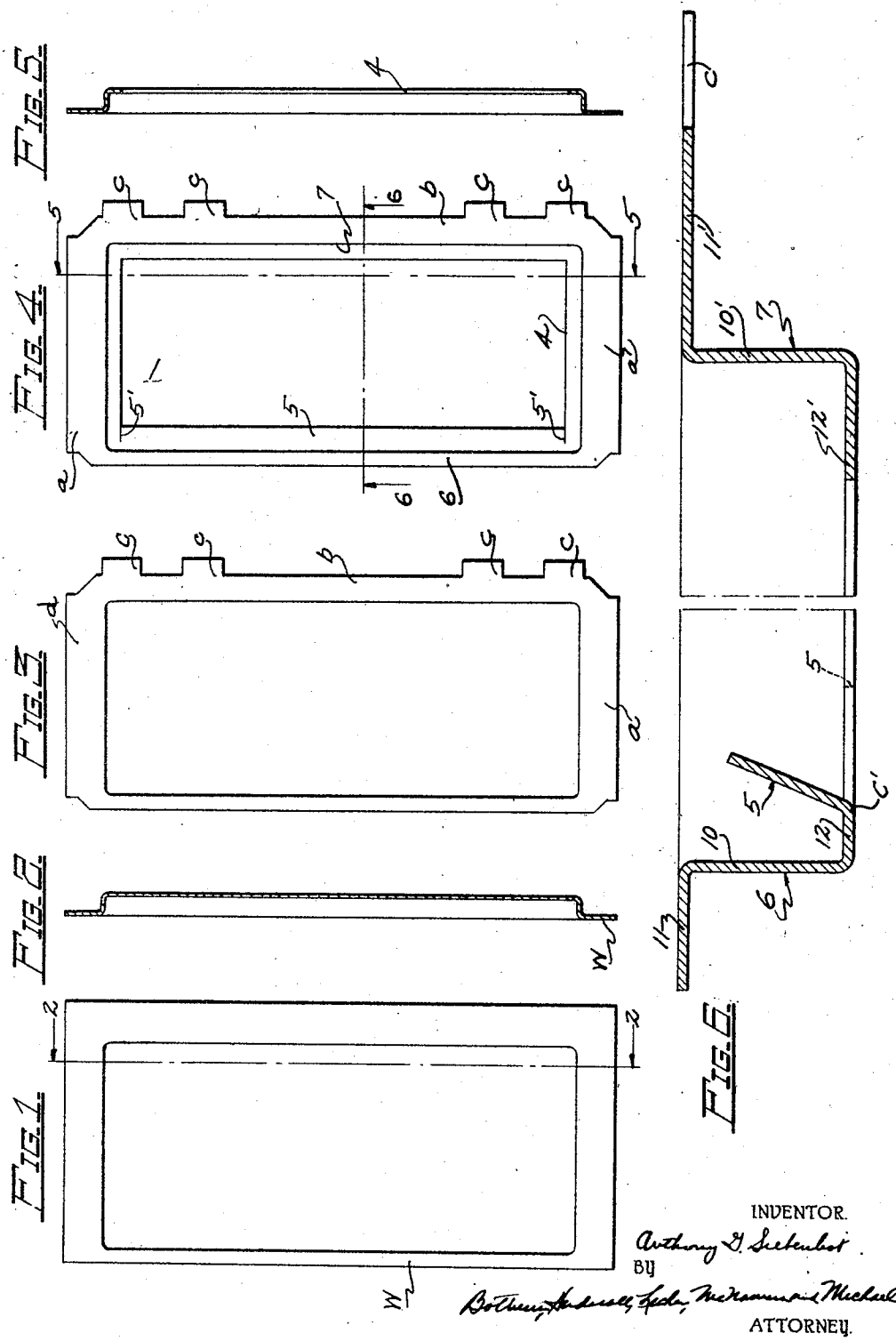
July 28, 1931. A. G. SIEBENLIST 1,816,498

METHOD OF MAKING METAL WINDOW STRUCTURES

Filed April 30, 1928 4 Sheets-Sheet 1



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July 28, 1931. A. G. SIEBENLIST 1,816,498

METHOD OF MAKING METAL WINDOW STRUCTURES

Filed April 30, 1928 4 Sheets-Sheet 2

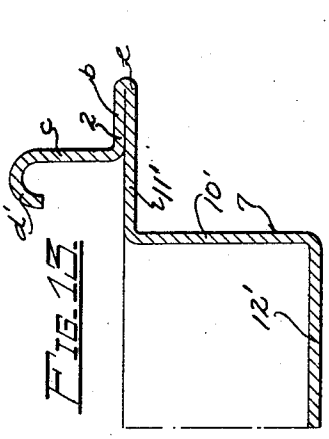


FIG. 13.

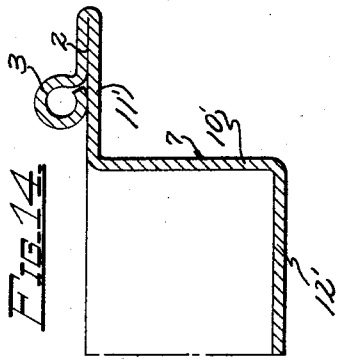


FIG. 14.

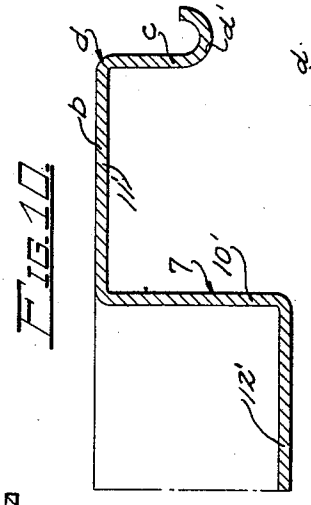


FIG. 10.

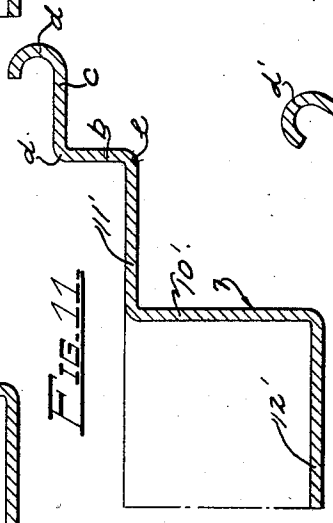


FIG. 11.

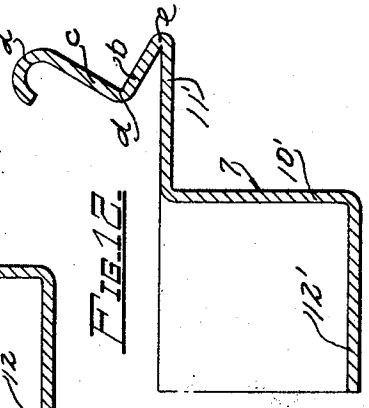


FIG. 12.

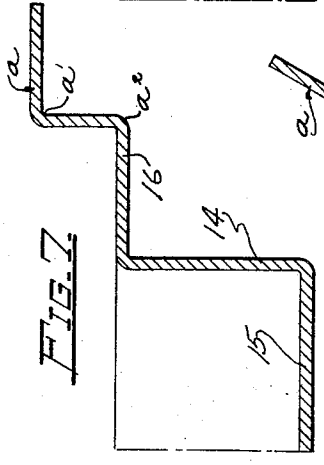


FIG. 7.

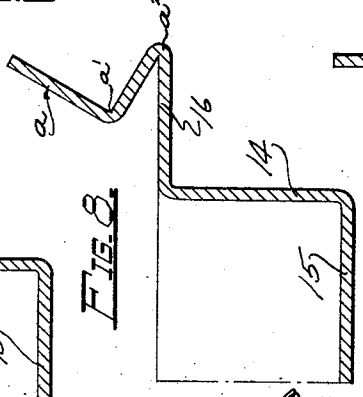


FIG. 8.

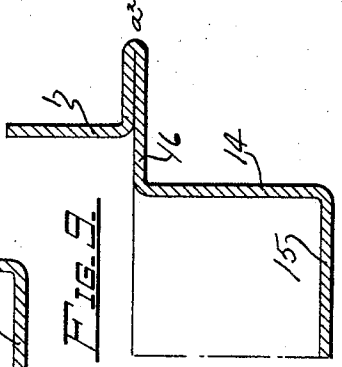


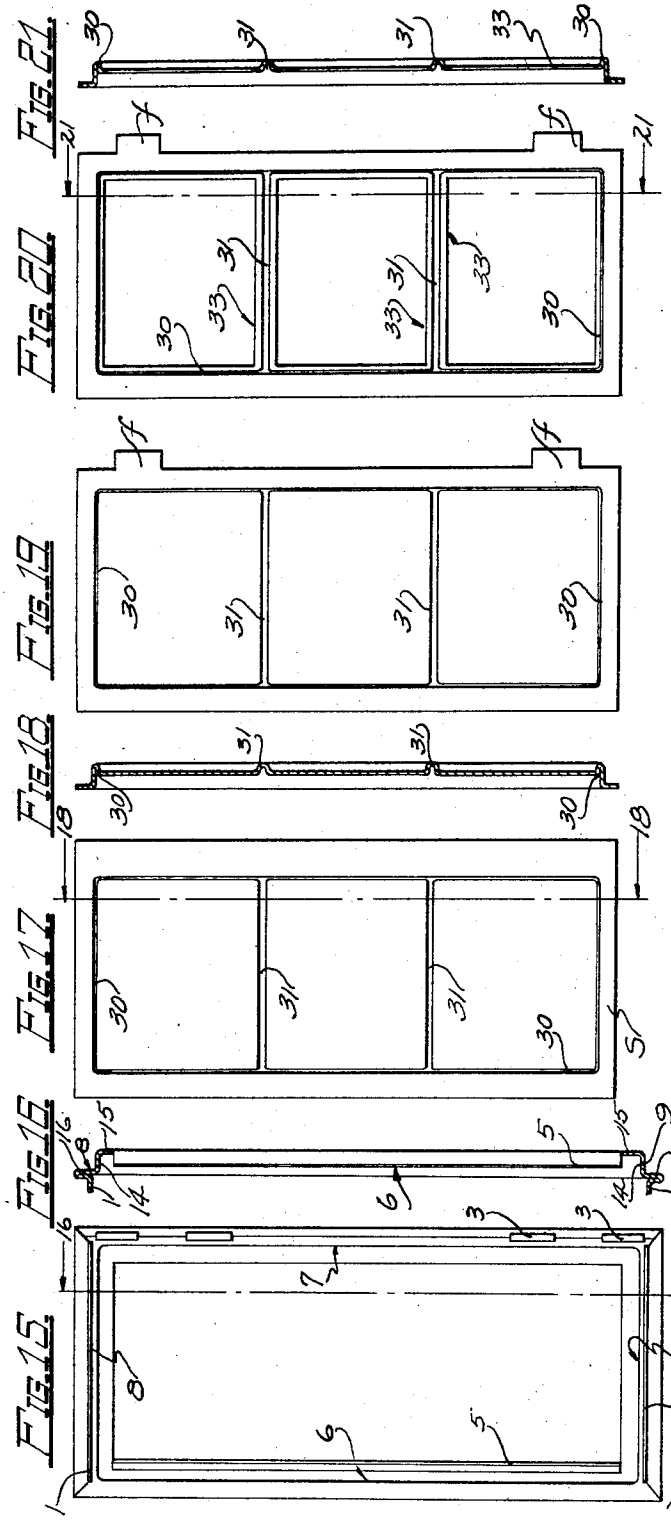
FIG. 9.

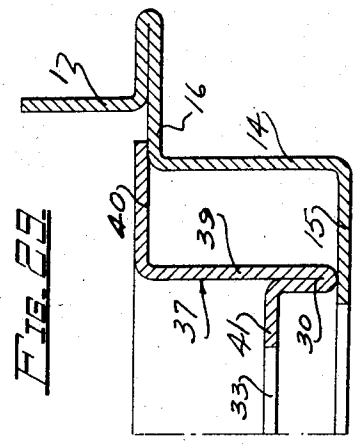
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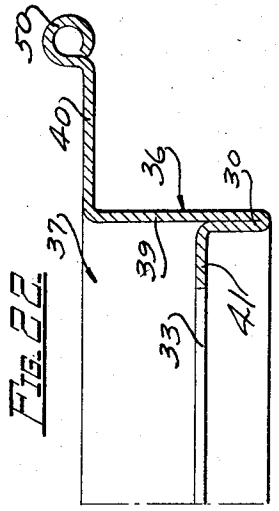
July 28, 1931. A. G. SIEBENLIST 1,816,498

METHOD OF MAKING METAL WINDOW STRUCTURES

Filed April 30, 1928 4 Sheets-Sheet 3







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METHOD OF MAKING METAL WINDOW STRUCTURES

Filed April 30, 1928 4 Sheets-Sheet 4

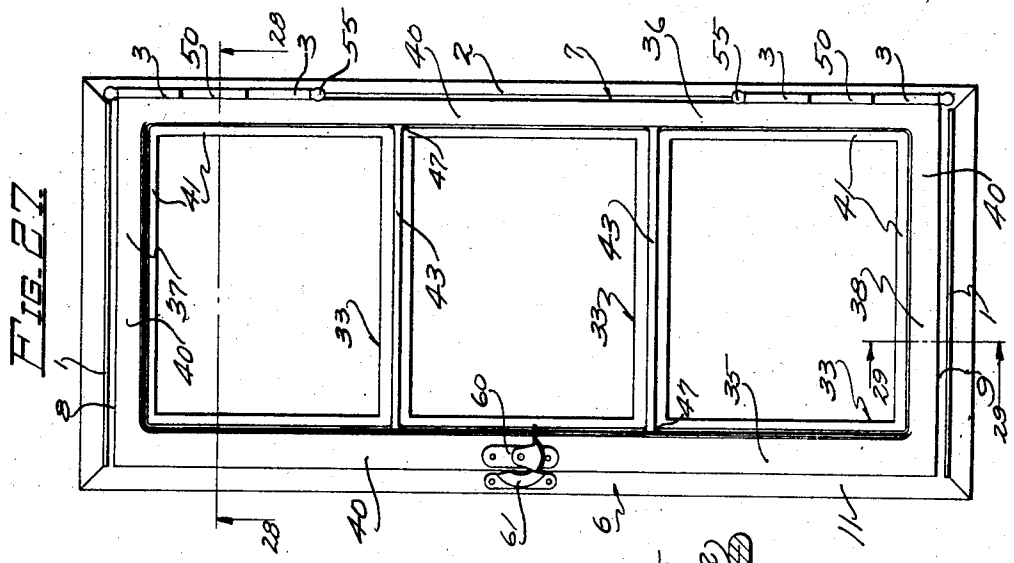


FIG. 27.

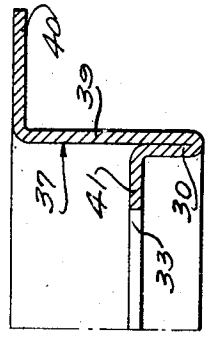


FIG. 25.

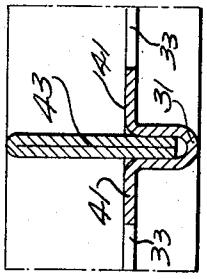


FIG. 26.

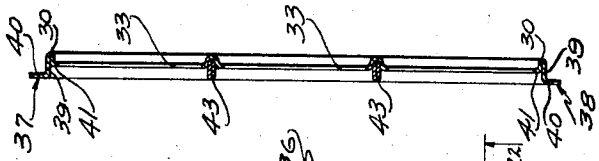


FIG. 24.

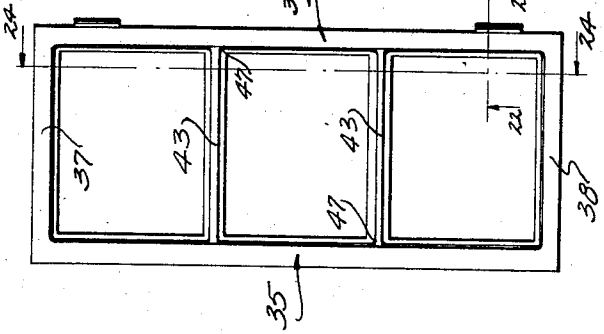


FIG. 23.

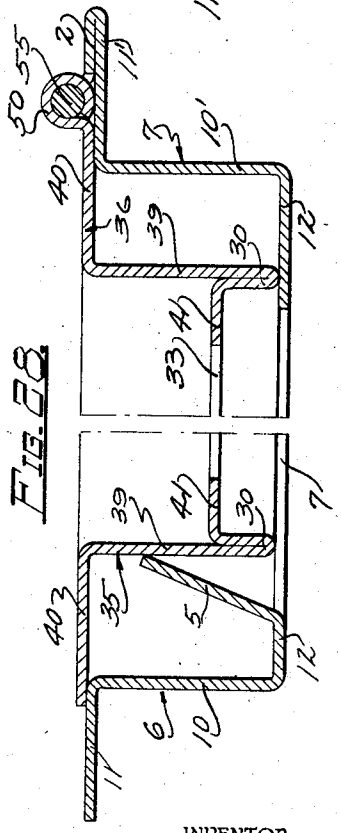


FIG. 28.

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Patented July 28, 1931

1,816,498

UNITED STATES PATENT OFFICE

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METHOD OF MAKING METAL WINDOW STRUCTURES

Application filed April 30, 1928. Serial No. 274,123.

This invention relates to metal window structures and to a method of making the same and in general aims to provide a metal window structure which is of simple and lightweight construction and yet strong and durable as well as stiff and rigid; which, in use, is easily opened and closed and yet in closed position provides a weather tight construction; and which is easy and comparatively inexpensive to manufacture.

One of the principal features of the invention resides in the manner of constructing the sash and window frames whereby the problem of production is simplified and the resulting construction, while of light weight, is so stiff, strong and rigid as not to be liable to be racked or strained in use.

In general these features and objects are obtained by forming the window frame from a single piece of metal, the major structural elements of the window frame being shaped and formed by a single drawing or cupping operation which fashions these elements from the metal of the one piece blank. Following the cupping operation, the outside edges of the blank are trimmed or cut to form the edges of the frame and to outline the stock to be subsequently shaped to constitute the appurtenances of the window frame, such as hinges, strengthening or reinforcing plates, stiffening wings, and the like. After this a portion of the blank within the confines of the frame members is cut away to provide the frame opening and to complete the shaping of the frame members and at least one of the margins of this opening may be shaped to provide a water shedding weather strip.

The same generic features are to be found in the construction of the sash frame, the major elements of the sash frame being fashioned from a single piece sheet metal blank by a single drawing or cupping operation which also shapes and forms the seats for the window glass employed and the supports or bases for the mullion strip. Immediately following the drawing or cupping operation the outside edges of the sash frame are trimmed or cut away to produce the edges of the sash frame members and to outline the stock subsequently utilized to constitute the appurtenances of the sash frame. The final major operation in the formation of the sash frame consists in cutting out portions of the blank within the confines of the frame members and intermediate the structure shaped to constitute supports for the mullion strips, thus affording the lights in the sash frame.

It will be understood that in respect of both the sash frame and the window frame the invention proposes the novel feature of forming the structural elements of the frame by cupping or drawing a one piece sheet metal blank. As effecting both frames the invention further contemplates the formation of the opening of the frame by removing a portion of the blank within the confines of the frame members subsequent to the cupping operation. Prior to the formation of this opening and subsequent to the cupping operation both frames are trimmed to define the edges of the frame and to outline the structure which is utilized to constitute the appurtenances of the frame.

The drawing or cupping operation by which the structural elements of both frames are formed produces angularly disposed frame members of continuous or integral construction and each frame member so formed has a body portion provided with edge flanges, the flanges of the side frame members affording hinge rails and latch rails and all of the frame members having their body portions and flanges designed to interfit and engage in the assembly to provide weather excluding members.

Following these major operations the stock outlined to constitute the appurtenances of the frames is bent and shaped to provide the hinge ears, reinforcing plates, stiffening wings, and weather stripping. Thus, the window frame and all its appurtenances are constituted of one piece of metal and the sash frame is also of one piece construction except for the two mullion or finishing strips which are applied and welded in position on the bases provided therefor, formed integral with the sash frame.

Due to the angular formation of the frame members, to their integral construction and to the manner of their formation, that is, to the cupping or drawing operation wherein the metal is upset and converted into a flanged formation, as well as to the bracing and stiffening means provided, the final construction, while of light weight, is exceptionally stiff and rigid so that the frames in use properly interfit when closed and yet may be easily opened.

Other objects and advantages reside in certain novel features which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings, and in which:

Figure 1 is a plan view showing how the sheet metal blank is drawn or cupped in the first operation in making a window frame;

Figure 2 is a view in section taken on line 2—2 of Figure 1;

Figure 3 is a plan view showing how the outside edges of the blank are trimmed in the second operation of the method of making a window frame;

Figure 4 is a similar view showing how the portion of the blank within the confines of the frame members is cut away to provide the opening of the frame and to delineate the inner edges of the frame members as well as to outline the weather strip formed along one side frame member;

Figure 5 is a sectional view on line 5—5 of Figure 4;

Figure 6 is a view in transverse section on line 6—6 of Figure 4 and showing how one weather strip is bumped up from the dotted line position which it occupies in Figure 4;

Figures 7, 8 and 9 are detail views partly in section and partly in elevation showing the three steps involved in the formation of the reinforcing wings on the end members of the window frame;

Figures 10, 11, 12, 13 and 14 are detail views partly in section and partly in elevation illustrating the five steps employed for stiffening the hinge rail of one side member and for forming the hinges thereon;

Figure 15 is a plan view of the complete window frame;

Figure 16 is a view thereof in section on line 16—16 of Figure 15;

Figure 17 is a plan view illustrating the drawing or cupping operation constituting the first step in the formation of the sash frame;

Figure 18 is a view thereof in section on line 18—18 of Figure 17;

Figure 19 is a plan view illustrating how the outside edges of the cupped blank of Figure 17 are trimmed;

Figure 20 is a similar view illustrating the operation of removing spaced portions of the blank to form the window lights;

Figure 21 is a view in section on line 21—21 of Figure 19;

Figure 22 is a view partly in section on line 22—22 of Figure 23 and partly in elevation illustrating how the hinges are rolled on the sash frame;

Figure 23 is a plan view showing the complete sash frame;

Figure 24 is a view thereof in section taken on line 24—24 of Figure 23;

Figure 25 is an enlarged fragmentary sectional view taken in the same plane as Figure 24 and showing the construction of an end frame member;

Figure 26 is a similar sectional view illustrating the construction of a mullion and the associated window glass seats;

Figure 27 is a plan view showing the complete assembly of window and sash frames;

Figure 28 is a sectional view taken on line 28—28 of Figure 26; and

Figure 29 is a fragmentary sectional view taken on line 29—29 of Figure 27.

Referring to the drawings, and more particularly to Figures 1 to 5, inclusive, wherein the major steps in the formation of the window frame are illustrated, W designates a single piece sheet metal blank, such as sheet steel, which originally is in the form of a flat sheet of rectangular form. This sheet is first cupped or drawn with suitable dies to the shape shown in Figures 1 and 2 thereby giving to the blank the form of a flanged cup or tray, the marginal portion of which is of angular formation and of such structure as to be adapted to constitute the frame members of the window frame. The next step in the method is shown in Figure 3 which illustrates how the outside edges of the blank in Figure 1 are trimmed or cut away to delineate the outside edges of the frame and to outline the outside edges of the stock *a* for the reinforcing wings 1 (see Figure 9) on the end members of the frame, the outside edges of the stock *b* for the stiffening member 2 of one side rail (see Figure 13), and the outside edges of the stock *c* for the hinge ears 3 on one of the side frame members (see Figure 13). By leaving the body of the blank intact during this trimming operation the shaped portions of the blank are preserved against distortion or strain. Following this trimming of the outside edges, the central portion of the blank is cut away or removed to provide the opening 4 of the window frame and is slit as at 5′ to outline the free edges of a weather strip 5 along one side frame member.

When the central portion of the blank is thus cut away we have, as a result of the operations described, side frame members 6 and 7 and end frame members 8 and 9 all constituted of a single piece of metal. The side and end frame members all have body portions and oppositely directed edge flanges

and as shown in Figure 6 the side frame member 6 has a body portion 10, an outwardly directed edge flange 11 and an inwardly directed edge flange 12 on which the weather strip 5 is formed. The side frame member 7 also has a body portion 10′, an outwardly directed edge flange 11′ and an inwardly directed edge flange 12′. As shown in Figures 9, 15 and 16, the end frame members are of identical construction and each includes a body portion 14, an inwardly directed edge flange 15, and an outwardly directed edge flange 16 on which the stiffening wing 1 is provided. The construction of the stiffening wings 1 will be hereinafter more fully described. This formation of the frame members from a single piece of metal in this manner results in a very rigid and stiff frame.

The formation of the stiffening wings 1 is illustrated in Figures 6, 7 and 8. As illustrated, the stock *a* of these wings, which is outlined by the operation shown in Figure 3, is first bent up to the angular form shown in Figure 6 by any suitable or known means, right angle bends occurring at a^1 and a^2 (see Figure 6). In the next operations the entire wing structure, as previously formed, is forced over the outwardly extending flange 16, the bend a^2 being thus made a reverse bend and one flange of the wing 1 being forced flush against the flange 16. The outwardly extending section of the wing 1 not only has a stiffening function but also affords a gauge or stop operable when the window is being put into place to indicate and limit the extent to which the structure of the building is built around the window frame.

As described, the weather strip 5 on the side frame member 6 is formed from the body of the blank and it is bumped up or bent as at *c′* (see Figure 6) to extend at an angle to the flange 12 of the side frame member 6 on which it is formed.

The formation of the hinge rail stiffening plate 2 and hinge ears 3 is illustrated in Figures 10 to 14, inclusive. As shown in these figures, the stock *b*, *c*, from which these parts are formed is first bent downwardly at the point *d* (see Figure 10) and has its extremity curved to the shape of approximately half a cylinder, as indicated at *d′*. Following this operation the stock of these parts is again bent upwardly at the point *e*, and this bend is carried through 270° to provide a reverse bend as indicated in Figures 12 and 13, thus positioning the plate 2 flush against the flange 11′ and inverting the curved or semi-cylindrical end portion *d′*. This end portion *d′* is next rolled down to form the hinge ear 3, as shown in Figure 14. This completes the construction of the window frame.

In producing the sash frame, a blank S is utilized which originally is in the form of a flat rectangular sheet and which is first cupped or drawn to the form shown in Figure 17. This cupping or drawing operation not only produces a blank which is in the form of a flanged cup or flanged tray (see Figures 17 and 18) but the dies utilized are also shaped to provide an inner marginal channel or crimp 30 and spaced transverse channels or crimps 31 in the body of the blank. Following this cupping operation the outside edges of the blank are trimmed or cut to the form shown in Figure 19 which delineates the edges of the sash frame and also outlines the stock of the hinge ears to be later formed. The next operation involved in the production of the sash frame consists in cutting out spaced portions of the body of the blank within and slightly spaced from the crimps or channels 30 and 31 to provide openings 33 affording the lights of the sash frame (see Figures 20 and 21). By cutting out the blank inwardly of the channels 30 and 31 integral flanges 41 are formed on these crimps or channels 30 and 31.

As a result of these operations, a sash frame is provided which consists of a single piece of metal and has side frame members 35 and 36 and end frame members 37 and 38 all constituted of a continuous and integral piece of metal and each having a body portion 39, an outwardly directed edge flange 40, a crimp or channel 30 around its inner margin, each crimp or channel 30 having an inwardly directed edge flange 41. In addition, there are the integral cross members constituted by the flanged channels or crimps 31 which brace and stiffen the side members of the frame and provide sockets for doubled mullion strips 43 inserted therein and spot welded as at 47 to the side frame members. The flanges 41 of the inner marginal channels or crimps 30 and of the cross channels 31 afford seats to which glazing is applied and secured by putty or other suitable means. The structure of the sash frame is completed by bending and rolling the stock *f* to provide the hinge ears 50 (see Figure 22).

The assembled window frame and sash frame is shown in Figures 27, 28 and 29. As illustrated in these figures the hinge ears 3 and 50 are brought into registration and pivotally secured together by suitable hinge pins 55. This permits the sash frame to be swung into the window frame as shown in Figure 28 at which time the outwardly directed flanges 40 of the sash frame members fit flush against and overlap the outwardly directed flanges 11, 11′ and 16 of the window frame; the body portions 39 of the frame members of the sash frame project into the opening of the window frame;

and the crimps or channels 30 formed around the inner marginal edge of the sash frame bear against the inwardly directed flanges 14 of the end frame members 8 and 9 and against the inwardly directed flange 12′ of the side member 7 of the window frame, thus providing a weather tight joint entirely around the frames at the inner side and a second weather tight joint entirely around one side member and two end members at the outside of the frame. A weather tight joint is also provided between the lower side member 6 of the window frame and the lower side member 35 of the sash frame but is constituted by the weather stripping 5 which is angled inwardly and upwardly toward the body portion 39 of the side member 35 of the sash frame so as to throw rain or water, that may drip down or be blown in against the frames, out to the exterior.

A latch 60 may be provided on the inside of the frame member 35 to coact with a keeper 61 fixed on the frame member 6, as shown in Figure 27.

The invention claimed is:

1. The hereindescribed method of making a one-piece window frame which consists in drawing a metal blank to form continuous frame members, trimming the outside edges of the blank to delineate edge portions of the frame and to outline stock for a stiffening member and hinge ears and bending and rolling the stock so outlined to double the stiffening member back upon the frame member with which it is formed and to form the hinge ears on said stiffening member.

2. The hereindescribed method of making a one piece metal window frame having side and end frame members, each of which includes a body portion and oppositely directed edge flanges, the body portion and edge flanges of the several frame members being one continuous and integral piece of metal, certain of the edge flanges having integral stiffening wings and integral hinge ears, which method consists in drawing a single piece sheet metal blank between dies and upsetting the metal of the blank during the drawing operation to produce a cupped formation having an outwardly directed marginal flange, then trimming the flange of the cupped blank to outline the stock of the stiffening wings and hinge ears, subsequently bending the stock of the stiffening wings back into position upon the marginal flange of the cupped blank to complete the formation of the stiffening wings, and rolling the stock of the hinge ears to complete the formation thereof, and finally cutting out a portion of the bottom of the cupped blank inwardly of the body portion thereof to form the opening of the frame and complete the formation of the frame members.

3. The hereindescribed method of making a one piece metal window frame having side and end frame members, each of which includes a body portion and oppositely directed edge flanges, the body portion and edge flanges of the several frame members being one continuous and integral piece of metal, certain of the edge flanges having integral stiffening wings, which method consists in drawing a single piece sheet metal blank between dies and upsetting the metal of the blank during the drawing operation to produce a cupped formation having an outwardly directed marginal flange, then trimming the flange of the cupped blank to outline the stock of the stiffening wings, subsequently bending the stock of the stiffening wings back into position upon the marginal flange of the cupped blank to complete the formation of the stiffening wings, and finally cutting out a portion of the bottom of the cupped blank inwardly of the body portion thereof to form the opening of the frame and complete the formation of the frame members.

In witness whereof I hereto affix my signature.

ANTHONY G. SIEBENLIST.