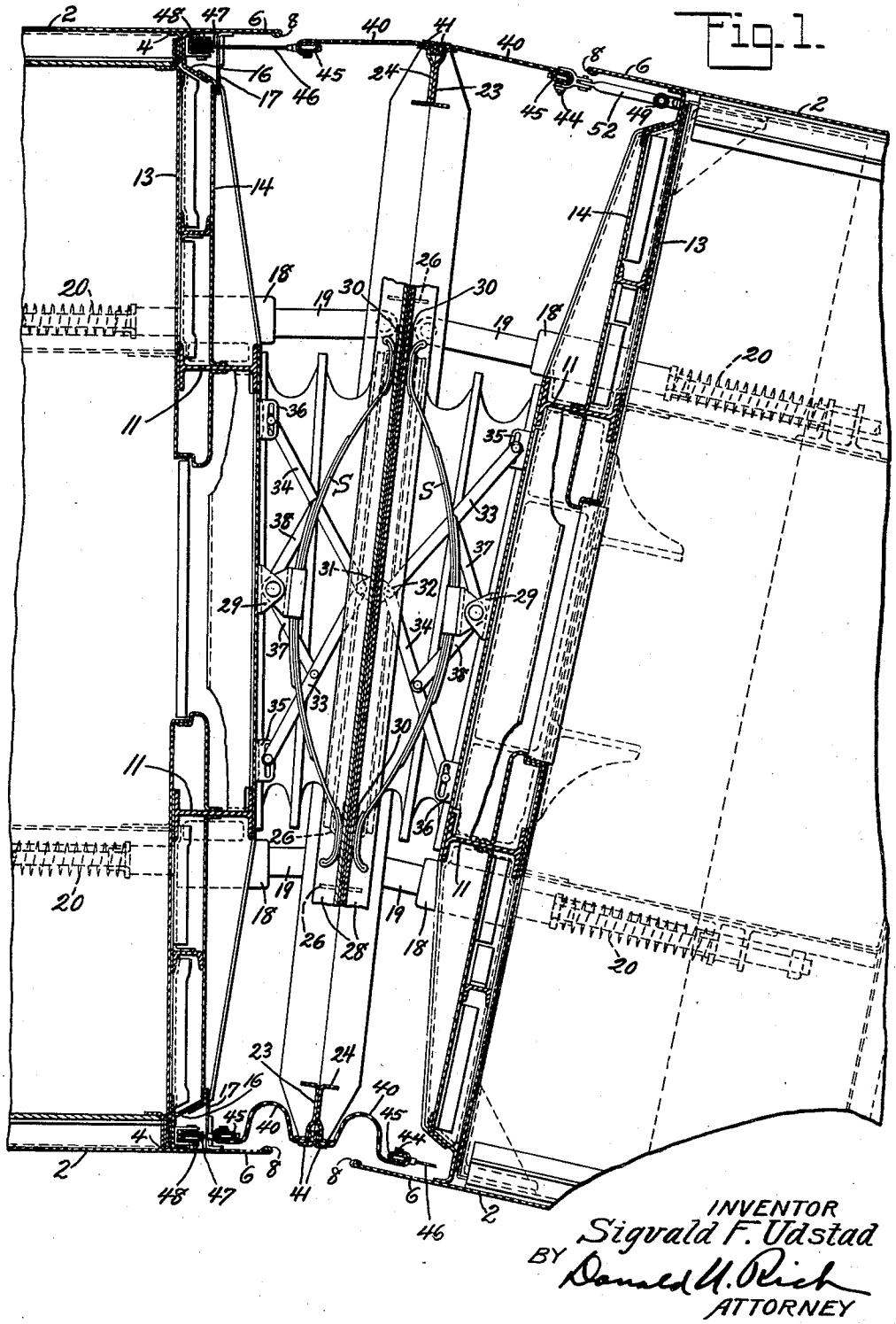
Aug. 17, 1937. S. F. UDSTAD 2,090,492

STREAMLINED CLOSURE FOR RAIL CARS

Filed Jan. 2, 1936 9 Sheets-Sheet 1

Fig. 1.

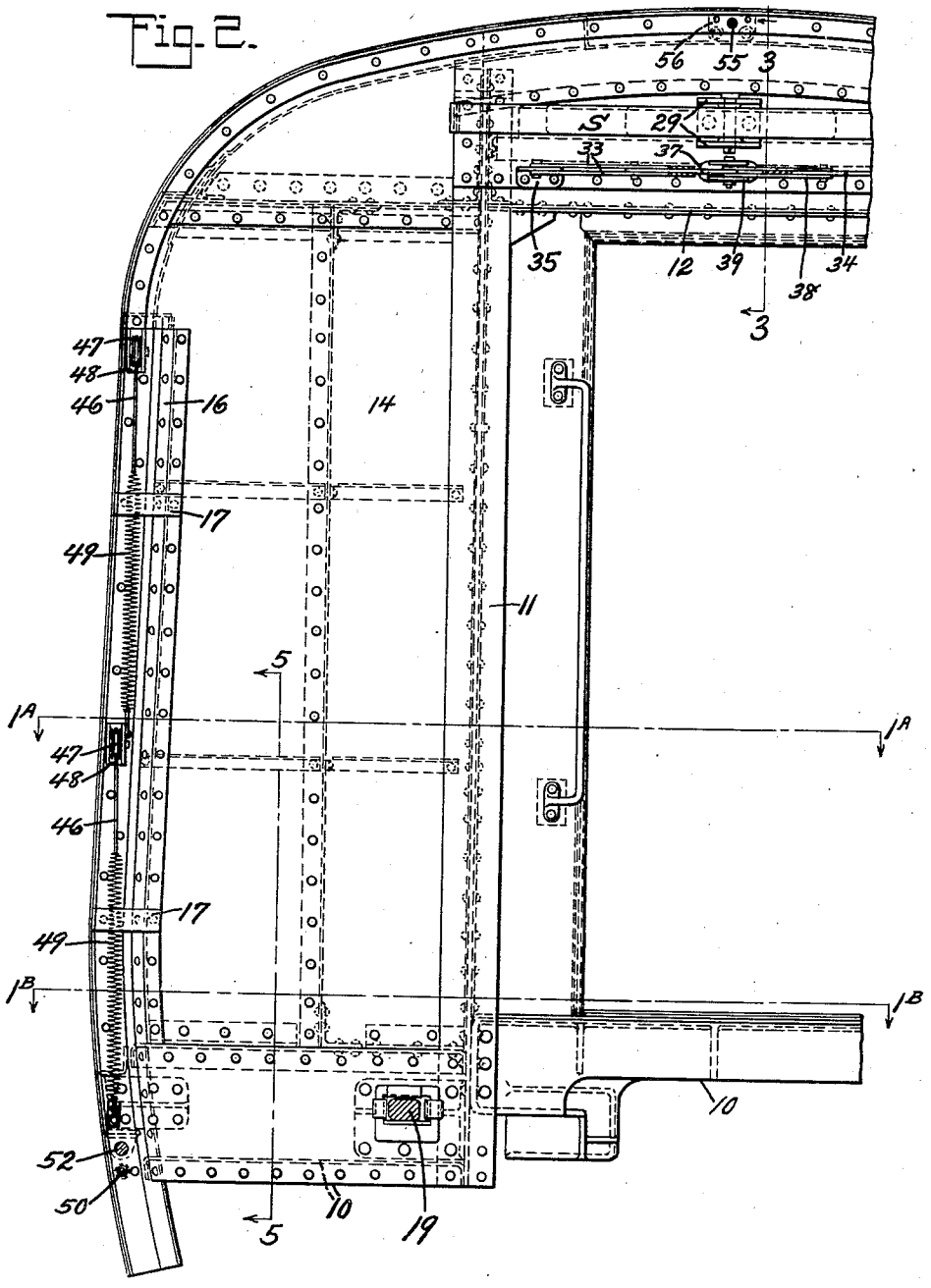


Aug. 17, 1937. S. F. UDSTAD 2,090,492

STREAMLINED CLOSURE FOR RAIL CARS

Filed Jan. 2, 1936 9 Sheets-Sheet 2

Fig. 2.



INVENTOR
Sigvald F. Udstad
BY Donald U. Rich
ATTORNEY

Aug. 17, 1937. S. F. UDSTAD 2,090,492

STREAMLINED CLOSURE FOR RAIL CARS

Filed Jan. 2, 1936 9 Sheets-Sheet 3

Fig. 3.

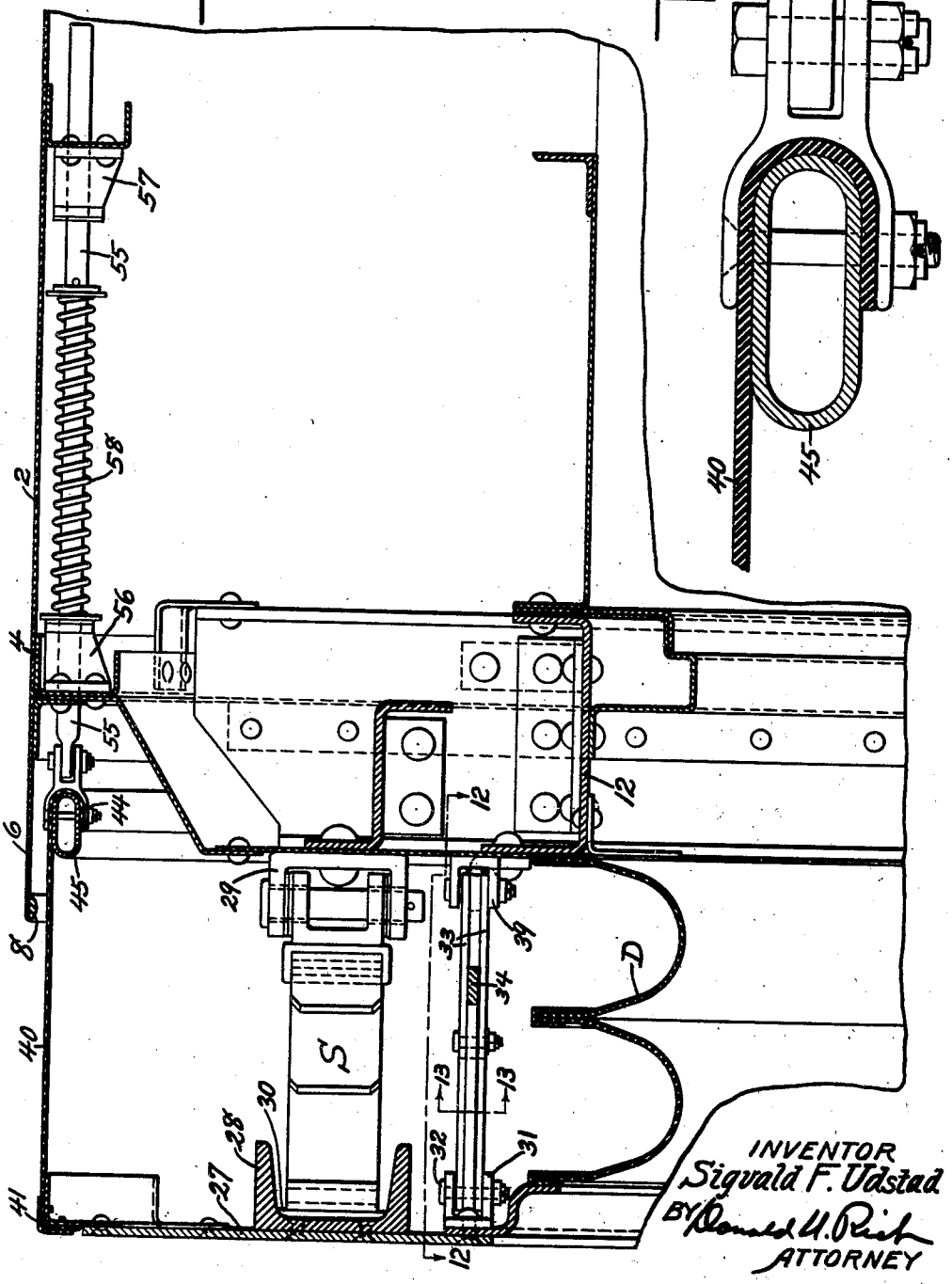
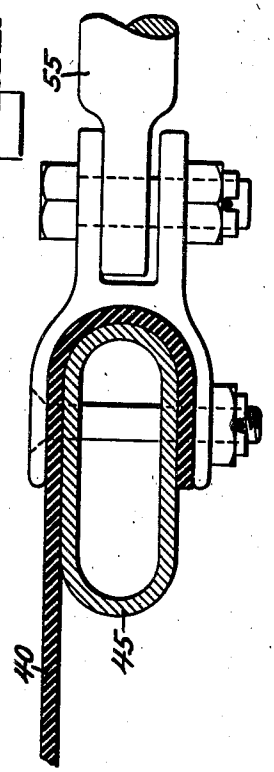


Fig. 10.

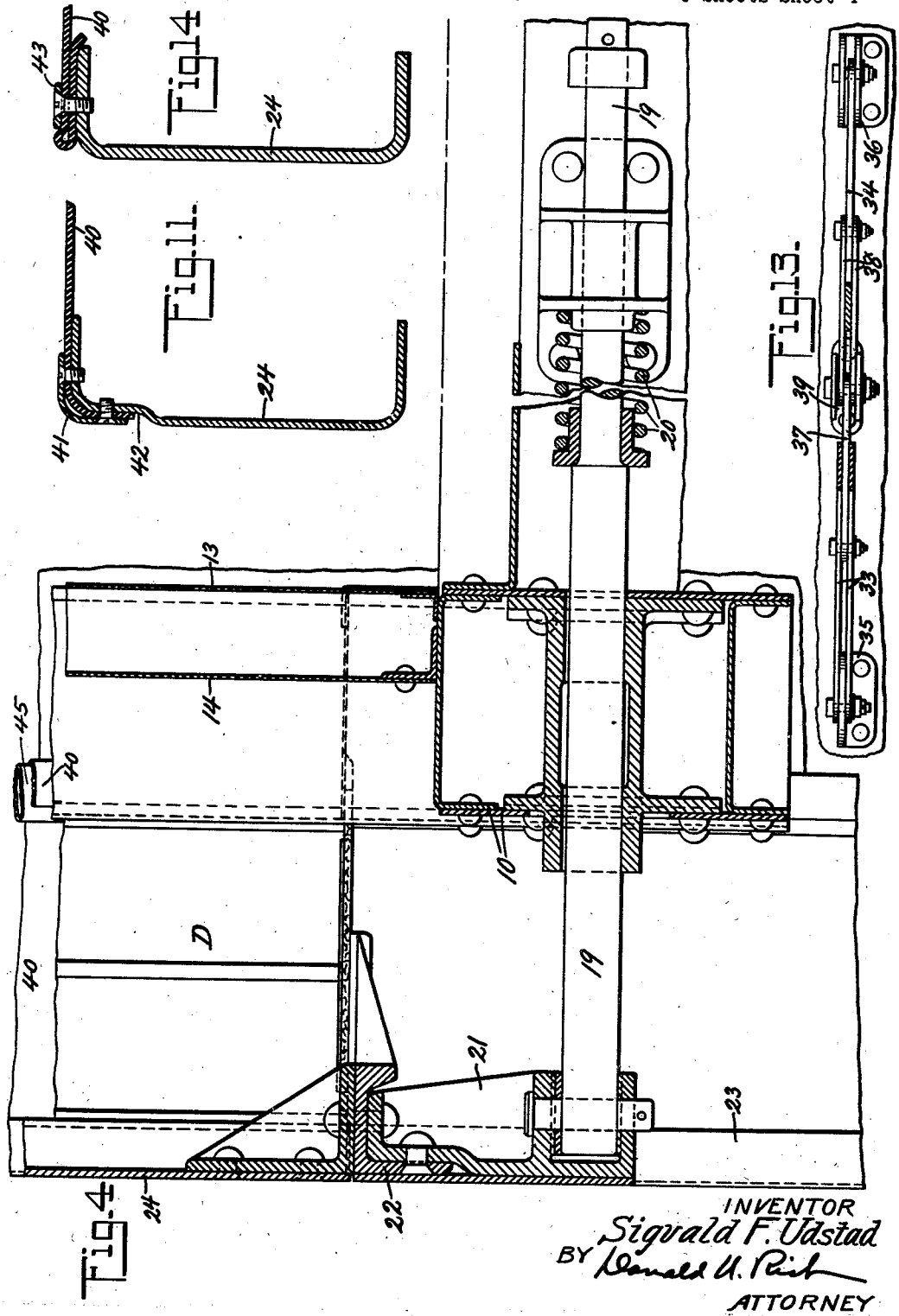


INVENTOR
Sigvald F. Udstad
BY Ronald U. Rich
ATTORNEY

Aug. 17, 1937. S. F. UDSTAD 2,090,492

STREAMLINED CLOSURE FOR RAIL CARS

Filed Jan. 2, 1936 9 Sheets-Sheet 4



Aug. 17, 1937. S. F. UDSTAD 2,090,492

STREAMLINED CLOSURE FOR RAIL CARS

Filed Jan. 2, 1936 9 Sheets-Sheet 5

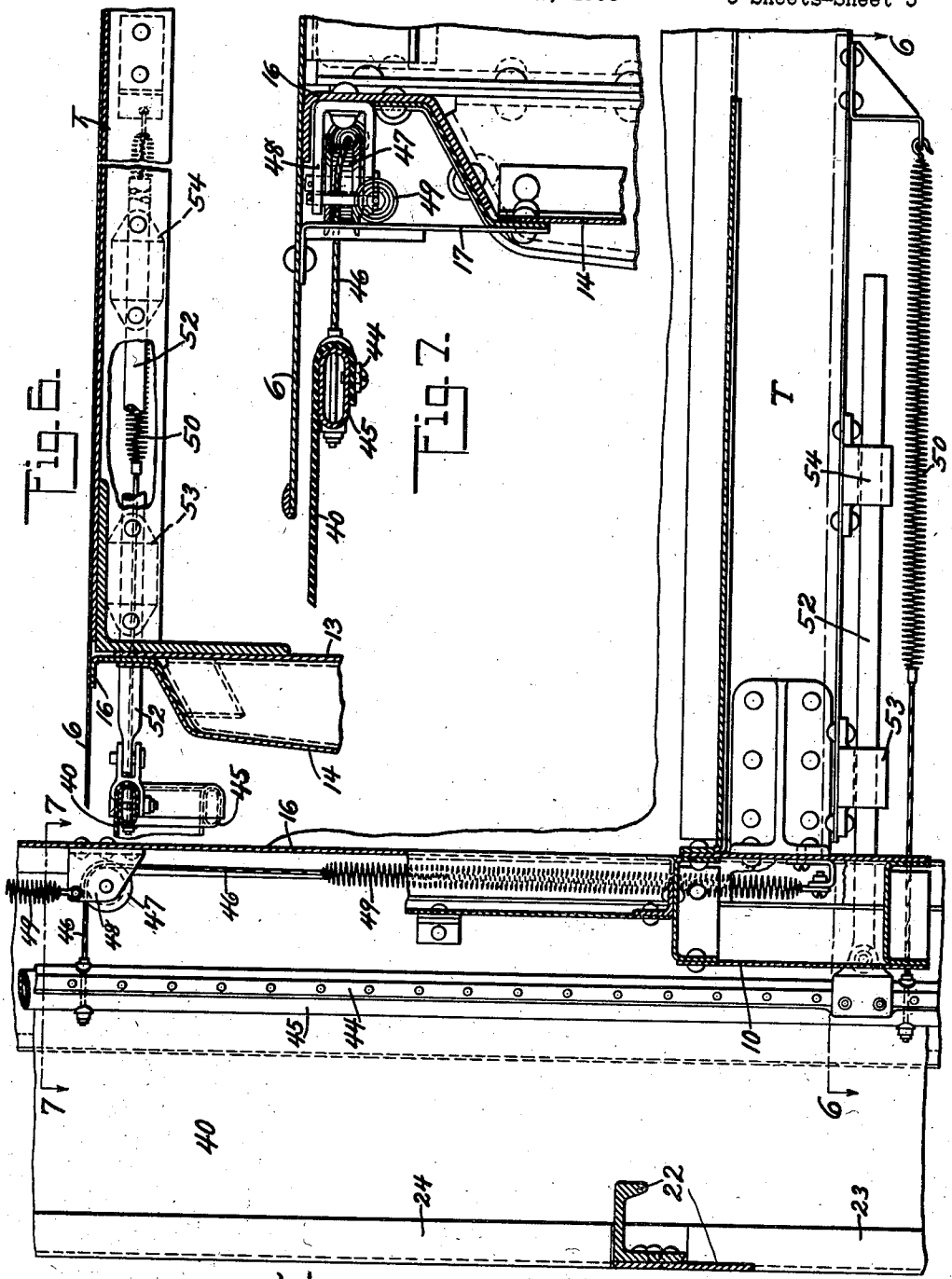


Fig. 6.

Fig. 7.

Fig. 5.

INVENTOR
Sigvald F. Udstad
BY Donald U. Rich
ATTORNEY

Aug. 17, 1937. S. F. UDSTAD 2,090,492

STREAMLINED CLOSURE FOR RAIL CARS

Filed Jan. 2, 1936 9 Sheets-Sheet 6

Fig. 8.

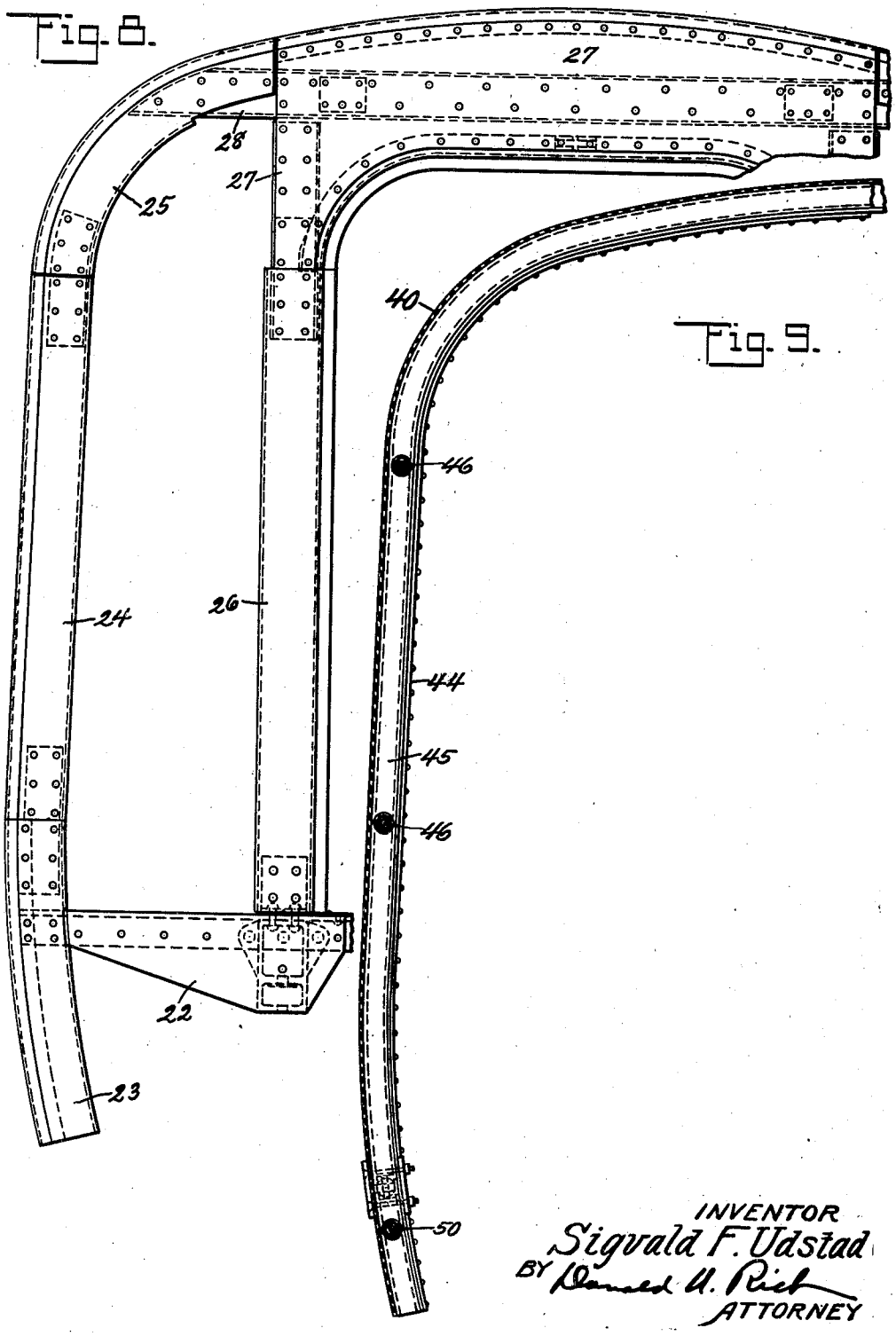


Fig. 9.

INVENTOR
Sigvald F. Udstad
BY Samuel U. Rich
ATTORNEY

Aug. 17, 1937. S. F. UDSTAD 2,090,492

STREAMLINED CLOSURE FOR RAIL CARS

Filed Jan. 2, 1936 9 Sheets-Sheet 7

Fig. 16.

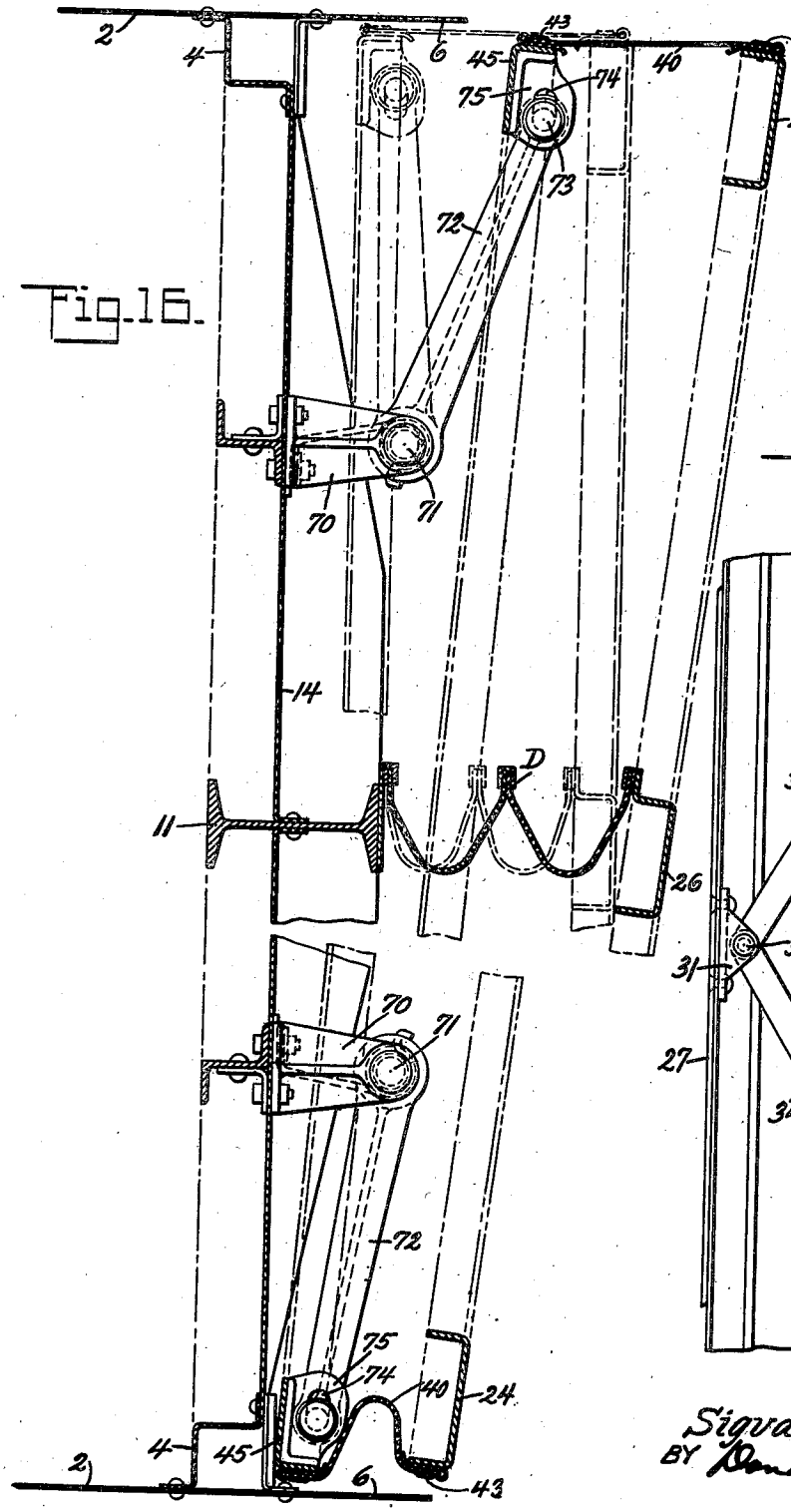
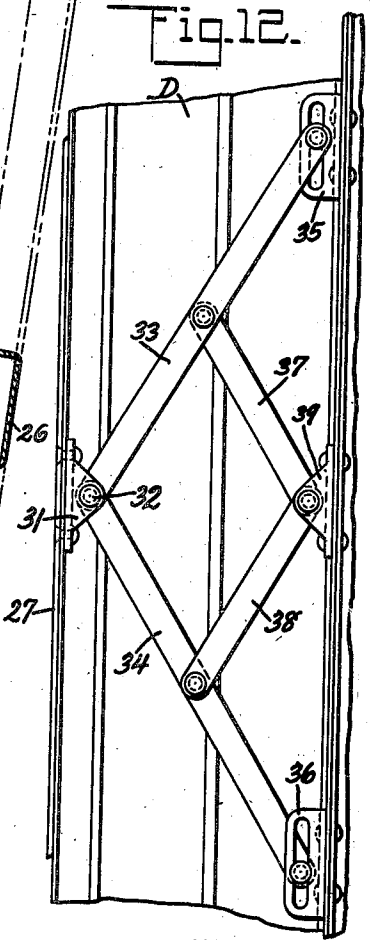


Fig. 12.



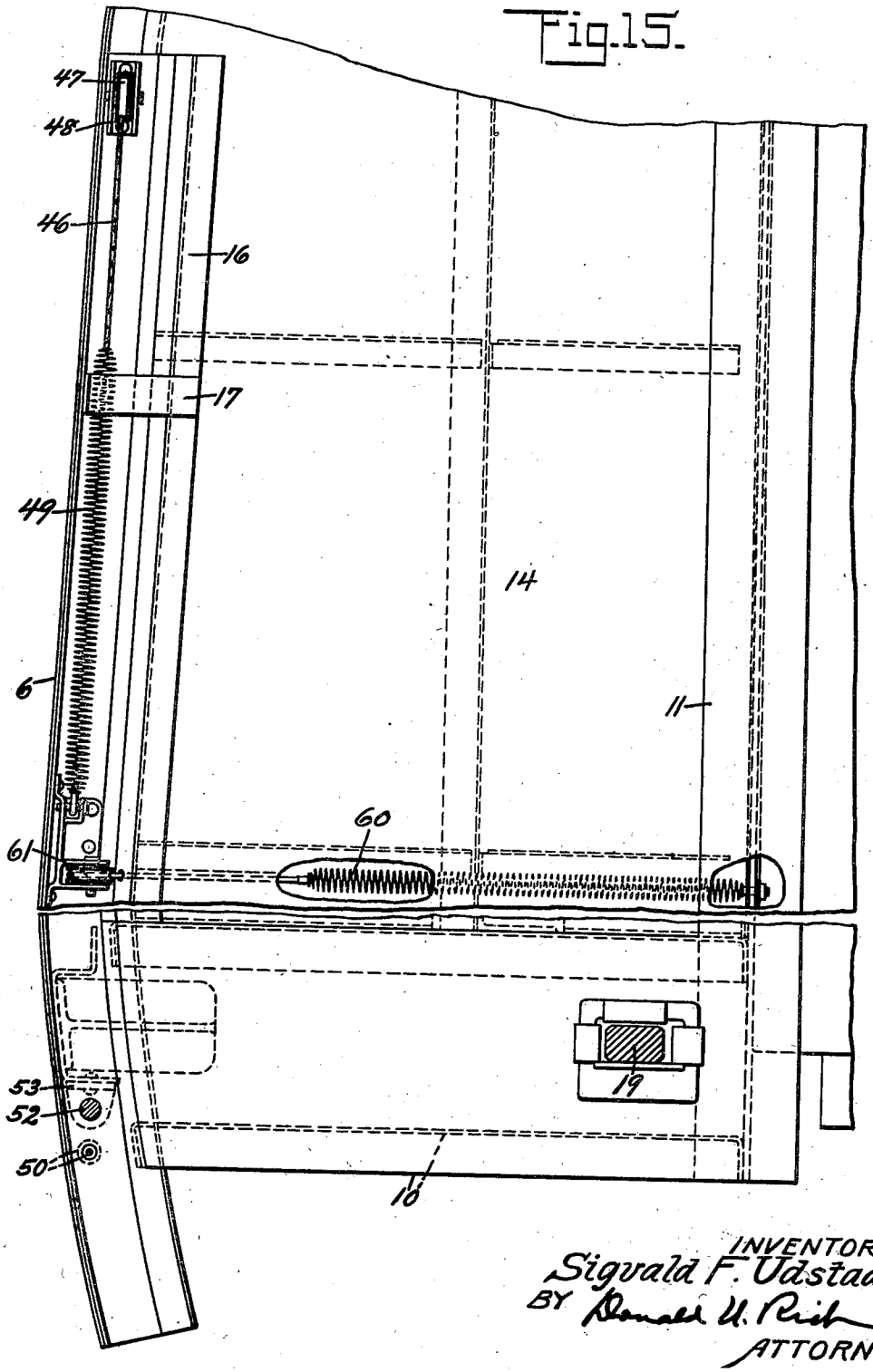
INVENTOR
Sigvald F. Udstad
BY Donald U. Rich
ATTORNEY

Aug. 17, 1937. S. F. UDSTAD 2,090,492

STREAMLINED CLOSURE FOR RAIL CARS

Filed Jan. 2, 1936 9 Sheets-Sheet 8

Fig. 15.



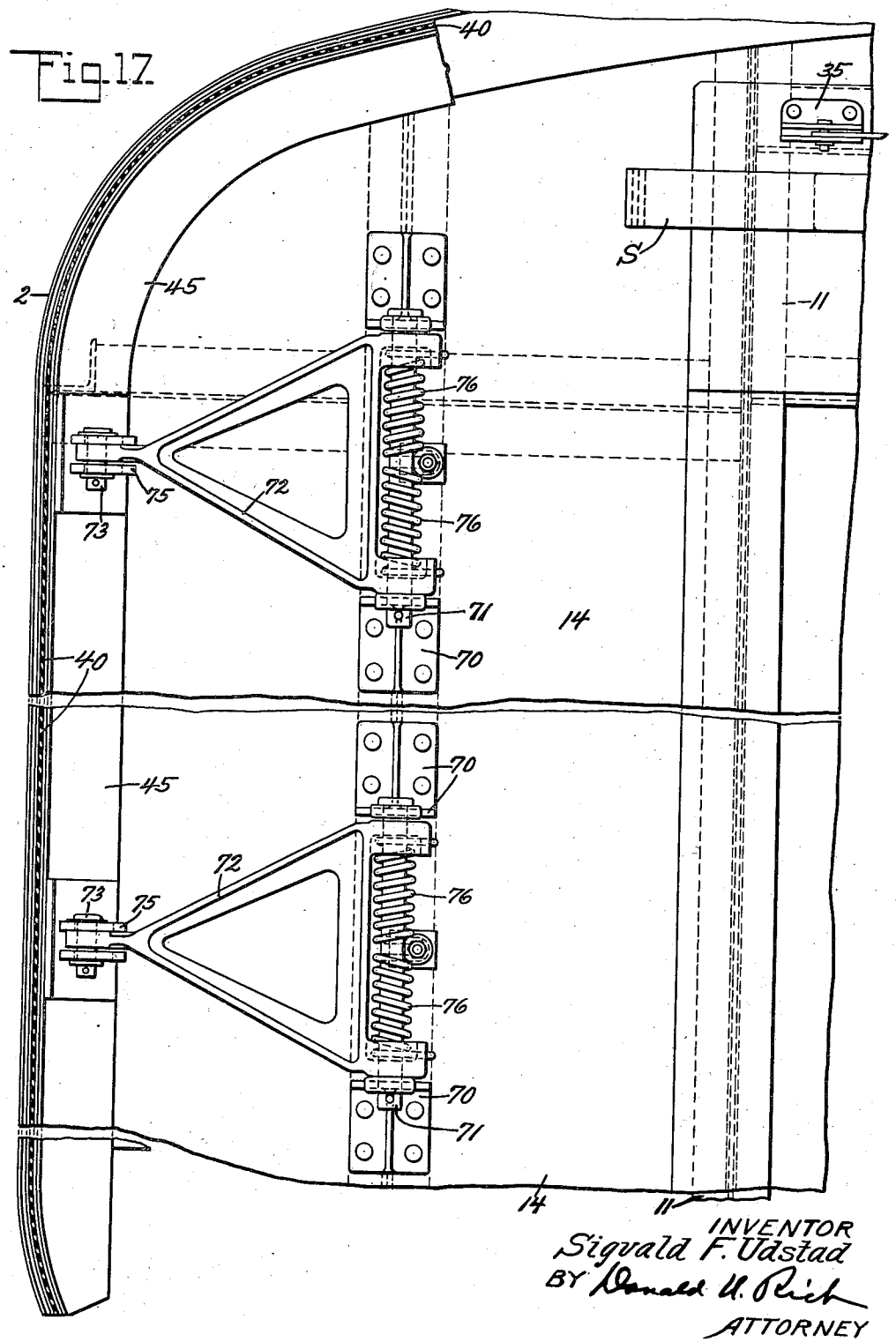
INVENTOR
Sigvald F. Udstad
BY Donald U. Rich
ATTORNEY

Aug. 17, 1937. S. F. UDSTAD 2,090,492

STREAMLINED CLOSURE FOR RAIL CARS

Filed Jan. 2, 1936 9 Sheets-Sheet 9

Fig. 17.



INVENTOR
Sigvald F. Udstad
BY Donald U. Rich
ATTORNEY

Patented Aug. 17, 1937 2,090,492

UNITED STATES PATENT OFFICE

2,090,492

STREAMLINED CLOSURE FOR RAIL CARS

Sigvald F. Udstad, Berwick, Pa., assignor to American Car and Foundry Company, New York, N. Y., a corporation of New Jersey

Application January 2, 1936, Serial No. 57,244

30 Claims. (Cl. 105—15)

The present invention deals with means to close the spaces between two rigid bodies capable of moving relative to each other and particularly to means conforming to the contour of rail cars for closing the space between adjacent cars.

In rail car construction there are two general types of cars to consider when constructing a closure and these are the common truck articulated type and the customary type having two independent trucks for each body. It is comparatively easy to provide a streamline closure for the common truck type of car, since the cars are seldom uncoupled and the center of rotation between two cars coincides with the truck center bearing thus eliminating any great amount of relative movement between the car ends.

In constructing streamline closures for the customary type of independent truck supported bodies it is necessary to provide a closure that does not interfere with rapid coupling or uncoupling and which will conform to the car outline to close the gap between cars when on curves. It is evident that since the adjacent car bodies rotate about a point which is several feet in from the car end a large amount of relative movement takes place at the car ends. Previously known practical constructions have side-stepped the problem by supplying a closure only for the vestibule which is, of course, comparatively near the car center line and the movements between the cars are, therefore, not so great. Attempts have been made in the past to provide streamline closures between cars of the two truck type but have all been impractical due to the hardships encountered during coupling and uncoupling of the cars and also due to the lack of proper construction to take care of the large amount of movement between the cars. These old constructions were workable only under favorable conditions and failed completely on sharp curves as in yards or on turnouts where a large amount of lateral motion must be accommodated.

It is an object, therefore, of this invention to provide a streamline closure particularly adapted to cars of the two truck type.

Another object of the invention is the provision of a streamline closure for cars that does not interfere in the least with coupling and uncoupling of the cars.

A further object of the invention is to provide a streamline closure which will permit of complete freedom of movement between the adjacent cars.

A still further object of the invention is to provide a flexible closure between adjacent cars which will effectively close the gap between the cars.

A yet further object of the invention is to provide a flexible closure between adjacent cars which will be held taut to conform to the car contour.

These and other objects will be apparent to one skilled in the art from a study of the following description and accompanying drawings in which:

Figure 1 is a sectional view of the upper portion of adjacent cars but with parts on the left hand side and the right hand side of the figure broken away to show the arrangement substantially on lines 1A and 1B respectively of Fig. 2;

Fig. 2 is a front view of the car end with the entire closure member removed;

Fig. 3 is an enlarged sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is an enlarged sectional view of the lower part of the car end and showing the lower buffer spring;

Fig. 5 is a sectional view of the lower portion of the closure taken on line 5—5 of Fig. 2;

Fig. 6 is a sectional view taken on line 6—6 of Fig. 5 and showing the inner yoke supporting and tensioning means;

Fig. 7 is an enlarged sectional view taken on line 7—7 of Fig. 5;

Fig. 8 is a front view of slightly more than half of the outer yoke or face member;

Fig. 9 is a sectional view through the flexible diaphragm and looking toward the inner yoke member;

Fig. 10 is an enlarged sectional view of the manner of connecting the guide and support stems to the inner yoke member;

Fig. 11 is an enlarged sectional view showing the manner of attaching the flexible outer diaphragm to the outer yoke member;

Fig. 12 is a sectional view taken on line 12—12 of Fig. 3 and showing the parallel motion device;

Fig. 13 is a sectional view of the parallel motion device taken on line 13—13 of Fig. 3;

Fig. 14 is an enlarged sectional view similar to Fig. 11 but showing a modification in the manner of connecting the diaphragm to the outer yoke member;

Fig. 15 shows a modification of the tensioning spring arrangement;

Fig. 16 is a sectional view similar to Fig. 1 but showing a further modification of the tensioning means, and

Fig. 17 is an end view partly in section of the device shown in Fig. 16.

Referring now to the drawings in detail it is

seen that the car, which is of the two truck type, is formed with an oval contour although this is merely representative as any other suitable streamline contour could be used. The side and roof sheets 2 are attached to oval or arch shaped end members 4 and extend beyond these members as at 6 to carry an oval shaped reenforcing member 8 having its inner surface curved to prevent abrasion of the flexible closure. The end sills 10 join the lower ends of the arch members and also carry opening defining posts 11 which are joined by header 12 and connected at the upper end to the arch end member. Inner and outer end sheathing plates 13 and 14 are attached to the posts and arch end members to form a strong end structure but it should be noted that the outer end sheathing plate is connected along its side edges to the members 4 by means of a deformed channel pressing 16. The web of this pressing contacts with the end member and thus provides a pocket, the purpose of which will later be described, and across which stiffening strips 17 extend to brace the side wall extension.

The end sill carries buffer guide castings 18 in which are slidably mounted buffer stems 19 urged outwardly at their inner ends by springs 20 and carrying at their outer ends the buffer casting 21 upon which is mounted the outer yoke or face member. This outer member is constructed with a lower member 22 secured to the buffer castings and carrying at its ends pressed channel shaped members 23, 24 and 25 having the flanges directed inwardly toward the car and with the web outward, thus forming an outer buffer face. Inner face plates 26 also of general channel form are connected at their lower ends to the lower member 5 and at their upper ends are joined together by plate 27 reenforced by a channel 28 which also serves to connect the plate to the members 25.

An extremely light outer yoke or face member is thus provided with the weight being carried by lower buffer stems which also urge the member outward away from the car. In order to control the upper portion of the member a semi-elliptic spring S is pivoted at its center to the car center by a bracket 29 and has its ends bearing on suitable pads 30 carried by the channel 28 previously referred to. Bracket 31 is secured to the outer yoke member at its center and by means of pin 32 pivotally carries links 33 and 34, the inner ends of which are slidably mounted in brackets 35 and 36 carried by the car end wall, these links permitting inward and outward movement of the member while limiting the outward movement thereof. Links 37 and 38 have one end pivoted to the links 33 and 34 respectively, while the other end is pivoted to bracket 39 arranged below bracket 29 and connected to the car and wall at the car center. Thus it is seen that a parallel motion device is formed which positively insures that the center of the outer yoke member remains substantially on the respective car center line, but which permits of pivoting of the member about pin 32 under control of the buffer springs.

Flexible diaphragm 40, preferably formed of rubber and conforming to the car contour, has one edge firmly attached to the outer yoke member by bending the rubber around the channel members and securing it in place by means of angle plate 41. The various channels 23, 24 and 25 and the plate 27 have a slight recess 42 pressed therein to accommodate the rubber and angle, all as clearly shown in Fig. 11, or the rubber may be simply doubled upon itself and secured by strip 43 to the flange of the channels or plate as shown in Fig. 14. The other edge of the rubber is bent around and securely fastened by means 44 to the inner yoke 45 which is of oval tubular formation conforming to the car contour and of such a size as to fit within the car wall projections 6. The inner yoke forms a tensioning means to which are attached flexible cables 46 passing over pulleys 47 carried by brackets 48 which have projecting means for the attachment of one end of a spring 49, the other end of which is attached to an adjacent cable. These pulleys and springs are housed in the pocket formed by member 16 and previously referred to. The tensioning means 50 for the bottom of the unit is attached to a portion of the side sill T and pulls directly on the yoke as clearly seen in Fig. 5. In order to support the weight of the inner yoke and prevent any wrinkling of the rubber the guide and support means 52 are attached to the yoke at the lower ends and extend inwardly through bearings 53 and 54 secured to the side sill. A guide and support means 55 is also attached to the yoke at the upper central portion and has bearing in spaced brackets 56 and 57 between which is interposed a compression spring 58 which will hold the central portion of the rubber stretched tight.

The usual inner flexible diaphragm D is also attached to the car end and to the inner face plates of the outer yoke member in order to protect the passageway between cars.

From the preceding description it is seen that an outer yoke member has been provided which is adapted to contact with an adjacent outer yoke member and have rubbing contact therewith to take care of any lateral movements of the cars and that a flexible member extends from the outer yoke inward toward the car to be overlapped by a portion of the car and close the gap necessary between the car and outer yoke member. This flexible member is held taut at all times under normal road conditions and may be painted in the same manner as the car sides to which it conforms in outline. Under extreme curving conditions as shown in Fig. 1 the inner yoke may contact with the car end in which case the rubber will wrinkle on one side, while on the other side an opening may appear as shown in Fig. 1, but it is to be remembered that this figure shows the cars on the sharpest curve upon which the cars might be operated during switching.

In the modification shown in Fig. 15 an alternate spring arrangement is shown which may be used alone or in conjunction with the previously described arrangement if it is necessary to obtain additional spring tension. In this form spring 60 extends transversely of the car and in the space between the inner and outer end sheets and acts upon the inner yoke by means of a flexible cable passing over pulley 61 fastened to the car side wall extension.

Referring now to Figures 16 and 17 wherein a modification of the tensioning means is disclosed and wherein parts previously described have applied thereto the same reference numerals. Brackets 70 are secured to the car end wall and by means of pin 71 movably carry arms 72, the outer end of which is pivotally connected to the inner yoke member by means of a pin 73 adapted to slide in a slot 74 provided in bracket 75 which is secured to the inner yoke member. Torsion

springs 76 surround the pin 71 and are tensioned so as to continually urge the inner yoke member toward the car but which will permit of the outward movement of the yoke. This tensioning means operates to hold the rubber diaphragm taut in the same manner as that previously described but due to the fact that the yoke rests on the arms 72 it is not necessary to provide the separate supporting means.

It is seen that a diaphragm has been provided which presents a smooth surface conforming to the car contour, yet which readily allows relative movement between the car bodies. It is also seen that due to the fact each diaphragm is connected to an outer yoke member which is free of connection to the adjacent outer yoke member that the cars may be coupled and uncoupled without any hindrance from the diaphragm unit.

While various forms and arrangements of metal members have been described and certain diaphragm materials mentioned, it is to be understood that the preceding description is purely representative as various modifications and arrangement of parts may be made without departing from the scope of the appended claims which define the invention.

What is claimed is:

1. A streamlined closure for rail or similar cars comprising an outer yoke member, resilient means urging said yoke member outward away from the car, an inner yoke member, flexible means connecting said yoke members together, and resilient means connected to said inner yoke member and car, said resilient means acting in opposition to maintain said flexible means taut.

2. A streamlined closure for rail or similar cars comprising an outer yoke member, resilient means urging said yoke member outward away from the car, means maintaining said outer yoke member centered with respect to said car, an inner yoke member, flexible means connecting said yoke members together, and resilient means connected to said inner yoke member and car, said resilient means acting in opposition to maintain said flexible means taut.

3. A streamlined closure for rail or similar cars comprising an outer yoke member, resilient means urging said yoke member outward away from the car, means maintaining said outer yoke member centered with respect to said car, an inner yoke member, means supporting the weight of said inner yoke member, flexible means connecting said yoke members together, and resilient means connected to said inner yoke member and car, said resilient means acting in opposition to maintain said flexible means taut.

4. A streamlined closure for rail or similar cars comprising, an outer yoke member having substantially the same contour as the car, means supporting said outer yoke member, resilient means urging said yoke member outward away from the car, an inner yoke member conforming substantially to the car contour, projecting side and roof sheets on the car overlapping said inner yoke member, flexible means connecting said yoke members, and resilient means connected to said inner yoke member and car, said resilient means acting in opposition to maintain said flexible means taut and in substantial conformity to the car contour.

5. A streamlined closure for rail or similar cars comprising, an outer yoke member having substantially the same contour as the car, means supporting said outer yoke member, resilient means urging said yoke member outward away from the car, means for maintaining said outer yoke member centered with respect to the car, an inner yoke member conforming substantially to the car contour, projecting side and roof sheets on the car overlapping said inner yoke member, flexible means connecting said yoke members, and resilient means connected to said inner yoke member and car, said resilient means acting in opposition to maintain said flexible means taut and in substantial conformity to the car contour.

6. A streamlined closure for rail or similar cars having an end wall and comprising, an outer yoke member having substantially the same contour as the car, means supporting said outer yoke member, resilient means maintaining said outer yoke member in spaced relation to the end wall, an inner yoke member conforming substantially to the car contour, side and roof sheets on said car extending beyond the end to overlap said inner yoke member, flexible means connecting said yoke members, resilient means connected to said inner yoke member and car, said last named means urging said inner yoke member toward the end wall to thereby maintain said flexible means taut and substantially in alignment with the extended side and roof sheets.

7. A streamlined closure for rail or similar cars having an end wall and comprising, an outer yoke member having substantially the same contour as the car, means supporting said outer yoke member, means maintaining said outer yoke member centered with respect to the car, resilient means maintaining said outer yoke member in spaced relation to the end wall, an inner yoke member conforming substantially to the car contour, side and roof sheets on said car extending beyond the end to overlap said inner yoke member, means supporting the weight of said inner yoke member, flexible means connecting said yoke members, resilient means connected to said inner yoke member and car, said last named means urging said inner yoke member toward the end wall to thereby maintain said flexible means taut and substantially in alignment with the extended side and roof sheets.

8. A streamlined closure for the gap between the ends of coupled rail cars comprising, an outer yoke member carried by each car, resilient means on each car urging said outer yoke members into separable contact with each other, an inner yoke member adjacent the end of each car, flexible means connecting the yoke members on each car, resilient means connecting each inner yoke member to the adjacent car, said last named resilient means urging the inner yoke member toward the respective car end to maintain said flexible means taut and in substantial alignment with each other and the car walls.

9. A streamlined closure for the gap between the ends of coupled rail cars comprising, an outer yoke member carried by each car, resilient means on each car urging said outer yoke members into separable contact with each other, an inner yoke member adjacent the end of each car, flexible means connecting the yoke members on each car, resilient means connecting each inner yoke member to the adjacent car, said last named resilient means urging the inner yoke member toward the respective car end to maintain said flexible means taut and in substantial alignment with each other and the car walls, means forming part of the outer yoke member, diaphragm means connected to said last named means and car to form a passageway spaced from said flexible means.

10. A streamlined closure for rail or similar

cars comprising an outer yoke member, resilient means urging said yoke member outward away from the car, an inner yoke member, flexible means connecting said yoke members together, arms mounted on the car for supporting said inner yoke member, and resilient means urging said arms toward the car to thereby maintain the flexible means taut.

11. A streamlined closure for rail or similar cars comprising, an outer yoke member having substantially the same contour as the car, means supporting said outer yoke member, resilient means urging said yoke member outward away from the car, an inner yoke member conforming substantially to the car contour, projecting side and roof sheets on the car overlapping said inner yoke member, flexible means connecting said yoke members, means carrying said inner yoke member, and resilient means urging said last named means toward the car to thereby maintain the flexible means taut.

12. In a streamlined closure for rail or similar cars, an outer yoke member, a lower buffer member supporting said yoke member, a resilient upper buffer means engaged with the upper portion of said yoke member and urging said yoke member away from the car, and means interposed between and interconnecting the yoke member and car so formed and arranged as to restrain the yoke member against lateral shifting with respect to the car but permitting rotation of said yoke member about its vertical center line.

13. In a streamlined closure for rail or similar cars, an outer yoke member, a lower buffer member supporting said yoke member, a resilient upper buffer means engaged with the upper portion of said yoke member and urging said yoke member away from the car, and parallel motion means interposed between and connecting the yoke member and car so formed and arranged as to restrain the yoke member against lateral shifting with respect to the car but limiting outward movement of the yoke member relative to the car.

14. In a streamlined closure for rail or similar cars having an end structure, an outer yoke member, means on said car carrying said outer yoke member, means urging said yoke outward away from the car, brackets on said car end structure and yoke, links connecting said brackets, at least two of said links being extended to have slidable connection with the end structure to thereby form a parallel motion device maintaining the yoke centered with respect to the car.

15. In a streamlined closure for rail or similar cars having an end structure, an outer yoke member, means on said car carrying said outer yoke member, means urging said yoke outward away from the car, brackets on said car end structure and yoke, links connecting said brackets, at least two of said links being extended to have slidable connection with the end structure to thereby form a parallel motion device maintaining the yoke centered with respect to the car and the connection between said links and yoke bracket permitting rotation of the yoke relative to the links.

16. A streamlined closure for rail or similar cars comprising, an outer yoke member, resilient means urging said yoke member outward away from the car, parallel motion means maintaining said outer yoke member centered with respect to the car during relative movement between the yoke member and car, an inner yoke member, flexible means connecting said yoke members together, and resilient means connected to said inner yoke member and car, said resilient means acting in opposition to maintain said flexible means taut.

17. A streamlined closure for rail or similar cars comprising, an outer yoke member having substantially the same contour as the car, means supporting said outer yoke member, resilient means urging said yoke member outward away from the car, parallel motion means maintaining said outer yoke member centered with respect to the car during relative movement between the yoke member and car, an inner yoke member conforming substantially to the car contour, projecting side and roof sheets on the car overlapping said inner yoke member, flexible means connecting said yoke members, and resilient means connected to said inner yoke member and car, said resilient means acting in opposition to maintain said flexible means taut and in alignment with the car contour.

18. A streamlined closure for rail or similar cars comprising, an outer yoke member having substantially the same contour as the car, means supporting said outer yoke member, resilient means urging said yoke member outward away from the car, links having one of their ends connected to the outer yoke member substantially at the vertical center thereof, the other end of said links being slidably connected to the car at spaced apart points, additional links having one of their ends pivotally connected to the car substantially at the vertical center thereof, the other end of said additional links being pivotally connected to spaced apart points on said first named links thereby forming a parallel motion means maintaining said outer yoke member centered with respect to the car during relative movement between the yoke member and car, an inner yoke member conforming substantially to the car contour, projecting side and roof sheets on the car overlapping said inner yoke member, flexible means connecting said yoke members, and resilient means connected to said inner yoke member and car, said resilient means acting in opposition to maintain said flexible means taut and in substantial alignment with the car contour.

19. A streamlined closure for rail or similar cars comprising, an outer yoke member, resilient means pivotally connected to the car substantially on the vertical center and urging said yoke member outward away from the car, an inner yoke member, flexible means connecting said yoke members together, and resilient means connected to said inner yoke member and car to urge the inner yoke member toward the car, said resilient means thereby acting in opposition to maintain said flexible means taut.

20. A streamlined closure for rail or similar cars comprising, an outer yoke member, resilient means pivotally connected to the car substantially on the vertical center and slidably engaging said yoke member at spaced points to urge said yoke member outward away from the car, an inner yoke member, flexible means connecting said yoke members together, and resilient means connected to said inner yoke member and car to urge the inner yoke member toward the car, said resilient means thereby acting in opposition to maintain said flexible means taut.

21. A streamlined closure for rail or similar cars comprising, an outer yoke member, resilient means urging said yoke member outward away from the car, flexible means connected to said

yoke member, and resilient means connected to said flexible means and car to urge the flexible means toward the car, said resilient means acting in opposition to maintain said flexible means taut.

22. A streamlined closure for rail or similar cars comprising, an outer yoke member having substantially the same contour as the car, means supporting said outer yoke member, resilient means urging said yoke member outward away from the car, flexible means connected to said yoke member, projecting side and roof sheets on the car overlapping a portion of said flexible means, and resilient means connected to said flexible means and car, said resilient means acting in opposition to maintain said flexibe means taut.

23. A streamlined closure for rail or similar cars comprising, an outer yoke member, resilient means urging said yoke member outward away from the car, an inner yoke member, flexible means connecting said yoke members together, resilient means connected to the car, pulley means carried by the car, and cable means passing over said pulleys and connecting said last named resilient means and inner yoke member thereby urging said inner yoke member toward the car to maintain said flexible means taut.

24. A streamlined closure for rail or similar cars comprising, an outer yoke member, resilient means urging said yoke member outward away from the car, an inner yoke member, flexible means connecting said yoke members together, resilient means connected to the car, pulley means carried by the car, cable means passing over said pulleys and connecting said last named resilient means and inner yoke member thereby urging said inner yoke member toward the car to maintain said flexible means taut, means slidably supporting said inner yoke member at spaced points on the car, and additional resilient means connected to said supporting means for additionally urging said inner yoke member toward the car.

25. A streamlined closure for rail or similar cars comprising, an outer yoke member, resilient means urging said yoke member outward away from the car, an inner yoke member, flexible means connecting said yoke members together, arms mounted on the car for supporting said inner yoke member, torsion spring means connected to each arm, said spring means urging said arms toward the car to thereby maintain the flexible means taut.

26. A streamlined closure for rail or similar cars comprising, an outer yoke member, resilient means urging said yoke member outward away from the car, an inner yoke member, flexible means connecting said yoke members together, arms supporting said inner yoke member, said arms being pivotally connected to the car and inner yoke member, and resilient means urging said arms toward the car to maintain the flexible means taut.

27. A streamlined closure for rail or similar cars comprising, an outer yoke member, resilient means urging said yoke member outward away from the car, an inner yoke member, flexible means connecting said yoke members together, arms supporting said inner yoke member, said arms being pivotally connected to the car and slidably pivoted to said inner yoke member, and resilient means urging said arms toward the car to maintain the flexible means taut.

28. A streamlined closure for the gap between the adjacent end portions of coupled rail cars comprising, inner and outer yoke members carried by each car, flexible means connected to each inner yoke member and each thereof extending to and being connected with an outer yoke member, and resilient means connecting each of said inner yoke members to the adjacent car end, said resilient means being so arranged as to maintain said flexible means taut.

29. A streamlined closure for the gap between the adjacent end portions of coupled rail cars comprising, inner and outer yoke members carried by each car and conforming substantially to the car contour, flexible means connected to each inner yoke member and each thereof extending to and being connected with an outer yoke member, and resilient means connecting said inner yoke members to the adjacent car end, said resilient means being so arranged as to maintain said flexible means taut and in substantial alinement with the car contour.

30. A streamlined closure for the gap between the adjacent end portions of coupled rail cars comprising, inner and outer yoke members carried by each car, flexible means connected to each inner yoke member and each thereof extending to and being connected with an outer yoke member, resilient means connected to each of the car ends, pulleys carried by each car, and cable means passing over said pulleys and connecting said resilient means and adjacent yoke member whereby to maintain said flexible means taut.

SIGVALD F. UDSTAD.