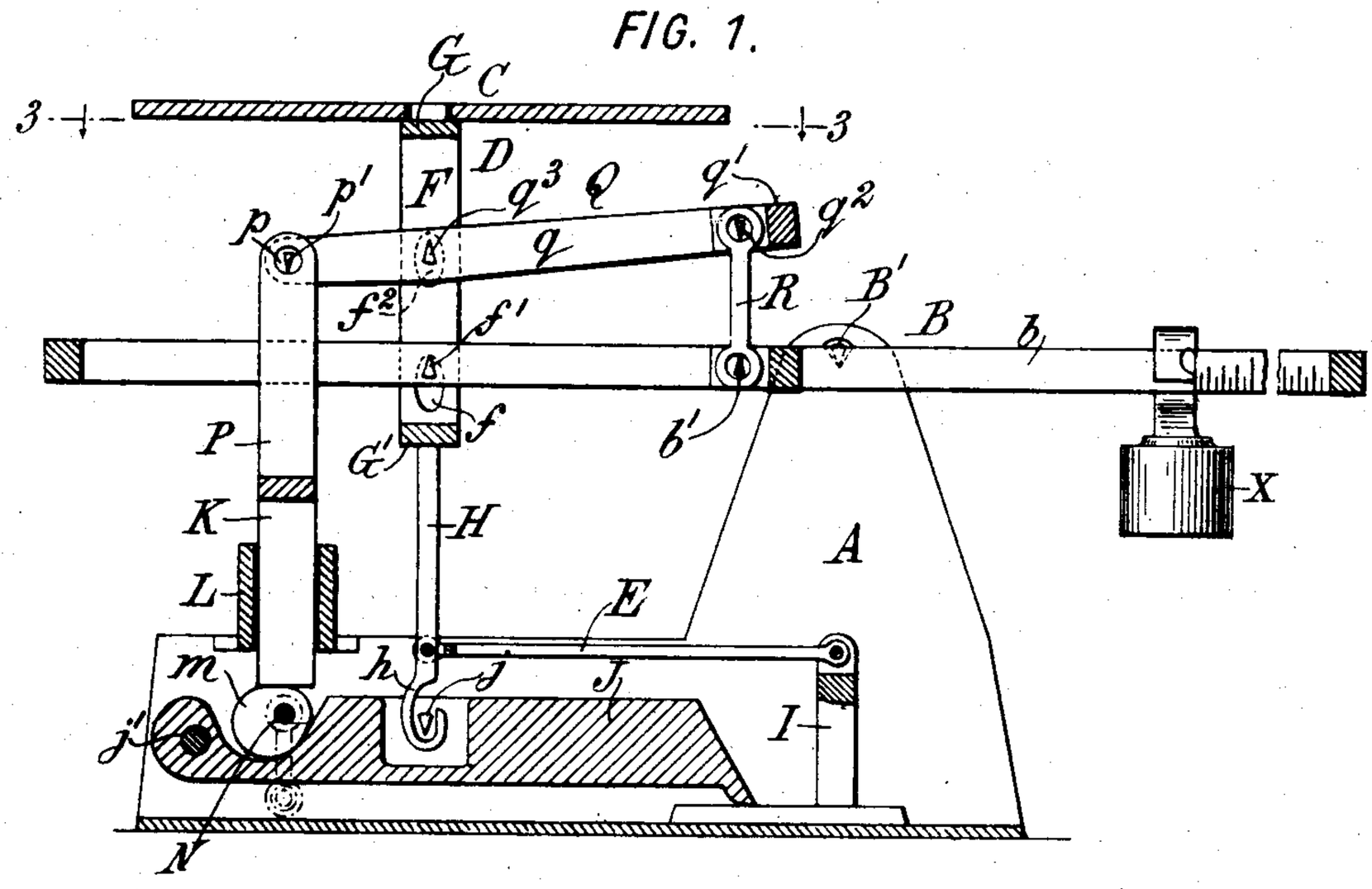

FIG. 2.

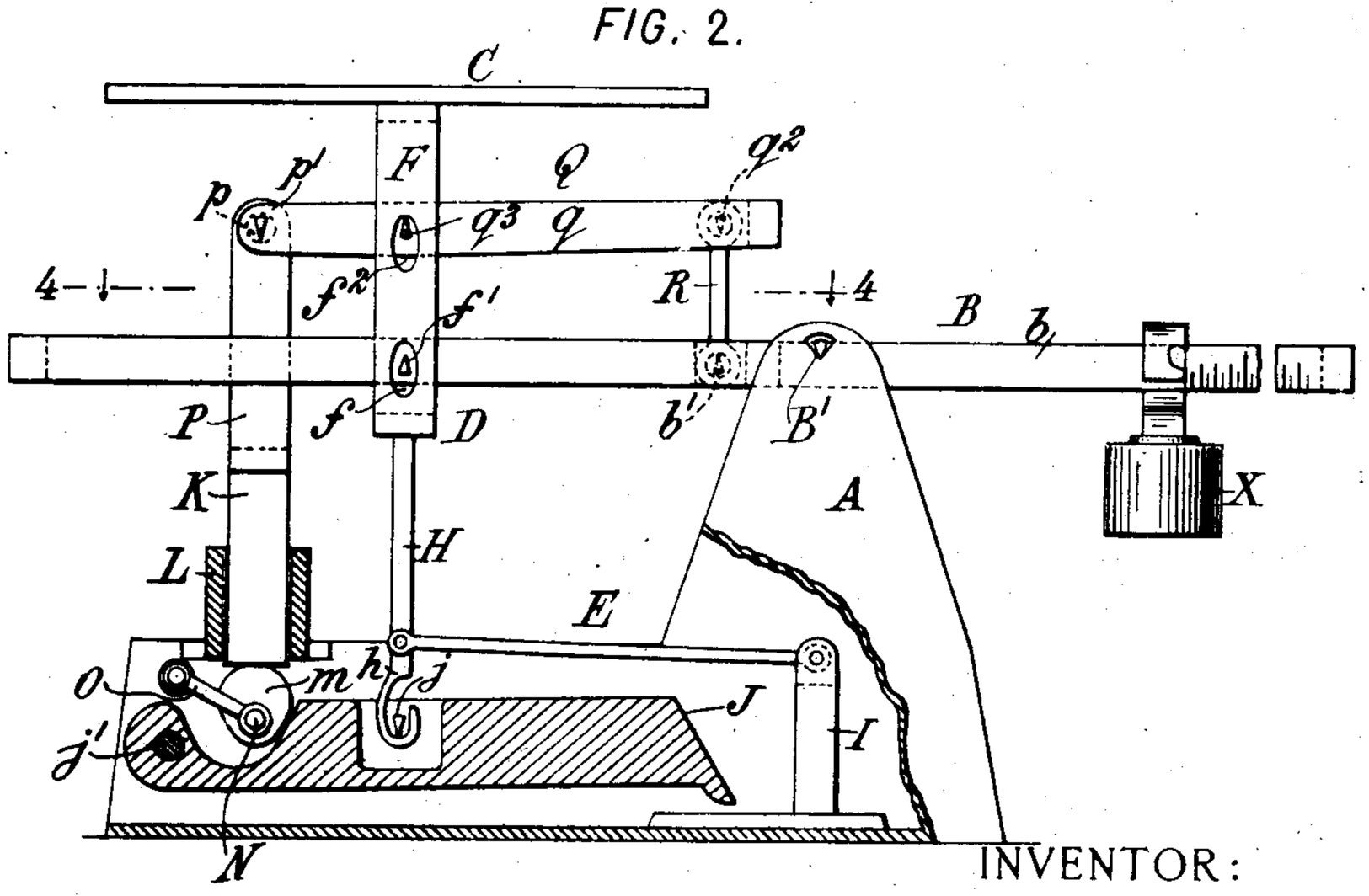

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FIG. 3.

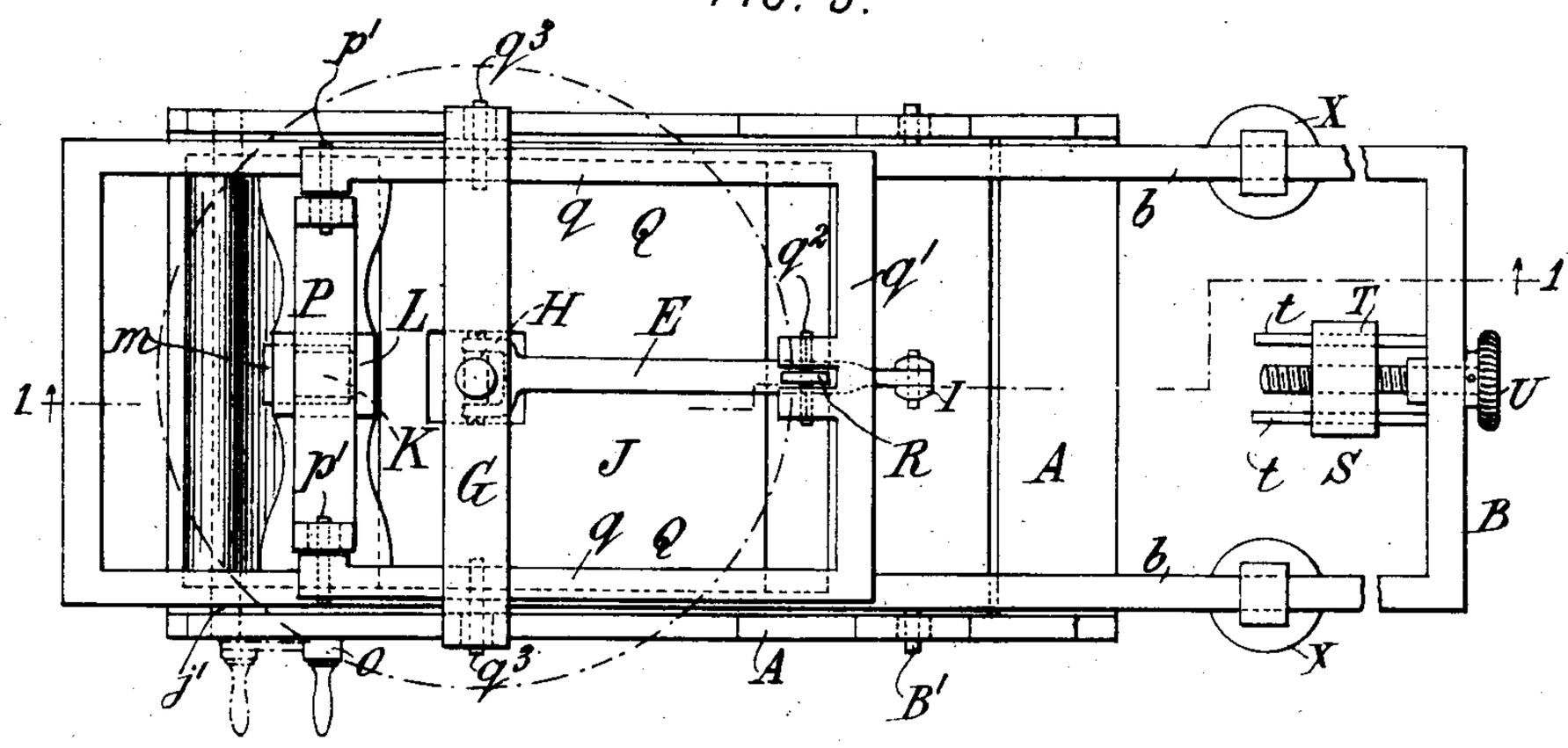
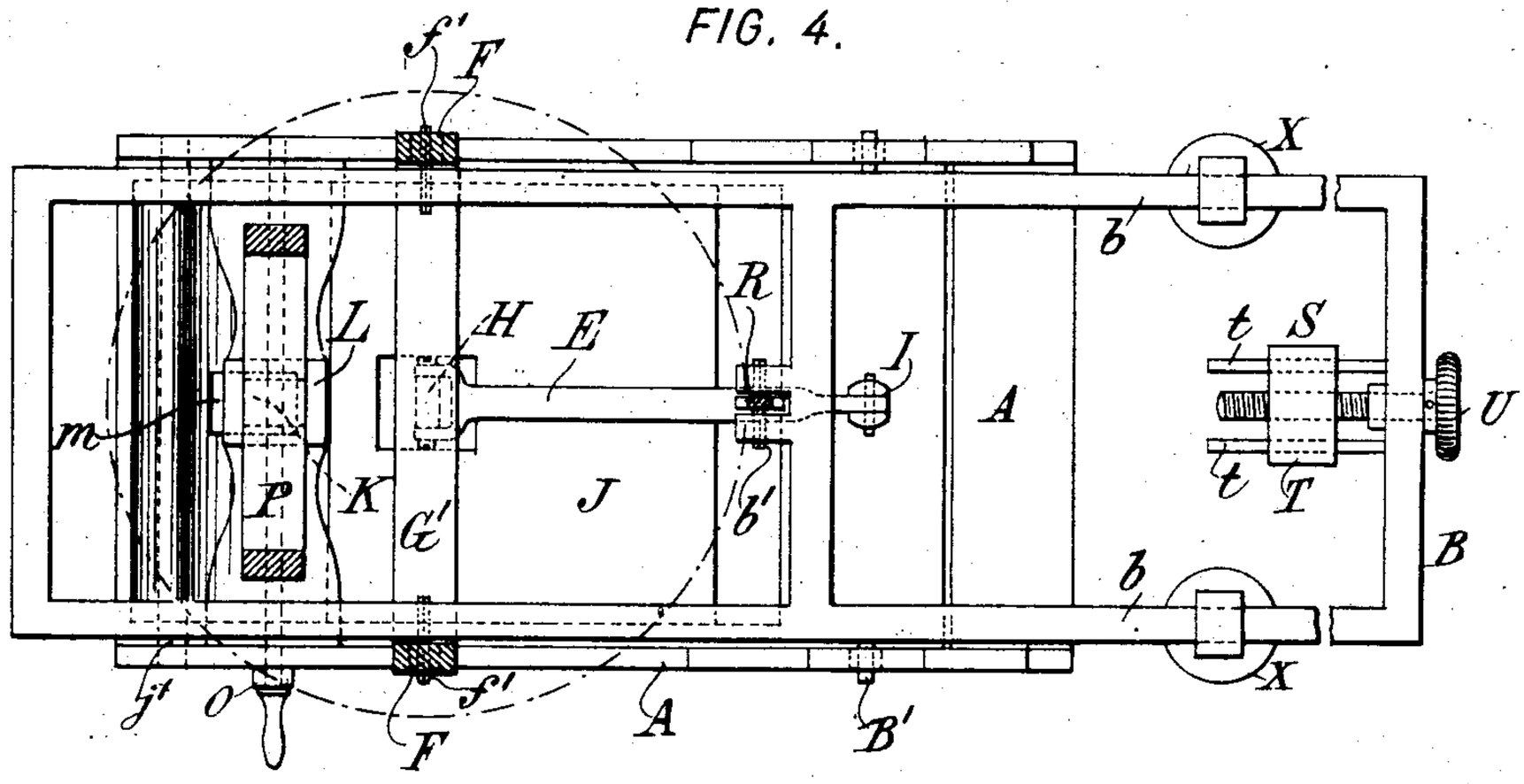


FIG. 4.



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UNITED STATES PATENT OFFICE.

LOUIS HACHENBERG, OF NEW YORK, N. Y.

WEIGHING-SCALE.

SPECIFICATION forming part of Letters Patent No. 684,425, dated October 15, 1901.

Application filed December 7, 1899. Serial No. 739,503. (No model.)

To all whom it may concern:

Be it known that I, LOUIS HACHENBERG, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Weighing-Scales, of which the following is a specification.

This invention relates to that class of weighing-scales in which a balanced beam is employed, and aims to provide a scale of this character which, while capable of accurately performing delicate-weighing operations, may be adjusted to greatly increase its capacity.

To this end in carrying out the preferred form of my invention I provide a scale having means for shifting the point of operative connection between the beam and the platform or other receiving device for the articles to be weighed, and I provide means for restoring the equilibrium of the beam thus affected.

My invention also includes means for assuming a part of the weight of the platform and the articles to be weighed, so that only a portion of such weight is transmitted to the beam.

Referring to the drawings, in which I have shown the preferred form of my invention as applied to a counter-scale, Figure 1 is a vertical longitudinal section of my improved device cut on the line 1 1 in Fig. 3, showing the same in position for delicate-weighing operations. Fig. 2 is a side elevation of my device in position for heavy-weighing operations, the base being partly cut away and the weight and guide being shown in section. Fig. 3 is a horizontal section on the line 3 3 in Fig. 1, and Fig. 4 is a horizontal section cut on the line 4 4 in Fig. 2.

Referring to the drawings, let A indicate a suitable base or standard; B, the beam, preferably formed in two parts *b b;* C, the platform or scale-pan, and D its upright support. The beam B is fulcrumed to the base A by any suitable form of pivotal axes, preferably by knife-edges B′, as shown. The platform C may be any convenient device for receiving the articles to be weighed. It is shown as the usual scale-pan common to counter-scales. The upright D is preferably formed as a frame, comprising two vertical members F F, connected by cross-pieces G G′ at top and bottom, respectively. Fixed to the middle of the bottom cross-piece G′ is a rod H, which extends downwardly, and near its lower end is connected to an upright I by a link E, this being the usual means employed for maintaining the platform-support in a vertical position. The lower end *h* of the rod II is formed as a hook and is designed to engage a knife-edge *j*, carried by a weight J, which may be suitably recessed, as shown, to receive the knife-edge and hook.

In Fig. 1 of the drawings the scale is shown as in position for weighing light articles, which is referred to herein as its "normal" position. In this position the hook-shaped portion *h* is out of contact with the knife-edge *j*, and the weight J is therefore passive. The weight J is shown as pivoted to the base by a suitable pivot *j′*, but may slide in suitable guideways or be otherwise confined to move within the base, if desired. The vertical members F F of the frame D are each formed near their lower ends with a hole *f*, through which pass suitable knife-edges *f′*, carried by the members *b b* of the beam B. In the normal operation of the device the knife-edges *f′* engage the upper walls of the holes *f*, and thus support the frame D and platform C, the weight of the platform and load during the weighing operation acting against the beam B at the point *f′*, as shown in Fig. 1. A vertically-movable rod K is arranged to slide in a suitable guideway L, formed in the base A, its movements being preferably imparted to it by a cam *m*, which is pivoted in the base by a shaft N, to one end of which is fixed an operating-handle O. As shown, the weight J is suitably recessed to permit rotation of the cam. The sliding rod K is fixed at its upper end to the middle of a frame P, which at its upper end is formed with holes *p*, which embrace knife-edges *p′*, carried by a horizontal lever Q. The lever Q preferably has two members *q q*, which pass between the members F F of the frame D and terminate near the fulcrum of the beam B, where they are connected together by a cross-piece *q′*. This cross-piece carries a knife-edge q^2 and is connected to the beam B by a link R, which embraces the knife-edge q^2 and a knife-edge *b′*, carried by the beam B. Each member *q* of the lever Q carries a knife-edge q^3, which extend through

suitable holes f^2, formed in the members F F of the frame D.

The operation is as follows: When in the normal position, (shown in Fig. 1,) the platform C and its frame D are supported directly by the beam at an operative point indicated by the knife-edges f'. In this position the frame D is out of engagement with the weight J and lever Q, the size of the hole f being such as to allow considerable movement of the frame D without contacting with the knife-edges q^3, and the lever Q and link R move idly with the beam. The weight of the load acts against the beam B at f'—a point remote from the beam-fulcrum B'—and hence a relatively great movement of the poise or poises X is necessary to counterbalance the weight of the load. This permits the weighing of very light articles with an accuracy not possible in scales of large capacity. In this position the beam is of course in a state of equilibrium when unloaded, the weight of the platform and its support counterbalancing the weight of the poises at their innermost positions. When it is desired to adjust the scale to greater capacity, the cam m is rotated by its operating-handle O, whereupon the scale assumes the position shown in Fig. 2. The first effect of the rotation of the cam is that the sliding rod K is lifted in its guide L until the walls of the holes p of the frame P, which engage the knife-edges p', lift the short end of the lever Q until the knife-edges q^3 engage the upper walls of the holes f^2, whereupon the frame D is raised and with it the platform or scale pan C. As soon as the frame D is raised the walls of its holes f are freed from engagement with the knife-edges f', thereby freeing the beam B of the weight of the frame D and platform C upon the fulcrum f' and transferring a portion of this weight to the fulcrum b' through the medium of the lever Q and link R. A greater or less part of the weight of the frame D and platform C (and accordingly of the load to be weighed) are assumed during this movement by the frame P, which is supported from the base. The precise portion of the weight thus assumed is dependent upon the relative arrangement and proportions of the parts. As shown, the frame D acts upon the lever Q at a point approximately one-third of the distance between the points of engagement of the latter with the frame P and link R, so that approximately two-thirds of the weight of the platform and its support falls upon the frame P. This may of course be varied according to convenience, depending upon the capacity designed to be given to the scale.

In the position shown in Fig. 1 the beam B is in a state of equilibrium with the weight of the platform and its support acting against the point f'. During the adjustment to the second position just described the beam is relieved of approximately two-thirds of the weight of these parts by the frame P and the remainder is transferred to a point b' through the medium of the lever Q and link R, where it acts with much less effect than when applied to the point f'. If this loss of weight is not compensated for, the side of the beam upon which the poise or poises are mounted will of course overbalance the platform side. This compensation is provided for in the present construction by the weight J, which during the latter part of the movement of the frame D is raised from its position of rest by the engagement of the lower end of the rod H with the knife-edge j, carried by the weight. This weight is so proportioned that it equalizes the weights upon the opposite sides of the beam, which thus again assumes a position of equilibrium. It should be borne in mind in proportioning this weight in the present construction that approximately two-thirds of it is assumed by the frame P and the remainder acts against the beam at a point b' near the fulcrum-axis of the beam, as in the case of the platform and its support.

When in the position shown in Fig. 2, the capacity of the scale is largely increased—that is to say, a given movement of the poise or poises which in the position shown in Fig. 1 would counterbalance the scale against a weight upon the platform, for example, of one ounce would in the position of Fig. 2 counterbalance the beam against a weight of, for example, six ounces. The exact ratio between the two is easily determinable and is effected by the proper proportioning and arrangement of the various parts of the scale. While the scale may be constructed with any suitable ratio in view, it is preferable that it should be as one or more ounces are to the pound, so that the same graduations of the scale-beam may serve in either position. The difference in capacity of the scale in the two positions is due, first, to the shifting of the point at which the load acts against the beam nearer to or farther from the fulcrum-axis of the beam, and, second, to the fact that in one position a portion of the load is supported by the base through the medium of the frame P, and accordingly only a certain part of the load to be weighed acts against the beam. The proportion thus acting against the beam of course bears a fixed relation to the entire weight of the load and may be any fractional part, depending upon the relative arrangement of the parts of the scale. It will be understood that the poises X may be used as complementary to each other or one may be used for tare and the other for net weight. As some slight inaccuracies in weight are likely to occur in the construction of the various parts of the scale which might affect the equilibrium of the beam, I provide a regulator S, which, as shown in Figs. 3 and 4, is carried by one end of the beam. This comprises a poise T, which is adapted to slide in guides t and is screw-threaded to engage a thumb-screw U. Inaccuracies in weight are compensated for by the manipulation of the

thumb-screw U to move the poise T toward or from the fulcrum-axis of the beam. In this construction the poise cannot be shifted from its set position except by the screw U, as it is held against rotation by the guides *t*.

It will be seen that by the preferred form of my invention the entire operation of changing the capacity of the scale is accomplished by the manipulation of a single operating-handle and that such operation is rapid and certain.

I prefer to use a weight J, adapted to be connected to the scale-beam in the manner shown; but it is obvious that it is within my invention to provide any suitable means of connection which will accomplish the desired result.

While I have shown and described knife-edges as the pivotal axes of my improved scale, it will be understood, of course, that any suitable form of pivot may be employed, knife-edges being the usual form in accurate weighing apparatus, and hence preferred by me, and in other respects I do not wish to be limited to the exact construction shown, as my invention is susceptible of a considerable degree of modification without departing from its essential features.

What I claim is—

1. In a weighing-scale, the combination with a beam and a platform moving in a substantially-fixed vertical plane, of two pivots through either of which the platform may act against the beam, and a means for causing the platform to act against the beam through either of said pivots.

2. In a weighing-scale, the combination with a beam and a platform moving in a plane substantially fixed with relation to the beam-fulcrum, of two pivots through either of which the platform may act against the beam, a means for causing the platform to act against the beam through either of said pivots, and means for restoring the balance of the beam.

3. In a weighing-scale, the combination with a beam and a platform moving in a plane substantially fixed with relation to the beam-fulcrum, of two pivots through either of which the platform may act against the beam, a means for causing the platform to act against the beam through either of said pivots, a weight for restoring the balance of the beam, and means for connecting the weight with the beam.

4. In a weighing-scale, the combination with a beam and a platform, the platform moving in a plane substantially fixed with relation to the beam-fulcrum, of means for adapting the scale to different capacities acting to shift the point of operative connection between the platform and beam, a weight for restoring the balance of the beam, means for connecting the weight with the beam, and an operating-handle for actuating both of said means.

5. In a weighing-scale, the combination with means for varying the balance of the beam, of a weight for restoring its balance, means for connecting the weight with the beam and disconnecting it therefrom, and a single operating-handle for actuating both said means.

6. In a weighing-scale, the combination with the beam, of a platform adapted to be connected thereto at a plurality of points remote from each other, so that when acting against the beam at each of such points the scale has a different capacity, and means for positively shifting said connection from one point to another, said means preventing said platform from acting normally against the beam between such points.

7. In a weighing-scale, the combination with the beam, of a platform adapted to be connected thereto at a plurality of points remote from each other, so that when acting against the beam at each of such points the scale has a different capacity, means for instantaneously and positively shifting said connection from one point to another, a weight, and means for connecting said weight to and disconnecting it from the beam simultaneously with the operation of said shifting means.

8. In a weighing-scale, the combination with a beam, of means adapted to be moved into and out of position for supporting a fixed proportion of the weights of varying loads from a point independent of the beam, said means adapted to permit a part of said load to simultaneously act upon the beam.

9. In a weighing-scale, the combination with a beam and a platform connected thereto, of means adapted to be moved into and out of position for supporting a fixed proportion of the weights of varying loads from a point independent of the beam, said means adapted to permit a part of the weight of said platform to simultaneously act upon the beam.

10. In a weighing-scale, the combination of a beam, a platform connected thereto, means for shifting the point of operative connection between said parts, and means adapted to be moved into and out of position for supporting from a point independent of the beam a fixed proportion of the weights of varying loads, said means adapted to simultaneously permit the beam to operate to effect the weighing operation.

11. In a weighing-scale, the combination with a beam and a platform connected thereto, of means for shifting the point of operative connection between said parts, means for supporting a part of the weight of the platform and load from a point independent of the beam, and an operating-handle for actuating said means simultaneously.

12. In a weighing-scale, a beam, a platform connected thereto, means for shifting the point of operative connection between said parts, and for assuming a part of the weight of the platform from a point independent of the beam, and means for restoring the equilibrium of the beam lost by the operation of said two first-mentioned means.

13. In a weighing-scale, the combination

with a stationary part to which the beam is fulcrumed, of a means adapted to be moved into and out of position for supporting a part of the weight of the platform from such stationary part, said means permitting a part of such weight to simultaneously act upon the beam.

14. In a weighing-scale, the combination with a base of a beam fulcrumed thereto, and means adapted to be moved into and out of position for supporting from the base a part of the weight of the platform, said means permitting a part of such weight to simultaneously act upon the beam.

15. In a weighing-scale, the combination with a beam and a platform connected thereto, of means for shifting the point of operative connection between said parts, means for assuming a part of the weight of the platform, and means for restoring the equilibrium of the beam lost by the operation of said two first-mentioned means, comprising a weight adapted to be connected to and disconnected from the beam.

16. In a weighing-scale, the combination with a beam and a platform connected thereto, of a lever connected to said beam and normally out of engagement with said platform, and means for moving the lever into engagement with said platform.

17. In a weighing-scale, the combination with a beam and a platform connected thereto, of a lever connected to said beam by a link, and means for lifting said lever to engage said platform and move the latter out of its normal connection with the beam, whereby the point of operative connection between the platform and beam is shifted to the point of engagement of the link with the beam.

18. In a weighing-scale, the combination with a beam and a platform connected thereto, of a lever connected to said beam by a link, means for lifting said lever to engage said platform and move the latter out of its normal connection with the beam, whereby the point of operative connection between the platform and beam is shifted to the point of engagement of the link with the beam, and means for connecting a weight with said beam when the beam is engaged by the lever.

19. In a weighing-scale, the combination with a base, and a beam mounted to oscillate about a single fixed fulcrum-axis, of a movable part carried by said base, a frame connected to said beam and said movable part, a platform normally connected to said beam at one point, and means for moving said movable part to cause the platform to act upon the beam at a point nearer the fulcrum-axis of the latter.

20. In a weighing-scale, the combination with the beam, of a regulator comprising a guide comprising a plurality of rods, each fixed at one end to the beam, and free at its other end, carried by the beam, a poise moving upon said rods and held against rotation thereby, and an adjusting-screw engaging said poise between such rods to move it toward or from the fulcrum-axis of the beam.

21. In a weighing-scale, the combination with a beam and a platform connected thereto, of means for shifting the point of operative connection between said members, a weight for restoring the balance of the beam and means for connecting the weight with the beam, and disconnecting it therefrom, whereby in one position the platform acts against the beam with lesser effect and the weight is connected to the beam, and in another position the platform acts against the beam with greater effect, and the weight is disconnected from the beam.

22. In a weighing-scale, the combination with a beam, a platform, means for connecting the platform with the beam at one point, means for connecting the platform with the beam at a point remote from the first, a weight for restoring the balance of the beam, and a single operating-handle adapted to operate said means for connecting said platform to the beam, and to connect said weight to the beam and disconnect it therefrom.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LOUIS HACHENBERG.

Witnesses:
EUGENE MEYERS,
FRED WHITE.