(No Model.)

A. JOHNSON.

SASH BALANCE.

No. 456,492. Patented July 21, 1891.

Fig. 1.

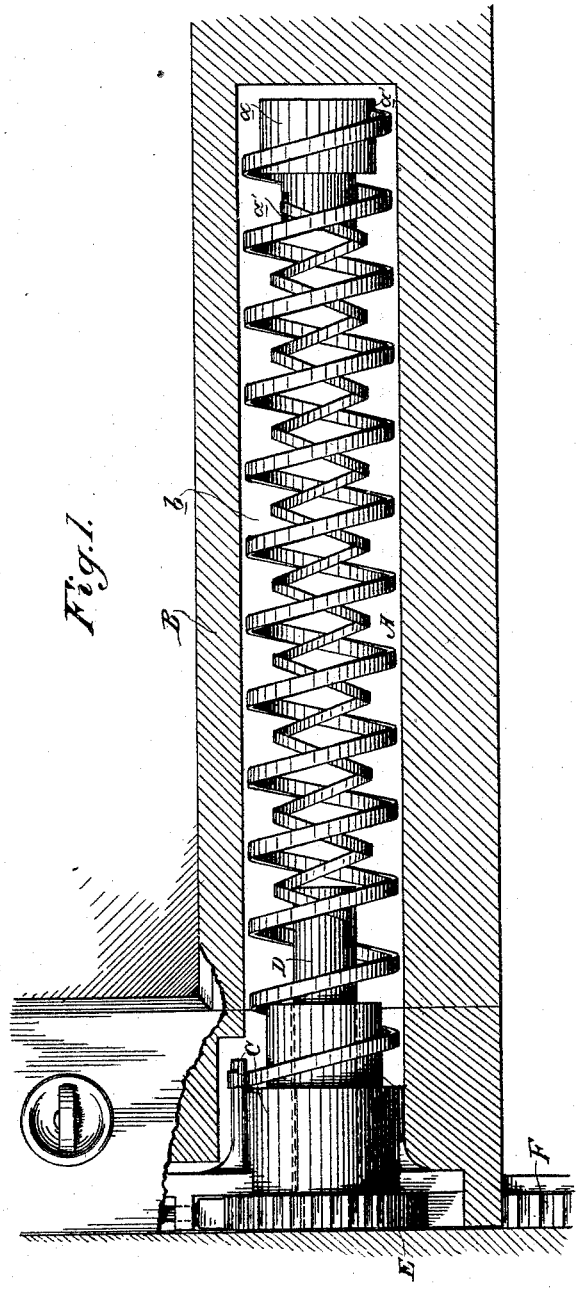
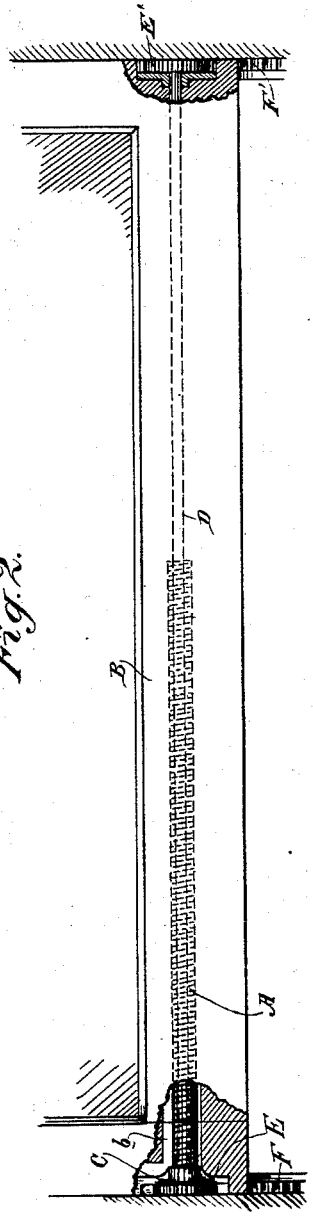


Fig. 2.



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UNITED STATES PATENT OFFICE.

AXEL JOHNSON, OF OAKLAND, ASSIGNOR TO THE MARSHALL IMPROVED WINDOW FURNITURE COMPANY, OF SAN FRANCISCO, CALIFORNIA.

SASH-BALANCE.

SPECIFICATION forming part of Letters Patent No. 456,492, dated July 21, 1891.

Application filed October 8, 1890. Serial No. 367,437. (No model.)

To all whom it may concern.

Be it known that AXEL JOHNSON, a citizen of Sweden, residing at Oakland, Alameda county, State of California, have invented an Improvement in Sash-Balances; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to that class of sash-balances in which a spring is let into a bore in the sash-rail and actuates and is actuated by a pinion which engages a rack on the window-casing, said class being exemplified by a previous patent, No. 433,596, issued August 5, 1890, to the Marshall Improved Window Furniture Company upon my application.

My present invention consists in a new and useful improvement in the spring, and in a novel arrangement providing for a pinion on each side of the sash engaging a rack on each side of the casing.

The objects of these improvements will be hereinafter fully set forth.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a section of the sash-rail, showing the spring and connected parts in elevation, the spring being shown unduly distended to illustrate it clearly. Fig. 2 is a view showing the provision of a double pinion and rack.

B represents the rail of a window-sash, in which said rail is made a bore *b*, in which is seated the spring A. This spring is a torsional one, returning within itself, one of its ends being secured to the axially-moving rod D, which carries the pinion E, and the other end secured to a non-rotary piece C, secured to the sash.

F is the rack with which the pinion engages. These parts are essentially the same in arrangement as those in the previous patent, and their operation is the same—namely, balancing the sash by the tension of the spring effected through the engagement of the pinion with the rack.

In the previous patent I set forth the advantages of a torsional spring consisting of a coiled piece returned within itself, having one of its ends fixed to a non-rotary bearing and the other secured to a piece that has a rotary movement. It was contemplated by my previous invention and it has been the practice heretofore to make this spring throughout its entire length of the same-sized wire or rod.

My present invention consists in making the inner portion of the spring—that is to say, that portion which returns on the inside—of a smaller-sized wire or rod than the outer portion. This can be done by making one portion of a single wire or rod from which the spring is made smaller than the other portion and returning said smaller portion on the inside; but I prefer to accomplish it by means of a separate piece of wire of smaller size, and still maintain the effect of a torsional spring returned within itself by connecting the adjacent ends of the two wires either directly or by making them bear against one another, or preferably, as I have here shown, through the intervention of a sleeve or thimble *a*, in notches *a'* in which the adjacent inner ends of the two wires are fitted, whereby they can be readily secured together and make a torsional spring returned within itself, the general effect being the same of winding up the spring and unwinding it throughout its entire length.

There are many important advantages which result from the present improved construction of spring. The three principal ones may be thus stated, and will be best understood by comparison with the former spring: In the former spring where the same-sized wire was used throughout, the inner portion (that which returned within) being necessarily of smaller diameter than the outer portion, was consequently less elastic than the outer portion, and the spring did not exert its power equally throughout its entire length, as the elasticity of the inner portion was not had to the best advantage, it being stiffer and more rigid than the outer portion on account of its reduced diameter, and still maintaining the same size or thickness of wire. Now by making the inner portion, or that which returns within, of a smaller-sized wire there is not this difference between the outer and inner portions in elasticity, for the inner portion has its elasticity increased and equals the outer portion in this respect, this result

being due to the fact of making it of a smaller-sized wire. As a consequence the entire spring is equal in its power throughout its whole length, and the best result is obtained. Again, in the former spring the outer portion, being more elastic than the inner portion on account of its greater diameter, was caused in winding up to reduce its diameter under the torsional strain faster or greater in proportion than the reduction of diameter of the inner portion, and as a consequence it came down into contact with or contracted upon the inner portion, thereby producing friction; but in the present construction, the inner portion being equally elastic with the outer portion, their diameters are reduced equally and friction is avoided. The third advantage is more properly one of degree, and may be expressed by saying that whereas the former spring enabled me to use a much shorter spring, and consequently a much shallower bore in the sash-rail than the ordinary single spring, the present spring enables me to use even a shorter spring than the former one, which result is due to equalizing the power and tension of the spring throughout its entire length to a much better advantage than in the former spring.

In heavy sashes it is sometimes found necessary to provide for a rack and pinion on each side of the sash, so as to avoid binding or cramping. To effect this result, I have shown in Fig. 2 the turn-rod D as much longer than the ordinary one, and as extending entirely through the rail of the sash and carrying upon its opposite end a pinion E′, which engages with a rack F′. At the first end the connection of the spring is the same as before, but at the other end there is no connection, as the same spring operates the entire rod and effects through it the simultaneous action of the opposing pinions.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a sash-balance or analogous device, the torsional spring consisting of an outer coiled piece or portion and an inner coiled piece or portion returning within the outer piece or portion and made of a wire or rod of smaller size than said outer piece or portion, the adjacent inner ends of said pieces or portions being connected and the adjacent outer ends the one secured to a non-rotary bearing and the other secured to a piece that has a rotary movement, substantially as herein described.

2. In a sash-balance or analogous device, the torsional spring consisting of an outer coiled piece or portion and an inner coiled piece or portion returning within the outer piece or portion and made of a wire or rod of smaller size than said outer piece or portion, the inner adjacent ends of said pieces or portions being connected by an intermediate sleeve or thimble and their outer adjacent ends the one connected to a non-rotary bearing and the other secured to a piece that has a rotary movement, substantially as herein described.

3. In a sash-balance or analogous device, an axially-moving rod and a rack and pinion for operating the same, in combination with a torsional spring consisting of an outer coiled piece or portion and an inner coiled piece or portion returning within the outer piece or portion and made of a wire or rod of smaller size than said outer piece or portion, the inner ends of said pieces or portions being connected and their outer ends the one secured to the axially-moving rod and the other fixed to a non-rotary piece, substantially as herein described.

4. In a sash-balance or analogous device, an axially-moving rod and a rack and pinion for operating same, in combination with a torsional spring consisting of an outer coiled piece or portion and an inner coiled piece or portion returning within the outer and of smaller size of wire or rod, the inner adjacent ends of said pieces or portions being connected by an intermediate sleeve or thimble and their outer adjacent ends the one secured to the axially-moving rod and the other fixed to a non-rotary piece, substantially as herein described.

5. A torsional spring returned within itself and having its inner portion made of smaller wire or rod than its outer portion, substantially as herein described.

6. A torsional spring consisting of an outer coiled piece or portion and an inner coiled piece or portion returning within the outer and made of a wire or rod of smaller size, said pieces or portions being connected at one end of the spring, substantially as herein described.

In witness whereof I have hereunto set my hand.

AXEL JOHNSON.

Witnesses:
S. H. NOURSE,
H. C. LEE.