May 19, 1936. A. LARSON 2,041,646

WINDOW SASH BALANCE

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Fig. 1.

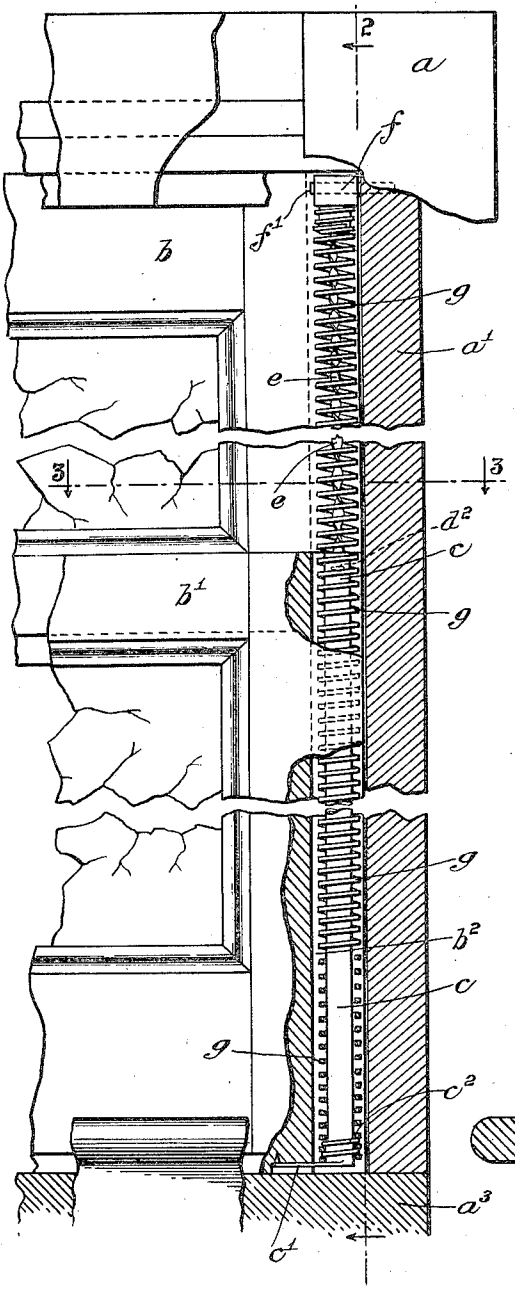
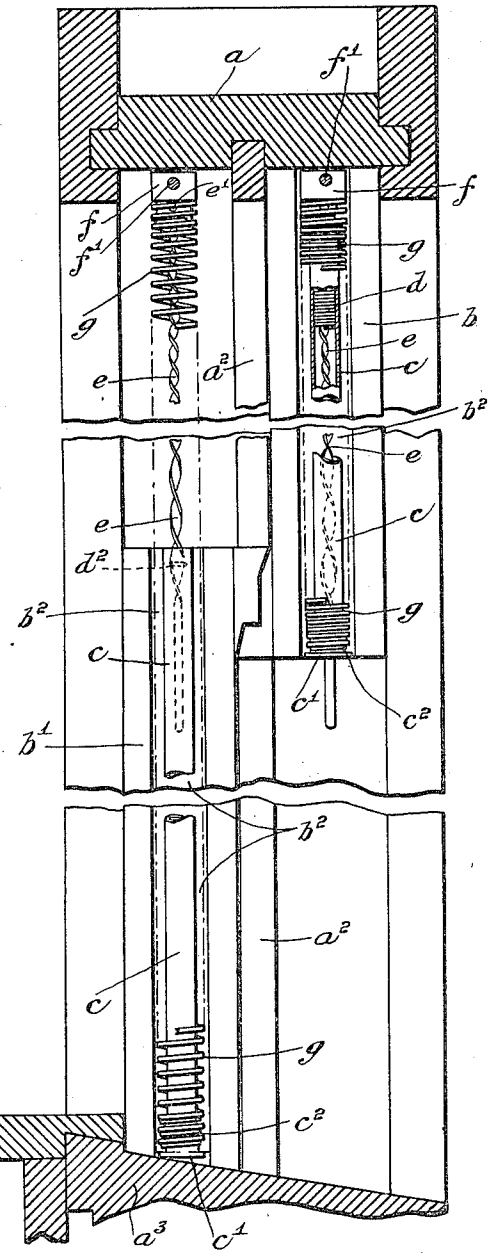


Fig. 2.



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ATTORNEYS

May 19, 1936. A. LARSON 2,041,646

WINDOW SASH BALANCE

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Fig. 3.

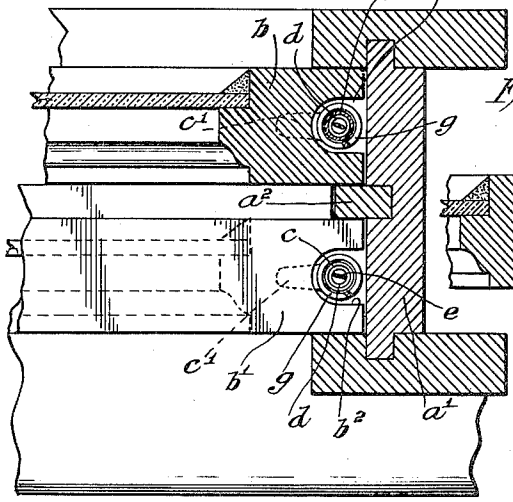


Fig. 4.

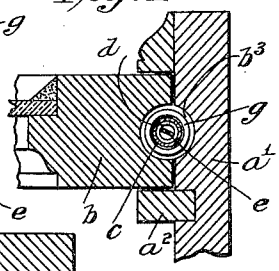


Fig. 5.

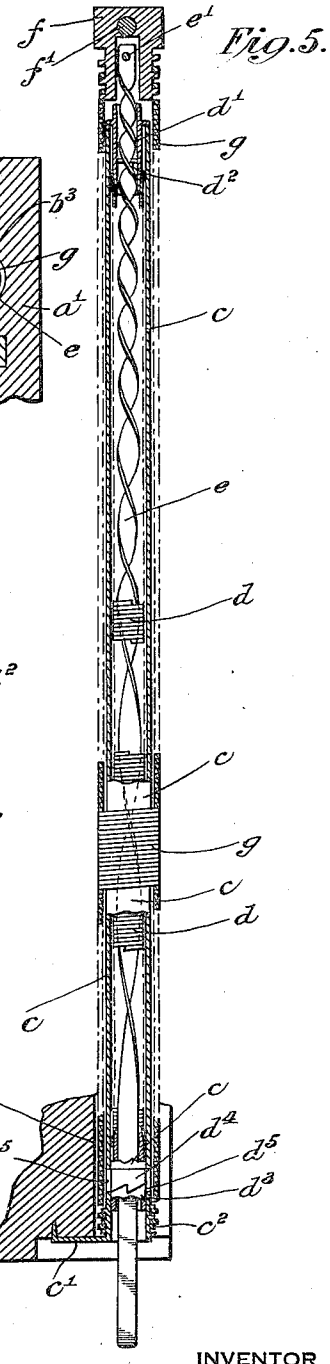


Fig. 6.

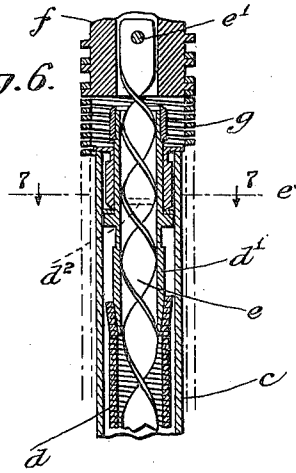
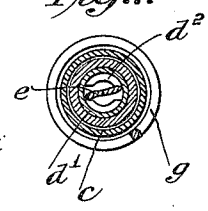


Fig. 7.



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WINDOW SASH BALANCE

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Fig. 8.

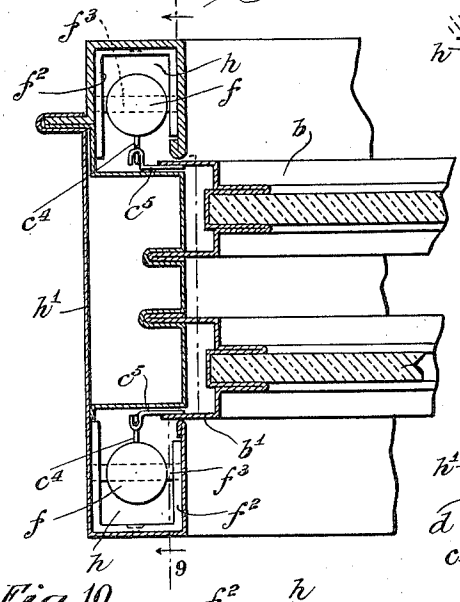


Fig. 9.

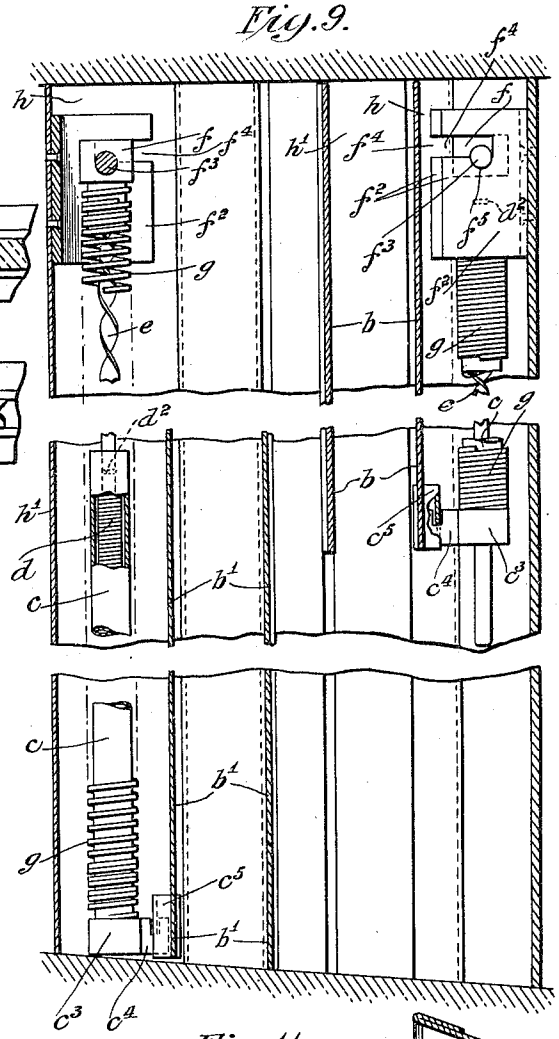


Fig. 10.

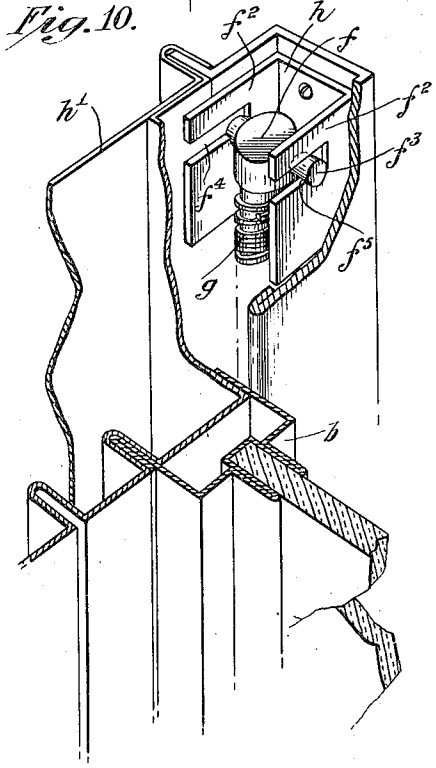
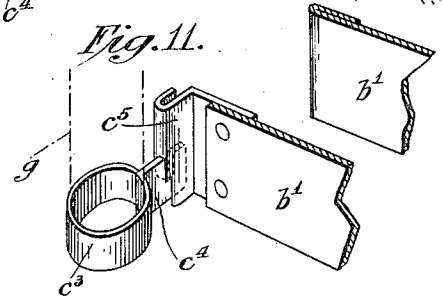


Fig. 11.



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WINDOW SASH BALANCE

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Fig. 12.

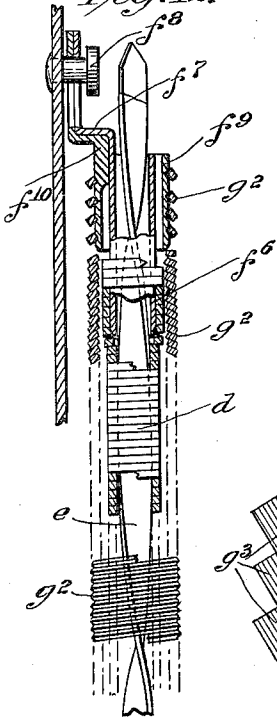


Fig. 13.

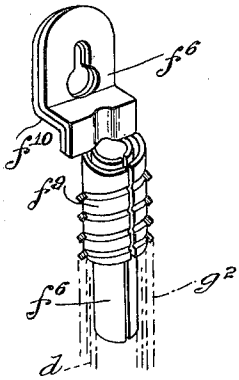


Fig. 14.

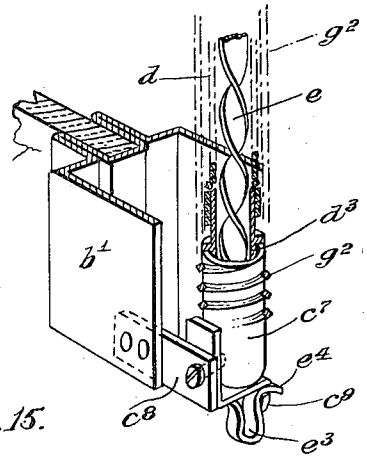
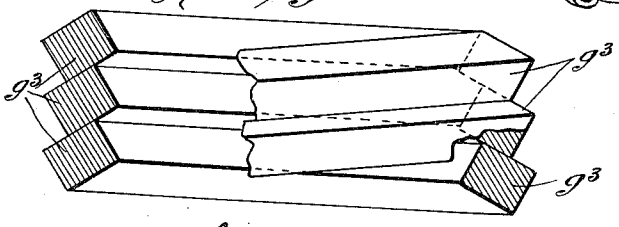


Fig. 15.



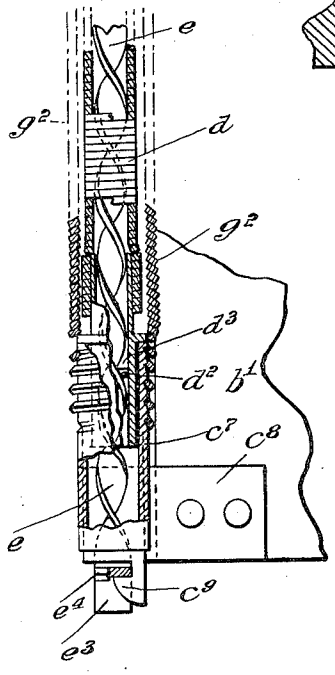
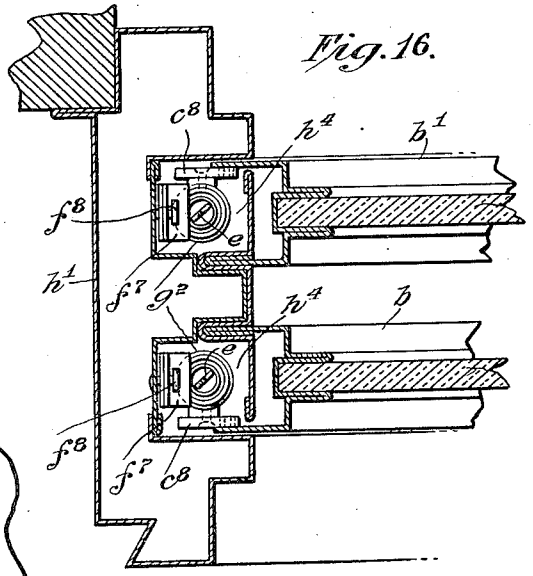


Fig. 16.



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Patented May 19, 1936 2,041,646

UNITED STATES PATENT OFFICE

2,041,646

WINDOW SASH BALANCE

Algot Larson, New York, N. Y., assignor to Unique Balance Company, New York, N. Y., a corporation of Illinois

Application March 17, 1934, Serial No. 716,062

3 Claims. (Cl. 16—197)

This invention relates to window sash balances of the type of that shown in Letters Patent of the United States No. 1,864,745 dated June 28, 1932, in which there is substituted for the usual sash weight and cord a spring balance in which an elongated spiral member, secured at one end to the sash near its bottom, enters within a coiled spring through a nut secured to the lower end of the spring, the upper end of the spring being secured to the window frame. When the sash, whether upper or lower, is lowered from its highest position the spring is wound up or placed under increasing tension by the coaction of the spiral member and the nut and when the sash is again raised its movement is assisted by the tension of the spring which, as it unwinds, causes the nut to rotate and therefore to travel on the spiral member which is held from rotation. In the application of such sash balances to heavy sashes it has been found that the coiled spring which causes the nut to rotate and therefore to travel on the fixed spiral member is not alone sufficient to assist the upward movement of the sash to a desirable degree and it is the object of the present invention to provide means to supplement the action of such spring. To that end there is combined with the sash balance as described in said Letters Patent a coiled spring which is stretched longitudinally and therefore placed under increasing tension in the downward movement of the sash and therefore returns to the sash, when it is to be raised, the lifting power which is put into it in the downward movement of the sash, thus supplementing the action of the spring the tension of which is developed by winding through the relative longitudinal movement of the nut, and exerting the greatest lifting power when the lifting power exerted through the spiral is least.

In the accompanying drawings, in which several embodiments of the invention are illustrated:

Figure 1 is a view in sectional elevation of a wooden window to which the improved sash balance is applied, the figure being broken out to save space.

Figure 2 is a view in vertical section on the plane indicated by the broken line 2—2 of Figure 1, looking in the direction of the arrows.

Figure 3 is a partial detail view in horizontal section on the plane indicated by the broken line 3—3 of Figure 1, looking in the direction of the arrows.

Figure 4 is a detail view in horizontal section showing the chamber for the reception of the balance as formed partly in the sash and partly in the jamb.

Figure 5 is a detail view partly in elevation, partly in vertical section and partly broken away showing the spiral balance by itself, except that a portion of a window sash is shown at the lower end of the balance.

Figure 6 is a detail view in sectional elevation on a somewhat larger scale than that of Figure 5, showing particularly the interrelation of parts at the upper end of the balance.

Figure 7 is a view in horizontal section on the plane indicated by the broken line 7—7 of Figure 6, looking in the direction of the arrows.

Figure 8 is a detail view in horizontal section of a portion of a metal window to which is applied the embodiment of the invention illustrated in Figure 9.

Figure 9 is a view in vertical, sectional elevation on the plane indicated by the broken line 9—9 of Figure 8, looking in the direction of the arrows, the figure being broken out to save space.

Figure 10 is a detail view in perspective illustrating particularly the connection of the balance to the window frame at the upper end of the balance.

Figure 11 is a detail view in perspective illustrating particularly the connection of the balance to the sash at the lower end of the balance, as represented in Figure 9.

Figure 12 is a view similar to Figure 5, but showing a construction in which the function of the tube *c* of Figure 5 is served in part at least by the supplemental spring and in which such supplemental spring is specially formed to develop maximum initial tension.

Figure 13 is a detail view in perspective and on a larger scale illustrating particularly the connection of the balance to the window frame, as shown in Figure 12.

Figure 14 is a detail view in perspective and on a larger scale illustrating particularly the connection of the balance to the sash at the lower end, as represented in Figure 12.

Figure 15 is a partly sectional view on a much enlarged scale illustrating more clearly the formation of the supplemental spring shown in Figure 12.

Figure 16 is a detail view in horizontal section of a portion of a metal window to which is applied the embodiment of the invention illustrated in Figures 12, 13, and 14.

In the embodiment of the invention shown in Figures 1–7 the frame of the window, embodying the head or lintel *a*, the jamb a^1 with the

parting strip a^2 and the sill a^3, is shown as constructed and arranged in usual manner, the upper sash b and the lower sash b^1 being arranged to move vertically therein. In Figures 1, 2 and 3 each side rail of each sash is shown as plowed out or grooved, as at b^2, to receive the spring balance to be described, while in Figure 4 the chamber or recess to receive the balance is shown, as at b^3, as formed partly in the sash and partly in the jamb. It will be understood that a balance is provided at each side of each sash. Each such balance, as shown in these figures, comprises a tube c which receives within it a coiled spring d in the nature of a shade-roller spring. At its upper end the spring d is secured to a sleeve member d^1 which is mounted within the tube c at its upper end and receives internally a nut d^2, consisting of two spaced members, for cooperation with a graduated, ribbon-like spiral member e which is secured at its upper end, as by a pin e^1, to a fixture f, which in turn is secured to the window frame at its top, as by a pin f^1. The lower end of the spring d is, in this illustrated embodiment of the invention, secured to one member d^3 of a clutch. The other member d^4 of the clutch engages the lower end of the tube c through lugs d^5 thereby permitting the clutch members to be disengaged, the spring to be wound up to adjust the tension and the parts to be reengaged. Secured to the lower end of the tube is a bracket c^1 for engagement with the sash frame, as shown in Figures 1 and 5. As the window sash is lowered the tension of the spring d, through the cooperation of the nut and the spiral, is increased somewhat and when the sash is lowered the power thus stored in the spring acts, through the rotation of the nut and the cooperation of the nut with the spiral, to assist in the upward movement of the sash. The assistance so afforded may be all that is desirable for light sashes, but it has been found to be insufficient when the balance is applied to a heavy sash. For the purpose of supplementing the action of the spring d in cooperating in the upward movement of the sash while retaining the advantages in the cooperation of the nut and spiral there is provided an extensible spring g which is secured at its upper end to the fixture f and therefore to the window frame at its top and is secured at its lower end, as at c^2, to the lower end of the tube c and therefore to the sash. When the sash is lowered the spring g is extended, as shown in Figure 1 and at the left hand in Figure 2, and the power so stored in the spring is available to cooperate in the upward movement of the sash when it is to be started from a condition of rest and at a time when the torsion spring d, acting through the nut and spiral, has the least effect in the raising of the sash. When the sash is in or near its lowest position the spiral, by reason of the long pitch of the part then in engagement with the nut, exerts practically no force, while the supplemental spring g, being then stretched, exerts its maximum force and takes practically the entire load.

In the application of the invention to metal windows, as illustrated in Figures 8–11, each balance may comprise as before the tube c, the spring d, the spiral e and the fixture f, but instead of being placed directly between the sash and the jamb, it is placed within a chamber h formed at the outer or inner side of the hollow metal frame or hanging stile h^1, as shown in Figures 8, 9 and 10. The fixture f is supported at the head of the window frame by a bracket f^2 which is suitably formed to receive the supporting pin f^3, the bracket being slotted, as at f^4, to permit the introduction of the pin f^3 and being recessed, as at f^5, to form seats for the pin. At its lower end the tube c receives a collar c^3 which, as shown in Figures 8, 9 and 11, has an arm c^4 formed to interlock with a bracket c^5 extended from the sash b or b^1, as the case may be. As before, the spiral e is secured at its upper end to the window frame at its top through the medium of the fixture f, to which the spring g is also secured at its upper end, the spring g being secured at its lower end to the sash through the medium of the tube c, the collar c^3 and the bracket c^5, the arm c^4 and the bracket c^5 being slotted so as to permit disengagement for the purpose of regulating the tension of the springs. The tube c as will be understood, is provided at its upper end with a nut, as at d^2.

When the weight of the sash is considerable it is particularly desirable that the initial tension of the supplemental spring shall be considerable also in order that the spring may be immediately effective in cooperating in the upward movement of the sash, even when the sash has been lowered but little. In the practical development of the invention it has been found that such maximum initial tension can be secured best by forming the supplemental spring g^2, as shown in Figure 12 and in much enlarged detail in Figure 15. In this spring the wire g^3 through its effective length is rectangular in cross-section and is canted and disposed so that each turn of the coil partly overlaps and lies upon the turn next below it. The supplemental spring thus not only develops high tension when initially stretched, but it also offers such resistance to lateral deflection that for some uses it fulfills sufficiently the function of the tube c in restraining lateral deflection of the spring d. A balance, comprising such a spring g^2 and dispensing with a separate tube, may be applied to a window, as shown in Figures 12, 13, 14 and 16, in which the spiral e is shown as placed with its end of least pitch down and therefore engaged at its lower end in the highest position of the sash, with the nut d^2 which is carried by a sleeve d^3 secured frictionally at the lower end of the spring d. The sleeve d^3 is free to rotate and is received, when the sash is in its highest position, within a sleeve c^7 which may be secured to the sash b^1 at or near its bottom by a bracket c^8. As the sash moves down the sleeve d^3 is withdrawn from the sleeve c^7 and rotates independently thereof. In this construction the spiral e is free at its upper end, but the spring d is held at this end from rotation, being frictionally engaged with the sleeve f^6 of a bracket f^7 which is engaged with a stud f^8 secured to the window frame at or near its top. The spiral e is formed at its lower end with an eye e^3 for engagement with a suitable tool and with a projecting lug e^4 adapted to engage, under the influence of the tension of the spring d, with a beveled detent c^9 formed with the bracket c^8. Downward movement of the spiral e with the sash causes the nut d^2 to rotate and therefore to increase the tension of the spring d, the power thus stored in the spring being returned through the nut to aid in raising the sash. The heavy, supplemental spring g^2 has a strong frictional engagement at its lower end with the sleeve c^7 and therefore with the sash b^1 and a similar engagement at its upper end with a sleeve f^9 carried by a bracket f^{10} which has a detachable

engagement with the stud f^8 secured to the window frame at or near its top. The balance as thus formed may be placed within a chamber h^4, formed at the outer or the inner side, as the case may be, of the hollow metal frame or hanging stile h^1.

To facilitate understanding of the operation of the invention, as it finds expression in the several embodiments illustrated and described herein, it is noted that when the balance is applied to the upper sash of a double hung window, as shown at the right hand in Figure 2, with the spiral placed with its end of steep pitch uppermost, neither the spring d nor the spring g is under material tension and the nut d^2 is carried by the tube c at its upper end; when the sash is moved downward, to open the window from the top, the nut d^2 is moved downward on the spiral e increasing the tension of the spring d and at the same time the supplemental spring g is extended and placed under tension, the force which is so stored in the springs being returned to cooperate in the upward, closing movement of the sash. On the other hand, when the balance is applied to the lower sash, as shown at the left hand in Figure 2, and the sash is then in its lowermost and closed position, the nut d^2 is at or near the upper end of the tube c, the spring d has been placed under tension by the downward movement of the nut on the spiral, and the supplemental spring g has been fully extended. The force thus stored in the springs is therefore ready to assist in the upward movement of the sash from its closed position. What has already been stated with respect to the application of the balance to the upper and lower sashes, as represented in Figures 1–7, is true also with respect to the application of the balance to the upper and lower sashes as shown in Figures 8–14. In the embodiment of the invention illustrated in Figures 12–16 the spiral is shown as placed with its sharply pitched portion lowermost and in this instance, in the construction shown, the nut d^2 is at or near the lower end of the tube c in engagement with the sharply pitched portion of the spiral, this arrangement being applicable to the upper sash.

In the old construction shown in applicant's prior Patents No. 1,864,745, June 28, 1932, and No. 1,926,951, September 12, 1933, in which a torsion spring alone is relied upon to assist the operator in the lifting of the window, the formation of the spiral member is such (the pitch of the spiral increasing slowly toward the lower end) that as the lower sash, for example, is moved downward and reaches its lowest position the torsion spring is most fully wound up. Then as the sash is raised and the torsion spring unwinds the loss of lifting power in the torsion spring as it unwinds is compensated by the form of the spiral, the lifting power of which increases by reason of the reduced pitch of the spiral.

The construction above referred to works satisfactorily in application to sashes which are not too heavy, but when the torsion spring alone is applied to a very heavy sash it is inadequate and it is necessary therefore to supplement the torsion spring by the provision of a tension spring. The lifting power of the tension spring is maximum when the tension spring is fully extended, that is, when the lower sash is all the way down. As the sash is raised and the tension spring is shortened its lifting power becomes less.

As the lifting power of the tension spring obviously decreases during the upward movement of the sash, the lifting power of the torsion spring must be increased to compensate for the reduced lifting power of the extensible spring g. The pitch of the spiral, however, is made to increase quite rapidly toward the lower end so that while the torsion spring is fully wound up as before during the downward movement of the sash the lifting power of the torsion spring is reduced by reason of the greater pitch of the spiral with which the nut is then engaged.

To compensate for the thus reduced power of the torsion spring, due to the pitch of the spiral, the tension spring must have high initial tension to compensate for the decreased lifting power of the torsion spring and because the lifting power of the torsion spring increases as the sash moves upward, by reason of the progressively lower pitch of the spiral, the lifting power of the tension spring may increase more slowly.

It will be understood that details of construction, particularly as involved in the application of the balance to the window, may be varied to suit different conditions of use and that, except as pointed out in the accompanying claims the invention is not restricted to the particular constructions shown and described herein.

I claim as my invention:

1. A sash balance for a window comprising a coiled torsion spring, a nut carried by the spring, a spiral member of rapidly increasing pitch toward the lower end adapted to be connected at one end to the window frame and cooperating with the nut to effect the storing of power in the torsion spring as the sash is lowered and the return of power to the sash to assist in the raising of the sash, and an extensible coiled spring of high initial tension and slow increase of tension as extended adapted to be connected at one end to the window frame and at the other end to the sash in which power is stored in the lowering of the sash and from which the stored power is returned to the sash to cooperate with the torsion spring, the torsion spring acting as an equalizer of the extensible coiled spring, and the two springs acting together as one element.

2. A sash balance for a window comprising a coiled torsion spring, a nut carried by the spring, a spiral member of rapidly increasing pitch toward the lower end adapted to be connected at one end to the window frame and cooperating with the nut to effect the storing of power in the torsion spring as the sash is lowered and the return of power to the sash to assist in the raising of the sash, a tube enclosing the spiral member and the spring and connected at one end to the spring and adapted to be connected at the other end to the sash, and an extensible coiled spring of high initial tension and slow increase of tension as extended surrounding the tube and adapted to be connected at its upper end to the window frame and at its lower end to the sash in which power is stored in the lowering of the sash and from which the stored power is returned to the sash to cooperate with the torsion spring in the raising of the sash.

3. A sash balance for a window comprising a coiled torsion spring, a nut carried by the spring, a spiral member of rapidly increasing pitch toward the lower end adapted to be connected at one end to the window frame and cooperating with the nut to effect the storing of power in the torsion spring as the sash is lowered and the return of power to the sash, a tube enclosing the spiral member and the torsion spring and con-

nected at one end to the torsion spring and adapted to be connected at the other end to the sash, and an extensible coiled spring of high initial tension and slow increase of tension as extended independent of the torsion spring and the tube and parallel therewith, said extensible spring being adapted to be connected at its upper end to the window frame and at its lower end to the sash and in which the power is stored in the lowering of the sash and from which the stored power is returned to the sash to cooperate with the torsion spring in the raising of the sash.

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