

Dec. 28, 1943.

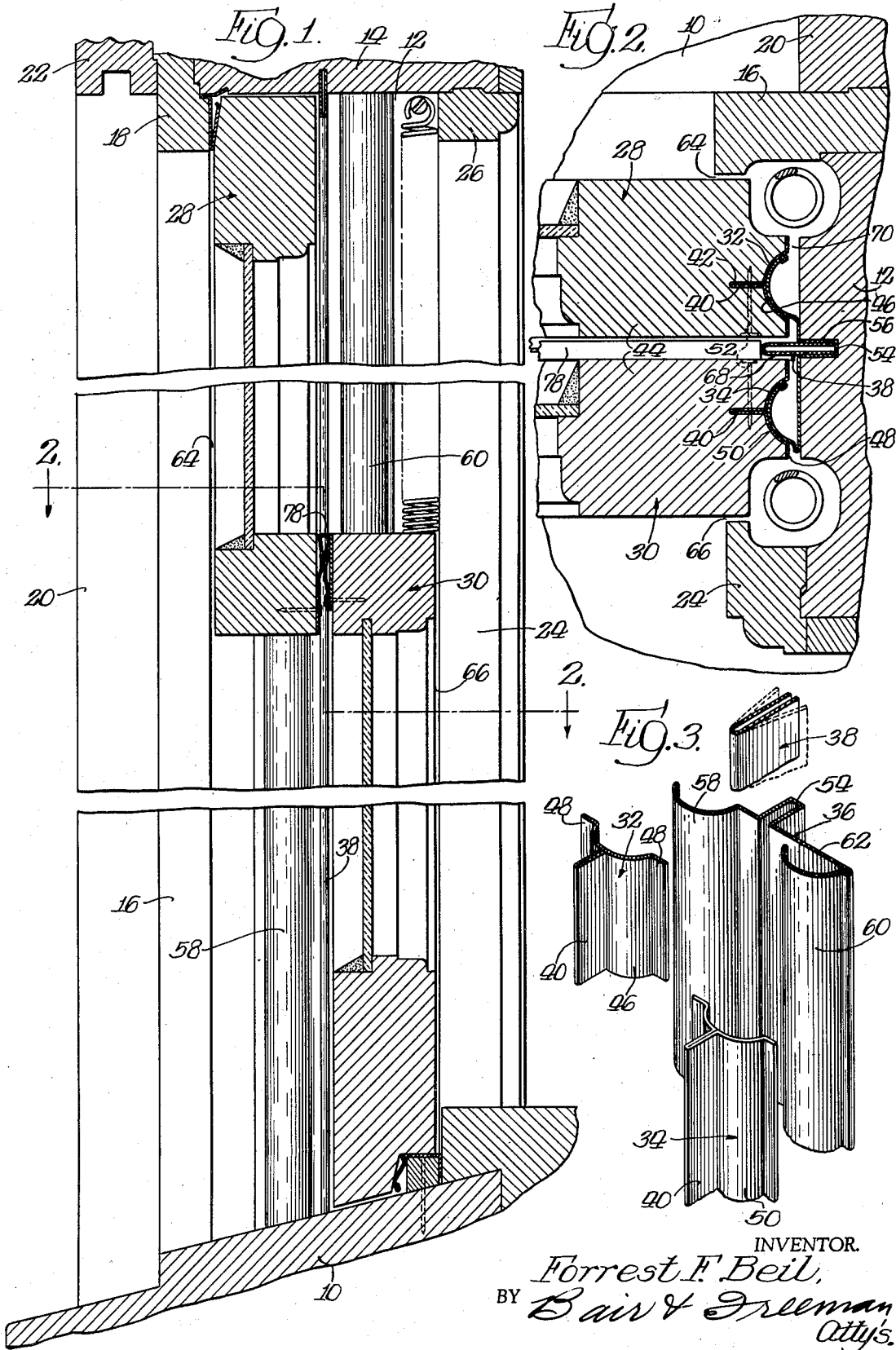
F. F. BEIL

2,337,633

WINDOW CONSTRUCTION

Filed April 9, 1941

2 Sheets-Sheet 1



INVENTOR.
Forrest F. Beil,
BY *Bair & Freeman*
Attys.

Dec. 28, 1943.

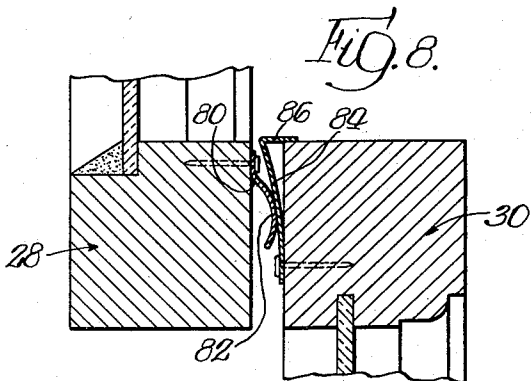
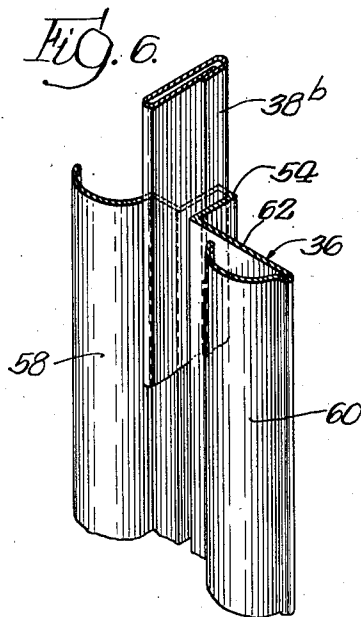
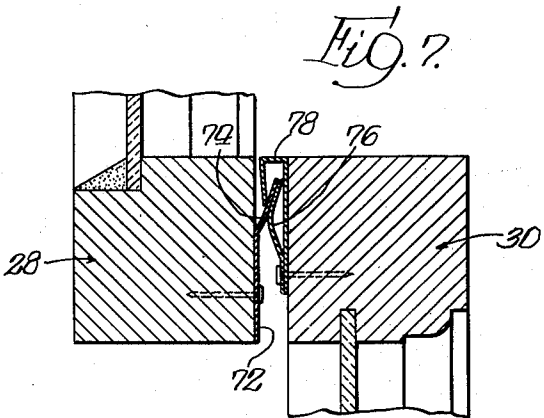
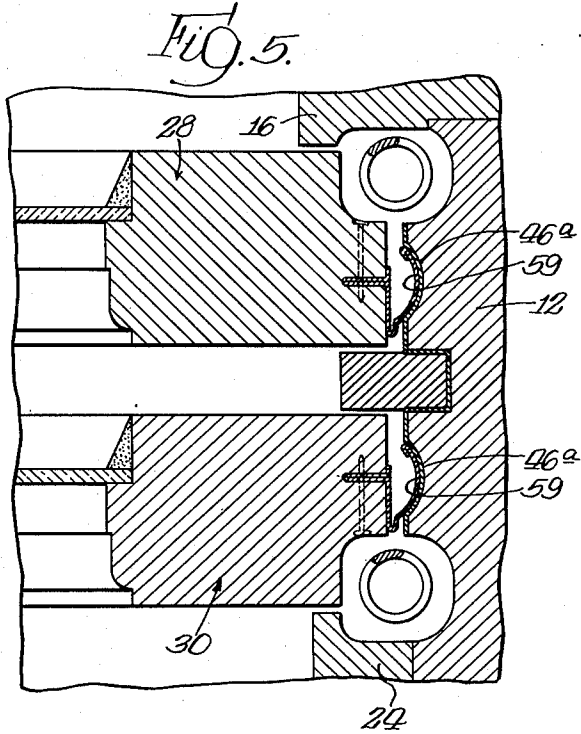
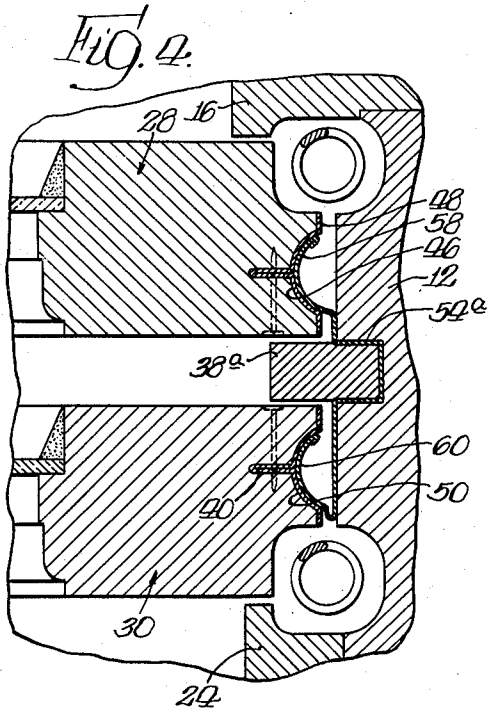
F. F. BEIL

2,337,633

WINDOW CONSTRUCTION

Filed April 9, 1941

2 Sheets-Sheet 2



INVENTOR.
BY *Forrest F. Beil,*
Bair & Freeman
Attys.

UNITED STATES PATENT OFFICE

2,337,633

WINDOW CONSTRUCTION

Forrest F. Beil, Clinton, Iowa, assignor to Curtis Companies Incorporated, Clinton, Iowa, a corporation of Iowa

Application April 9, 1941, Serial No. 387,597

6 Claims. (Cl. 20—52)

My invention relates to a construction for a double hung window.

Several of the newer types of wall constructions are somewhat thinner than has been considered standard in the past. The minimum wall thickness for which conventional window frames can be fitted has been limited by a number of factors. The standard sash thickness is 1 3/8 inches, and with two such sash, plus the conventional types of blind stop, parting stop and inside stop, it has not been practical to make a window frame of the ordinary type for a wall thickness less than 4 7/8 inches.

I have devised an improved construction, including a metal parting stop, which makes it possible to construct a high quality, weather-tight window for a wall thickness of 4 1/2 inches.

In addition to the reduction in dimensions above described, it is an object of my invention to provide a double hung window construction which eliminates the necessity for a rabbeted or beveled check rail.

A further object of my invention is to provide slides for the sash, including metal strips on both sash and jamb, which will permit smooth and easy operation of the sash under all weather conditions.

Another object is to provide a window construction in which the sash are manufactured with clearances all around, so that no wood parts rub together when the sash are moved, the joints being made weather-tight by spring metal strips which keep the sash square and level in the frame.

Other objects are the provision of a type of mounting slide which facilitates insertion of the sash in the frame, and removal therefrom; which forms a trap or pocket keeping dirt, snow, water, etc., from getting between the slide strips, or into the house when the window is closed; and in which the sliding friction can be adjusted while the strip is in place, without removal from the window.

It is another object of my invention to provide a weather seal construction for the check rails or meeting rails of the sash which gives a tight joint when the sash are in closed position, and which serves to hold the parting stops in place.

It is a further object of my particular type of mounting slide to keep the sash from rocking in the frame.

In a modified form of my invention it is an object to provide a slide strip which can be used with a wood parting stop as desired.

In all these features it is an object to provide

a window construction which can be largely completed at the factory, leaving a minimum of assembly operations to be performed on the job.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, in which:

Figure 1 is a vertical cross-sectional view of a window frame embodying my construction.

Figure 2 is an enlarged fragmentary horizontal cross-sectional view taken on the line 2—2 of Figure 1.

Figure 3 is an exploded perspective view of the various metal strip elements entering into my construction.

Figure 4 is a view similar to Figure 2, showing a modified form used with a wooden parting stop. Figure 5 is a view generally similar to Figure 2, but showing a modified form of weatherstrip arrangement.

Figure 6 is a perspective view showing a modified form of metal parting stop.

Figure 7 is an enlarged fragmentary view of the weather seal construction used on the check rails in the central portion of Figure 1.

Figure 8 is a view similar to Figure 7, but showing a modified form of weather seal.

In the accompanying drawings I have shown a window frame consisting of a sill 10, side jambs 12, head jamb 14, side blind stops 16, head blind stop 18, outside side casing 20 outside head casing 22, side inside stop 24, and head inside stop 26. In the window frame an upper sash 28 and a lower sash 30 are slidably mounted.

The principal elements of the slidable mounting are metal strips 32 and 34 attached to the stiles of the upper and lower sash, respectively, and a metal strip 36 fitted to the side jambs 12, and carrying a metal parting stop 38.

The strips 32 and 34 may be the same in construction, being formed from a unitary sheet of thin, springy, corrosion-resistant metal such as bronze or nickel silver. The central part of the strip is doubled to form a fin 40 which is received in a saw kerf or slot 42 formed in the stiles 44 of the sash. Adjacent the fin 40, the strips are formed in a rounded channel 46, terminating in outwardly extending flanges 48. The curved channel portion 46 is received in a similarly shaped recess 50 cut in the faces of the stiles 44, and the flange portions 48 overlie the remaining portions of the stile face. The strips 32 and 34

may be retained in the stiles 44 of their respective sash members 28 and 30 by brads or small nails 52 driven into the stiles, and passing through the fins 40, as shown in dotted lines in Figures 2 and 4.

The conformation of the jamb strip 36 is clearly shown in Figure 3. This strip has a centrally located narrow channel portion 54 which is received and frictionally retained in a groove 56 cut in the side jamb 12.

The parting stop 38 consists of a doubled strip of metal, such as that used for the parts 32, 34 and 36. In normal position, the sides of the strip tend to spread apart somewhat, as indicated in dotted lines in Figure 3. When the sides are pressed together, however, the strip 38 can be inserted into the channel portion 54 of the jamb strip 36, and by reason of the spring tension will be retained in the channel.

On each side of the channel portion 54 the jamb strip 36 has a spring leaf, conforming in shape to the curved channel portions 46 of the sash strips 32 and 34. The spring leaf 58 is connected directly to the channel portion 54, whereas the spring leaf 60 is connected with the channel portion 54 through a laterally extended connecting web 62. The result is that the free edges of both spring leaves face in the same direction, and they are preferably mounted in the jamb in such a way that both spring leaves point generally toward the outside of the window, as may be seen in Figures 2 and 4. When the jamb strip is installed in this way, the spaces beneath the curved spring leaves 58 and 60 constitute traps which catch dirt and moisture, causing them to drop to the bottom of the strips. This arrangement is very effective in preventing infiltration of dust and dirt into the house.

The spring leaves 58 and 60 are so arranged that when the sash is in place the spring leaves are under tension, and thus have a frictional engagement with the sash strips 32 and 34.

In many respects my present invention constitutes an improvement over the window construction which has come into wide commercial use, embodying the teachings of United States Patents 1,869,760 and 1,889,752. In constructing window frames according to my present invention, I follow the practice indicated in the first patent mentioned above, to the extent of forming the sash parts in such a way that they may have substantial play in the frame. In Figure 2 of my drawings, for example, I call attention to the space between the outer sash 28 and the side blind stop 16, indicated at 64; the space between the side inside stop 24 and the lower sides 30, indicated at 66; the space between the parting stop 38 and the sash rails, indicated at 68; and the space between the faces of the sash stiles and the side jambs, indicated at 70.

Each sash is maintained in position, spaced approximately midway between the adjacent stops, by the coating curved surfaces of the spring leaves 58 and 60 on the jamb, and the sash strips 32 and 34. The sash are maintained in "floating" position midway between the jambs, by the opposed spring action of the tensioned leaves on opposite jambs. With the clearance provided as noted above, there is assurance that the sash can be moved smoothly and freely on the slides regardless of changes in atmospheric conditions, the clearance being such that no amount of swelling ordinarily encountered will cause rubbing engagement of the wood parts. Furthermore, because the spring leaves 58 and 60 press

inwardly on the sash at all points along its length, the sash is maintained in square, level position. With the construction shown in the first patent mentioned above, this was not true; the clearance spaces permitted the sash to be cocked somewhat in the frame, so that the meeting rails might not be level, and hence might not line up in true relation, and the weather strips had no tendency to correct the difficulty.

Because of the clearances provided, and the fact that guiding of the sash is by the metal strips, rather than by the stops as in the ordinary window, the stops serve no real function except to conceal the joints or clearance spaces between the sash and the jambs.

My invention may be embodied in windows with pulley and weight counterbalances, or in windows with spring suspensions. Where a suspension of the latter type is used, it is important that sliding friction can be controlled and adjusted in some convenient manner, so that if the sash has any tendency to creep from the extreme positions of its movement, the necessary corrections can be made. With the type of jamb strip which I have described, the friction can be increased simply by inserting a suitable tool under the leaf 58 or the leaf 60, and prying the leaf outward to the desired extent. On the other hand, should it be desired to reduce the friction, so that the window will slide more freely, the curved spring leaves 58 and 60 can be simply pressed toward the jamb as much as necessary.

My construction has the further advantage that it facilitates removal of the sash from the frame when this may be necessary, as for the replacement of a broken glass. The inside stops 24 must be removed, but when this is done nothing more is necessary for removal of the lower sash 30 than to pull the sash toward the inside; or the sash can be moved toward one jamb or the other, thus compressing the spring leaf on the side toward which it is moved, and facilitating the disengagement of the opposite stile from its associated spring leaf by movement of that opposite edge of the sash toward the inside of the window. The procedure for removal of the upper sash is the same, except that the parting stop 38 must be removed.

It will be obvious that the very thin parting stop 38 enables the sash to run closer together, and thus makes possible a reduction in the all-over thickness of the window frame. As I have pointed out above, my improvement makes possible a frame which can be fitted into a $4\frac{1}{2}$ inch wall, whereas the standard frames cannot will be reduced below $4\frac{7}{8}$ inches.

The closer spacing of the sash also makes possible a simpler check rail. Rather than using rabbeted check rails or beveled check rails, I prefer to use plain rails, of the same thickness as the stile members in the sash. To provide a weather tight joint between the check rails when the sash are in closed position, I have devised suitable coating metal strips of attachment to the respective check rails of the upper and lower sash.

The preferred form of check rail strip is shown in Figures 1 and 7, and a modified form is shown in Figure 8.

In the preferred form a strip 72 is attached to the check rail of the upper sash, and has an upwardly and outwardly extending spring leaf 74. To the lower sash is attached a strip having an upwardly extending spring leaf 76, and an ad-

ditional portion 78 which extends up and over the leaf 76, in the form of an overhanging channel. As the sash are moved to closed position, the spring leaf 74 passes under the overhanging channel 78, in engagement with the spring leaf 76. As the sash move to their final positions, the engagement between the spring leaf 74 and the lower edge of the overhanging channel 78 becomes tighter, and this is also true of the engagement between the leaf 74 and the leaf 76. The result is that there are two lines along which the strips on the respective sash are in pressure engagement, and a very effective seal is thereby achieved.

In the modified form shown in Figure 8, the strips are of somewhat simpler cross section, consisting of a strip 80 on the upper sash, having a downwardly extending, outwardly convex spring leaf 82, and a strip 84 attached to the check rail of the lower sash, and curved outward slightly from its line of attachment to the rail. A horizontal flange portion 86 at the upper edge overlaps the top of the sash, and serves the double purpose of substantially concealing the gap between the two check rails, and preventing access of dirt and moisture into the space between the stop 84 and the check rail of the lower sash.

In either of the forms described, the ends of the check rail strips, and particularly the parts thereof which are horizontal when seen in the cross section (such as the portion 86 in Figure 8 or the web of the channel in Figure 7), come into close relation with the parting stop 38, and thus serve to keep it from coming out of the channel portion 54 of the metal jamb strip. This close relation, which may be seen in Figure 2, also serves to minimize air leakage through the window at the junction between check rails and jamb.

My invention lends itself to exemplification in several modified forms, some of which I have shown in the drawings.

In Figure 4, for example, I have illustrated a construction entirely similar to that shown in Figures 1, 2 and 3, except that the channel portion of the jamb strip has been made sufficiently wide to receive the conventional wooden parting stop. The channel as thus modified has been designated at 54a in the drawings, and the wood parting stop is indicated by the reference numeral 38a. This construction can be employed where there is no need to take advantage of the reduced wall thickness which my preferred form makes possible, or where it is desired to preserve the appearance of the conventional style of window with a wood parting stop.

The slide strips can also be made in an arrangement which involves a simple reversal of the elements shown in Figures 1 to 4. In Figure 5 I have shown such a modified form, in which the concave portions are formed on the jamb strip, and are designated as 46a. The convex spring leaves, corresponding to the leaves 58 and 60 in the preferred form, are mounted in the sash stiles, and are designated in Figure 5 by the reference numeral 59. As in the preferred form, the convex spring leaves are arranged so that the space behind them opens toward the outside of the window. Obviously, this modified form may be used either with the wood parting stop, as illustrated in Figure 5, or with a narrow channel 54 and a metal parting strip 38.

The metal parting strip also may be made in a modified form, illustrated in Figure 6, where

it is designated as 38b. Here it will be noted that one leg of the strip is longer than the other, and is return bent over it. This return bent edge gives a somewhat stiffer fit in the channel 54 than the form of strip 38 shown in Figure 3.

Windows constructed according to what I have indicated herein as the preferred form have been tested in a wind tunnel and found to embody substantial advantages, so far as their resistance to air leakage is concerned, over a high grade type of standard commercial window.

In the following tabulation, the "new" window is the one constructed according to the teachings of the present invention. In addition to the details mentioned herein, it may also be pointed out that the new window frame adjacent the top rail (as shown in Figure 1), was equipped with a sealing strip of the type disclosed in Patent No. 2,077,845. The bottom rail was equipped with a sealing strip of the type shown in my copending application, Serial No. 387,598, filed April 9, 1941. In the test, leakage through the entire window units was measured, and then the various joints were isolated, by sealing off all other parts so that leakage at various places could be determined.

COMPARATIVE TESTS OF INFILTRATION

Wind velocity—25 m. p. h.

30 New window size..... 2'4" x 3'10"—sash perimeter 14'8"
Standard window size..... 2'0" x 3' 0"—sash perimeter 12'0"

Check rail locks locked

Section tested	Per unit length of joint (Cu. ft./hr./lineal ft.)		Total (Cu. ft./hr.)		Percent reduction over standard
	New	Standard	New	Standard	
40 Entire unit.....	30.8	71.5	453	858	57.0
Vertical weather-strip.....	31.6	49.5	242	297	36.2
Bottom rail.....	63.2	168.5	147	337	62.5
Check rail.....	38.6	65.5	90	130	41.0

45 It will be appreciated, therefore, that my invention as herein disclosed represents a substantial advance in the art. The problem of obtaining a weathertight, easily operated window of the double hung type has not, to my knowledge, been satisfactorily solved by previous workers. It is well known that one of the major losses which contribute to the expense of heating a home is the infiltration through window joints, and the reductions indicated in the table above point the way to appreciable fuel savings. Furthermore, at all times of the year the continual leakage brings with it a quantity of dirt; reduction of the leakage consequently means less labor and expense in keeping the house clean.

60 Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. A weatherstrip for mounting on a window jamb, consisting of a channel portion extending longitudinally of said strip and engageable in a groove in a window jamb, a spring leaf portion integral with said channel portion, outwardly convex, engageable with a shallow groove in a sash and with its free edge extending away from said channel portion, and a web extending laterally

from said channel portion, said web being return bent to form a second spring leaf portion, outwardly convex, with its free edge extending toward said channel portion.

2. A double hung window including a frame having side jambs, for each of said jambs a weatherstrip consisting of a strip of sheet metal formed with a channel along its median portion, frictionally received in a groove in the jamb, and with outwardly convex spring leaves disposed on opposite sides of the channel and spaced from the jamb, sashes hung in said frame, in each sash a concave cylindrical groove being cut longitudinally in the face of each stile, and coacting with the convex surface of one of said spring leaves, each of said spring leaves being normally spaced away from the adjacent jamb, and being placed under tension when a sash is in place between the spring leaves, the space between the jamb and each spring leaf defining a pocket opening toward the outside of the window, said space being sufficiently great so that when the adjacent stop strip is removed and the sash is moved toward one jamb, the sash stile can be disengaged from the spring leaf at the opposite jamb, permitting removal of the sash from the frame.

3. A weatherstrip for mounting on a window jamb, consisting of a channel portion extending longitudinally of said strip, a spring leaf portion integral with said channel portion, outwardly convex, engageable with a shallow groove in a sash, and with its free edge extending away from said channel portion, and a web extending laterally from said channel portion, said web being return bent to form a second spring leaf portion, outwardly convex engageable with a shallow groove in a sash, with its free edge extending toward said channel portion.

4. A weatherstrip having a longitudinally extending median portion, a spring leaf portion integral therewith, outwardly convex, engageable with a shallow groove in a sash, and with its free edge extending away from said median portion, and a web extending laterally from said median portion, said web being return bent to form a second spring leaf portion, outwardly convex, engageable with a shallow groove in a sash, and with its free edge extending toward said median portion.

5. A double hung window including a frame having side jambs, for each of said jambs a weatherstrip consisting of a strip of sheet metal formed with a channel along its median portion and with outwardly convex spring leaves disposed on opposite sides of the channel and spaced from the jamb, sashes slidably mounted in said frame, each sash having a concave cylindrical groove cut longitudinally in the face of each stile, and coacting with the convex surface of one of said spring leaves, each of said spring leaves being normally spaced away from the adjacent jamb, and being placed under tension when a sash is in place between the spring leaves, the space between the jamb and each spring leaf defining a pocket opening toward the outside of the window, said space being sufficiently great so that when the sash is moved toward one jamb against the tension of the spring leaf on that jamb, removal of the adjacent stop strip on the opposite jamb permits the edge of the sash to be disengaged from the spring leaf on said opposite jamb, whereby the sash may be removed from the frame.

6. A double hung window including a frame having side jambs, for each of said jambs a weatherstrip consisting of a strip of sheet metal having a longitudinally extending median portion and with outwardly convex spring leaves disposed on opposite sides of the median portion and spaced from the jamb, sashes hung in said frame, each sash having a concave cylindrical groove extending longitudinally in the face of each stile, and coacting with the convex surface of one of said spring leaves, each of said spring leaves being normally spaced away from the adjacent jamb, and being placed under tension when a sash is in place between the spring leaves, the space between the jamb and each spring leaf defining a pocket opening toward the outside of the window, said space being sufficiently great so that when the sash is moved toward one jamb against the tension of the spring leaf on that jamb, removal of the adjacent stop strip on the opposite jamb permits the edge of the sash to be disengaged from the spring leaf on said opposite jamb, whereby the sash may be removed from the frame.

FORREST F. BEIL.