Nov. 3, 1936. H. E. CAMPBELL 2,059,436

OPERATOR FOR COUNTERBALANCED WINDOWS

Original Filed June 22, 1933 2 Sheets-Sheet 1

Fig. 1.

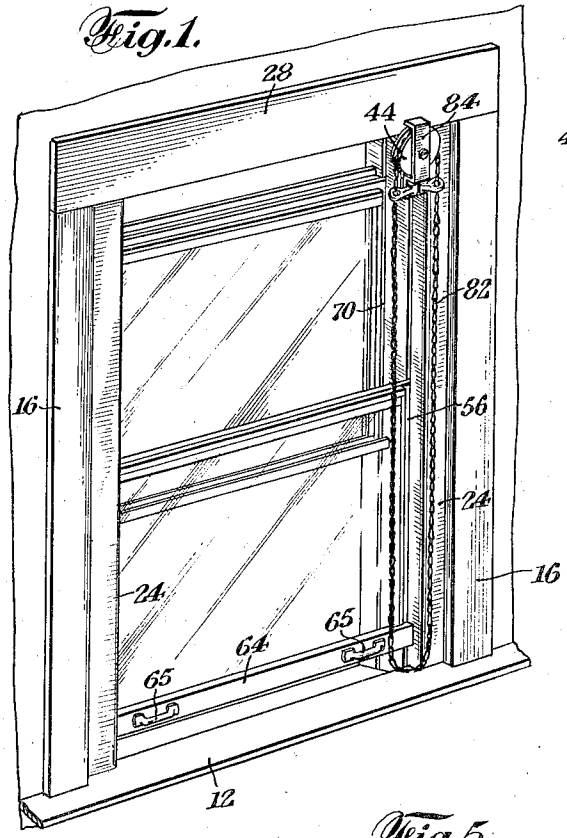



Fig. 3.

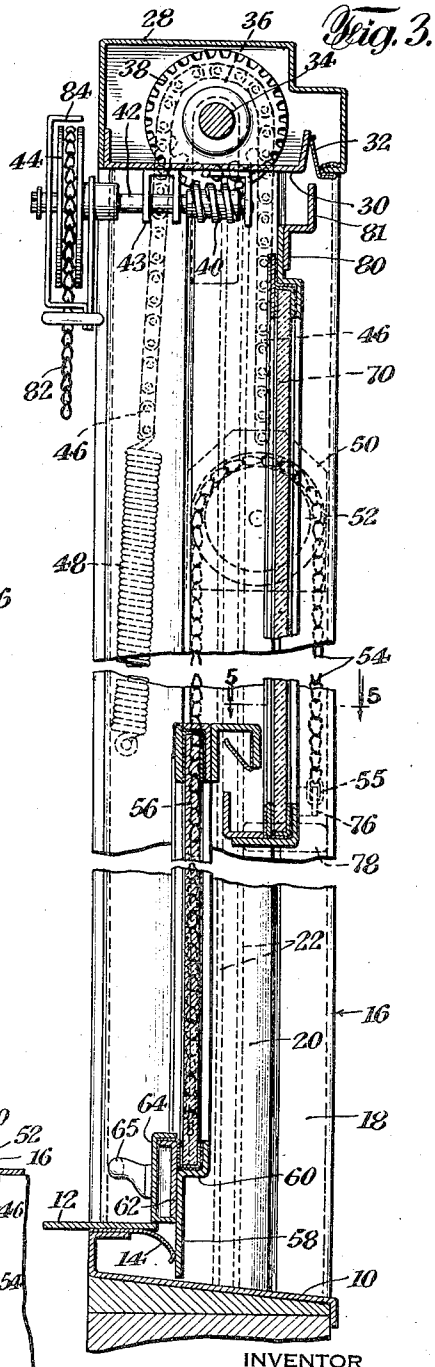



Fig. 5.

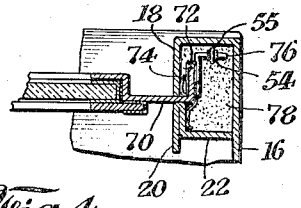
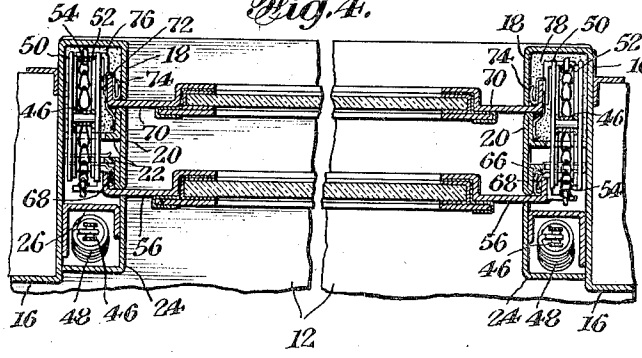



Fig. 4.




INVENTOR

Harry E. Campbell

BY

Pennie Davis Marvin & Edmonds

ATTORNEYS

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OPERATOR FOR COUNTERBALANCED WINDOWS

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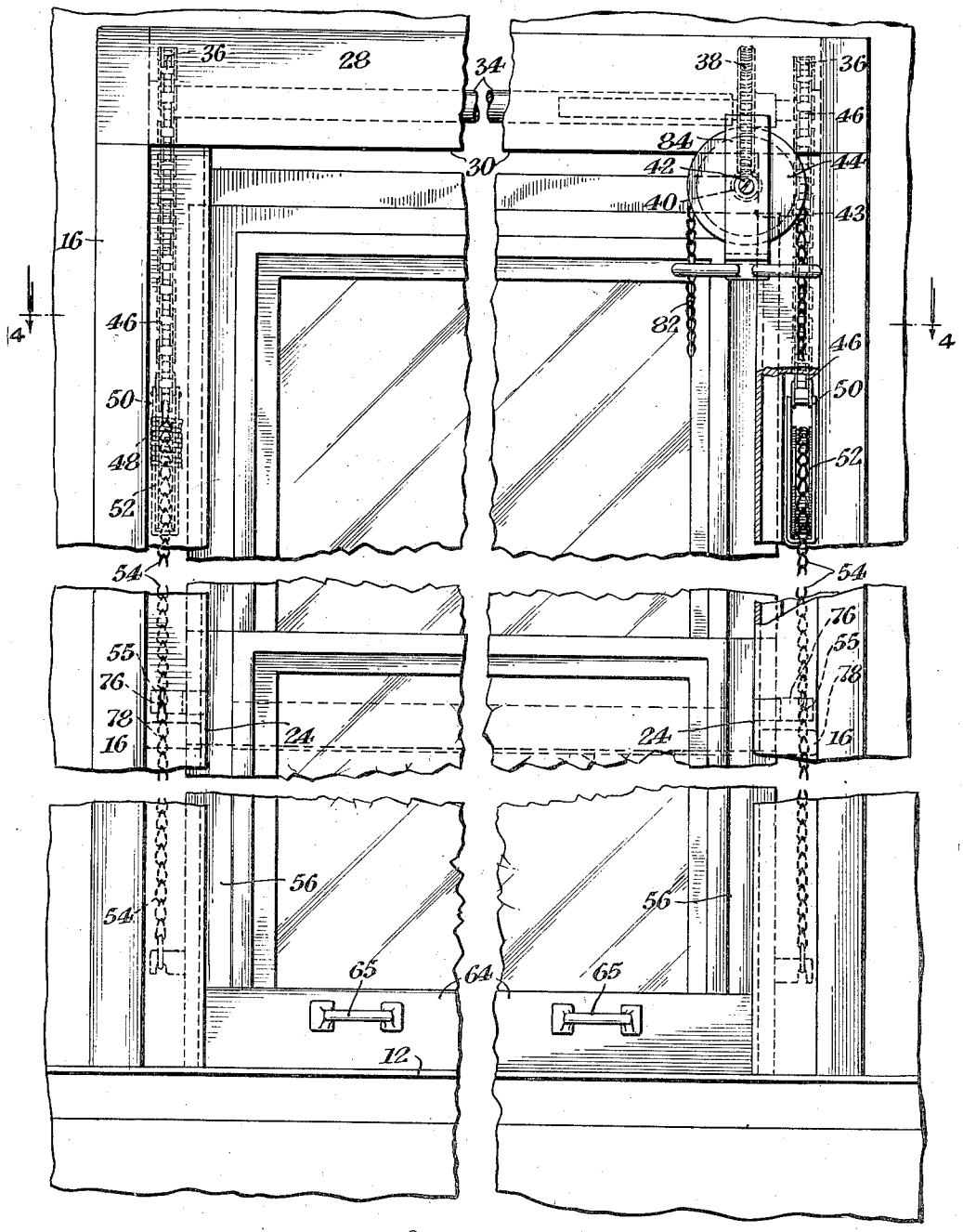



Fig. 2

INVENTOP
Harry E. Campbell
BY
Prindle Beaumont
ATTORNEYS

Patented Nov. 3, 1936 2,059,436

# UNITED STATES PATENT OFFICE

2,059,436

## OPERATOR FOR COUNTERBALANCED WINDOWS

Harry E. Campbell, Baltimore, Md., assignor to Campbell Metal Window Corporation, Baltimore, Md., a corporation of Maryland

Application June 22, 1933, Serial No. 677,015
Renewed April 11, 1936

5 Claims. (Cl. 268—130)

This application relates to a window construction in which the sashes are mounted to slide up and down and are mounted with one sash used to counterbalance the other. Ordinarily, in such counterbalanced sash constructions it necessarily follows that when one sash is moved, the other sash likewise is moved, so that it is not possible to have only one sash open at a time. Further, it is difficult to get the connecting chain adjusted with exact accuracy, so that both sashes will shut tight but have no slack, and even if such adjustment is once made, there is a tendency of the chain to stretch, spoiling such adjustment.

According to my invention, the two sashes can be moved simultaneously in opposite direction as in the ordinary counterbalanced sash, or each sash can be moved separately, and no problem arises in regard to the exact length of the connecting chain. Broadly speaking, this result is accomplished by interconnecting the two sashes but providing means whereby the positions of the pulley wheels over which the connecting chains pass may be adjusted up or down. According to the present invention, such vertical adjustment of the pulley wheels is accomplished by suspending each such pulley wheel from a chain and then having each of these chains pass over a sprocket wheel with the two sprocket wheels interconnected and operated through a worm gear cut at such an angle that it will not be self-reversing. Some counterbalancing means may be attached to the free end of each of these chains which may be a spring of substantial strength, or I may use a weight which may be only heavy enough to insure adequate contact of the chain with its sprocket wheel.

When the pulley wheels are thus made adjustable it follows that if the window is closed and both pulley wheels are raised, the lower sash will rise. In the same way if the window is closed and both pulley wheels are lowered, the upper sash will drop. In order that the reverse movements may be readily accomplished I have found it desirable to have the lower sash substantially heavier than the upper one. In such case if the lower sash has been raised and then the pulley wheels are lowered, the added weight of the lower sash will cause this to drop without the upper sash moving. In the same way, if the upper sash has been lowered and the pulley wheels are raised, the upper sash will be raised while the extra weight of the lower sash will hold it in place. The difference in weight between the two sashes must not be so great as to produce automatic movement when both sashes are left open. It is desirable that the worms be irreversible so that the pulleys will remain in the position to which they are brought by the worms without the use of special locking means.

Ordinarily the use of movable pulleys would be ugly and cumbersome, but I have found that by applying this invention to windows of the type having side plates which extend into the jambs, it is possible to conceal the movable pulleys within the jambs and at the same time have direct suspension to the sashes.

In windows of this type the plates of each sash go into separate compartments or pockets and it is essential that leakage from one of these pockets to the other be kept to a minimum to prevent cold air from entering below the upper and outer sash and then passing through to the inner pocket and into the room above the lower sash. In order to provide for the movable pulley, the baffle or member which separates these two pockets must be cut away for a part of its height. The danger of leakage resulting from this can be overcome if desired by supplying an inside housing in which the pulley wheel moves, but I have found that this ordinarily is not necessary and that satisfactory results can be obtained by affixing felt blocks near the bottom edge of the upper sash which prevents vertical movement of the cold air, as is more fully explained in my Patent No. 1,666,043, issued April 10, 1928.

My invention can readily be understood by reference to the annexed drawings showing an illustrative example thereof in which Fig. 1 is a perspective view of a window embodying my invention; Fig. 2 is a front elevation with parts broken away; Fig. 3 is a vertical section through one jamb; Fig. 4 is a horizontal section with one sash raised and the other lowered to open position, and Fig. 5 is a detail on line 5—5 of Fig. 3.

In the illustrative example shown in the drawings, the sill construction is made up of three members. Numeral 10 represents the sill proper to which is attached the inner plate or stool 12 and between which is positioned the flexible weather strip member 14. Each jamb is built around a hook-shaped member 16 having a portion 18 forming a part of the inner jamb wall. The baffle plate or middle portion of the inner jamb wall is designated by the numeral 20, and has two legs 22 extending back to member 16. The legs 22 are cut off at the upper part of the window to provide space for movement of the chain pulley. The remainder of the inner jamb wall is provided by the member 24 which is attached to member 16 by a channel member 26.

This channel member 26 may extend the whole height of the window but preferably it extends down only a short distance from the top of the window and is supplemented at the bottom by short sections of similar contour.

The lintel or head consists of a main box member 28 and a supplementary bottom plate 30. The head is also here shown as provided with a weather strip member 32. It is to be noted that the jambs simply extend between the sill and head, that is, the sill and head extend across the ends of the jamb.

Extending all the way across the window in the box-like head is a shaft 34 carrying at each end a sprocket wheel 36 and having adjacent one end a gear wheel 38 which cooperates with a worm 40 mounted on a shaft 42, which is suspended below the head by a bracket 43 and extends to the inner face of the jamb, and there carries an operating wheel 44. Mounted on each sprocket wheel 36 is a chain 46 which has fastened at one end a spring 48 positioned between members 24 and 26. This spring may, as desired, be made only strong enough to hold the chain 46 on its sprocket wheel 36, or heavy springs may be used sufficient almost to counterbalance the weight of one of the sashes. The other end of each chain 36 is attached to a sheaf 50 in which is mounted the pulley wheel 52 over which runs the sash chain 54.

The inner or lower sash is here indicated as having side plates 56 which extend into the jamb between the members 20 and 24. One end of each chain 54 is attached to one side of the lower sash near the bottom of plate 56.

The bottom rail construction here illustrated comprises a plate 58 bent as indicated at 60 to form a glass rabbet and having attached to the inside a plate 62. Connected to the plate 62 is a cover plate 64 which is of such height that it just rests on stool 12. Sash lifts of any desired sort may be attached to plate 64. In the illustrative example here shown simple handles 65 are indicated, but ordinarily I prefer to use lever lifts such as shown in my Patent No. 1,763,577. Also if desired catches may be employed that will engage with the sill and be released by upward pressure on the sash-lifts. Any desired form of meeting rail construction may be employed such for example as that shown in Patent No. 1,857,093 or Reissue Patent No. 18,026. The lower sash is here shown provided with weather strip members 66 and 68 which operate as described in Patent No. 1,673,393.

The upper sash, instead of having flat side plates, has side plates 70 bent over as indicated at 72 to pass by the sheaf 50. Attached to member 72 is a weather strip member 74 which presses against portion 18 of member 16. Attached to member 72 near the lower edge of the sash is an angle bar 76 to which is attached one end of the chain 54 as at 55. A felt block 78 is attached to plate 70 below the angle member 76, and rides with the upper sash, to stop vertical air currents as described in my said Patent No. 1,666,043. The upper edge of the upper sash is formed with a flat plate 80 carrying an offset member 81 which extends up into the lintel.

In the construction here shown the lower sash will be appreciably heavier than the upper sash, this difference in weight amounting to from 6 to 8 pounds on windows of ordinary size. In selecting the glass for the sashes some care should be taken to see that the glass for the upper sash is not substantially heavier than the glass for the lower sash. By having the lower sash heavier than the upper sash, the windows will be in equilibrium when closed and it will take slightly more effort to open them than to close them.

With the construction shown, if the lower sash is lifted by using the lift handle 65, it is obvious that this will slacken chain 54 and the upper sash will drop the same distance that the lower sash is raised. In this respect the window will operate as an ordinary counterbalanced window. On the other hand, if wheel 44 is so rotated as to lift pulley wheels 52, the upper sash not being able to move, the lower sash will rise two inches for each inch that the pulley wheels are lifted. In the same way, if the pulley wheels are lowered, the upper sash will open due to the force of gravity.

I have found that if the lower sash is made heavier than the upper sash, the difference in weight will be of advantage in closing the window when either the upper sash or lower sash alone is opened. Thus if the upper sash is open and the pulley wheels 52 are raised, the weight of the lower sash will be sufficient to hold it in place and the lift will all be transmitted to close the upper sash. In the same way, if the lower sash is open and the pulley wheels 52 are lowered, the extra weight of the lower sash will cause this sash to move while the upper sash remains in place. In each of these instances, the extra friction of the weather stripping which cooperates with the sashes when closed will tend to hold the closed sash from moving and cause the movement of the pulley wheels to be transmitted to the open sash.

The wheel 44 may be rotated in any desired manner; for example, it may be provided with a light chain or it can be provided with a friction face and have an operated cord held tensioned over it. In the drawings, I have shown a chain 82 which passes over the wheel 44 and is kept in place on this wheel by a cover plate 84.

It is understood that the foregoing example is given by way of illustration only and may be modified in many particulars without departing from the spirit of my invention.

What I claim is:

1. In combination with a window frame, two vertically sliding sashes, flexible suspension members interconnecting the sashes and passing around pulley wheels so that the sashes tend to mutually counterbalance each other, and means for exerting a tension on such flexible members comprising a shaft, sprocket wheels carried by such shaft, chain members passing over such sprocket wheels each having one end operatively connected with one of said flexible members, and counterbalancing means operatively connected with the other ends of said chain members so that when said shaft is rotated an upward tension may be exerted on said flexible members.

2. In combination with a window frame having two vertically sliding sashes, flexible suspension members interconnecting the sashes on each side, pulley wheels around each such suspension member, mountings for such pulley wheels, chains connected with such mountings and each passing around a sprocket wheel, means connected to the free end of each of said chains tending to counterbalance the weight of the sashes, and means for driving said sprocket wheels simultaneously.

3. In combination with a window-frame having two vertically sliding sashes and flexible suspension members connecting the sashes and passing around pulley wheels so that the sashes tend mu-

tually to counterbalance each other, means for exerting a tension on such flexible members tending to lift the sashes comprising chain members, each having one end attached to one of said pulley wheels, said chains passing over wheels mounted on fixed axes in the window-frame and having counterbalancing means operatively connected with the other end of each of said chains.

4. In combination with a window-frame having two vertically sliding sashes, flexible suspension members interconnecting the sashes on each side, a pulley wheel around which each such suspension member passes, mountings for such pulley wheels, a chain connected with each such mounting and each passing over a wheel mounted at a fixed point in the window-frame and means connected to the free end of each of said chains tending to counterbalance the weight of the sashes.

5. In combination with a window-frame having two vertically sliding sashes, a pair of wheels mounted for rotation about fixed axes near the top of the window-frame, chains passing over said wheels, a second wheel mounted for rotation at one end of each such chain, flexible suspension members interconnecting the sashes on each side and passing around said second wheels and a tension spring connected with the free end of each of said chains tending to counterbalance the weight of the sashes.

HARRY E. CAMPBELL.