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LABORATORY FUME HOOD

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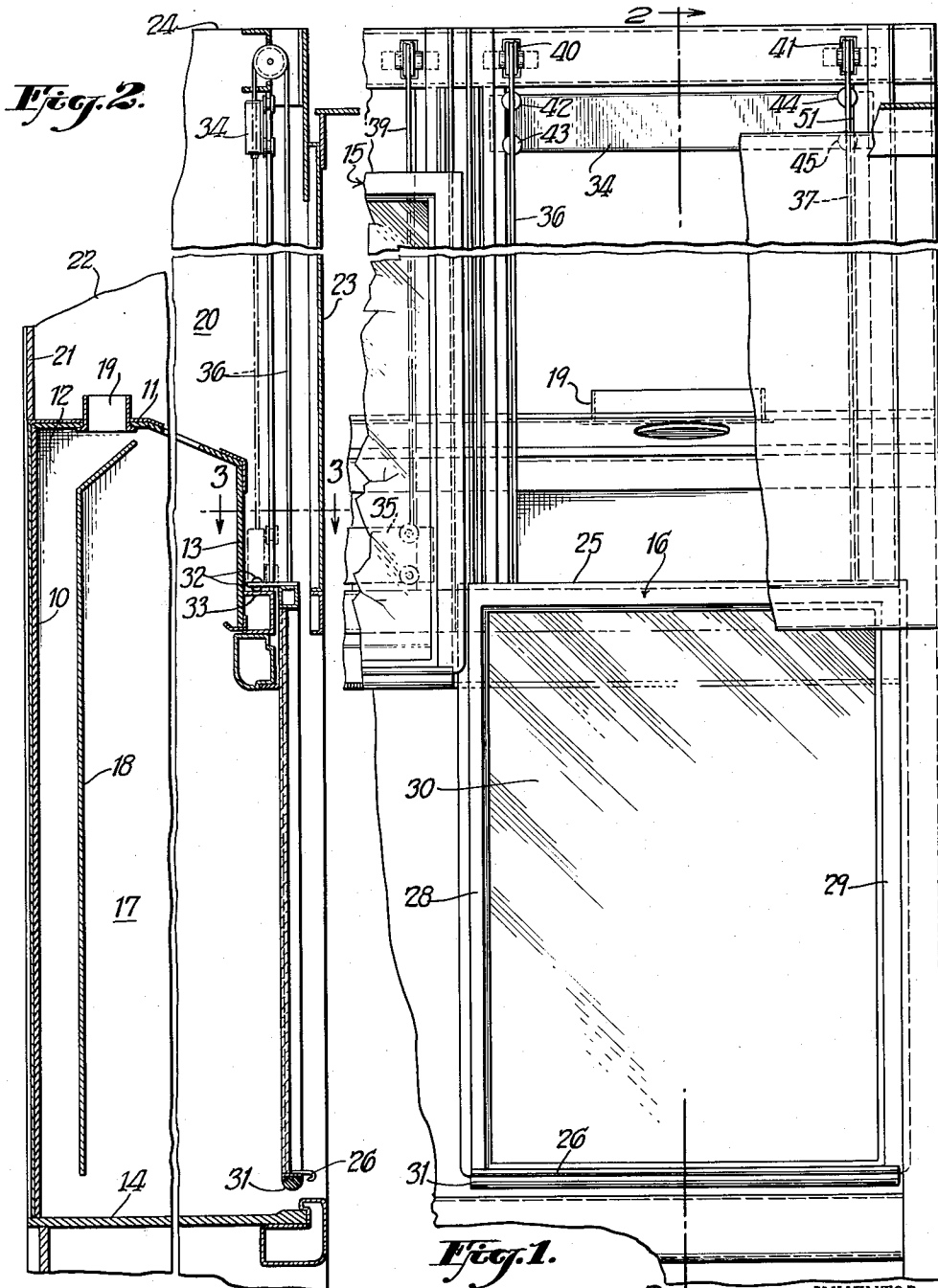


Fig. 2.

Fig. 1.

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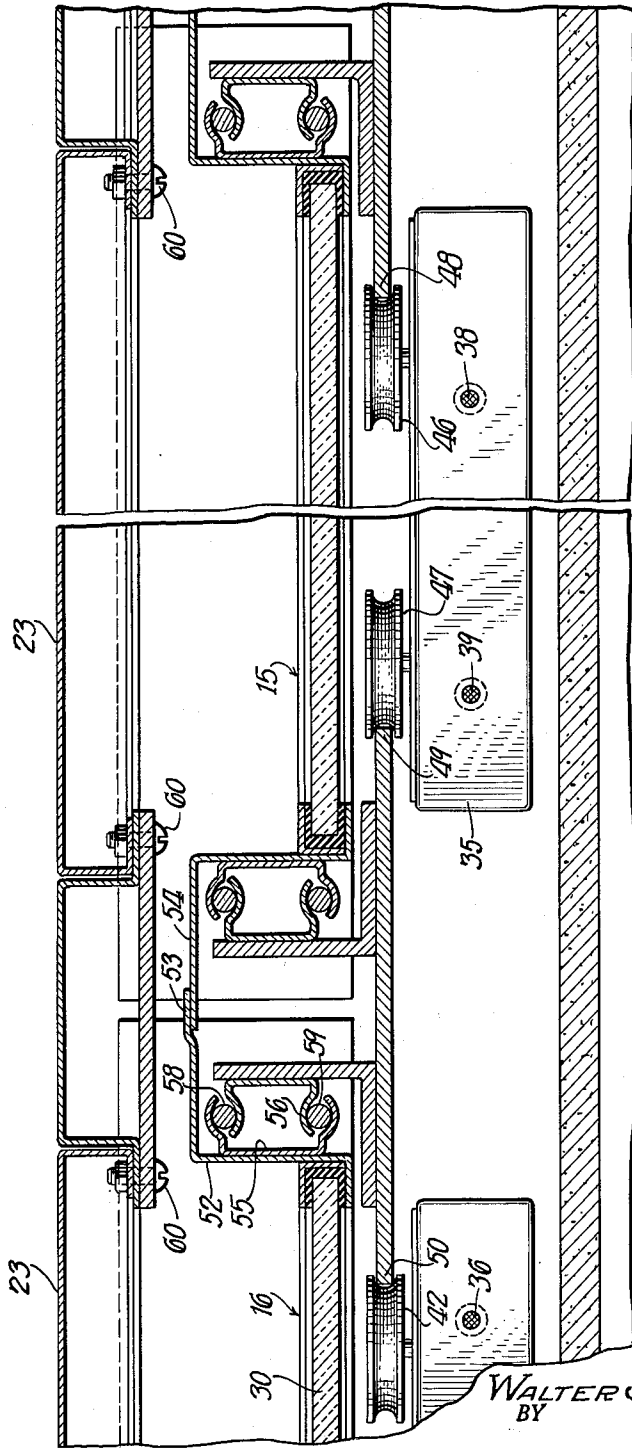
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Fig. 3.



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LABORATORY FUME HOOD

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This invention relates to fume hoods and more particularly to means for mounting a movable sash and a counter-weight therefor in such fume hoods.

In conventional fume hoods, the interior or work chamber is made available to a worker through an opening in a wall of the hood which may be at least substantially covered by one or more glass-filled sashes. Each sash is relatively heavy, and to permit the holding of the sash in various raised positions as well as to make it easier to raise the sash, various devices have been employed to counter-balance the weight of the sash. For example, spring-loaded devices have been employed which are connected to the sash by cords or cables. Although such devices occupy relatively little space, they have been found to be difficult to adjust and to maintain in adjustment over long periods of time. Counter-weights connected to the sash by cords or cables have also been employed, but it has been the custom to employ a plurality of counter-weights for each sash, each counter-weight being connected to a sash by a single cord or cable. However, because the sash is raised and lowered a relatively large number of times as compared with ordinary window sashes and because the connecting means, such as the cords or cable, may be exposed to corrosive atmospheres, it frequently happens that during use one of the connecting means breaks and permits the sash to fall with considerable force causing injury to a worker or damage to the sash.

It should be borne in mind that the problems involved with a fume hood sash are somewhat unique as compared with the problems encountered with sashes employed for other purposes. Thus, with a fume hood, a worker often has his hands and arms extending through the hood opening when the sash is raised and may also have other parts of his body extending through the opening. Furthermore, when a fume hood sash is raised, dangerous chemicals may be passed through the opening by a worker and valuable and expensive materials and apparatus may be passed through or extend through the opening. This is not true, for example, with an ordinary window opening employed merely for ventilation.

Therefore, it is important that the sash for fume hoods be counter-balanced so that it easy to operate, gas tight and reliable in operation and will not fall without warning.

Counter-weight arrangements which have been employed previously have also been objectionable because the weights themselves have been located in a compartment disposed rearwardly of the fume hood working chamber. Thus, the depth of the hood is greater than necessary for the other functions of the hood, and the weights and their connecting means are relatively inaccessible for repair purposes when the connecting means becomes defective. In many cases, the back of the fume hood is against a wall making it necessary to move the hood itself to provide access to the weights.

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In accordance with my invention, each sash of a fume hood is counter-balanced by a weight which is heavy enough to provide the desired operation of the sash and which is connected to the sash by a plurality of connecting means, such as a plurality of cords, cables, chains, etc. Each connecting means is strong enough to support the counter-weight and preferably, the connecting means are attached to the weight and to the sash at points spaced a substantial distance apart, so that if the other connecting means fails but one connecting means remains intact, the sash will not fall and the operation of the sash will be impaired, such as by binding or tilting, indicating to the worker or user that the counter-weight apparatus must be repaired before being used further.

Also, in accordance with the preferred embodiment of my invention, the counter-weight or weights are located in a chamber above and near the front of, but isolated from, the working chamber, and the weight or weights are accessible from the front of the fume hood for repair or adjustment purposes.

One object of the invention is to provide a counter-weight arrangement for use with the sash of fume hoods which is simple in construction and which will provide easy, safe and reliable operation of the sash.

Another object of the invention is to provide a fume hood construction with a sash counter-weight arrangement which is readily accessible.

A further object of the invention is to provide counter-weight apparatus for the sash of the fume hood which provides an indication of partial failure of the counter-weight apparatus without endangering the user of the fume hood or the apparatus or materials employed in conjunction therewith.

Other object and advantages of the invention will be apparent from the following detailed description of the manner in which I now prefer to practice the invention, which description should be considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a fragmentary, front elevation view of a preferred embodiment of the invention;

FIG. 2 is a cross-sectional view of the embodiment shown in FIG. 1 and is taken along line 2-2 indicated in FIG. 1; and

FIG. 3 is an enlarged, fragmentary, cross-sectional view of the embodiment shown in FIGS. 1 and 2 and is taken along the line 3-3 indicated in FIG. 2.

Although the invention may be employed in connection with other types of fume hoods, the drawings illustrate a preferred embodiment of the invention as it may be applied to one type of conventional fume hood. Referring to FIGS. 1 and 2, the fume hood selected for purposes of illustration, comprises a rear wall 10, a top wall 11, a side wall 12, a partial front wall 13 and a bottom wall or counter 14. The fume hood also comprises an opposite side wall (not shown) similar to the side wall 12 and a pair of vertically movable sashes 15 and 16. Although two sashes 15 and 16 are shown, it will be apparent that a greater or lesser number of sashes may be employed. The aforesaid walls of the fume hoods as well as the sashes 15 and 16 define a working chamber 17 in which various processes may be carried out by a worker, such processes often involving the generation of poisonous or noxious fumes. A baffle 18 is in-

cluded within the working chamber 17 for well known purposes. A flanged pipe 19 passes through the top wall 11 of the hood, such pipe 19 providing means for connecting an exhaust duct to the fume hood for the purpose of exhausting gases and vapors from the working chamber 17.

In the preferred embodiment of the invention, a second chamber 20 above the working chamber 17 is defined by a further plurality of walls which may be extensions of the walls of the working chamber 17 or which may be separate panels. Thus, the second chamber 20 is defined by a rear wall 21, a side wall 22, a removable front wall or panel 23, a top wall 24 and an opposite side wall (not shown) like the side wall 22. The top wall 11 of the fume hood forms a common wall for the working chamber 17 and the second chamber 20. Although the rear wall 21 permits sealing of the second chamber 20, it may be omitted if desired.

Each of the sashes 15 and 16 and the mountings therefor may be identical, and the sash 16, for example, comprises top and bottom members 25 and 26, and side members 28 and 29. Preferably each sash is filled with a sheet 30 of transparent material, such as glass, but it will be understood that translucent or opaque material may be employed in place of transparent material. Each sash may be raised or lowered between lower and upper positions, the sash 16 being shown in the lowermost position and the sash 15 being shown in its uppermost position in FIG. 1, and each sash may be stopped and will remain fixed in any intermediate position. Each sash may be provided with a rubber bumper 31, and in the preferred embodiment each sash is provided with a stop, such as the stop 32 (FIG. 2) which is engageable with a frame member 33 of the fume hood to prevent complete closing of the opening into the working chamber 17. By preventing complete closing of the sash, air flows into the working chamber 17 between the bumper 31 and the counter 14 at all times and aids in exhausting the gases and vapors from the working chamber 17 in a well known manner.

Preferably, the height of the second chamber 20 is at least equal to the length of the path of vertical movement of the sash, such as the sash 16, and each sash is fully covered and protected when it is raised to its uppermost position, such as the position of the sash 15 shown in FIG. 1. In addition by making the chamber 20 of this height, the apparatus employed to counter-balance the weight of the sash may be completely enclosed.

Referring to FIG. 3 the sash 16 has secured to one side edge thereof, such as by welding, a member 52 which extends for substantially the full height of the sash 16. The member 52 has an offset portion 53 which is slidably engageable with a member 54 secured to a side edge of the sash 15, the member 54 extending substantially for the full height of the sash 15. By the use of such members 52 and 54 on adjacent edges of the sash, leakage of air into working chamber 17 of the fume hood between the edges of the sash is substantially prevented.

A U-shaped member 55 is secured to the member 52, such as by welding, and a U-shaped member 56 is secured to the frame of the fume hood. A pair of vertically extending rods 58 and 59 are mounted between the adjacent arms of the U-shaped members 55 and 56 and are supported by the arms of the member 56. The arms of the member 55 are slidably engageable with the rods 58 and 59 and serve to guide the sash 16 as it is raised and lowered. A similar arrangement for guiding the sash is provided at each edge of the sash as indicated in FIG. 3.

To provide easy access to the counter-balancing apparatus the removable panels 23 may be provided with key-hole shaped openings which receive headed studs 60 mounted on the frame of the fume hood. Accordingly, when it is necessary to repair or adjust the counter-balancing apparatus, the panels 23 may be removed

quickly and easily to provide access to the cords and counter-weights.

Each sash is counter-balanced by a single counter-weight which may be made up of one or more sections for adjustment purposes. Thus, the sash 16 is counter-balanced by a counter-weight 34 and the sash 15 is counter-balanced by a counter-weight 35. Each counter-weight is similarly suspended and connected to its associated sash, and the counter-weight 34 is connected to the sash 16 by a plurality of flexible connecting means, each of which may, for example, be a cord, a cable, a chain, etc. In the preferred embodiment of the invention, the counter-weights 34 and 35, are each connected to the corresponding sash by a pair of nylon cords, or nylon encased Monel cables 36, 37, 38 and 39. Of course, it will be understood that a greater number of connecting means or cords may be employed for interconnecting each of the counter-weights with each of the sashes. In FIG. 2, the counter-weight 34 is shown in solid lines in its uppermost position which corresponds to the lowermost position of the sash 16, and is shown in dotted lines in its lowermost position, which corresponds to the uppermost position of the sash 16.

Preferably, the cords, such as the cords 36 and 37 are connected to the sash 16 adjacent the side edges of the sash 16 and to the counter-weight 34 adjacent its ends so that in the event that one of the cords 36 and 37 breaks, the sash 16 will tend to tilt and bind against the guide rods 58 and 59 (FIG. 3) and the counter-weight 34 will similarly tend to tilt and bind. The cords 36 and 37 may be connected to the sash 16 and to the counter-weight 34 at their opposite ends in any suitable manner, and they pass over and engage a pair of rotatable pulleys 40 and 41 mounted in any suitable manner in the upper portion of the chamber 20. By means of the pulleys 40 and 41 and the cords 36 and 37, the sash 16 and the counter-weight 34 are suspended in counter-balanced relationship, the weight of the counter-weight 34 being substantially equal to the weight of the filled sash 16. Each of the cords 36 and 37 is strong enough to support the counter-weight 34 by itself so that the counter-weight 34 and the sash 16 will not drop or fall in the event that one of the cords 36 and 37 breaks.

The counter-weight 34, and each other counter-weight, is provided with four flanged rollers 42, 43, 44 and 45. The counter-weight 35 is similarly provided with four flanged rollers only two of which, flanged rollers 46 and 47, are shown in FIG. 3. Each vertically aligned pair of rollers engages a fixed rail secured to the frame of the fume hood. Thus, the rollers 46 and the roller vertically aligned therewith (not shown) engages a rail 48, the roller 47 and the roller vertically aligned therewith (not shown) engage a rail 49 and the rollers 42 and 43 engage a rail 50.

The use of the aforesaid rollers and the rails serves two purposes. In the first place, they minimize and substantially prevent movement of the counter-weights along paths other than the vertical paths defined by the rails. In this way, undesirable "slapping" of the counter-weights is substantially prevented. In the second place, each vertically aligned pair of rollers forms vertically extending guide means which prevents dropping of one end of the counter-weight and hence falling of the associated sash in the event that one of the interconnecting means or cords breaks. By making the distance between the surface of a roller which engages its associated rail and the surface of the diagonally opposite roller which engages its associated rail greater than the separation between the rails, the counter-weight will not drop but will merely tilt by small amount when an interconnecting cord breaks. For example, if the distance between the surface of the roller 42 which engages the rail 50 and the surface of the roller 45 which engages its associated rail 51 is greater than the separation between the rails 50 and 51, the left-hand end of the counter-weight 34, as viewed in FIG. 1, cannot drop if the cord 36 breaks.

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Similarly, if the distance between the surface of the roller 43 which engages the rail 50 and the surface of the roller 44 which engages the rail 51 is greater than the separation between the rails 50 and 51, the right-hand end of the counter-weight 34, as viewed in FIG. 1, cannot drop if the cord 37 breaks. Accordingly, it is apparent that by the use of vertically extending guide means for guiding the counter-weights, the counter-weight and its associated sash cannot drop as long as one of the interconnecting cords remains intact.

It will be apparent to those skilled in the art that other types of vertically extending guide means may be employed in place of the flanged rollers 42-45. Furthermore it also will be apparent to those skilled in the art that when only one interconnecting cord remains intact, both the counter-weight and the associated sash will tilt at least small amount and will reduce the ease of operation of the sash due to increased friction between the counter-weight guide means and the associated rails and due to increased friction between the sash and its associated guide means. Such impairment of the ease with which the sash may be raised or lowered may be readily recognized by a worker, and therefore, the worker will be warned that the counter-balancing apparatus requires repair or adjustment before being used further. It will be noted that such warning of the breakage or failure of one of the suspending cords will be given to a worker before the condition of the counter-balancing apparatus is such that a sash is permitted to fall and injure a worker or damage the materials or apparatus with which he is working.

While the invention has been described in detail with respect to a preferred embodiment, it will be understood by those skilled in the art that various modifications may be made without departing from the spirit and scope of the invention and it is intended to cover all such changes and modifications in the appended claims.

I claim:

1. A fume hood comprising a plurality of walls and a movable, filled sash defining a working chamber, a vertically movable, laterally extending counter-weight mounted exteriorly of said chamber, a pair of laterally spaced rotatable members, a pair of flexible means interconnecting said counter-weight and said sash, one of said means being connected at opposite ends respectively to a first portion of said counter-weight adjacent one end thereof and to a first portion of said sash and engaging one of said members and the other of said means being connected at opposite ends respectively to a second portion of said counter-weight adjacent the other ends thereof and to a second portion of said sash and engaging the other of said members, and means for restricting the movement of said counter-weight substantially to a vertical path even in the absence of one of said connecting means.

2. A fume hood comprising a plurality of walls defining an open sided working chamber, a vertically movable sash mounted to cover said open side, means forming a further chamber above said working chamber, a laterally extending, vertically movable counter-weight in said further chamber, a pair of laterally spaced pulleys mounted in said further chamber, a pair of laterally spaced flexible connecting means each passing over one of said pulleys and itself being strong enough to support said counter-weight, said means being secured at one end thereof to different portions of said counter-weight adjacent the respective ends thereof, and at the other end thereof to different, spaced portions of said sash, a pair of vertically extending guide rails, each mounted adjacent opposite ends of said counter-weight, first vertically extending guide means mounted at one end of said counter-weight and in engagement with one of said rails and second vertically extending guide means mounted at the other end of said counter-weight and in engagement with the other of said rails.

3. A fume hood comprising a plurality of walls defining an open sided working chamber, a vertically movable

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filled sash mounted to cover said open side, means forming a further chamber above said working chamber, a laterally extending, vertically movable counter-weight in said further chamber, a pair of laterally spaced pulleys mounted in the upper portion of said further chamber, a pair of flexible connecting means, each itself strong enough to support said counter-weight, one of said means being secured at one end to a first portion of said counter-weight, being secured at its other end to a first portion of said sash and passing over one of said pulleys and the other of said means being secured at one end to a second portion of said counter-weight spaced laterally from said first portion of said counter-weight, being secured at its other end to a second portion of said sash spaced laterally from said first portion of said sash and passing over the other of said pulleys, a pair of vertically extending guide rails, each mounted adjacent opposite ends of said counter-weight, and means for restricting the movement of said counter-weight to a predetermined path in the absence of either of said connecting means comprising first vertically extending guide means mounted at one end of said counter-weight and in engagement with one of said rails and second vertically extending guide means mounted at the other end of said counter-weight and in engagement with the other of said rails.

4. A fume hood comprising a plurality of walls and a filled sash movable along a predetermined vertically extending path, said walls and said sash defining a working chamber and one of said walls having means for connecting an exhaust duct thereto, means forming a further chamber above said working chamber, said further chamber having a height at least equal to the length of said path, a laterally extending, vertically movable counter-weight in said further chamber, a pair of laterally spaced pulleys mounted in the upper portion of said further chamber, a pair of flexible connecting means, each itself strong enough to support said counter-weight, one of said means being secured at one end to said counter-weight adjacent one end thereof, being secured at its other end to a first portion of said sash and passing over one of said pulleys, and the other of said means being secured at one end to said counter-weight adjacent the end thereof opposite to said one end thereof, being secured at its other end to a second portion of said sash spaced laterally from said first portion thereof and passing over the other of said pulleys, a pair of vertically extending guide rails, each mounted adjacent opposite ends of said counter-weight, a first pair of vertically spaced, flanged rollers mounted at one end of said counter-weight and in engagement with one of said rails and a second pair of vertically spaced, flanged rollers mounted at the other end of said counter-weight and in engagement with the other of said rails.

5. A fume hood comprising a plurality of walls and a filled sash movable along a predetermined vertically extending path, said walls and said sash defining a working chamber and one of said walls having means for connecting an exhaust duct thereto, means forming a further chamber above said working chamber, said further chamber having a height at least equal to the length of said path, a laterally extending, vertically movable counter-weight in said further chamber, said counter-weight having a width substantially equal to the width of said filled sash and a weight approximately equal to the weight of said filled sash, a pair of pulleys mounted in the upper portion of said further chamber and spaced apart a distance approximately equal to the width of said sash, a pair of flexible nylon cords, each itself strong enough to support said counter-weight, one of said cords being secured at one end to said counter-weight adjacent one end thereof, being secured at its other end to said sash adjacent one side edge thereof and passing over one of said pulleys and the other of said cords being secured at one end to said counter-weight adjacent the end thereof opposite to said one end thereof, being secured at its other

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end to said sash adjacent the side edge thereof opposite to said one side edge thereof and passing over the other of said pulleys, a pair of vertically extending guide rails, each mounted adjacent opposite ends of said counter-weight, a first pair of vertically spaced, flanged rollers mounted at one end of said counter-weight and in engagement with one of said rails and a second pair of vertically spaced, flanged rollers mounted at the other end of said counter-weight and in engagement with the other of said rails.

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