No. 612,069. Patented Oct. 11, 1898.

J. H. SWIHART.

SPRING BALANCE SCALE.

(Application filed Mar. 2, 1897.)

(No Model.)

3 Sheets—Sheet 1.

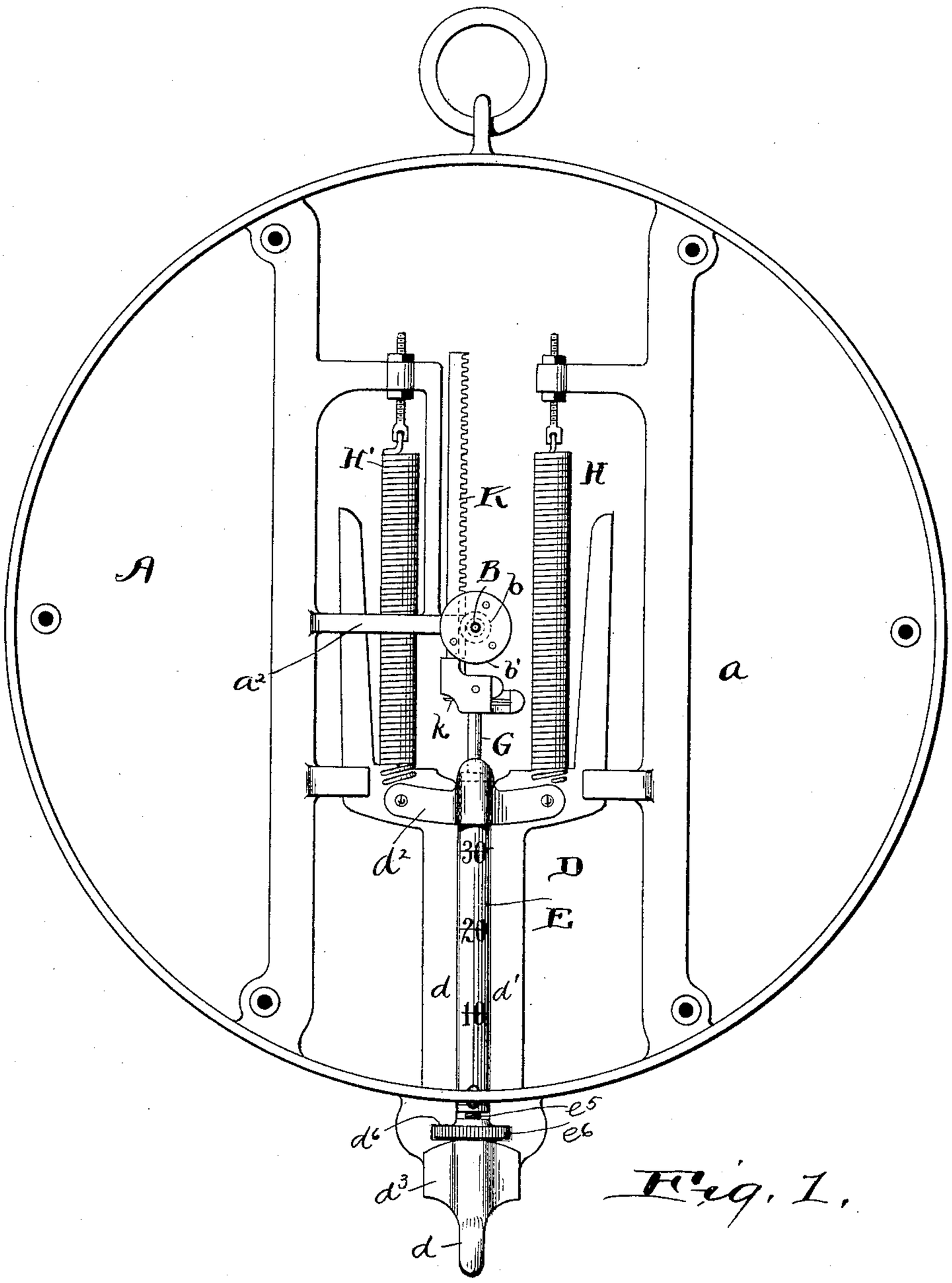

Fig. 1.

Witnesses.
E. B. Gilchrist
A. M. Rankin

Inventor.
John Henry Swihart
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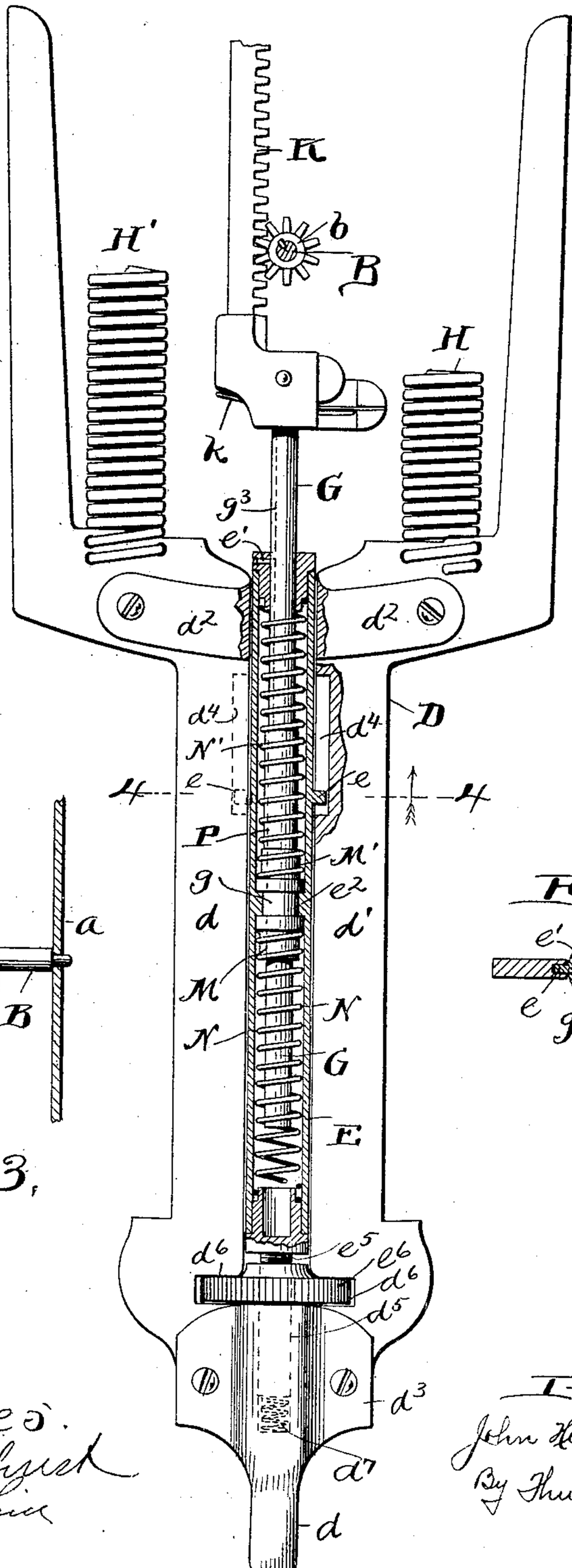

Fig. 2.

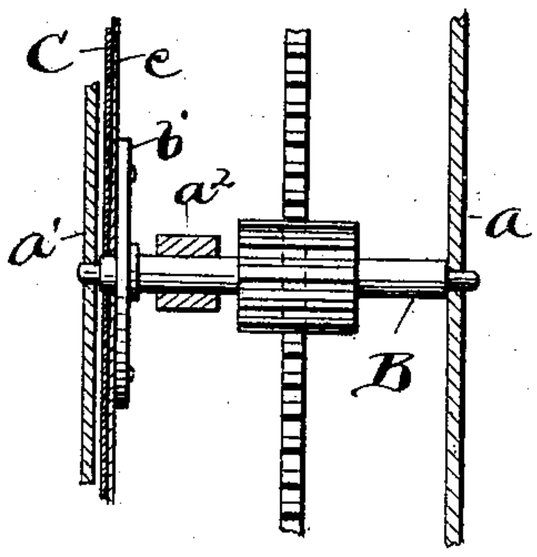

Fig. 3.

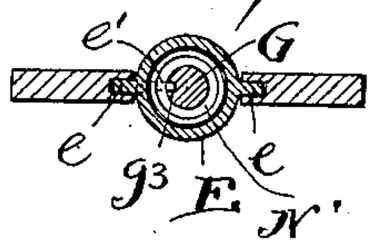

Fig. 4.

Witnesses.
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(Application filed Mar. 2, 1897.)

(No Model.) 3 Sheets—Sheet 3.

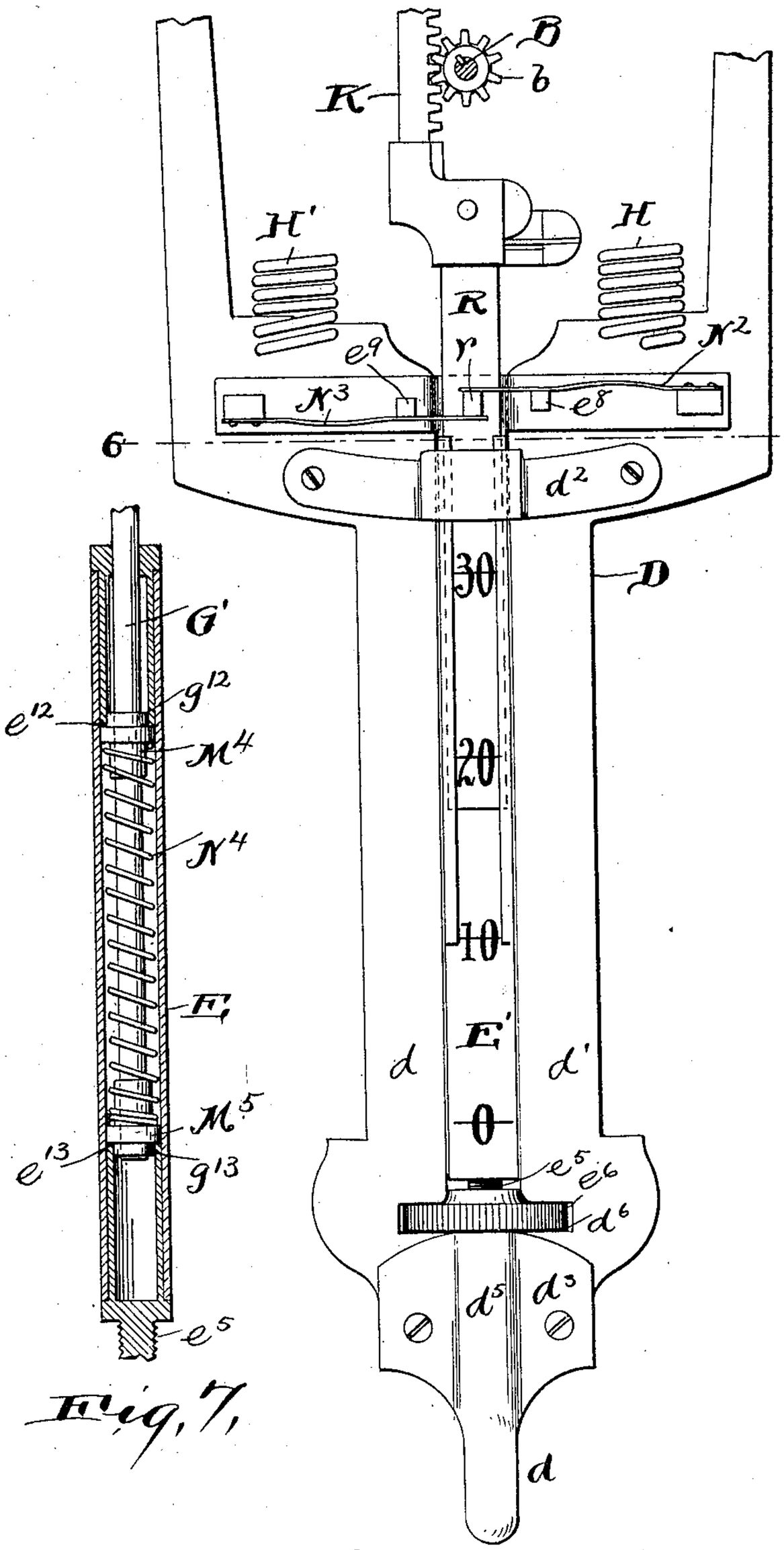

Fig. 5.

Fig. 7.

Fig. 6.

Witnesses:
E. B. Gilchrist
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UNITED STATES PATENT OFFICE.

JOHN HENRY SWIHART, OF CLEVELAND, OHIO, ASSIGNOR TO THE NATIONAL COMPUTING SCALE COMPANY, OF SAME PLACE.

SPRING-BALANCE SCALE.

SPECIFICATION forming part of Letters Patent No. 612,069, dated October 11, 1898.

Application filed March 2, 1897. Serial No. 625,714. (No model.)

To all whom it may concern:

Be it known that I, JOHN HENRY SWIHART, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Spring-Balance Scales; and I do hereby 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.

My invention relates to improvements in spring-balance scales wherein a shaft to which an indicator (dial or pointer) is rigidly secured is proportionately rotated by the load upon the scale-pan.

The primary object of the invention is to prevent injury to the scale and particularly to the dial or other form of indicator and its connection with the shaft when a weight is suddenly thrown upon or taken from the scale-pan.

The invention consists, broadly, in the combination of a rotatable shaft, an indicator rigidly secured thereto, and mechanism for operating the shaft with a spring-supported frame and a double-acting spring-buffer, which is always under tension, which connects said frame with the shaft-operating mechanism and permits their relative movement, but compels them to come to rest in the same relation to each other. It also consists in the combination of parts substantially as described constituting the double-acting spring-buffer shown, in the combination, substantially as described, with the spring-supported frame, of a double-acting spring-buffer adjustably connected therewith, and in the other combinations of parts, as pointed out in the claims.

In the drawings, Figure 1 is a front view of the scale mechanism when the face-plate and dial have been removed. Fig. 2 is an enlarged view of the spring-supported frame and the mechanism which transmits motion from it to the shaft to which the dial is secured, a part of said mechanism being shown in vertical section. Fig. 3 is a vertical sectional view of the scale near the axis of the shaft. Fig. 4 is a transverse vertical sectional view on line 4 4 of Fig. 2. Fig. 5 is a view of a modified construction. Fig. 6 is a sectional view on line 6 6 of Fig. 5, looking upward; and Fig. 7 is a sectional view of another modified construction.

Referring to the parts by letters, A represents the scale-case; B, a horizontal transverse shaft which is supported in journals which may be formed in the front and back plates a a' of the case and in a fixed arm a^2. The indicator C, as shown, is a dial, a part of which may be seen in Fig. 3. Its frame c is rigidly connected with the shaft by means of a plate b', which is rigidly fixed to said shaft. The frame D, which in its general form is like similar frames heretofore used, is suspended in the usual manner from the two scale-springs H H' and projects out through the bottom of the case. The scale-pan, which is not shown, is to be suspended from the loop d on the lower end of this frame. The frame D, as shown, is formed of two bars d d', the lower portions of which are parallel and are rigidly connected at a suitable distance apart by yokes d^2 d^3. A tare-bar E lies between the two bars d d'. In the form shown in Figs. 1, 2, and 7 this bar is tubular, whereby it is especially adapted to support, inclose, and coöperate with the particular form of buffer-springs employed. Suitable means are provided for preventing lateral movement while permitting longitudinal movement of said bar relative to the frame D. In the construction shown two pins e, which project from the sides of said bar, enter vertical slots d^4 in the proximate faces of the bars d d'. On the lower end of the bar E is a threaded stem e^5, which enters a socket d^5 in the yoke d^3. A nut e^6 upon this stem lies in horizontal slots d^6 in the bars d d', wherefore by the turning of this nut the bar E is moved endwise relative to the frame D. A spring d^7 may be compressed in the socket d^5 below the stem e^5, the function of such spring being to take up lost motion of the nut e^6 in slots d^6.

As stated, the bar E is a tube in the construction shown in Figs. 1 and 2, and both ends are wholly or partly closed sufficiently to form abutments for the springs. A vertical plunger-rod G passes centrally into the said tube through the upper end thereof. The rack-bar K is connected to the upper end of this plunger-rod by suitable means, which

may be and, as shown, are substantially like the means by which heretofore a similar rack-bar has been connected directly with the spring-frame—that is to say, by a horizontal pivot—the rack-bar being constantly pressed by a spring *k* toward the pinion *b*. This rack-bar engages with the pinion *b*, which is rigidly connected with the shaft B. The rack-bar K and pinion *b* constitute the best form of shaft-operating mechanism. Inside the tube E and about midway between its ends is an internal flange e^2. On the rod G is an external flange *g*, which is of such diameter that it may pass the flange e^2.

Surrounding the rod G, on opposite sides of the flanges *g* and e^2, are the two thimbles M M′, which fit upon the rod and in the tube, although they are freely movable relative to both, wherefore said thimbles act to hold the rod G centrally in the tube E. The coil-springs N N′ surround the rod G in the tube and even when the scale is at rest are respectively compressed between the ends of the tube and the thimbles M M′. The springs exert constantly upon the thimbles force enough to normally hold them in contact with opposite sides of the flange e^2 and to return them into contact therewith when in the operation of the scale they have been moved out of contact. The opposite faces of the flange e^2 act as stops to limit the movement of said thimbles, and since the thimbles engage with the flange *g* they (said springs) act to move said flange *g* to and normally hold it in the same plane with the flange e^2, and consequently act to return the rod G to a certain definite position relative to the frame D. It is evident that the plunger-rod G may move in either direction from its normal position relative to the tube E, the springs N N′ yielding to permit such motion. This movement, when downward, is resisted by the spring N and is limited by the engagement of the lower end of the rod G with the bottom of the tube E. When the movement of said rod is upward, it is resisted by spring N′ and is limited by a loose sleeve P, which surrounds the rod G inside of the spring N′ and which when said spring is sufficiently compressed engages with the top of the tube and with the thimble M′. The described means for limiting the movements of the plunger-rod away from its normal position relative to the tube E are provided for the purpose of preventing the springs from being too much compressed, whereby they may become set.

The operation of the described mechanism is the following: When a weight is thrown suddenly upon the scale-pan, the frame D and the tubular bar E are jerked down. This motion of the frame and bar E must be transmitted, through the spring N′, plunger-rod G, and rack-bar K, to the pinion *b* before the shaft B is moved. The strength of the spring, however, is not great enough to immediately overcome the inertia of the parts named. The spring, therefore, yields or is compressed and permits the frame D and tube E to move independently of the plunger-rod and the parts named connected therewith. The spring subsequently expands to its normal condition, whereby the rod G is drawn down to its normal position relative to the frame D, as above described, and consequently is drawn down a distance proportionate to the weight upon the scale-pan, and this movement of the rod effects, through the mechanism described, the proportionate rotation of the shaft B and indicator attached thereto. When a weight is suddenly taken from the scale-pan and the frame D is moved suddenly upward by the springs H H′, the lower spring N yields, permitting the plunger-rod G to temporarily remain stationary, and then expands to return said rod to its normal position relative to said frame B, wherefore the shaft B and indicator rigidly attached thereto are returned to their normal positions. Obviously the springs act to gradually check all movements of the rod G relative to the frame, or vice versa, and also to return said rod to its normal position relative to the frame D.

It is necessary with the construction shown to prevent the plunger-rod G from turning upon its axis in the tube E, and to effect this result a longitudinal groove g^3 is formed in it, and a pin *e′*, which passes through the wall of the tube E, engages in this groove. As before stated, the tubular tare-bar E is adjustably connected with the frame D, and the means described for moving it relative to said frame are provided for the purpose of taking off tare, and it operates in the following manner: When a vessel is placed upon the scale-pan, it draws the frame D downward, carrying with it necessarily the tube E and all of the parts associated with said tube. By turning the nut e^6 the tube may now be moved upward relative to the frame D until the dial or other indicator attached to shaft B has been returned to its normal position. Thereafter the mechanism will act in the described manner and will show the correct weight or value of the material placed in the vessel.

It will be understood that when the scale is used for ascertaining weights or values the bar E is rigidly connected with frame D and may be considered as a part of it.

In Figs. 5 and 6 I have shown a modified construction of the spring-buffer which serves to connect the frame D with the shaft-operating mechanism. The two spring-arms N^2 N^3, which are secured to arms e^{10} on the tare-bar E′, act against opposite sides of a lug *r* on the slide R, (which corresponds in function to rod G,) having a sliding connection with the tare-bar E′, which is not tubular in this case. The spring N^2 acts to move the slide R down until said spring strikes the stop e^8 on the tare-bar E′, and the spring N^3 acts to move said slide up until the spring strikes a stop e^9 on said tare-bar. Both springs yield to permit independent movement of the frame D

and slide R. The rack-bar K is connected with slide R in a suitable manner.

In Fig. 7 is still another modification of the invention. A tubular bar E is to be attached to the frame D. The plunger-rod G′ enters the said bar through its upper end. Only one spring N^4 is employed. It lies between the two thimbles M^4 M^5 and is under constant tension sufficient to force said thimbles respectively against two internal shoulders e^{12} e^{13}. On the rod G are two flanges g^{12} g^{13}, which are respectively above and below said thimbles. This rod G′ is to be connected with the shaft-operating mechanism substantially as shown on the other figures. When the frame D is violently moved downward, the upper shoulder e^{12}, pressing against thimble M^4, will compress the spring N^4, and the subsequent expansion of the spring will press thimble M^5 down against shoulder g^{13}. When the frame D is moved violently upward, it carries the lower thimble M^5 upward, thereby compressing the spring N^4, which will expand again and move thimble M^4 up against the shoulder g^{12}. These movements of the thimbles when the spring is compressed are not necessarily accompanied by the movement of the rod G; but as the spring expands these thimbles M^4 M^5 engage with the flanges g^{12} g^{13} and return the rod to the position in which it stands at rest relative to the frame D, the shoulders e^{12} e^{13} acting as stops to limit the movement of said thimbles.

The tare-bar, whatever be its shape, is rigidly connected with the frame D when the scale is being used for weighing, and therefore for the purposes of the invention may be regarded as a part of said frame. The rod G or slide R and the springs and associated parts constitute what I call the "double-acting spring-buffer," and the pinion *b* and rack-bar K constitute the shaft-rotating mechanism. Each of these three groups of parts may be varied to any desired extent without departure from the generic invention.

Having described my invention, I claim—

1. In a spring-balance scale, the combination of a vertically-movable spring-frame, a rotatable indicator-operating shaft, shaft-rotating mechanism, a vertically-movable member which forms part of said shaft-rotating mechanism, which member has a sliding connection with the spring-frame, whereby they may move relatively to each other, and a double-acting buffer device which opposes said relative movement of the frame and member in both directions from their normal positions, substantially as specified.

2. In a spring-balance scale, the combination of a vertically-movable spring-frame, a rotatable indicator-operating shaft, shaft-rotating mechanism, a vertically-movable member which forms a part of said shaft-rotating mechanism, which member has a sliding connection with the spring-frame, whereby they may move relatively to each other, a double-acting spring-buffer device which opposes the relative movements of the frame and member in both directions from their normal positions, and stops which limit the positive action of said buffer device upon said shaft-operating member, whereby it always comes to rest in the same position relative to the spring-frame, substantially as specified.

3. In a spring-balance scale, the combination of a vertically-movable spring-frame, a rotatable indicator-operating shaft, a member which is movable vertically relative to the frame and has a sliding connection therewith, mechanism for transmitting motion from said member to said shaft, and a double-acting spring-buffer device which is under tension in both directions when said member and frame are in their normal positions, and acts to resist the relative movement of said parts in both directions, substantially as specified.

4. In a spring-balance scale, the combination of a vertically-movable spring-frame, a rotatable indicator-operating shaft, a member which is slidable vertically upon the spring-frame, mechanism for transmitting motion from said member to said shaft, a double-acting spring-buffer device which, when said member and frame are in their normal positions, is under tension in both directions, and acts to resist the relative movement of said parts in both directions, and stops which limit the positive action of said spring-buffer device in both directions, whereby said parts are brought to rest in their normal relative positions, substantially as specified.

5. In a spring-balance scale, the combination of a vertically-movable frame, a rotatable indicator-operating shaft, a member which is slidable vertically upon said spring-frame, mechanism for transmitting motion from said member to said shaft, and two buffer-springs interposed between the frame and vertically-movable member and acting upon said member in opposite directions, and stops carried by the frame with which said springs respectively engage under tension when they have returned to their normal positions, substantially as specified.

6. In a spring-balance scale, the combination of the spring-supported frame, a tube secured thereto, having near its middle an internal flange, a plunger-rod entering one end of said tube and passing said flange, an external flange on said rod, two springs under tension surrounding said rod in the tube, and adapted respectively to thrust endwise against the ends of said tube and the flange in the tube and the flange on the plunger-rod, substantially as specified.

7. In a spring-balance scale, the combination of the spring-supported frame, a vertical tube secured thereto having closed ends and an internal flange between the ends, a plunger-rod passing into the tube through the upper end thereof and having an external flange, freely-movable thimbles which fit said tube and embrace said rod on opposite sides of said flanges, and two springs respec-

tively compressed between the end of the tube and said thimbles, a rotating indicator, and mechanism for transmitting motion from the plunger-rod to the indicator, substantially as specified.

8. In a spring-balance scale, the combination of the spring-supported frame, a vertical tube secured thereto having closed ends and an internal flange between the ends, a plunger-rod passing into the tube through the upper end thereof and having an external flange, freely-movable thimbles which fit said tube and embrace said rod on opposite sides of said flanges, and two springs respectively compressed between the ends of the tube and said thimbles, a rotating indicator, and mechanism for transmitting motion from the plunger-rod to the indicator, and stops to limit the relative movement in both directions of the plunger-rod and tube, substantially as specified.

9. In a spring-balance computing-scale, the combination of the spring-supported frame, a vertical tube supported thereon and having an internal flange, and means for changing the relative positions of said tube and frame, a plunger-rod passing into said tube through its upper end and having an internal flange, two springs in the said tube arranged to respectively thrust against the ends of the tube and on opposite sides of the two flanges named, with a movable indicator and mechanism transmitting motion from the plunger-rod to the indicator, substantially as specified.

10. In a spring-balance computing-scale, the combination of the scale-case, a rotatable shaft, an indicator rigidly attached thereto, and shaft-operating mechanism, with a spring-supported frame, a tare-bar adjustably secured thereto, a double-acting spring-buffer under constant tension supported by said tare-bar and connecting the same with the shaft-operating mechanism, and stops carried by said tare-bar for limiting the action of said spring-buffer upon the shaft-operating mechanism, substantially as specified.

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

JOHN HENRY SWIHART.

Witnesses:

E. L. THURSTON,

ALBERT H. BATES.