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PATENTED JAN. 15, 1907.

R. G. AINSWORTH.

ASSAY BALANCE.

APPLICATION FILED MAY 8, 1905.

2 SHEETS—SHEET 1.

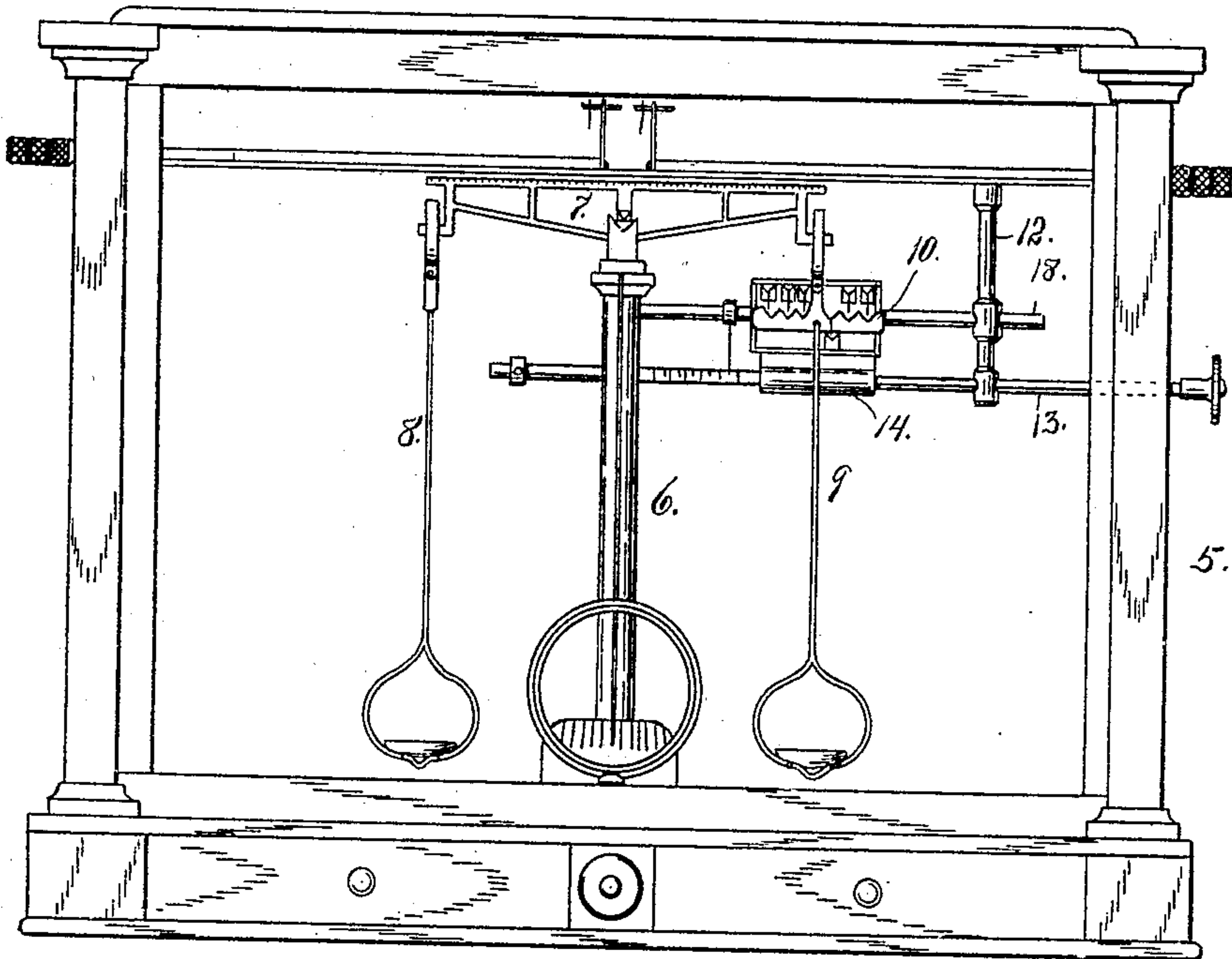


Fig. 1.

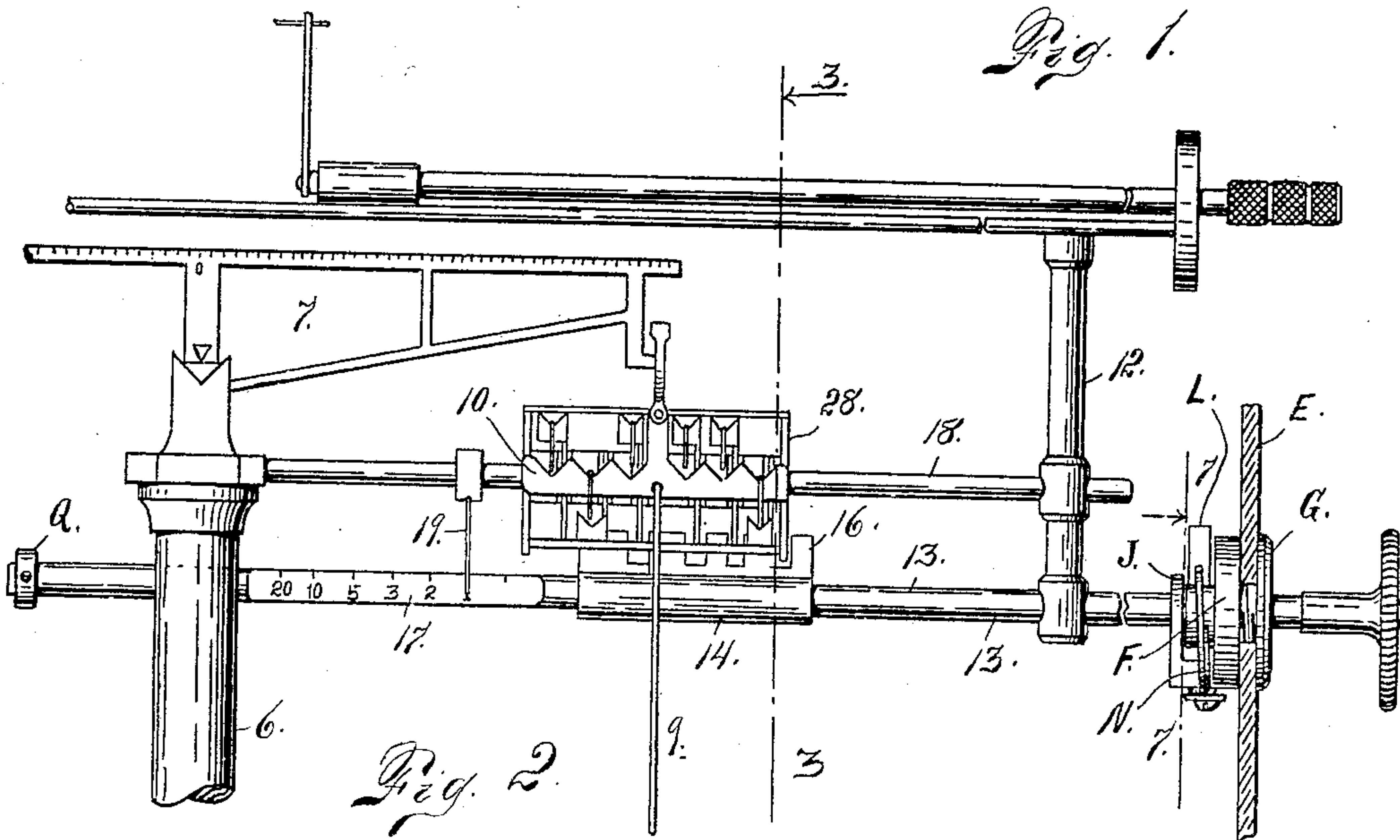


Fig. 2.

Witnesses

Otto E. Hoddick.  
Dena Nelson.

Robt. G. Ainsworth

By

Inventor

A. H. Mear

Attorney

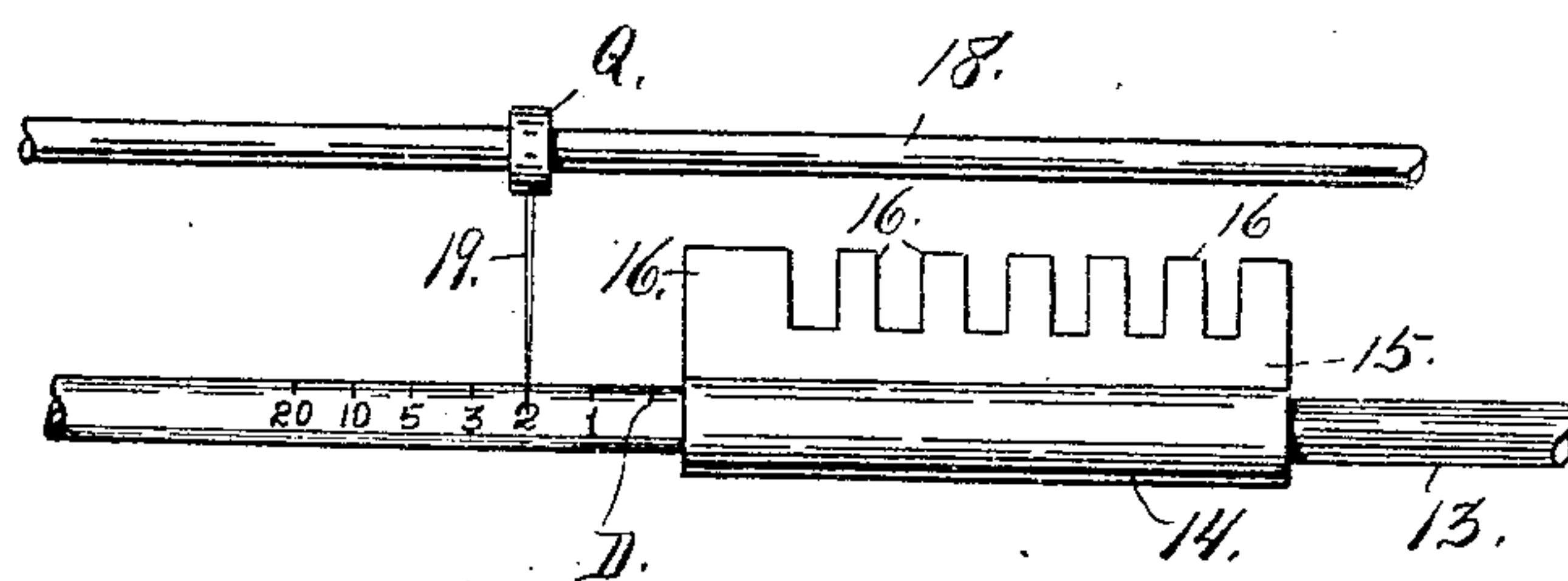
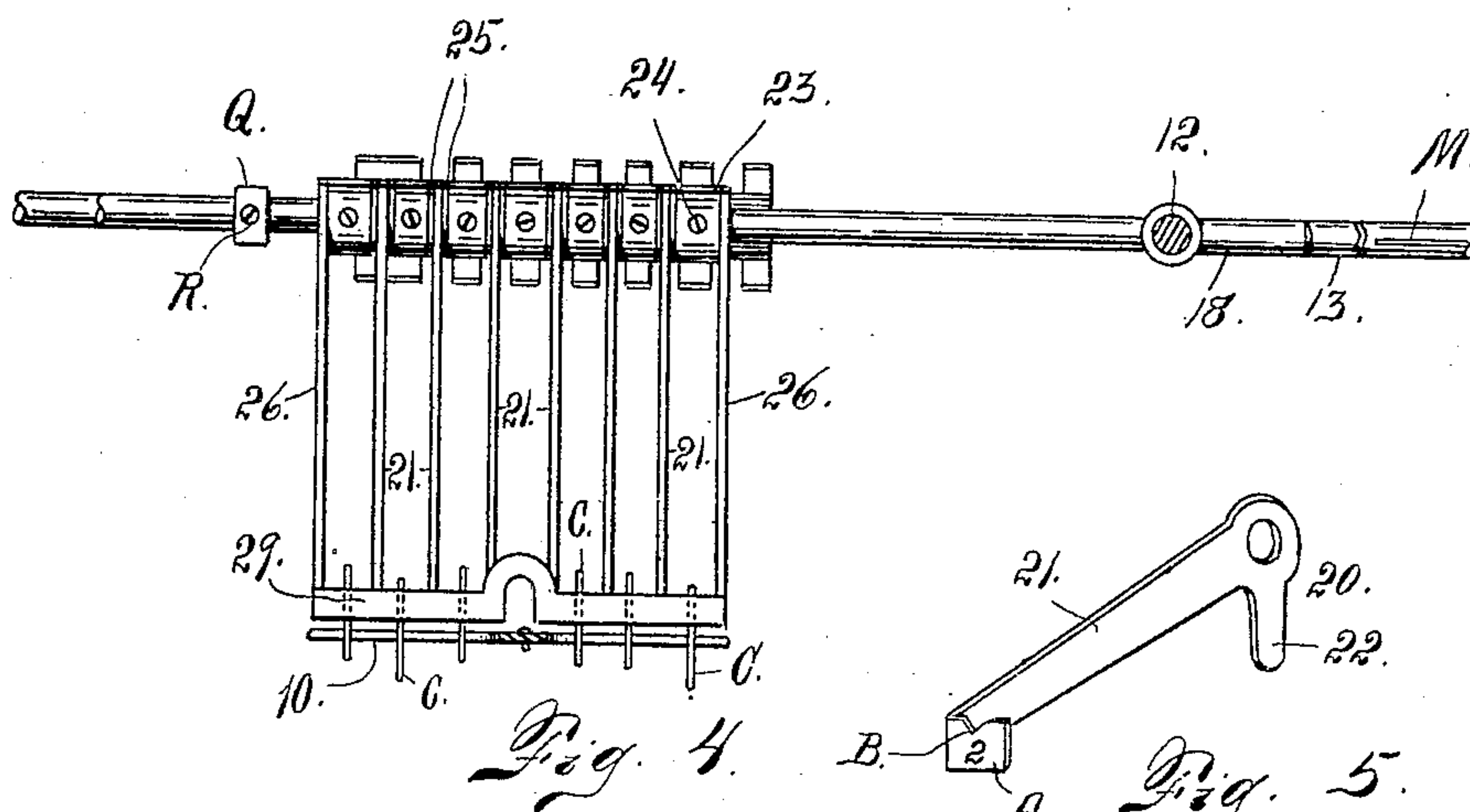
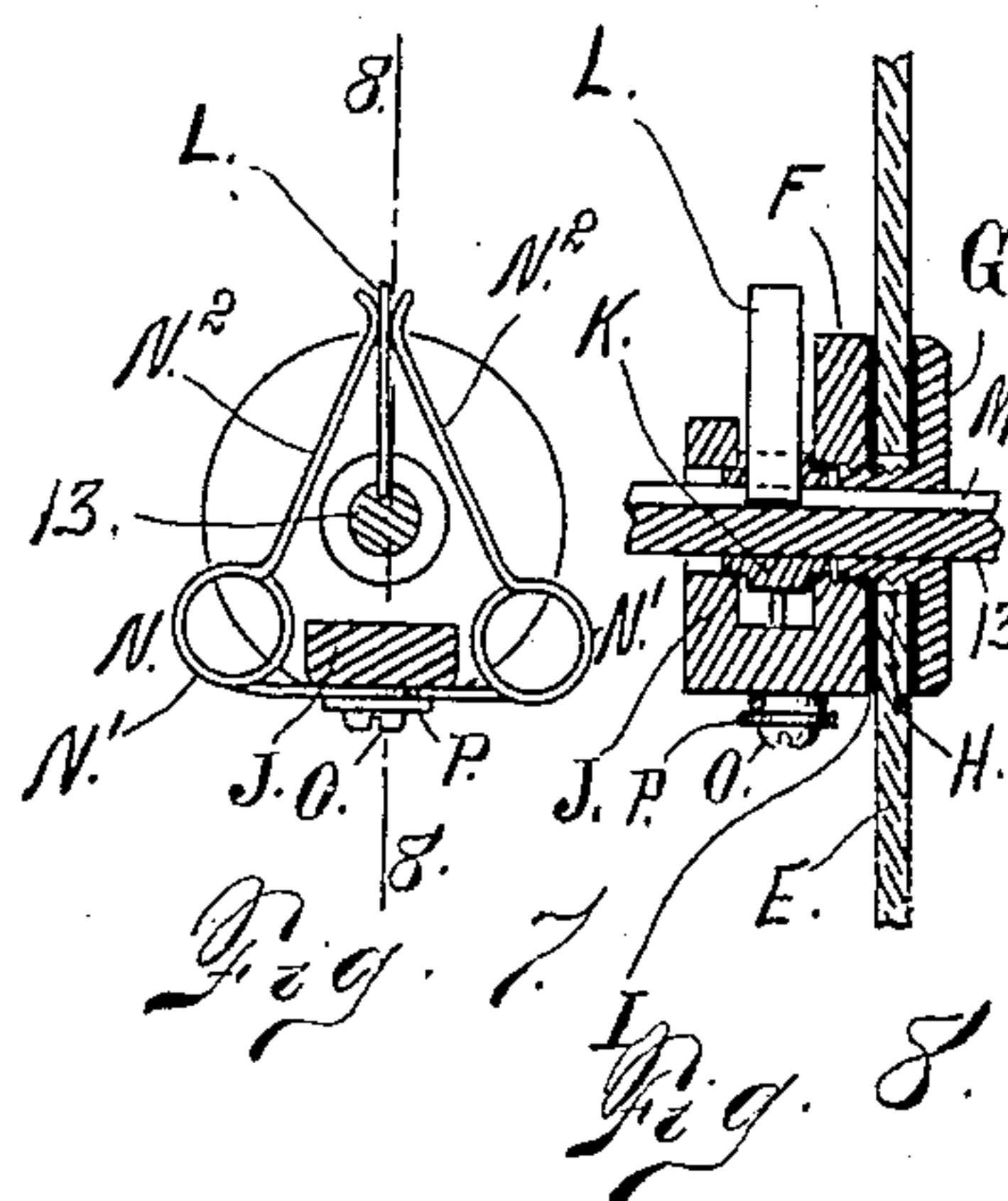
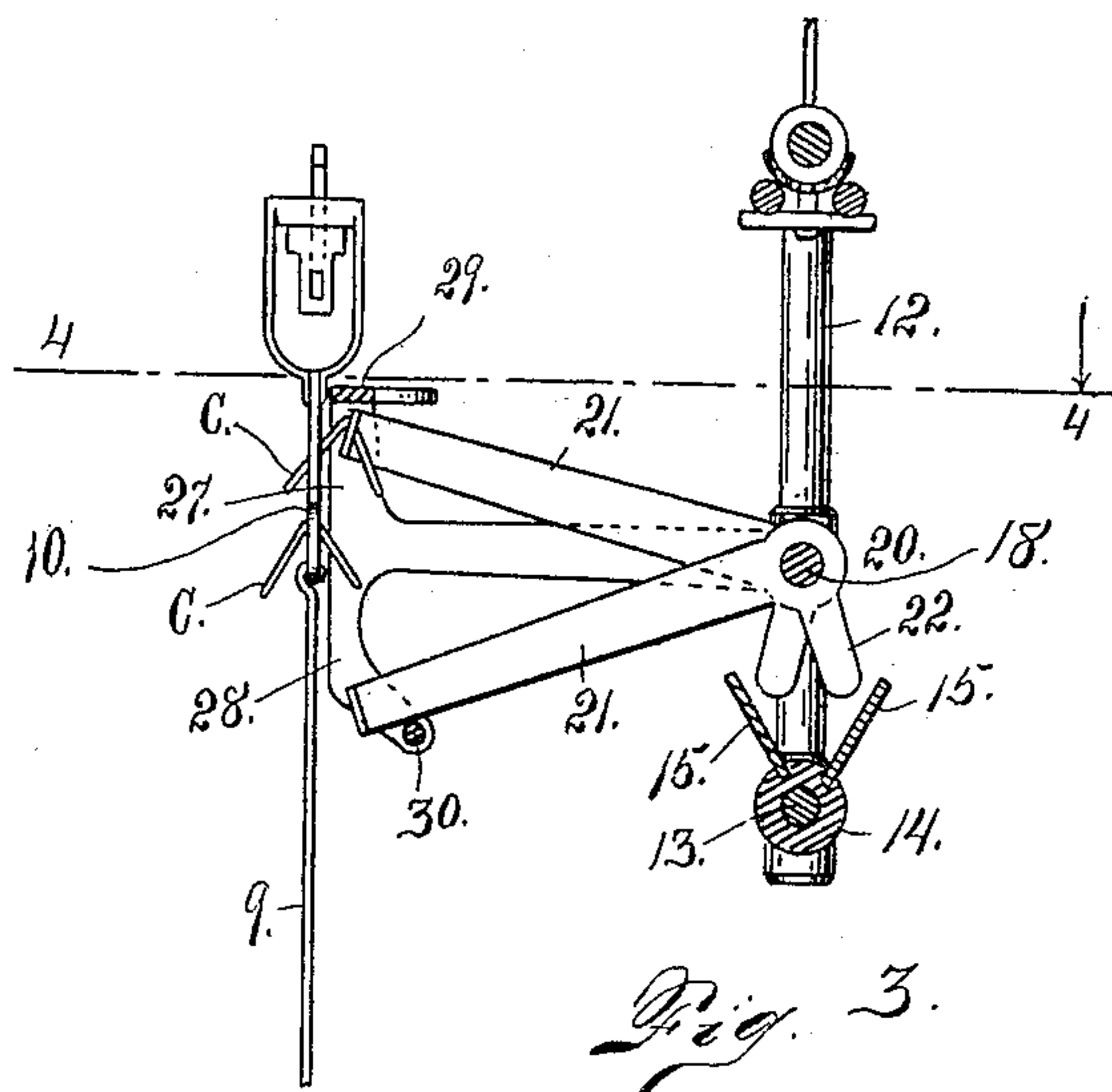
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2 SHEETS—SHEET 2.



Witnesses  
Otto E. Haddick.  
Dena Nelson.

By *R. G. Ainsworth.*  
Inventor  
*A. J. Mien*  
Attorney



# UNITED STATES PATENT OFFICE.

ROBERT G. AINSWORTH, OF DENVER, COLORADO.

## ASSAY-BALANCE.

No. 841,477.

Specification of Letters Patent.

Patented Jan. 15, 1907.

Application filed May 8, 1905. Serial No. 259,380.

*To all whom it may concern:*

Be it known that I, ROBERT G. AINSWORTH, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Assay-Balances; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in assay-balances or fine balances employed in assaying and analytical work.

My object is to provide an attachment for the ordinary assay-balance to avoid the necessity of handling the very small weights usually employed in connection with this class of work. The smallness of these weights renders it difficult to handle them either by the use of tweezers or by taking them directly in the fingers. By virtue of my improvement so-called "riders" are employed to take the place of the very small weights. These riders take the place of weights from one milligram up to a number of milligrams, as may be desired.

By virtue of my improvement the hanger, with one end of the balance-beam, is equipped with a rider-holder. Suitably mounted adjacent this holder is a number of rider-carrying levers, the same being movably mounted or fulcrumed on a suitable bar or rod. These levers, as shown in the drawings, are of the bell-crank variety. Mounted below the fulcrum-rod of the levers is a rod having both revoluble and longitudinal movement, the same being capable of manipulation from the outside of the case. Upon this rod is made fast a device for manipulating the rider-carrying levers, the same being capable of longitudinal adjustment in such a manner that the levers may be simultaneously or independently actuated by the manipulating device. By turning this device in one direction the rider-carrying levers may be raised, whereby one or more of the riders are lifted from the rider-holder of the hanger, while by turning this device in the opposite direction one or more of the rider-carrying levers are actuated to deposit a corresponding number of weight-riders on the holder of the hanger. These weight-riders compensate for the usual

weights deposited in the pan of the hanger opposite that containing the material to be weighed. The larger size weights may still be employed in the pan in the usual manner.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a front view of an assay-balance equipped with my improvements. Fig. 2 is a fragmentary view of the mechanism with the parts shown on a larger scale. Fig. 3 is a section taken on the line 3 3, Fig. 2. Fig. 4 is a horizontal section taken on the line 4 4, Fig. 3, looking downwardly. Fig. 5 is a perspective view in detail of one of the rider-carrying levers. Fig. 6 is a detail view illustrating features of the device on an enlarged scale. Fig. 7 is a section taken on the line 7 7, Fig. 2, viewed in the direction of the arrow. Fig. 8 is a section taken on the line 8 8, Fig. 7, showing the glass of the case in place.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the casing or cabinet in which the mechanism of the balance is located. This mechanism includes an upright post 6, a balance-beam 7, and hangers 8 and 9. The hanger 8 is of ordinary construction, while the hanger 9 is provided intermediate its extremities with a horizontally-disposed rider-holder 10, the same being provided with saw-tooth notches located on opposite sides of the body of the hanger to receive weight-riders. Suitably journaled in one side of the casing and in a hanger 12, forming a part of the balance mechanism, is a rod 13, which is also longitudinally movable in its bearings. Upon this rod is rigidly mounted a manipulating device 14, in which are set two inclined plates 15. These plates have their lower edges set into the sleeve, and they are inclined outwardly as they extend upwardly. Their edges are recessed to form teeth 16. This rod 13 is flattened on one side, as shown at 17, and graduated to indicate milligrams.

Upon a rod 18, mounted directly above the rod 13, is mounted a pointer 19, adapted to occupy a position in close proximity to the graduated part of the rod 13, whereby as the latter is moved longitudinally the pointer may be made to point out any desired figure on the graduated portion of the rod. Upon



this rod 18 is also fulcrumed a number of bell-crank levers 20, each of which is provided with a forwardly-extending rider-carrying arm 21 and a depending arm 22. These 5 levers, as shown in the drawings, are six in number, or equal to the number of weight-riders to be manipulated. The levers are spaced by collars 23, mounted on the rod 18 and held fast thereon by set-screws 24. Between the collars and on opposite sides of 10 each lever are located friction-disks 25. The levers are fulcrumed on the rod 18 between two arms 26, whose extremities remote from the rod are provided with upwardly and 15 downwardly projecting parts 27 and 28, respectively. The upper extremities of the parts 27 are connected by a transverse piece 29, while the lower extremities of the parts 28 are connected by a rod 30. These parts 20 29 and 30 form stops to limit the upward and downward movement of the arms 21 of the rider-carrying levers. Hence the parts 26, 27, 28, 29, and 30 form a stationary frame within which the rider-carrying levers are 25 operated. The extremity of each lever 20 remote from its fulcrum is provided with a lip A, bent at right angles to the arm 21 and provided with a notch B, adapted to receive a weight-rider C. These riders, as shown in 30 the drawings, are V-shaped. These lips A of the levers move in close proximity to the rider-holding part 10 of the hanger 9, so that as the levers are moved up and down the riders may be lifted from or deposited upon 35 the holder, as circumstances may require.

The manipulating-sleeve 14 is provided with a number of teeth 16 equal to one more than the number of levers 20 to be manipulated. As the rod 13 is moved longitudinally it may be adjusted to actuate all of the 40 levers 20 simultaneously or to actuate them independently in either direction, as may be required. If it is desired to actuate all the levers for the purpose of depositing all the 45 riders upon the rider-holder or for the purpose of removing all the riders from the rider-holder, the rod 13 will be moved to bring the pointer directly in front of the unnumbered graduated mark D on the rod 13. 50 If it is desired to actuate a single lever 20 for the purpose of handling a weight-rider of one, two, three, five, ten, or twenty milligrams, the rod 13 will be moved to bring the pointer 19 directly in front of the number indicating 55 the weight of the rider to be manipulated.

From the foregoing description it will be understood that as the rod 13 is turned rearwardly its teeth 16 will engage the depending arms of the bell-crank levers and move 60 the latter rearwardly, whereby the forwardly-extending arms 21 are thrown downwardly. During this action the riders carried by the arms 21 of the levers will be deposited upon the rider-holder. Now as the rod 13 is

turned in the opposite direction the other 65 set of fingers 16 will act on the arms 22 of the levers to throw the latter forwardly and raise the lever-arms 21, whereby the weight-riders are lifted from the rider-holder.

Where the rod 13 passes through the glass 70 plate E of the case, a bearing for the rod is formed, composed of two members F and G, preferably disk-shaped. The disk F is located on the inside of the plate E and the disk G on the opposite side. The glass plate 75 is provided with an opening H, and a threaded sleeve formed on the disk G passes through this opening F. Between the plate E and the disk F is a packing-washer I, adapted to form a dust-tight joint around 80 the opening H. Formed integral with the disk F is a lug J, whose upper portion is separated from the disk, and in this space is located a sleeve K, which is journaled in the 85 parts F and J. Made fast to this sleeve K is a small plate or finger L, which is fast in the sleeve and whose inner extremity enters a longitudinal groove M, formed in the rod 13. Mounted upon the lower part of the lug J is a 90 spring N, held in place by a screw O and a washer P. The screw passes through the washer and is threaded in the lug, whereby the spring is clamped in place. The spring 95 is composed of wire and has a central coil around the screw and coils N' on opposite sides. Extending upwardly from the coils N' are two spring-arms N<sup>2</sup>, which normally engage or approximately engage the finger L of the sleeve K. The function of this spring is to 100 return the manipulating-rod 13 to its normal position after each rotary movement for the purpose of actuating the rider-carrying levers.

From the foregoing description the use and operation of my improved device will be readily understood. I have not described 105 the entire mechanism of the balance, since the features not described are not new and do not directly cooperate with the novel features. Preparatory to using the device the 110 weight-riders C which are to be used in the operation of the balance may be placed upon the rider-holder 10, the same being arranged with reference to the marks and numbers on the graduated part of the rod 13. Assuming that the weight-riders are placed upon 115 the holder, the bell-crank levers 20 should be first manipulated to throw their arms 21 downwardly. Then by operating the rod 13 and its sleeve 14 the arms 21 may be 120 thrown upwardly, whereby all of the weight-riders or as many of them as may be necessary will be lifted from the rider-holder. If it is desired to lift them all, the rod 13 will be adjusted to bring the pointer 19 directly in 125 front of the unnumbered mark D. This pointer 19 is mounted on a collar Q, held in place on the rod 18 by a set-screw R, whereby the pointer may be adjusted at will.



Having thus described my invention, what I claim is—

1. In a balance of the class described, the combination with a balance-beam, of a hanger connected therewith and provided with a horizontal part adapted to hold weight-riders, a rider-carrying lever mounted in suitable proximity to said horizontal part, and means for manipulating said lever comprising a revoluble rod carrying fingers projecting on opposite sides of one arm of the lever whereby the latter may be moved in opposite directions by the manipulation of the rod.

2. In a device of the class described, the combination with a balance-beam, of a hanger connected therewith and provided with a part adapted to hold weight-riders, a rider-carrier composed of a number of levers mounted in suitable proximity to said horizontal part, and means for manipulating said levers comprising a rod mounted to have both revoluble and longitudinal movement, and equipped with means for actuating a single lever or any number of levers simultaneously according to the longitudinal adjustment of the rod.

3. In a balance, the combination with a balance-beam, of a hanger connected therewith and provided with a part adapted to hold weight-riders, a rider-carrier composed of a number of levers fulcrumed in suitable proximity to said horizontal part, and means for manipulating the said levers simultaneously, or separately, comprising a rod mounted to have both revoluble and longitudinal movement and equipped with means for actuating the levers.

4. In a balance of the class described, the combination of a hanger connected therewith and provided with a part adapted to hold weight-riders, a rider-carrier composed of levers mounted in suitable proximity to said horizontal part, and means for actuating said levers simultaneously or independently of one another comprising a single rod equipped with lever-actuating devices and mounted to have both revoluble and longitudinal movement.

5. In a balance of the class described, the combination of a hanger provided with a part adapted to hold weight-riders, a rider-carrier composed of a number of levers independently fulcrumed in suitable proximity to the rider-holder, and means for actuating said levers comprising a rod mounted to have both revoluble and longitudinal movement and equipped with means for actuating the levers either simultaneously or independently of one another as may be desired.

6. In a balance, the combination of a hanger provided with a part adapted to hold weight-riders, a number of levers independently fulcrumed in suitable proximity to the

rider-holder, the said levers being adapted to carry weight-riders, and a manipulating device mounted in suitable proximity to the levers and consisting of a rod mounted to have both revoluble and longitudinal movement and carrying-fingers arranged to actuate one or more of the levers as the rod is turned, substantially as described.

7. In a balance, the combination with a balance-beam, of a hanger connected with the beam and provided with a rider-holding part, levers independently fulcrumed adjacent said part and having depending arms, a rod mounted to have both revoluble and longitudinal movement, the said rod being provided with a manipulating device composed of two sets of teeth normally occupying positions on opposite sides of the depending arms of the levers and adapted to actuate the levers by engaging the depending lever-arms from either side, the said fingers being adapted by the longitudinal movement of the rod to be brought into position to actuate all of the levers simultaneously, or any lever independently as circumstances may require.

8. In a balance of the class described, the combination of a hanger provided with a rider-holding part, a rider-carrier mounted in suitable proximity to said part and composed of a number of members mounted to move independently of one another, a rod mounted to have both revoluble and longitudinal movement, and a manipulating device carried by the rod and adapted to act on the members of the rider-carrier either simultaneously or separately according to the longitudinal adjustment of the rod, the latter being graduated, and a stationary pointer located in suitable proximity to the graduated part of the rod, the rod being graduated to correspond with the weight of the riders to be used.

9. In a balance of the class described, the combination of a hanger provided with a rider-holding part having V-shaped notches located on opposite sides of the hanger proper, weight-riders adapted to engage the notches of the holder, a rider-carrier mounted in suitable proximity to the holder and consisting of a plurality of rider-carrying levers independently fulcrumed, a manipulating device consisting of a rod mounted to have both revoluble and sliding movement, the said rod having a part graduated in terms of the weights of the different riders, a pointer mounted in suitable proximity to the graduated part of the rod, a manipulating device mounted on the rod and composed of two sets of teeth normally occupying positions on opposite sides of the rider-carrying levers to be actuated, and means for normally returning the rod to its normal position after each revoluble act, substantially as described.



10. In a device of the class described, the combination with a balance-beam, of a hanger connected with the beam and provided with a rider-holding part, a number of  
 5 bell-crank levers independently fulcrumed in suitable proximity to the rider-holder, the outer extremity of one arm of each lever being bent and notched to hold a weight-rider, the opposite arm of each lever extending  
 10 downwardly, means for limiting both the upward and downward movement of the rider-carrying arms of the levers, and means adapted to act on the depending arms of the levers from either side whereby the rider-  
 15 carrying arms may be raised or lowered as may be desired.

11. In a device of the class described, the combination of a hanger provided with a rider-holding part, a rider-carrier composed  
 20 of a number of levers independently fulcrumed adjacent said part, and a manipulating device consisting of a rod mounted to have both revoluble and sliding movement, the said rod carrying two sets of fingers  
 25 adapted by the longitudinal movement of the rod to be brought into proper alinement to act on all the levers simultaneously or

upon each lever individually, substantially as described.

12. In a device of the class described, the  
 30 combination of a rider-holder, a rider-carrier mounted in suitable proximity to the holder, and a manipulating device for the rider-carrier, consisting of a rod mounted to have  
 35 both revoluble and longitudinally-sliding movement, the said rod having a longitudinal groove, a bearing through which the grooved portion of the rod passes, a sleeve journaled in said bearing and provided with  
 40 a tooth fast in the sleeve but protruding into the groove of the rod, and a spring acting on the said tooth from opposite sides whereby as the rod is turned in either direction the  
 45 tooth acts on the spring, and the recoil of the latter has a tendency to return the rod to its normal position after each revoluble movement.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT G. AINSWORTH.

Witnesses:

DENA NELSON,  
 A. J. O'BRIEN.