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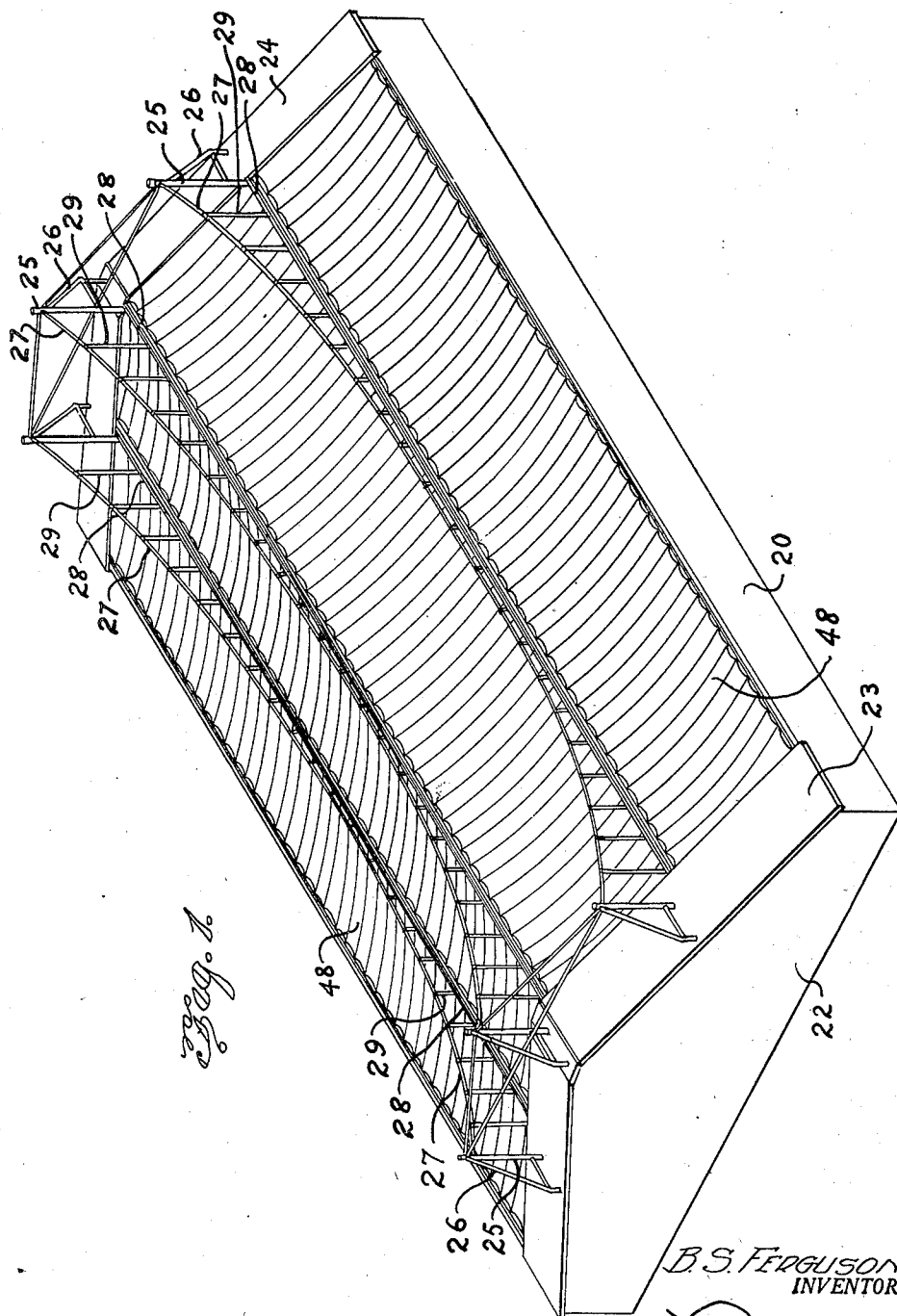
B. S. FERGUSON

2,415,202

REMOVABLE ROOF

Filed Sept. 28, 1945

7 Sheets-Sheet 1



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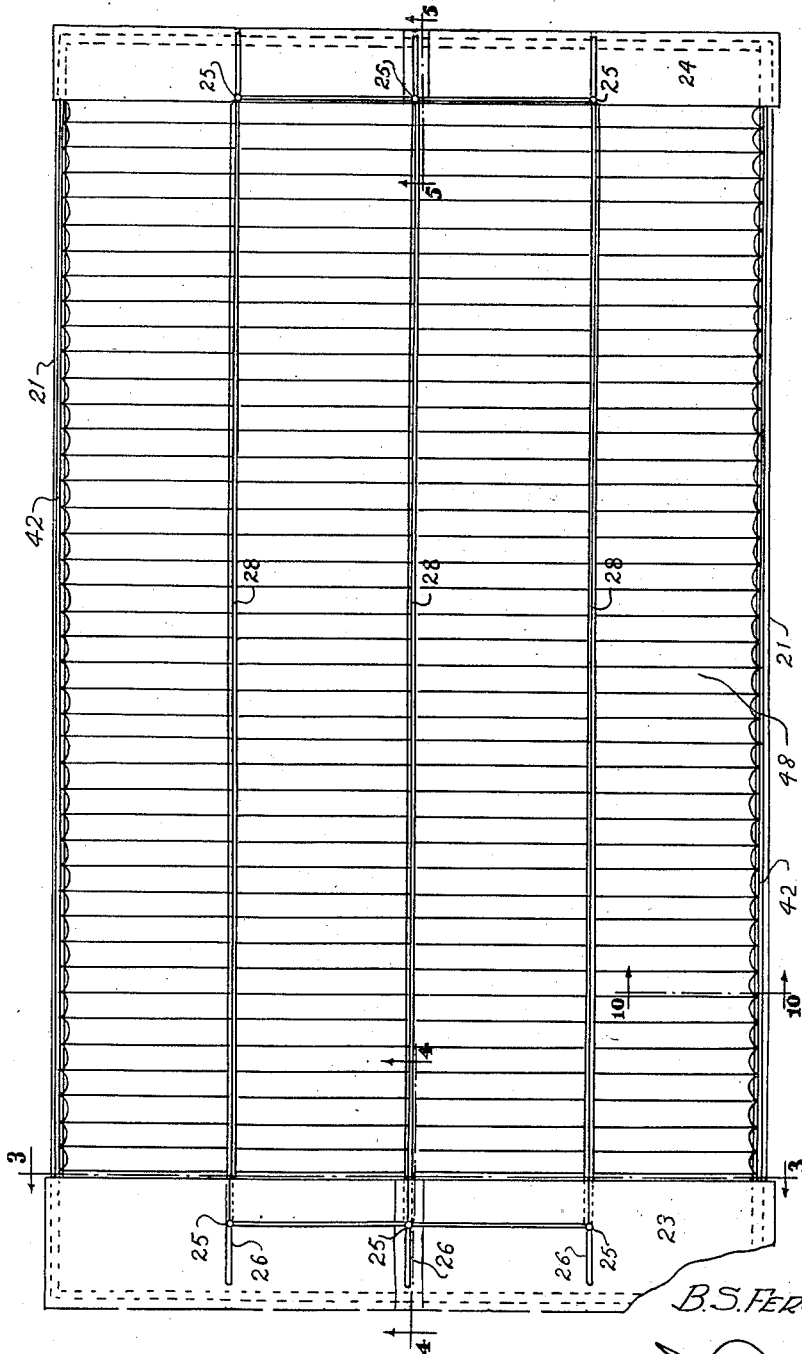
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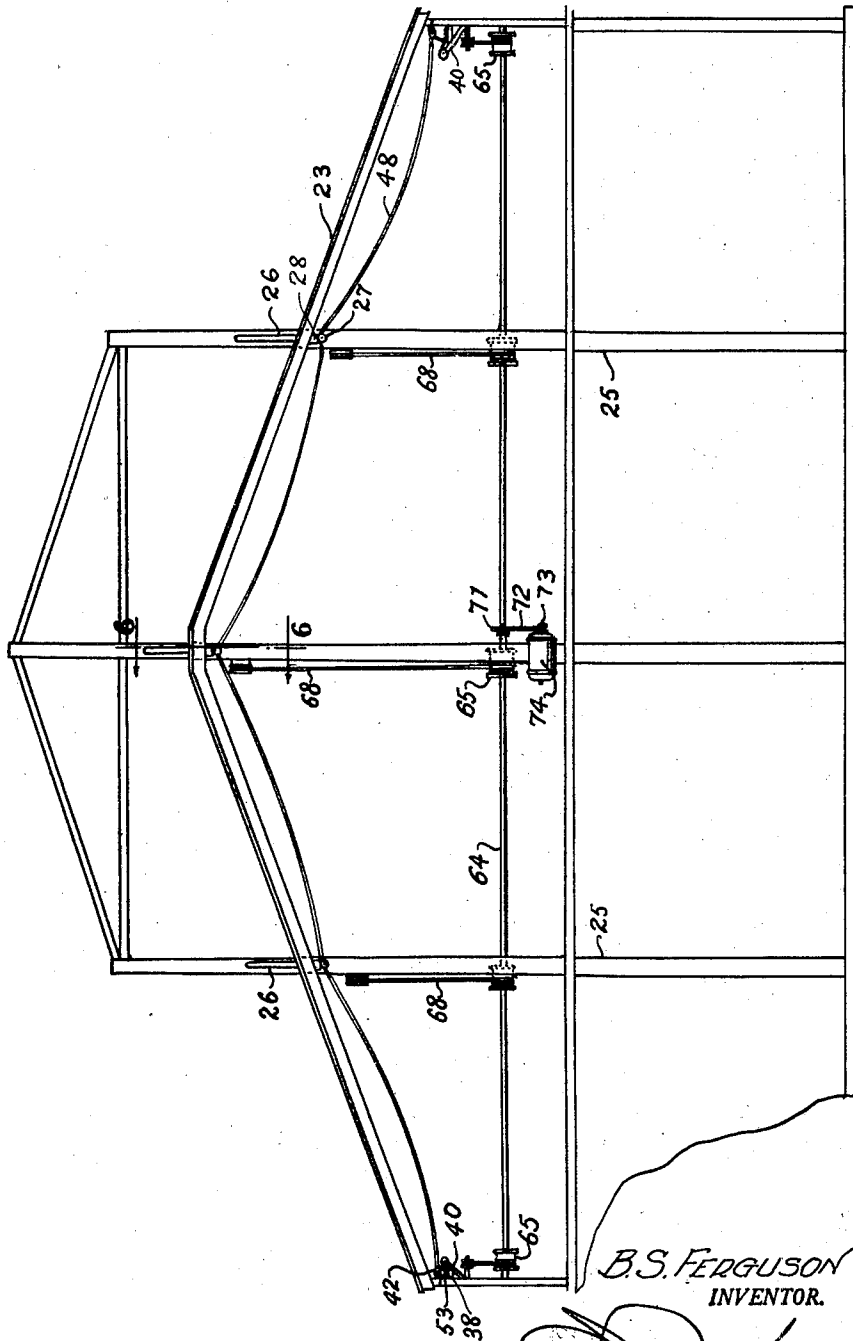
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Fig. 3.



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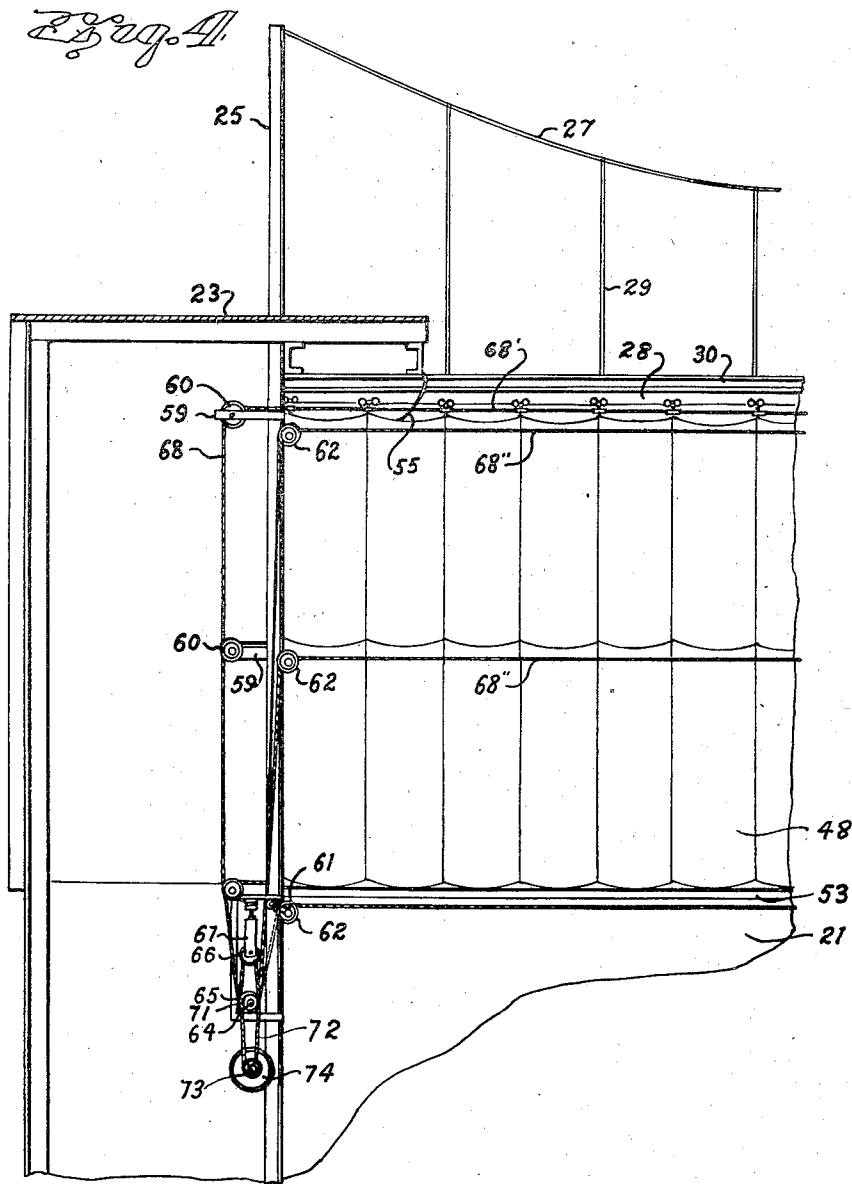
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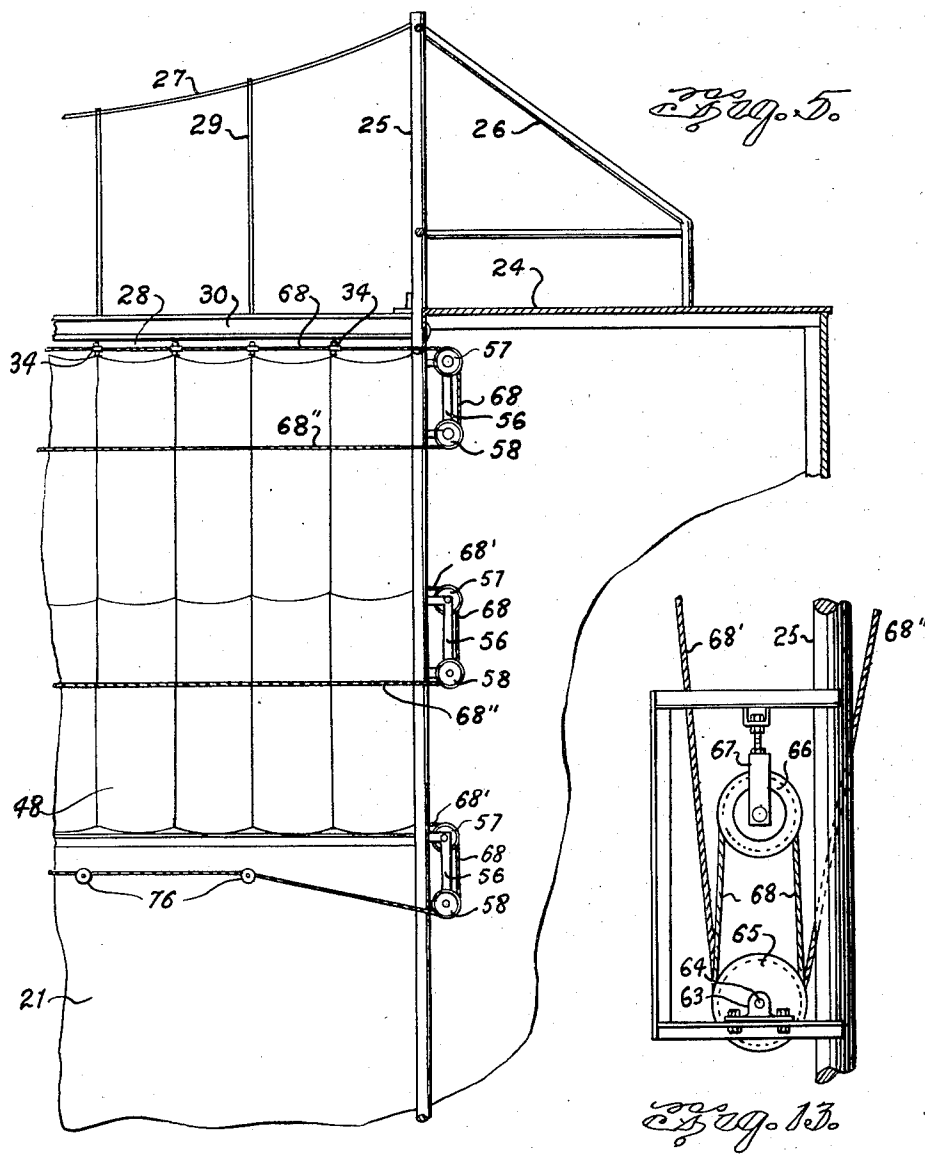
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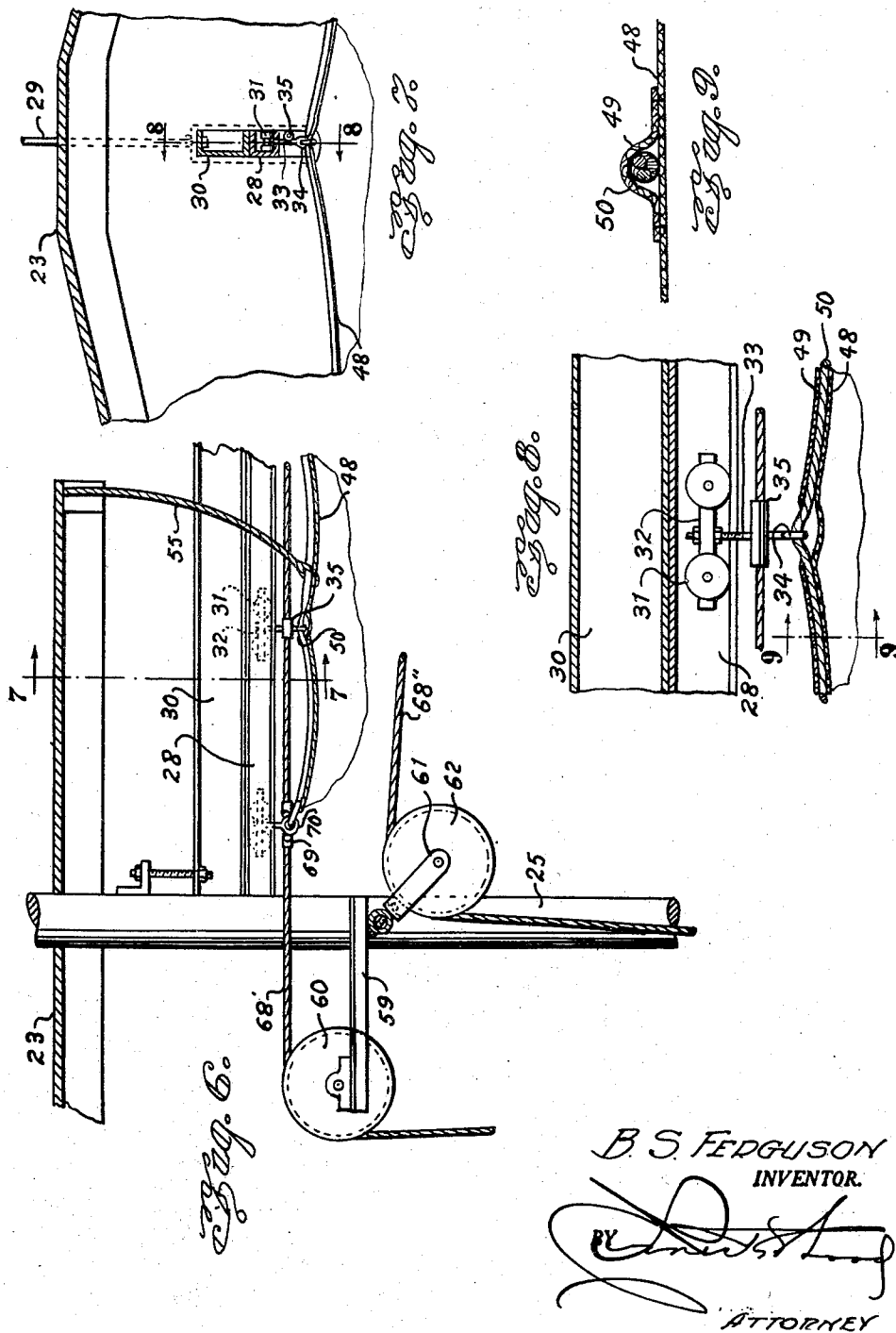
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REMOVABLE ROOF

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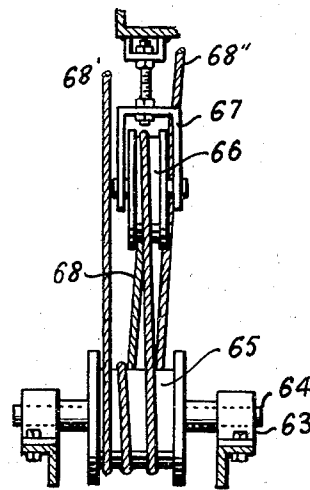
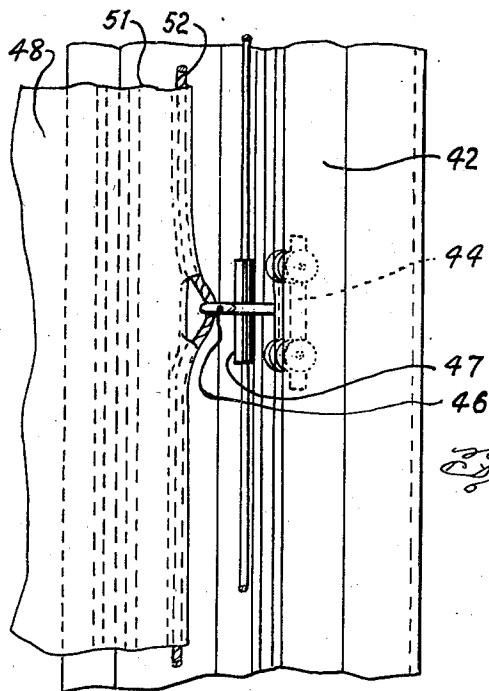
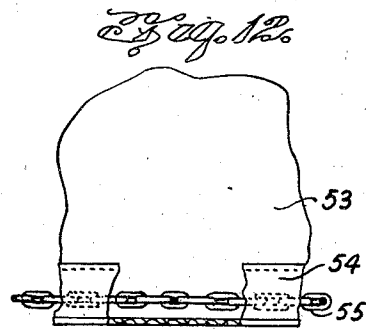
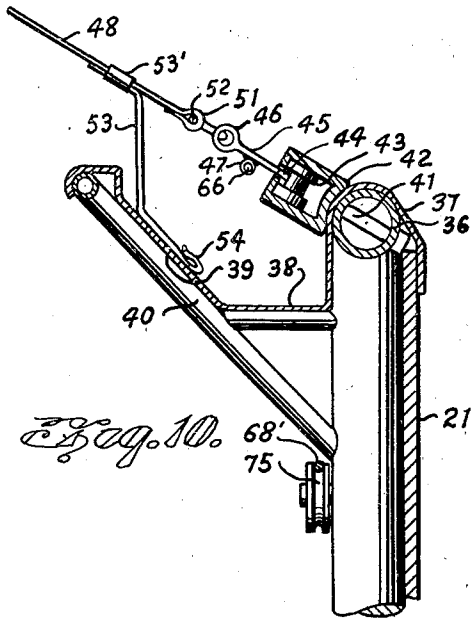
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REMOVABLE ROOF

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UNITED STATES PATENT OFFICE

2,415,202

REMOVABLE ROOF

Benjamin S. Ferguson, Dallas, Tex.

Application September 28, 1945, Serial No. 619,146

12 Claims. (Cl. 108—2)

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This invention relates to a removable roof and has for its primary object to enclose a space, weather-tight and yet permit the space to be opened to the sky in a matter of a few moments.

Another object is to so suspend the roof as to avoid interferences with the occupants or the contents of the space enclosed thereby.

The above and other objects may be attained by employing this invention which embodies among its features, spaced parallel trackways extending longitudinally of a building structure, carriages movable longitudinally on each trackway, a unitary flexible canopy supported on the carriages and means to extend or retract the roof to suit the weather conditions.

Other features include means to move the leading carriages in unison longitudinally of the trackways and sealing means at the ends and sides of the unitary canopy to render the junction of the roof with the sides of the structure weather-tight.

Still other features include suspension means for holding the trackways in proper position through the entire length of the building structure and a rigid roof member at each end of the structure above the flexible canopy beneath which opposite ends of the canopy are housed when the roof is extended.

In the drawings:

Figure 1 is a perspective view of a building structure equipped with a removable roof embodying the features of this invention.

Figure 2 is a top plan view of Figure 1.

Figure 3 is a transverse sectional view through Figure 2.

Figure 4 is a fragmentary enlarged sectional view taken substantially on the line 4—4 of Figure 2.

Figure 5 is an enlarged fragmentary sectional view taken substantially on the line 5—5 of Figure 2.

Figure 6 is an enlarged fragmentary sectional view taken substantially on the line 6—6 of Figure 3.

Figure 7 is a transverse sectional view taken substantially on the line 7—7 of Figure 6.

Figure 8 is an enlarged fragmentary sectional view taken substantially on the line 8—8 of Figure 7.

Figure 9 is a fragmentary sectional view on an enlarged scale taken substantially on the line 9—9 of Figure 8.

Figure 10 is an enlarged sectional view taken substantially on the line 10—10 of Figure 2.

Figure 11 is a top plan view of Figure 10.

Figure 12 is an enlarged fragmentary side view

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partially in sections illustrating the manner in which the weather sealing valances are weighted.

Figure 13 is an enlarged detail view of the drive mechanism, and

Figure 14 is an end view of Figure 13.

Referring to the drawings in detail, a building structure designated generally 20 comprises side walls 21 and end walls 22. Secured to opposite end walls and overlying a portion of the interior of the building structure for a comparatively short distance are permanent roof members 23 and 24 respectively, which slope downwardly from a point midway of each end wall toward the side walls 21 as will be readily understood upon references to Figure 1. Supported on suitable columns 25 which are suitably braced as at 26 are suspension cables 27 upon which spaced parallel longitudinal track members 28 are supported as by suspension rods 29. In order to provide a non-sagging structure, I find it advantageous to employ a longitudinally extending channel 30 to which the lower ends of the suspension rods 29 are secured and then to attach at properly spaced points to the under side of the channel 30, the track 28 as will be readily understood upon reference to the drawings (Figure 7). The trackways 28 comprise inverted channels with inwardly turned flanges extending longitudinally of the lower edges of the side walls of the channels and mounted for longitudinal movement within the trackways 28 are the wheels 31 of a plurality of carriages 32 each of which is provided with a depending suspension rod 33 terminating at its lower end in an eye 34. Extending transversely of each rod 33 intermediate its ends is a tubular guide member 35, the purpose of which will be more fully hereinafter described.

Extending longitudinally of the upper edge of each side wall 21 is a supporting member 36 to which the outer flange 37 of a gutter 38 is attached. This gutter is provided with an upwardly and inwardly inclined wall 39 and the gutter and wall 39 are supported on suitable brackets 40 attached to the supporting standards of the side walls 21. Bolted or otherwise secured as at 41 to each supporting member 36 is a longitudinally extending trackway 42 in which the rollers 43 of a plurality of carriages 44 run. Like the trackways previously described, the trackways 42 comprise substantially U-shaped channel members having intumed flanges at the ends of their side walls against which the rollers 43 engage. Carried by each carriage 44 is a rod 45 terminating at its end opposite that attached to the carriage in an eye 46, the purpose of which

will be more fully hereinafter described. A suitable tubular guide member 47 is secured to the rod 45 intermediate its ends for a purpose to be more fully hereinafter described. As illustrated in Figure 10, the trackways 42 are inclined upwardly in a plane substantially parallel to the plane of inclination of the permanent roof members 23 and 24 previously mentioned.

A flexible roof member designated generally 48 comprising a plurality of strips of canvas or the like water resistant or water repellent material sewn together to form a unitary structure is suspended from the eyes 34 of the carriages 32 as will be more fully hereinafter explained. Secured to the upper side of the flexible roof member 48 in longitudinal alignment with the trackways 28 are longitudinally spaced strips 49 forming tubular members through which suspension ropes 50 extend. Between adjacent ends of the tubular members 49 the suspension ropes extend through the eyes 34 of the carriages 32, so that as the carriages move along their respective trackways, the flexible roof 48 will be extended to lie in a plurality of trough-like roof members, or when the roof 48 is retracted the canvas will hang in festoons between each carriage. Formed at uniformly spaced intervals at the opposite side edges of the roof or canopy 48 are spaced hems 51 through which supporting cables 52 extend. These cables extend through the eyes 46 of the carriages 44 and it will thus be seen that the side edges of the flexible roof or canopy 48 are sustained in proper position. Attached to the under side of the flexible roof or canopy 48 adjacent each longitudinal side edge is a valance 53 the lower edge of which is provided with a relatively deep hem 54 for the reception of a weighting chain 55a by means of which the lower edge of the valance is retained against the inclined flange 39 of the trough 38 as will be readily understood upon reference to Figure 10. It is to be understood of course, that the valance 53 extends for the full length of the flexible roof 48 so that when the latter is extended a weather-tight junction will be effected between the gutters 38 and the side edges of the roof.

In order to seal the ends of the roof 48 when it is extended and exclude inclement weather from the interior of the building structure, a valance 55 (Figure 6) is suspended from the inner edge of each permanent or fixed roof member 23 and 24 and the lower edges of these valances are weighted as described for the valance 53 so as to cause them to lie in close contact with the flexible roof 48 when the latter is extended as will be readily understood upon reference to Figures 4 and 6.

Secured to the standards 25 at the end of the building structure covered by the permanent roof 24 U-shaped frames 56 each of which carries an upper roller 57 and a lower roller 58 at the junction of its bight portion and the leg. These rollers 57 and 58 serve as guide pulleys for the operating cables and the upper roller of each group of rollers is arranged so that its periphery lies in alignment with the tubular guides 34 carried by the carriages 32 as will be readily understood upon reference to Figure 5. It will thus be understood that there is a frame 56 for each supporting column 25 and also a similar frame carried by the supporting columns of the side walls 21. Carried by outwardly extending supporting brackets 59 at the opposite end of the building structure are guide rollers 60 which, like the rollers 57 are arranged with their peripheries

in alignment with the guide sleeves 34 as will be readily understood upon reference to Figure 6. It will be understood that the brackets 59 are carried on the columns 25 at the end of the building housed beneath the permanent roof section 23. Mounted in suitable yokes 61 supported on the columns 25 near the brackets 59 are guide pulleys 62 which cooperate with the guide pulleys 58 in a manner to be more fully hereinafter explained. Mounted in suitable bearing brackets 63 (Figure 13) carried by the columns 25, and below the general level of the lowermost bracket 59 is transversely extending shaft 64 upon which are secured drums 65, one for each column and each drum being so mounted as to align vertically with the guide roller 60. An idler pulley 66 is mounted in a vertically adjustable yoke 67 above each drum 65 and wound about each drum and idler pulley is a cable designated generally 68 one run 68' of which extends upwardly over the rollers 60 and thence horizontally through the guide sleeves 34 to the roller 57 at the opposite end of the building structure from whence the cable extends downwardly around the guide rollers 57 and 58 so that its lower run 68'' extends from the lowermost guide pulley 58 to the guide pulley 62 from whence the run 68'' extends downwardly to the drum 65. Opposite ends of the cable are provided with attaching hooks 69 which are connected to the eyes 70 (Figure 6) of the carriages 32 connected to the foremost edge of the roof or canopy 48. It will thus be seen that as the shaft 64 is rotated, the drums 65 and the idler pulley 66 will rotate in unison therewith thus causing the cables which are wound around the drums and idler pulley to move so as to advance or retract the removable roof according to the direction of rotation of the shaft 64. In order to drive the shaft 64 I find it convenient to attach at a suitable point thereto a drive pulley 71 around which a drive belt 72 is trained. This drive belt has driving connection with a suitable drive pulley 73 mounted on the shaft of a prime mover 74 such as an electric motor of the reversible type so that when the motor is energized, the shaft 64 will be driven.

While I have referred to a valance 55 as being carried by each of the permanent roof sections 23 and 24, it is to be understood that if so desired one end of the removable roof may be attached as at 75 to the forward edge of the permanent roof section 24 to form a weather-tight joint as will be seen upon reference to Figure 5.

In operation, it will be understood that as the motor 74 is operated to drive the shaft 64 the drums 65 will be set in motion thereby causing the cables 68 to move so as to advance or retract the removable roof 48 as the case may be. Assuming that the roof is fully extended a weather-tight junction will be formed between the side edges of the flexible roof 48 and the side walls of the building structure. As the roof moves forwardly, the extreme forward end encounters the valance 55 so as to form an effective weather-tight seal as will be readily appreciated upon reference to Figure 6. When it is desired to open the building to the sky, the motor is operated in reverse direction thereby causing the upper runs 68' of the cable 68 to move the carriages carrying the forward edge of the roof 48 toward the permanent roof section 24 so that the portions of the flexible roof between the carriages will be suspended in festoons from the eyes 34 of the rods 33, until such time as it is again desired to extend the roof.

It is obvious that if so desired, suitable sustaining rollers 76 may be mounted on the side walls 21 to support the lower runs 68' of the cable 68 which are attached to the carriages 44 which support the side edges of the roof as will be readily understood upon reference to Figures 5 and 10, it being understood that the upper runs 68' of the cables adjacent the side walls 21 extend through the guide sleeves 47 and are connected to the leading carriages 44 as previously described.

While in the foregoing there has been shown and described the preferred embodiment of this invention it is to be understood that minor changes in the details of construction, combination, and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as claimed.

What I claim is:

1. In a removable roof, spaced parallel trackways extending longitudinally of a building structure, a plurality of carriages movable longitudinally of each trackway, a unitary flexible canopy supported on the carriages rigid roof members at each end of said structure, flexible, weighted valances supported thereby and contacting said canopy to seal the opening between said canopy and said roof members and means to move the carriages supporting the forward edge of the canopy in unison longitudinally of the trackways.

2. In a removable roof, spaced parallel trackways extending longitudinally of a building structure, a plurality of carriages movable longitudinally of each trackway, a unitary flexible canopy supported on the carriages rigid roof members at each end of said structure above said canopy, flexible means supported by said roof members and overlying the space between said roof members and said canopy and means to move the carriages supporting the forward edge of the canopy in unison longitudinally of the trackways.

3. In a removable roof, spaced parallel trackways extending longitudinally of a building structure rigid roof members at each end thereof, a plurality of carriages movable longitudinally of each trackway, a unitary flexible canopy supported on the carriages whose ends are housed beneath said roof members when extended and means to move the carriages supporting the forward edge of the canopy in unison longitudinally of the trackways, and a longitudinally extending gutter at each side edge of the canopy.

4. In a removable roof, spaced parallel trackways extending longitudinally of a building structure, a plurality of carriages movable longitudinally of each trackway, a unitary flexible canopy supported on the carriages and means to move the carriages supporting the forward edge of the canopy in unison longitudinally of the trackways, a rigid roof member at each end of the structure above the flexible canopy a weighted valance supported by each of said roof members and depending into contact with said canopy, and a longitudinally extending gutter at each side edge of the canopy.

5. In a removable roof, spaced parallel trackways extending longitudinally of a building structure, a plurality of carriages movable longitudinally of each trackway, a unitary flexible canopy supported on the carriages, means to move the carriages in unison longitudinally of the trackways, a rigid roof member at each end of the structure above the flexible canopy, and a weighted valance of flexible material carried by

each rigid roof member for contact with the flexible canopy whereby a weather-tight junction is effected between the flexible canopy and the rigid roof members.

6. In a removable roof, spaced parallel trackways extending longitudinally of a building structure, a plurality of carriages movable longitudinally of each trackway, a unitary flexible canopy supported on the carriages, means to move the carriages in unison longitudinally of the trackways, a rigid roof member at each end of the structure above the flexible canopy, and a weighted valance of flexible material carried by at least one rigid roof member for contact with the flexible canopy whereby a weather-tight junction is effected between the flexible canopy and the rigid roof member.

7. In a removable roof, spaced parallel trackways extending longitudinally of a building structure, a plurality of carriages movable longitudinally of each trackway, a unitary flexible canopy supported on the carriages and means to move the carriages in unison longitudinally of the trackways, and a longitudinally extending gutter at each side edge of the canopy, and a weighted valance of flexible material carried by each side edge of the flexible canopy for contact with the wall of its respective gutter whereby a weather-tight junction is effected between the flexible canopy and the gutters.

8. In a removable roof, spaced parallel trackways extending longitudinally of a building structure, a plurality of carriages movable longitudinally of each trackway, a unitary flexible canopy supported on the carriages and means to move the carriages in unison longitudinally of the trackways, a rigid roof member at each end of the structure above the flexible canopy, a longitudinally extending gutter at each side edge of the canopy, and a weighted valance of flexible material carried by each side edge of the flexible canopy for contact with the wall of its respective gutter whereby a weather-tight joint will be effected between the flexible canopy and the gutters.

9. In a removable roof, spaced parallel trackways extending longitudinally of a building structure, a plurality of carriages movable longitudinally of each trackway, a unitary flexible canopy supported on the carriages and means to move the carriages in unison longitudinally of the trackways, and a rigid roof member at each end of the structure above the flexible canopy, a longitudinally extending gutter at each side edge of the canopy, a weighted valance of flexible material carried by at least one rigid roof member for contact with the flexible canopy whereby a weather-tight junction is effected between the flexible canopy and the rigid roof member, and a weighted valance of flexible material carried by each side edge of the flexible canopy and the contact with the wall of its respective gutter whereby a weather-tight joint is effected between the flexible canopy and the gutters.

10. In a removable roof, spaced parallel trackways extending longitudinally of a building structure, rigid roof members at each end of said structure, a plurality of carriages movable longitudinally of each trackway, a unitary flexible canopy supported on the carriages, valences suspended from said roof members for contact with said canopy, an operating cable movable longitudinally of each trackway, each cable being attached to one end of the flexible canopy and means to move the cables in unison to move the canopy to open or closed position.

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11. In a removable roof, spaced parallel trackways extending longitudinally of a building structure, a plurality of carriages movable longitudinally of each trackway, a unitary flexible canopy supported on the carriages, a rigid roof member at each end of said structure above said canopy beneath which the opposite ends of said canopy are housed when the latter is extended, an operating cable movable longitudinally of each trackway, each cable being attached to one end of the flexible canopy, means to move the cable in unison to move the canopy to open or closed position, and means on each carriage to support one run of the operating cable against sag.

12. In a removable roof, spaced parallel trackways extending longitudinally of a building structure, a rigid roof member at each end of said structure, a plurality of carriages movable longitudinally of each trackway, a unitary flexible

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canopy supported on the carriages whose ends are housed beneath said roof members when extended, operating cables movable longitudinally of each trackway, each cable being attached to one end of the flexible canopy, means to move the cables in unison to move the canopy to open or closed position, means on each carriage to support the upper run of the operating cable out of contact with the canopy.

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The following references are of record in the file of this patent:

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