May 10, 1927. 1,628,511

G. E. PETERSEN

COLLAPSIBLE SLIDING CLOSURE

Filed June 23. 1924 5 Sheets-Sheet 1

Fig. 1.

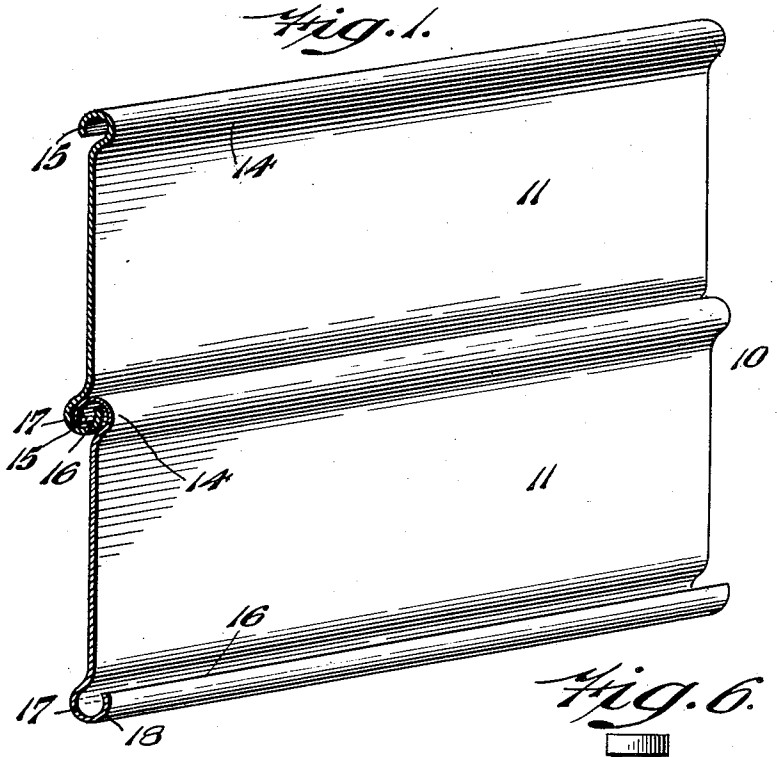


Fig. 6.

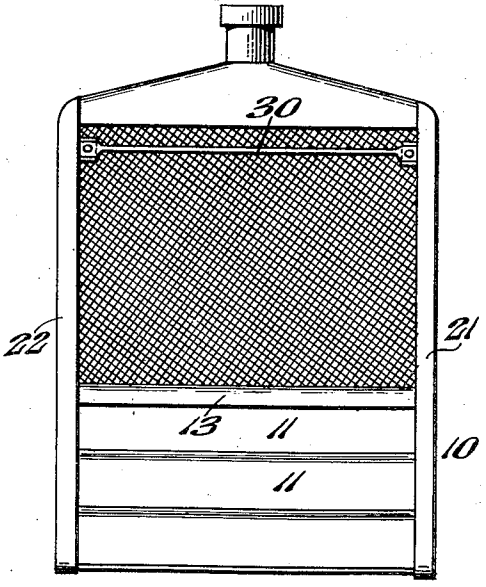
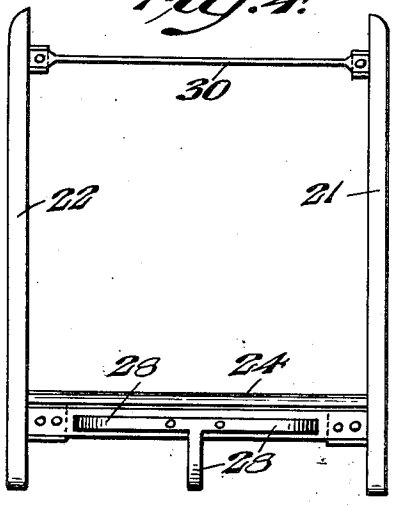


Fig. 4.



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Fig. 2.

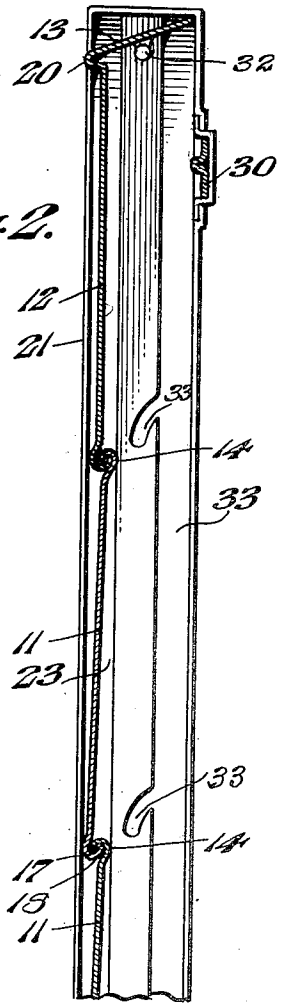


Fig. 3.

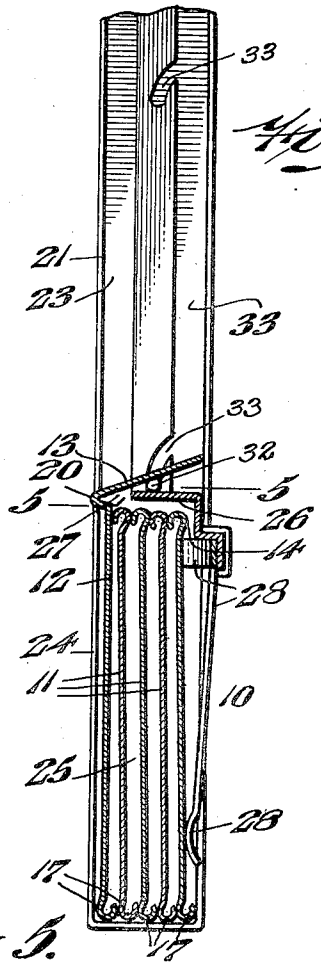
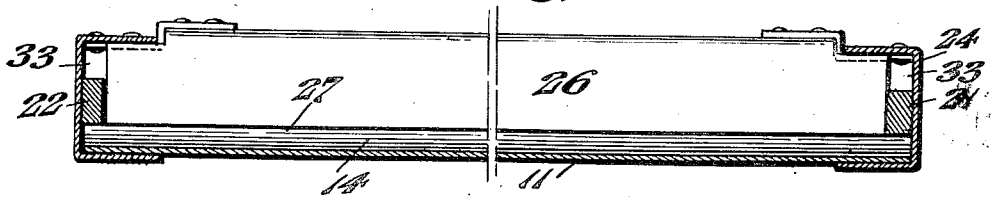


Fig. 5.

ON LINE. 5-5. FIG. 3.



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Fig. 7.

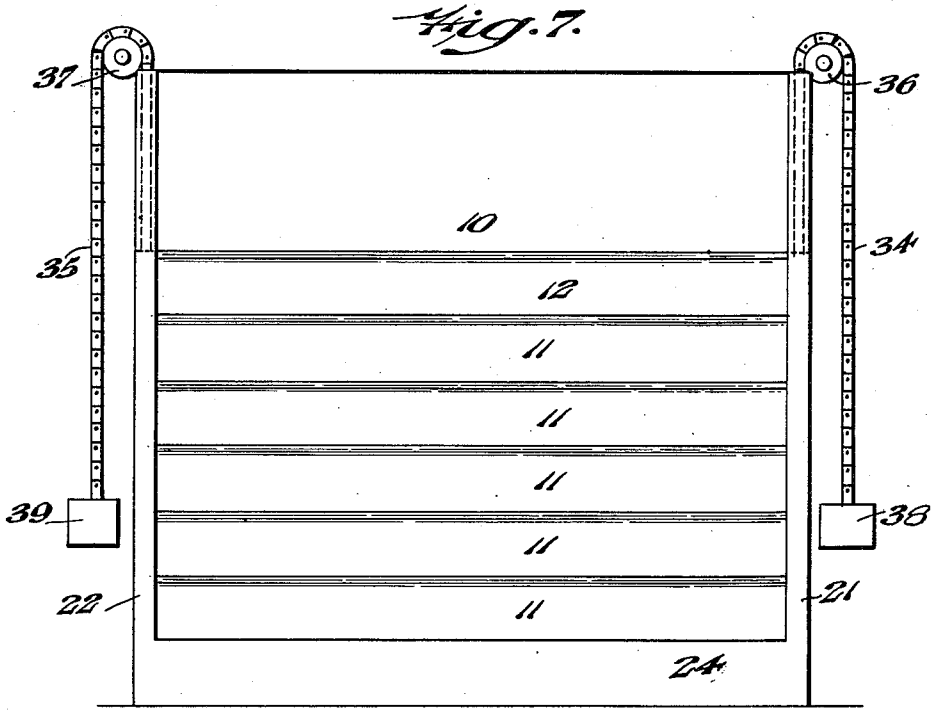
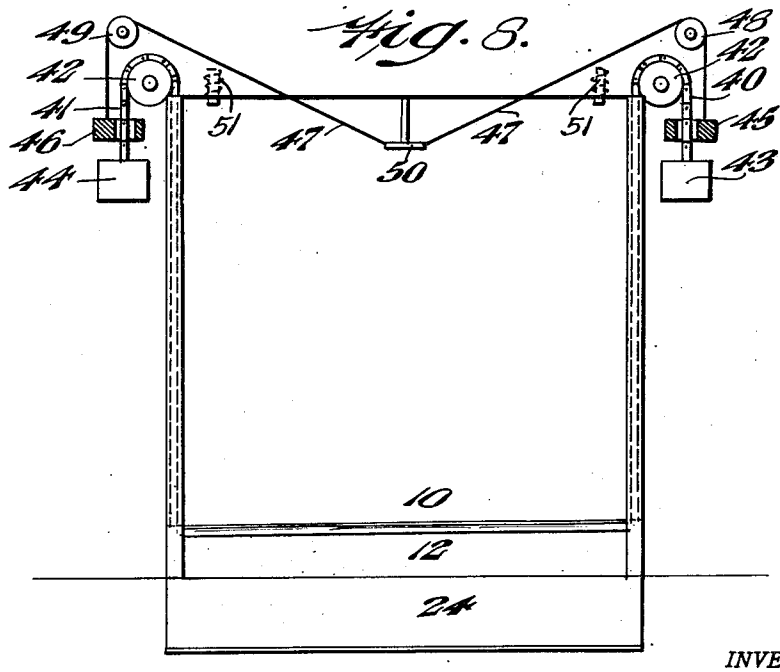


Fig. 8.



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COLLAPSIBLE SLIDING CLOSURE

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Fig. 9.

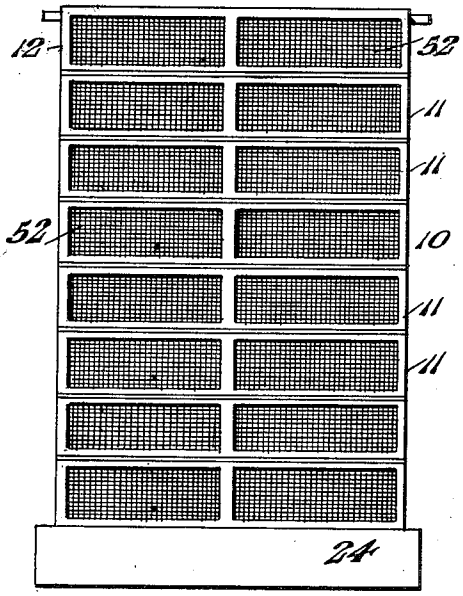


Fig. 10.

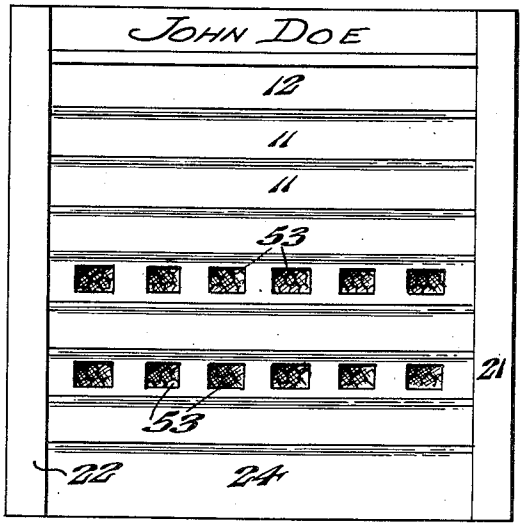
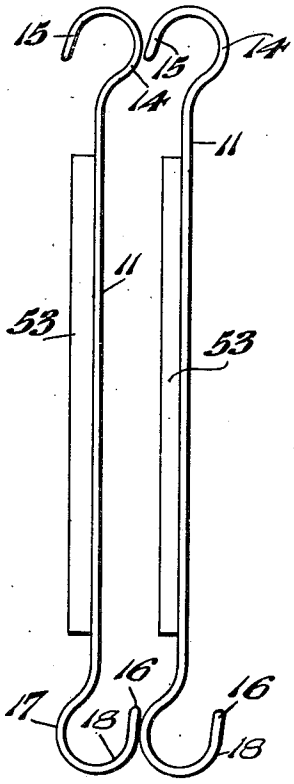


Fig. 11.



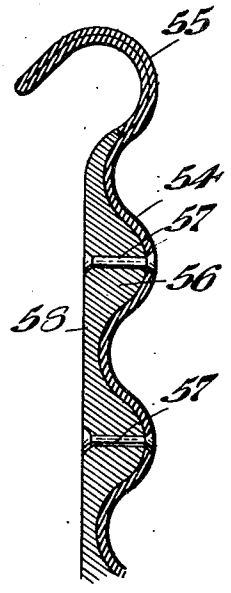
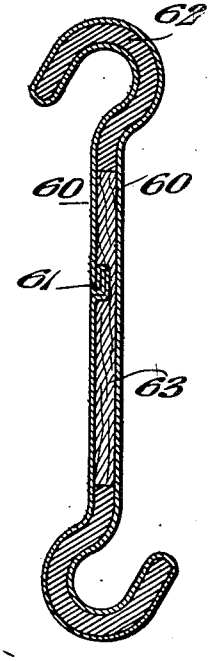


Fig. 12.

Fig. 13.



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COLLAPSIBLE SLIDING CLOSURE

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Fig. 14.

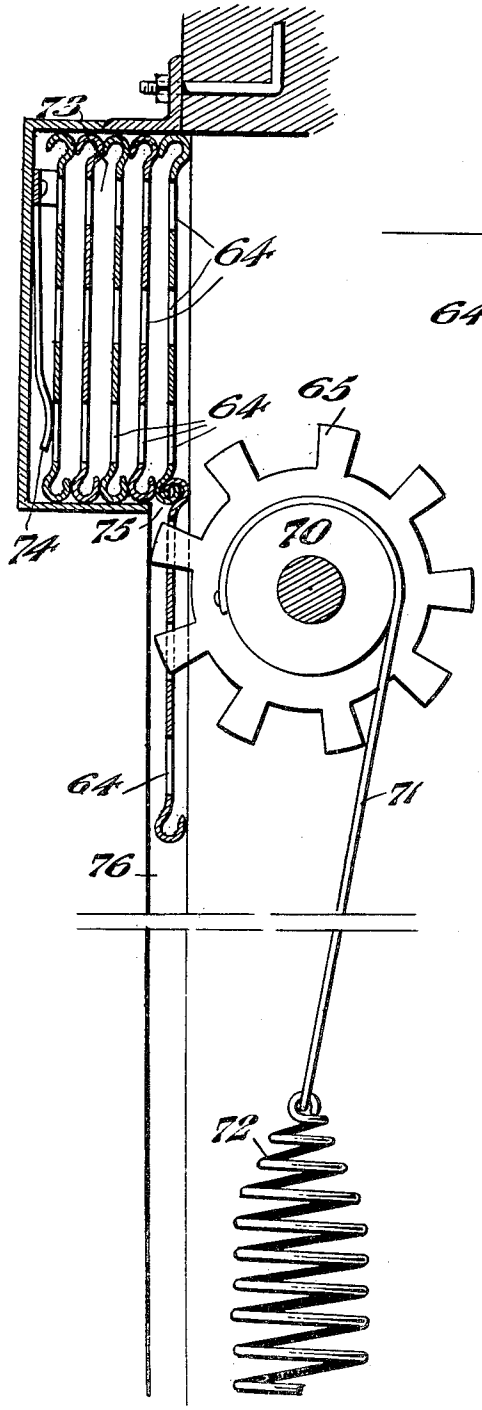
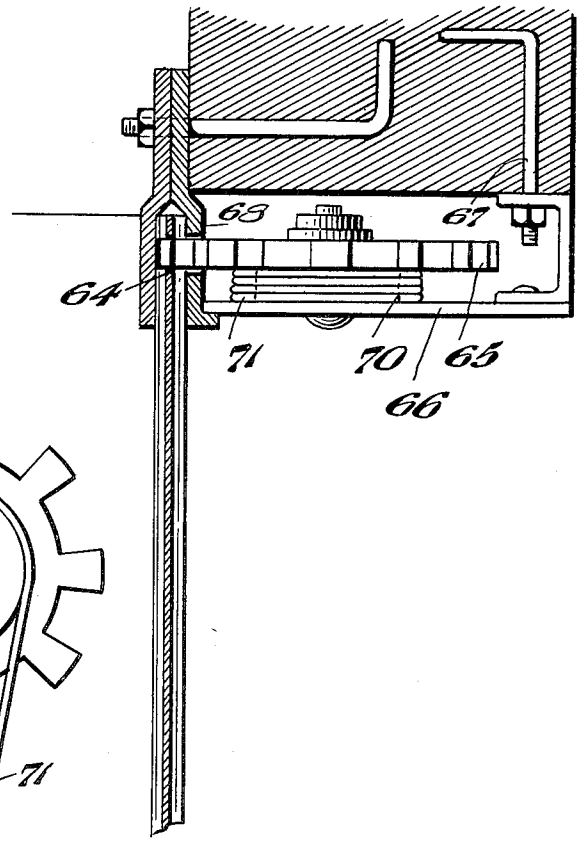


Fig. 15.



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Patented May 10, 1927. 1,628,511

UNITED STATES PATENT OFFICE.

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COLLAPSIBLE SLIDING CLOSURE.

Application filed June 23, 1924. Serial No. 721,849.

The present invention relates to closures for openings and more particularly to a form of closure which in inoperative position is collapsed and takes up a relatively small space. The invention relates generally to an improved collapsible closure which can be used for a variety of purposes, such for example as a fire door or curtain; elevator gate; as a door for warehouses, garages or other buildings; or for window openings as a screen or burglar proof shutter; for porch enclosures, either the glass or screen type; or for closures for hatches on vessels; or for any other opening which is to be closed in a secure manner.

Some of the objects of the present invention are to provide an improved collapsible, sliding closure for openings; to provide a closure of the collapsible type in which the parts are held rigid in any position of the closure; to provide an improved collapsible, sheet metal shutter formed of interlocking sections which can be extended to cover any ordinary opening and can be collapsed into a relatively small space to leave the opening unobstructed; to provide an improved interlocking connection for shutter sections of a collapsible closure whereby abutting sections of the closure are rigidly interlocked to prevent either rattling or disconnection of the parts and to maintain the closure unit in the form of a substantially solid wall closing the opening with which it is associated; to provide an improved counterbalanced collapsible door for use in warehouses, garages or any other opening which is to be closed; and to provide other improvements as will hereinafter appear.

In the accompanying drawings, Fig. 1 represents a perspective of a portion of a sectional collapsible shutter unit embodying features of the present invention; Fig. 2 represents a vertical section of the top portion of the shutter unit and showing the end rail construction embodying one form of the present invention; Fig. 3 represents a vertical section of a portion of the shutter unit showing more particularly the construction of the shutter at the bottom of the opening to which the shutter is to be applied; Fig. 4 represents a front elevation of the shutter supporting frame of the present invention and of a form particularly designed for use with a radiator of an automobile whereby the shutter construction forms a closure for varying the effective area of the radiator; Fig. 5 represents a section on line 5—5 of Fig. 3; Fig. 6 represents a front elevation showing a form of the invention as applied to the radiator of an automobile and wherein the shutters are partially open; Fig. 7 represents a form of the invention in which the closure is in the form of a counterbalanced door or elevator gate; Fig. 8 represents an elevation of the form of the invention as used as an automatic fire door; Fig. 9 represents an elevation of a convertible screen type of shutter; Fig. 10 represents an elevation of a shutter embodying sections having transparent portions; Fig. 11 represents an end elevation of two of the sections used in Fig. 10; Fig. 12 represents a section of a modified form of fire door construction; and Fig. 13 represents a section of one of the shutter sections showing a modified form for use in fire doors.

Referring to the drawings, one form of the present invention comprises a closure unit 10, formed of a plurality of interlocked sections 11, all of which are identical in construction with the exception of the top section 12, which is provided in the present instance with a laterally disposed and inclined top flange 13, which serves generally as a top closure for the opening to which the shutter is applied. The shutter sections 11 are preferably formed of sheet metal, generally of rectangular configuration, with all points of the body portion lying in the same plane, while the two opposite edges are provided with means for interlocking with the next adjacent section of the unit. In this instance, the top edge of each section 11 is formed with an offset 14 in the form of a curved bead which is reversely turned to form a lip 15 offset from the opposite side of the body of the section 11. The offset 14 and lip 15 are preferably formed on the same radius of curvature, the center of which lies in the plane of the body portion of the section 11, so that the offset

of the lip-formed edge or hook is the same at both sides of the body 11. The lower edge of the section 11 is formed by a second reversely curved hook or lip 16, which is formed by offset portions 17 and 18, similar to the construction at the opposite edge of the body portion of the section 11. Thus each section of the shutter unit is provided with an upper curved offset lip or hook extending the length of the unit and a lower offset lip or hook 16 extending throughout the length of the section 11 at its lower edge and disposed at the opposite side of the body from the hook 15. The top section 12 of the shutter is formed at its lower edge with the same type and form of interlocking lip as the other sections but its top edge is provided merely with an offset 20 which merges into the top flange 13 and serves as a means for manually moving the shutter from one position to another.

For supporting the shutter unit for sliding movement, two end rails 21 and 22 are provided, each of which has a guide slot 23 formed therein of a depth sufficient to operatively receive the inserted end of the shutter sections and of a width corresponding to the diameter of the section offsets plus the thickness of material of which the sections are made. Thus, as seen in Fig. 2, when the ends of the shutter sections are properly seated in the respective slots 23, they will have a snug, sliding fit, but there will be practically no play between the interlocked joints of the shutters, and consequently no opportunity for the bottom of one shutter to become released from the top of the next lower shutter. The rail sections 21 and 22 are joined at their lower ends to a frame or casing 24, which forms a magazine or pocket 25 of a size designed to receive all of the shutters in collapsed condition. This magazine 25 is preferably closed on all sides, and has a top 26, provided with a slot 27 in register with the lower ends of the slots 23, so that the shutters can pass, one at a time, from the slots into the magazine 25.

For the purpose of maintaining a desirable tension upon the shutter sections when in inoperative position within the magazine 25, and also to insure the sections being automatically advanced so that they can be successively withdrawn to operative position, the rear wall of the frame 24 is provided with spring arms 28, which are disposed laterally with respect to each other to engage substantially the length of the opposed shutter section and also to maintain pressure across the width of the section. In Fig. 3, the shutter unit is shown in its collapsed or inoperative position with all of the sections arranged vertically side by side in the magazine 25, and the spring 28 is consequently under its maximum tension and acts upon the withdrawal of any shutter section to advance the others a distance equal to the width of the section removed.

In Fig. 4 of the drawings, the rail sections are shown as designed for use with and connection to the front of a radiator as shown in Fig. 6 and in this construction the upper ends of the rails are connected by a brace bar 30, of such form and construction as to function in the desired manner while presenting as small a surface as possible across the face of the radiator. In this radiator form of the invention it is desirable to provide means so that the opening can be partially open in order to vary the exposed area of the radiator, and to that end the end rails 21 and 22 in the present instance are provided with recesses 31 spaced horizontally apart a like distance in order to form locking openings or seats to respectively receive pins 32 which are fixed to the flange 13 of the top section 12. When the shutter is moved from one position to another the pins 32 ride respectively in guide slots 33 into which the recesses 31 open, so that the shutter can be fixed in closed position or in a selected partially closed position by drawing the section 12 in a direction to cause the pin 32 to ride into the recesses 31. In Fig. 7 of the drawings, the shutter unit is shown arranged for use as an elevator gate, and the details of the construction are generally similar to those described in connection with Figs. 1, 2 and 3, except that the end rail construction is of heavier type and the shutter unit itself is connected at opposite ends respectively to the ends of chains 34 and 35, which pass respectively over guide pulleys 36 and 37 and carry counterbalance weights 38 and 39. The two chains 34 and 35 are of like construction and each consists of a plurality of links pivotally connected together and each of a predetermined weight so that the chain has a definite weight for a foot of its length, this weight being proportioned with respect to the weight of the shutter unit which it is to counterbalance. For example, in an elevator gate of the type shown in Fig. 7, the shutter sections will weight approximately forty pounds each, and the chain is calculated on a basis of ten pounds per foot, so that in taking into consideration the suspended weight at the end of the chain there will be such an equalizing of the weights as to permit the shutter unit to be moved freely from one position to another.

In Fig. 8 of the drawings, the shutter unit is shown in use as an automatic fire door operated in a similar manner to the unit of Fig. 7 by chains 40 and 41 operating over pulleys 42 and carrying weights 43 and 44 at the free end of the chains. In this form of the invention additional weights 45 and

46 are connected by a rope 47, or like fastening means, which passes over auxiliary pulleys 48 and 49 so that the respective weights are suspended directly above the counterbalancing weights but normally out of contact therewith by reason of a fusible link 50, which is interposed between the ends of the rope 47, and prevents the release of the weights as long as the fusible link is in place. In case the fusible link 50 is melted by a temperature exceeding the normal atmospheric temperature the rope 47 will be severed and allow both the weights 45 and 46 to drop by gravity upon the counter-weights, thereby increasing the weight acting to close the shutter, and it will thereupon be drawn upwardly to a position shutting off the door opening. The shock or jar of the shutter closing is preferably minimized by the provision of spring bumpers 51 located along the top edge of the door opening.

In Fig. 9 of the drawings a modification of the invention is shown wherein the shutter is of a form in which its sections are of open construction to receive wire mesh panels 52 whereby the unit can be employed in a window or door opening to serve as a fly or insect screen during the summer months. This type of panel shutter can readily be converted into the solid type of shutter by providing either steel panels to take the place of the wire mesh panels or by substituting the ordinary solid shutter sections.

In Figs. 10 and 11 another embodiment of the invention is shown wherein it is desirable to equip certain of the shutter sections with wire glass panels 53 or panels having ordinary glass, thus being particularly useful in burglar-proof curtains where it is desirable to see through the shutter into the store or other place, as will be understood.

In Fig. 12 a form of the invention is shown for use in heavy fire door construction and in this instance each shutter is formed with a corrugated body 54 for strengthening purposes, while the hook ends 55 are reinforced by reversely turning the end of the material of the shutter, as will be apparent. As a further means for strengthening this type of shutter one face thereof is provided with relatively heavy metal inserts 56, which are connected to the body of the section by rivets 57 or like fastening devices, and are suitably molded on one face to snugly interfit with the corrugations of the shutter proper. In this connection it will be noted that the face 58 of this insert, which is disposed toward the path of movement of the shutter sections when being opened, is a smooth plane surface, so that the lower or pickup hooks of each shutter section can ride freely over this face and engage the top hook during the extending or closing movement of the shutter.

In Fig. 13 another form of the shutter section is shown for use with fire doors wherein the section is formed of sheet metal, having double spaced walls 60 suitably interlocked by a tight joint 61 at their meeting ends and providing a hollow shutter section conforming in shape to the shutter sections heretofore described. In order to reinforce and properly weight the ends of this tubular section, the hooked portions are filled with metal castings 62 conforming in shape to the configuration of these end portions of the section while the main body portion of the tubular section is filled with a packing 63 of asbestos or other fire-proof material, whereby a complete unitary fire-proof unit is provided.

In Figs. 14 and 15 a modification of the invention is shown in which the shutter is supported at the top of the opening and is closed by drawing the shutter down and open by moving in the opposite direction. In this form of the invention the ends of each shutter section are provided with a row of slots 64 of a size to cooperate with the teeth of a sprocket wheel 65. It will be understood that there are two sprocket wheels 65 arranged at opposite sides of the top of the opening and being suitably mounted for rotary movement in a frame 66, which is anchored in any well-known manner, such as 67, to the abutting wall. These sprockets 65 project through one of the heavy rail bars 68 in order to engage the slotted ends of the shutter and transmit motion thereto, as will be understood. The sprockets 65 are provided respectively with winding drums 70 at one side and cables 71 are fastened to the respective winding drums at one end while their opposite ends are connected respectively to closecoiled springs 72. The coils of these springs are so designed as to length and stiffness as to balance the weight of the shutter section and in closed position of the shutter the springs are extended with the cable wound around the drums so that it is a comparatively easy matter to manually lift the shutter and raise it to its closed position. It is also equally easy to lower the shutter to closed position as the weight of the parts is equalized and properly balanced. In this construction the shutters are arranged to be disconnected and nested in a magazine 73 at the top of the opening and as in the construction already described a suitable pressure spring or springs 74 are provided to normally press the shutter sections toward the opening 75 of the guide slot 76.

It will now be apparent that a complete unitary collapsible shutter construction has been provided which is adaptable to various forms of construction, serving in one instance as an adjustable, rigid, non-rattling closure for radiator fronts, and in others for window or door openings, and more

particularly for heavy fire door or elevator constructions. In this latter connection, it will be noted that the desired massive door construction is possible because movable sections are not required to bend or turn about guide rolls in moving from closed to open position, but to the contrary, each section as it is closed is disconnected from its abutting section, and no bending or other distortion of the shutter is necessary.

While several forms are shown in which this invention may be embodied, it is to be understood that the invention is not limited to any specific construction, but might be applied to various forms without departing from the spirit of the invention or the scope of the appended claims.

Having thus described my invention, I claim:

1. A collapsible closure for openings, consisting of a frame having a receptacle or magazine at one end and slots forming fixed guides respectively in two opposite sides opening into said magazine, a shutter formed of a plurality of sections arranged in collapsed condition to fit side by side in said magazine and in an extended position to lie substantially in the same plane with opposite ends of each section seating respectively in said guides, connections between adjacent shutters arranged to interlock by movement of said shutters in one direction and to release by movement of said shutters in an opposite direction, said connections fitting said guides for free sliding movement but held against movement transverse of said guides, and spring means normally maintaining said sections pressed together whereby upon the removal of one section from said magazine another section is automatically moved to removal position.

2. A collapsible closure for openings, consisting of a frame having a receptacle or magazine at one end and slots respectively in two opposite sides opening into one end of said magazine, a shutter formed of a plurality of sections arranged in collapsed condition to fit side by side in said magazine and in extended position to lie substantially in the same plane with opposite ends of each section seating respectively in said slots, spring means at the opposite end of said magazine from said slot openings arranged to maintain pressure on the shutter sections in said magazine, and a flange extending longitudinally of an end shutter section to close the opening into said magazine.

3. A collapsible closure for openings, consisting of a frame having a receptacle or magazine at one end and slots forming fixed guides respectively in two opposite sides opening into said magazine, a shutter formed of a plurality of sections arranged in collapsed condition to fit side by side in said magazine and in an extended position to lie substantially in the same plane with opposite ends of each section seating respectively in said guides, connections between adjacent shutters arranged to interlock by movement of said shutters in one direction and to release by movement of said shutters in an opposite direction, said connections fitting said guides for free sliding movement but held against movement transverse of said guides, and means arranged in spaced relation to support said shutter in different extended positions.

4. A collapsible closure for openings, consisting of a frame having a receptacle or magazine at one end and slots forming fixed guides respectively in two opposite sides, opening into said magazine, a shutter formed of a plurality of sections arranged in collapsed condition to fit side by side in said magazine and in an extended position to lie substantially in the same plane with opposite sides of each section seating respectively in said guides, each body section of said shutter being formed of a flat strip of metal having two opposite side edges formed as a reversely curved hook, one hook opening to one side of said section and the other hook opening to the opposite side of said section, said shutter being assembled in said magazine with said sections side by side and all of the hooks at one side of said shutter sections being disposed in the same direction and the hooks at the opposite side of said sections being disposed in the opposite direction whereby transverse movement of one section with respect to the other causes two hooks to interlock and transmit the movement to the next adjacent shutter, and means to hold the said assembled shutter sections under tension.

5. A collapsible closure for openings, consisting of a frame having a receptacle or magazine at one end and slots respectively in two opposite sides opening into said magazine, a shutter formed of a plurality of sections arranged in collapsed condition to fit side by side in said magazine and in an extended position to lie substantially in the same plane with opposite ends of each section seating respectively in said slots, connections between adjacent shutters arranged to interlock by movement of said shutters in one direction and to release by movement of said shutters in an opposite direction, said connections fitting said slots for free sliding movement but held against movement transverse of said slots, and means including a chain formed of links of unifom predetermined weight for counterbalancing said shutter.

6. A collapsible closure for openings, consisting of a frame having a receptacle or magazine at one end and slots respectively in two opposite sides opening into said maga-

zine, a shutter formed of a plurality of sections arranged in collapsed condition to fit side by side in said magazine and in an extended position to lie substantially in the same plane with opposite ends of each section seating respectively in said slots, connections between adjacent shutters arranged to interlock by movement of said shutters in one direction and to release by movement of said shutters in an opposite direction, said connections fitting said slots for free sliding movement but held against movement transverse of said slots, means for counterbalancing said shutter, and means automatically operable for increasing the weight of said counterweight means to automatically close said shutter.

7. A collapsible closure for openings, consisting of a frame having a receptacle or magazine at one end and slots respectively in two opposite sides opening into said magazine, a shutter formed of a plurality of sections arranged in collapsed condition to fit side by side in said magazine and in an extended position to lie substantially in the same plane with opposite ends of each section seating respectively in said slots, connections between adjacent shutters arranged to interlock by movement of said shutters in one direction and to release by movement of said shutters in an opposite direction, said connections fitting said slots for free sliding movement but held against movement transverse of said slots, means for counterbalancing said shutter, and means including a fusible link automatically operable for increasing the weight of said counterweight means to automatically close said shutter.

8. A collapsible closure for openings, consisting of a frame having a magazine and side rails provided respectively with slots opening into said magazine, a shutter formed of a plurality of sections arranged in collapsed condition to fit side by side in said magazine and in extended position to lie substantially in the same plane with opposite ends of each section seating respectively in said slots, removable panels for each shutter section, and connections between adjacent sections arranged to interlock by movement of said sections in one direction and to release by movement of said sections in an opposite direction, said connections fitting said slots for free sliding movement but held against movement transverse of said slots.

9. A collapsible closure for openings, consisting of a frame having a magazine and slide rails provided respectively with slots opening into said magazine, a shutter formed of a plurality of sections arranged in collapsed condition to fit side by side in said magazine and in extended position to lie substantially in the same plane with opposite ends of each section seating respectively in said slots, interchangeable panels for each shutter section, and connections between adjacent sections arranged to interlock by movement of said sections in one direction and to release by movement of said sections in an opposite direction, said connections fitting said slots for free sliding movement but held against movement transverse of said slots.

10. As a new article of manufacture, a shutter section having two opposite side edges formed as oppositely disposed reversely curved hooks, and a removable panel for said section.

11. As a new article of manufacture, a corrugated shutter section having two opposite side edges formed as oppositely disposed reversely curved hooks, and a reinforcing member attached to the body of said shutter.

12. As a new article of manufacture, a corrugated shutter section having two opposite side edges formed as operatively disposed reversely curved hooks, and a reinforcing member attached to the body of said shutter having a plane outwardly disposed surface.

13. As a new article of manufacture, a tubular shutter section having two opposite side edges formed as oppositely disposed reversely curved hooks, and a fireproof material packed in said section.

14. As a new article of manufacture, a tubular section having two opposite side edges formed as oppositely disposed reversely curved hooks, asbestos packing in the body of said section, and metal inserts weighting the respective hooks.

15. A collapsible closure for openings consisting of a frame having a magazine and side rails provided respectively with slots opening into said magazine, said rails extending downwardly from said magazine, a shutter formed of a plurality of sections arranged in collapsed condition to fit side by side in said magazine and in extended position to lie substantially in the same plane with opposite ends of each section seating respectively in said slots, connection between adjacent sections arranged to slide freely in said slots but held against movement transverse of said slots, and means including sprockets in mesh with said sections for counterbalancing said shutter.

16. A collapsible closure for openings consisting of a frame having a magazine and side rails provided respectively with slots opening into said magazine, said rails extending downwardly from said magazine, a shutter formed of a plurality of sections arranged in collapsed condition to fit side by side in said magazine and in extended position to lie substantially in the same plane with opposite ends of each section seating respectively in said slots, connections between adjacent sections arranged to slide freely in said slots but held against movement trans-

verse of said slots, and means including an equalizing spring for counterbalancing said shutter.

17. In a collapsible closure for openings, the combination of a frame, a shutter formed of a plurality of sections detachably connected together and arranged to slide in said frame, and a counter-balancing device for said shutter arranged to automatically vary its counter-balancing weight in accordance with the number of shutter sections it controls.

Signed at Philadelphia, county of Philadelphia, State of Pennsylvania, this 18th day of June, 1924.

GEORGE E. PETERSEN.