Feb. 13, 1940. M. P. BLOMBERG ET AL 2,190,144

RAILWAY CAR

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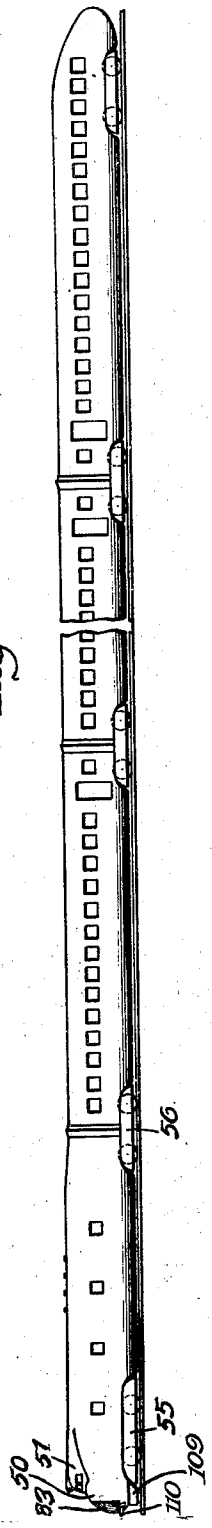


Fig. 1.

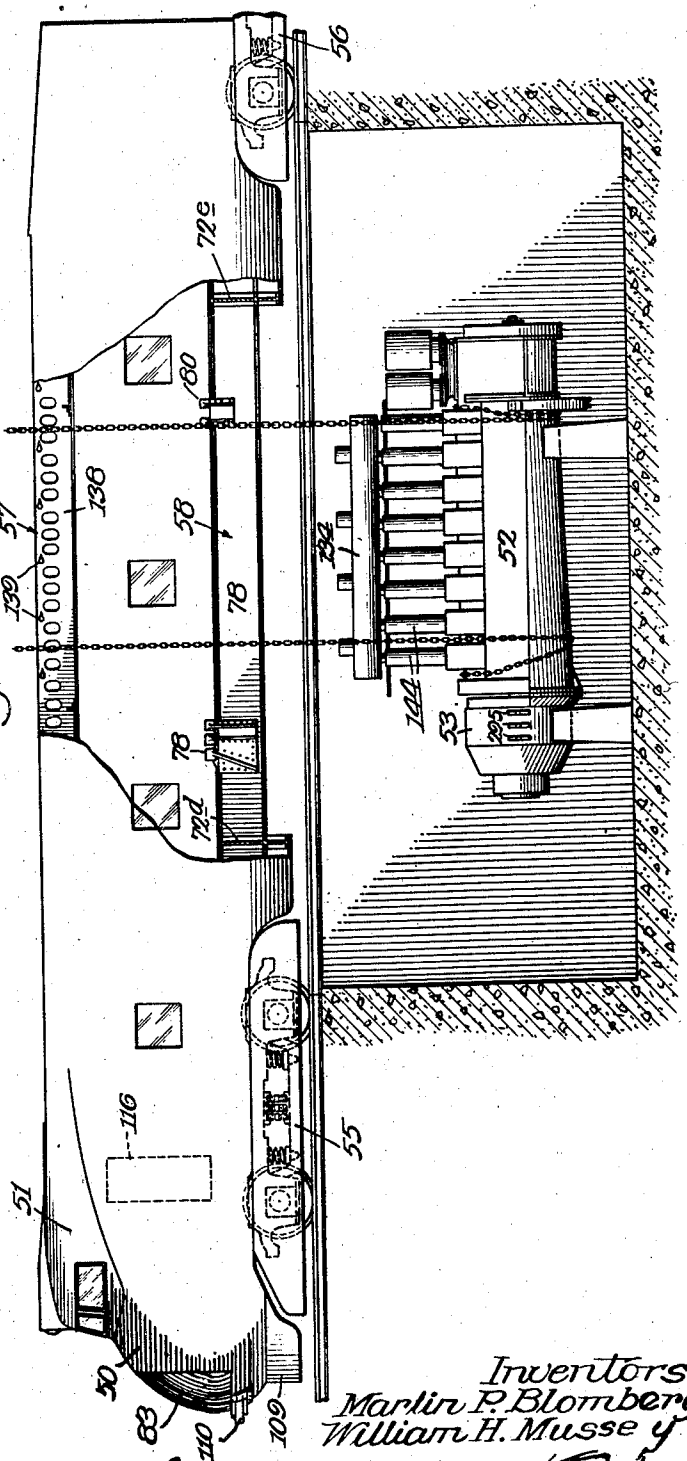


Fig. 2.

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RAILWAY CAR

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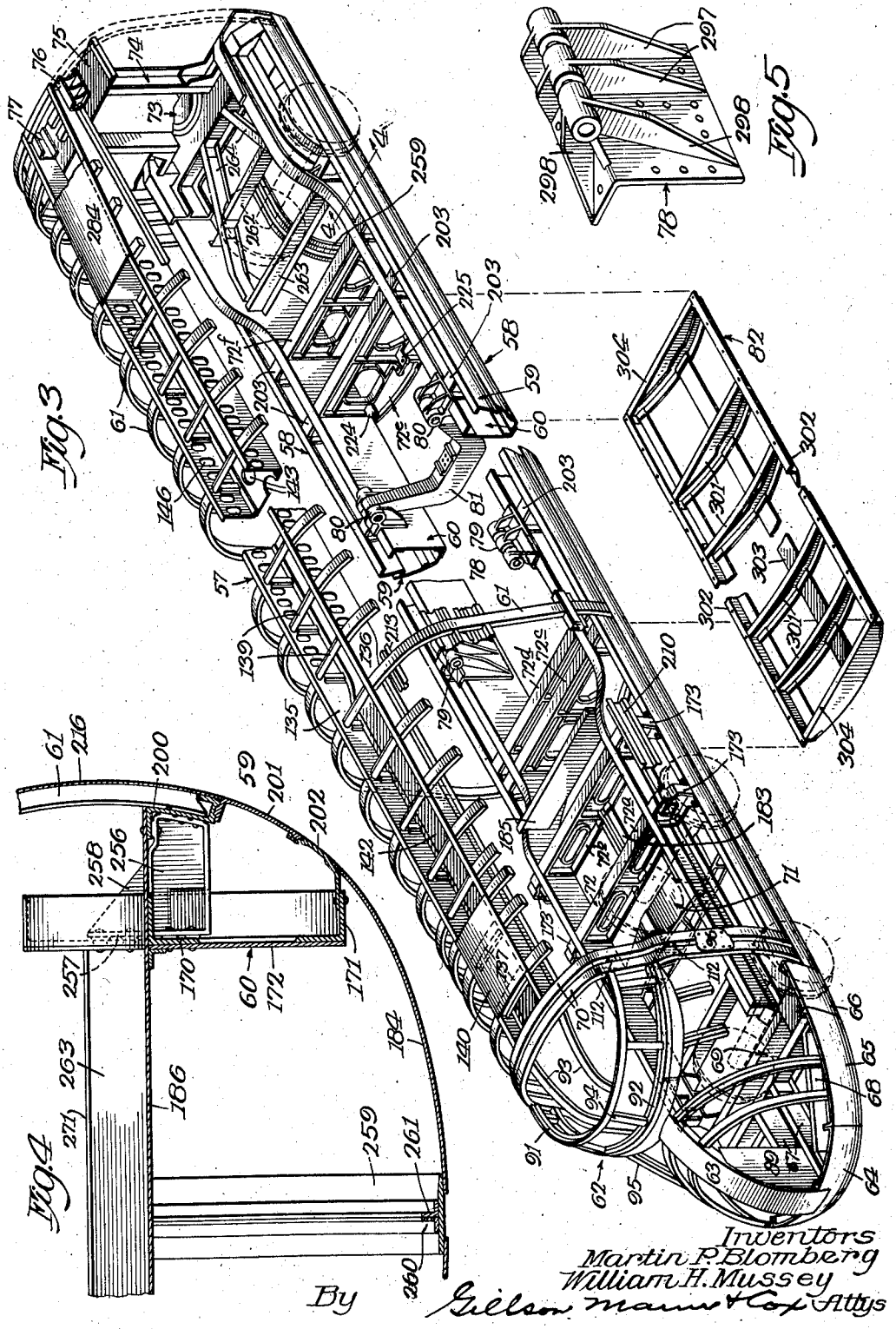


Fig. 3

Fig. 4

Fig. 5

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RAILWAY CAR

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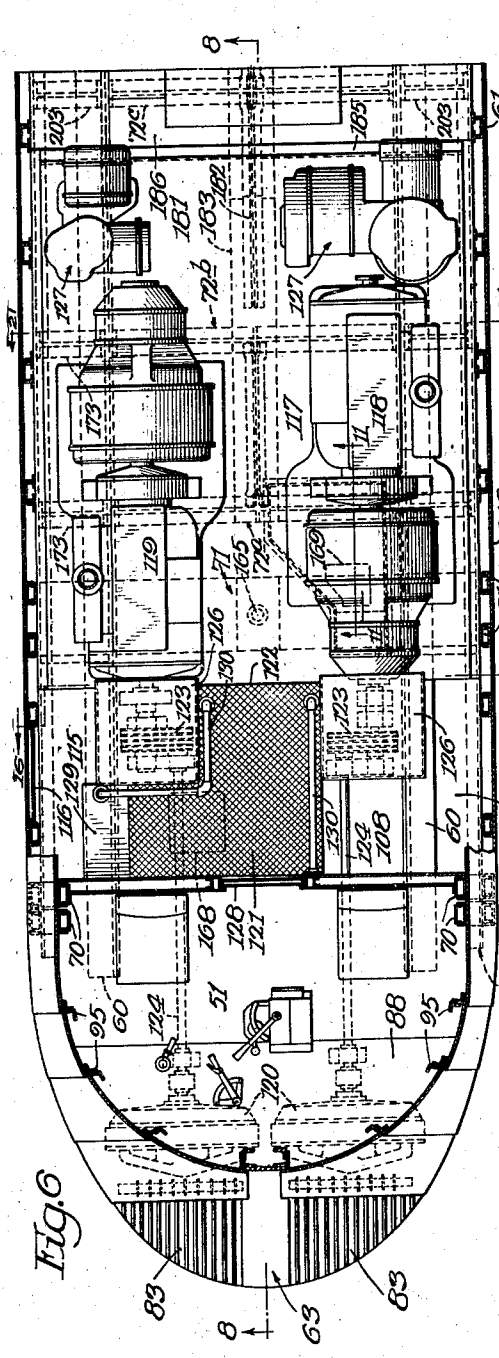


Fig. 6

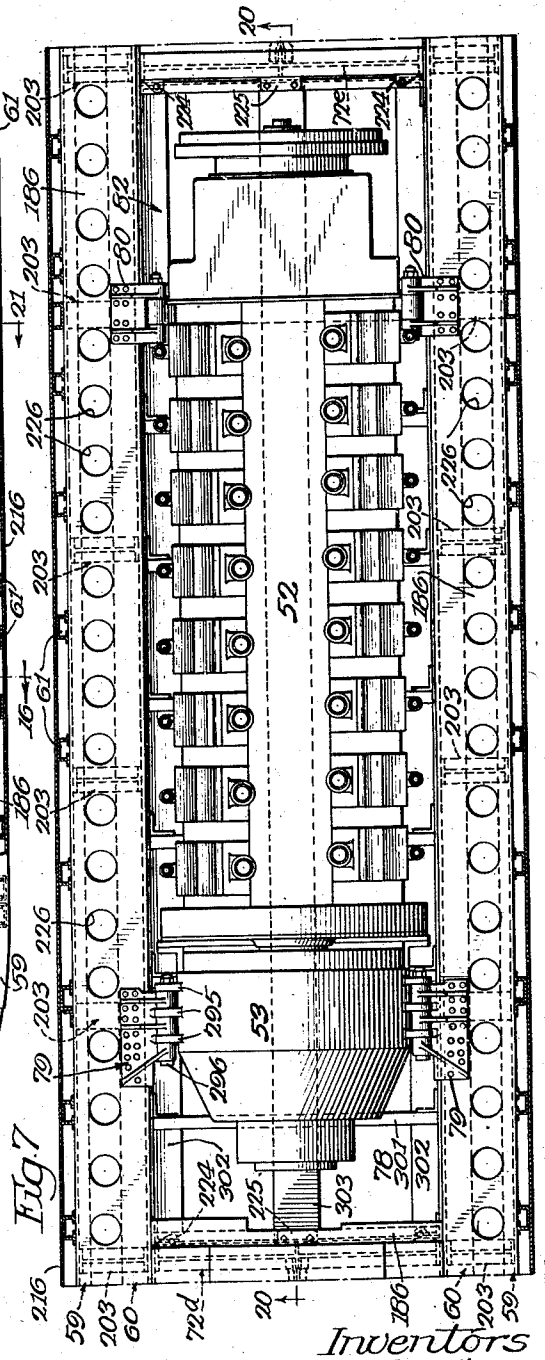


Fig. 7

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RAILWAY CAR

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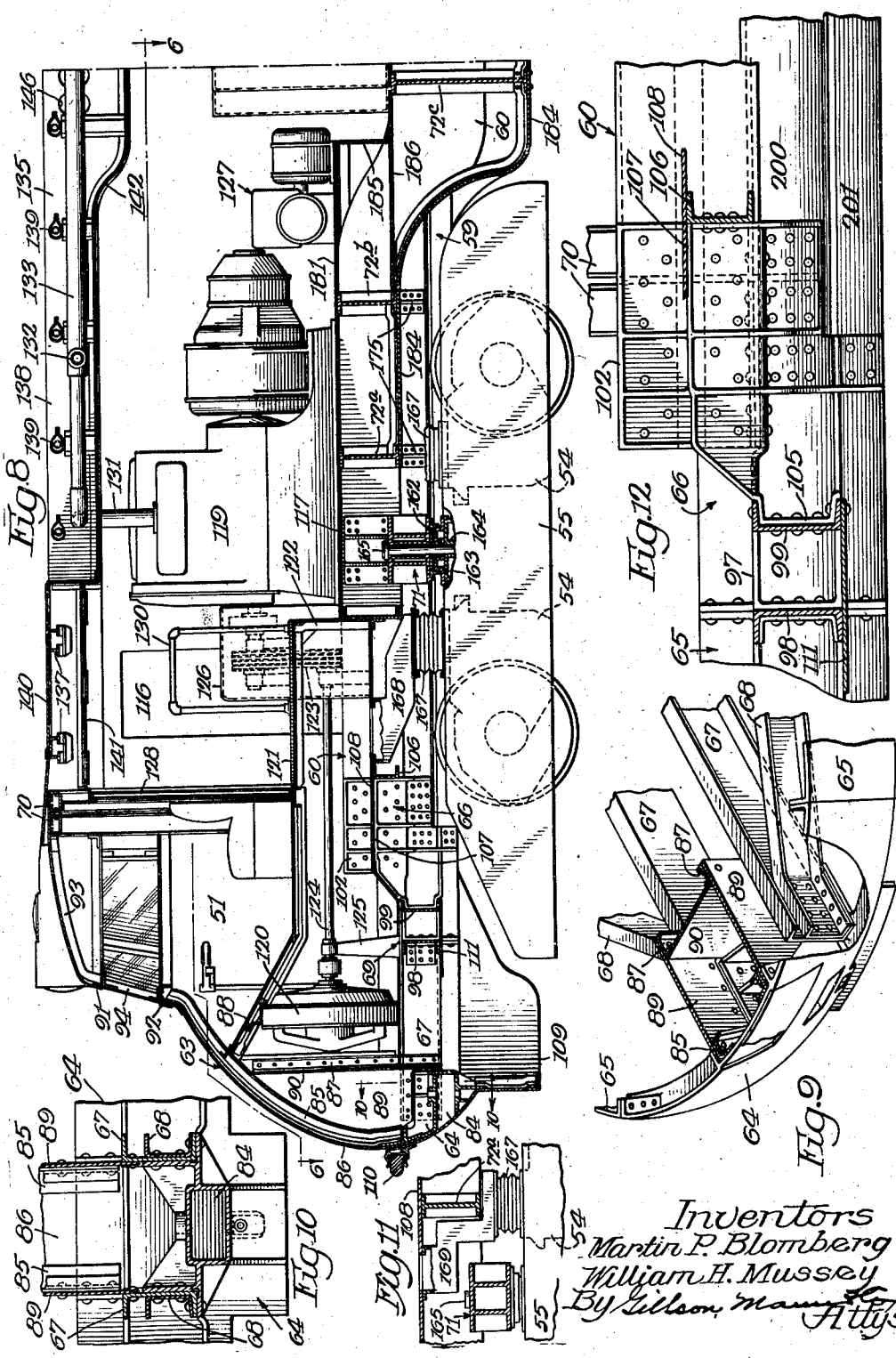


Fig. 8

Fig. 12

Fig. 9

Fig. 10

Fig. 11

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RAILWAY CAR

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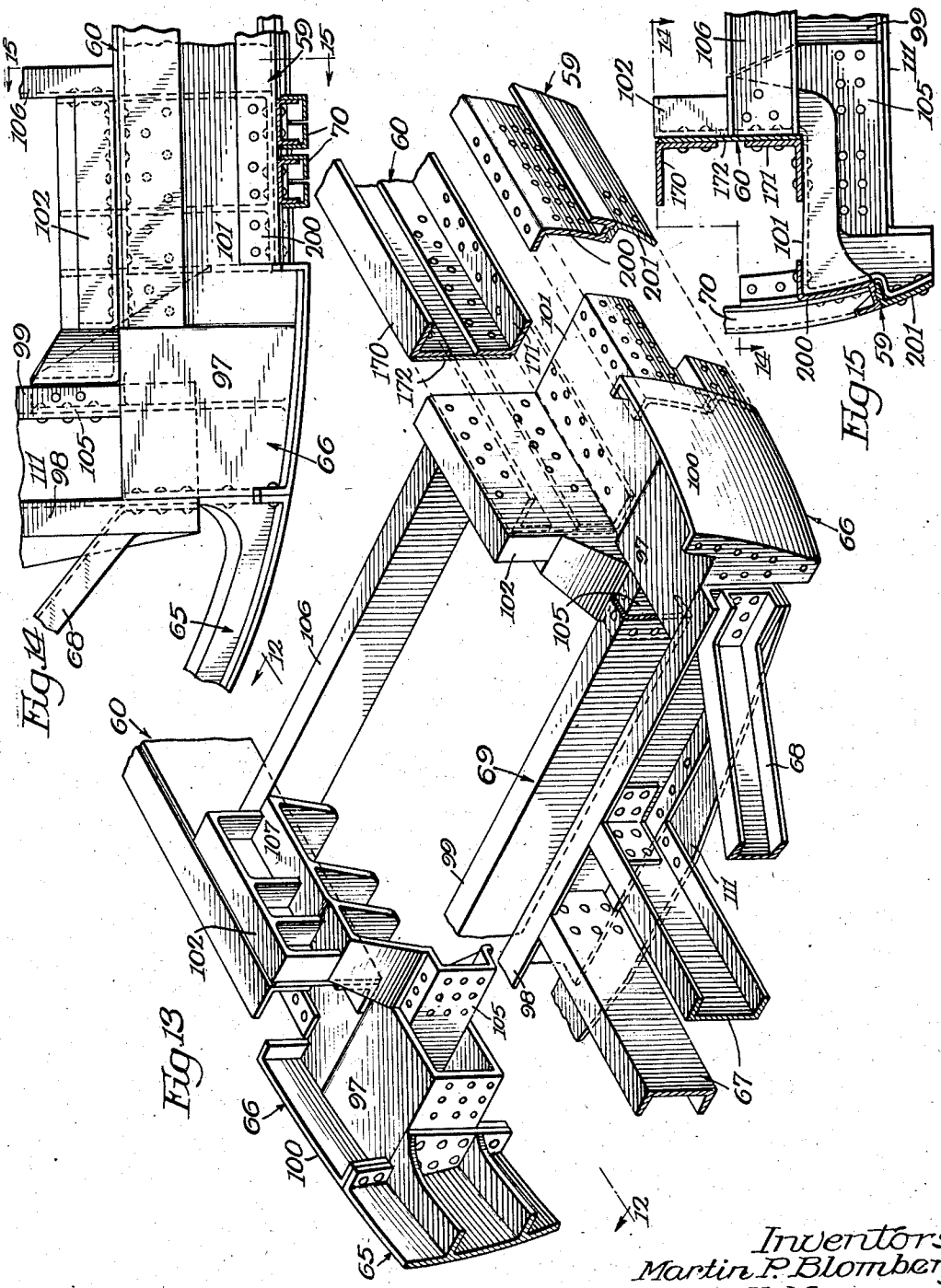


Fig. 14

Fig. 15

Fig. 13

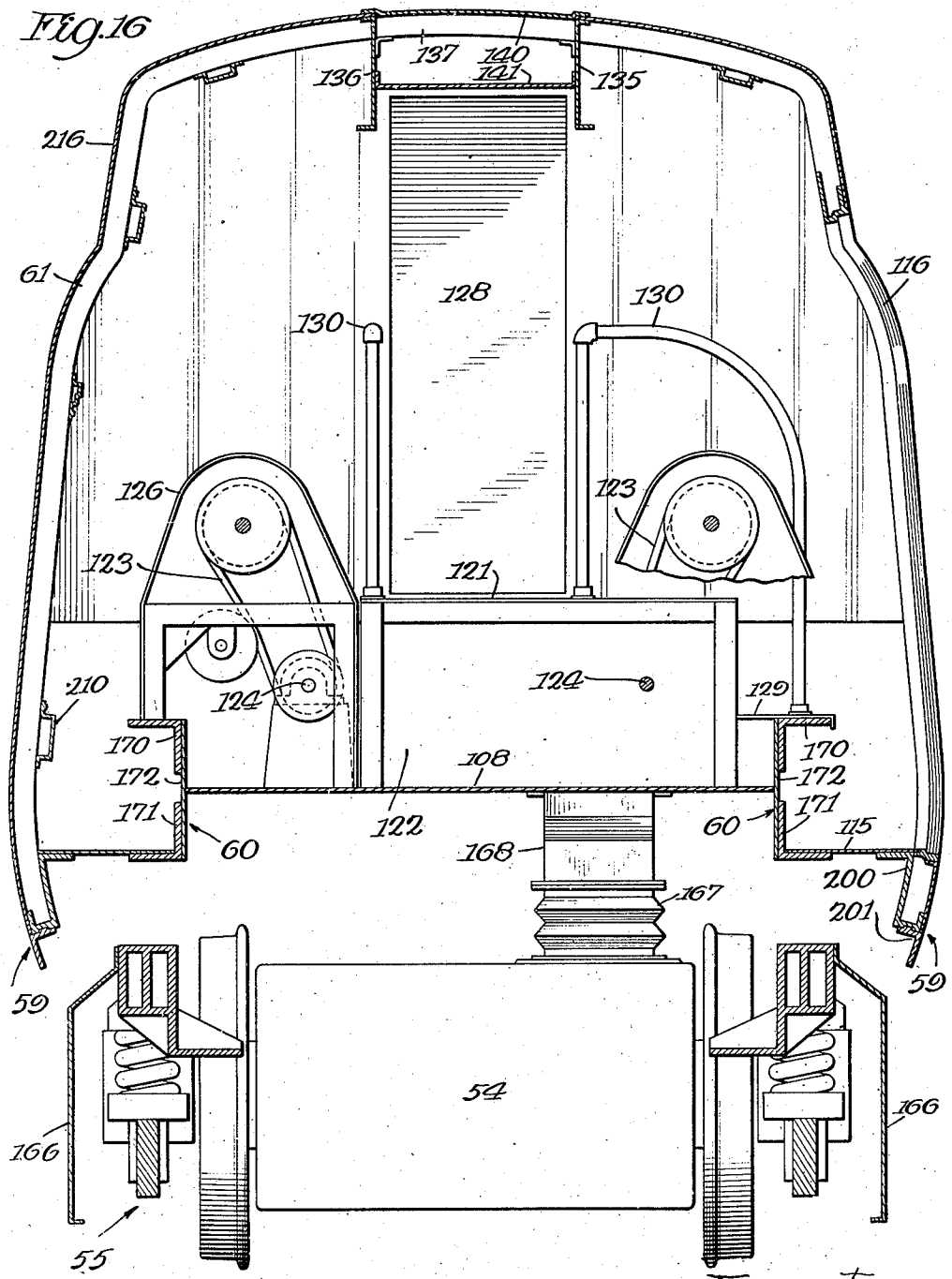
Inventors
Martin P. Blomberg
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RAILWAY CAR

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Fig. 16



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RAILWAY CAR

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Fig. 17

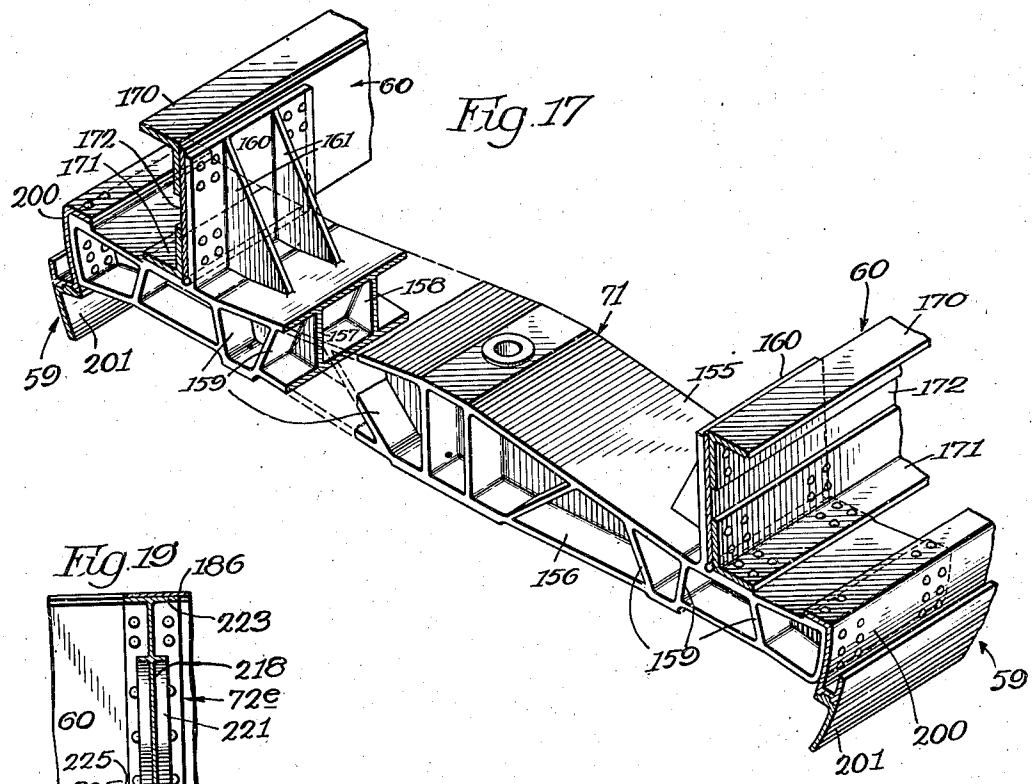
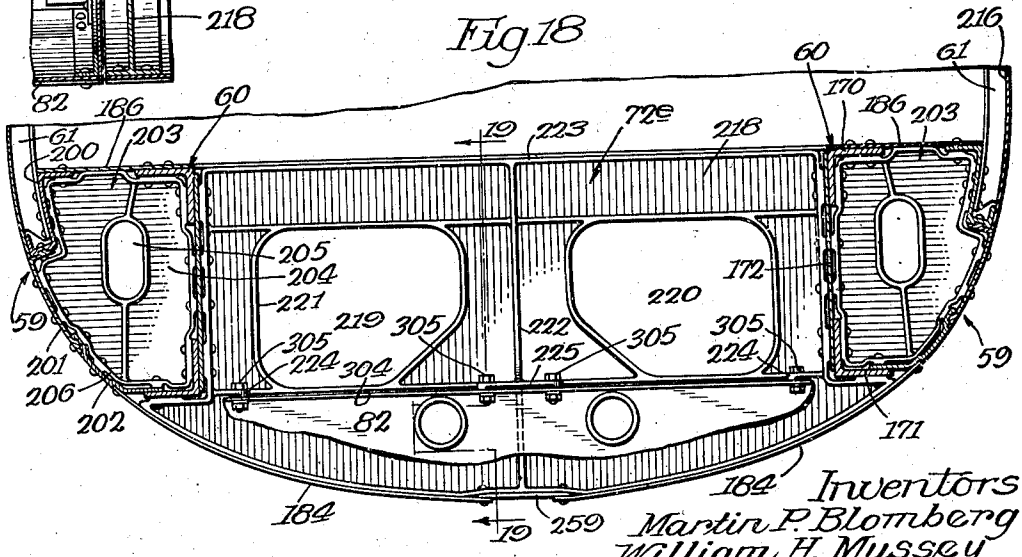


Fig. 19

Fig. 18



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RAILWAY CAR

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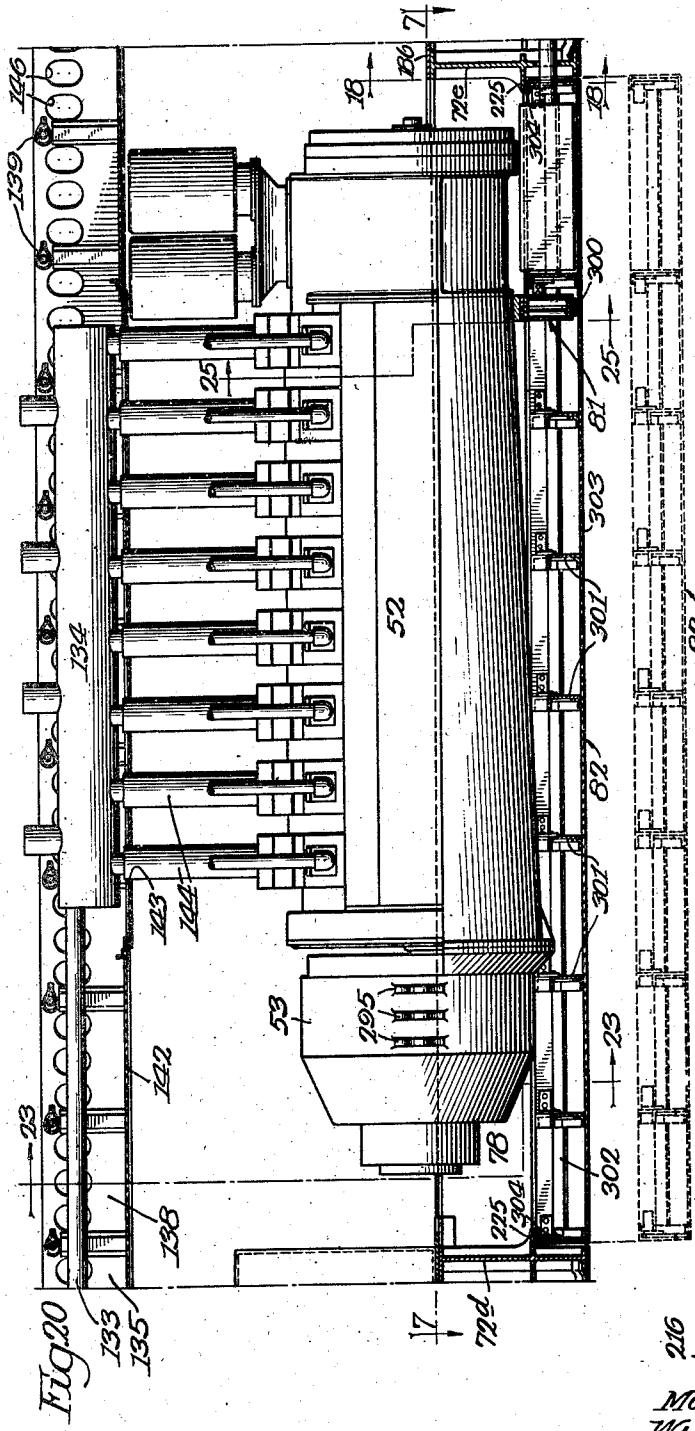


Fig. 20

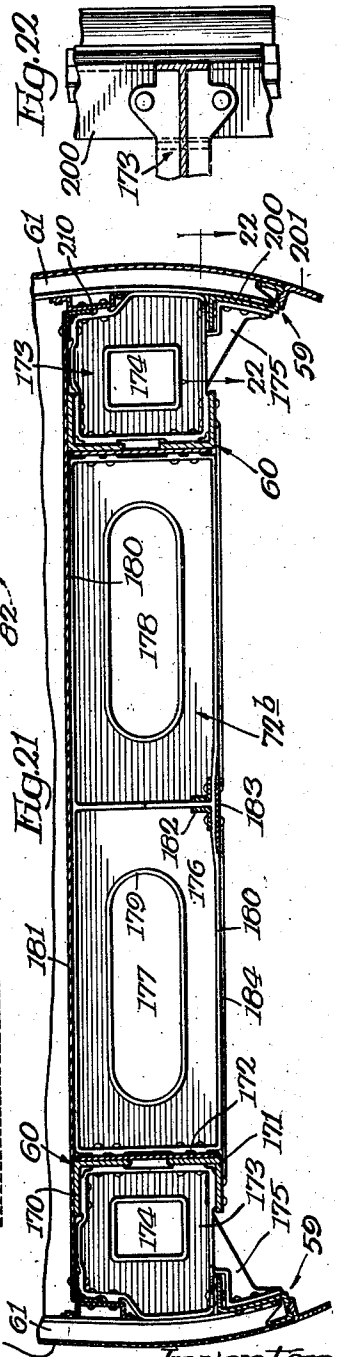


Fig. 21

Fig. 22

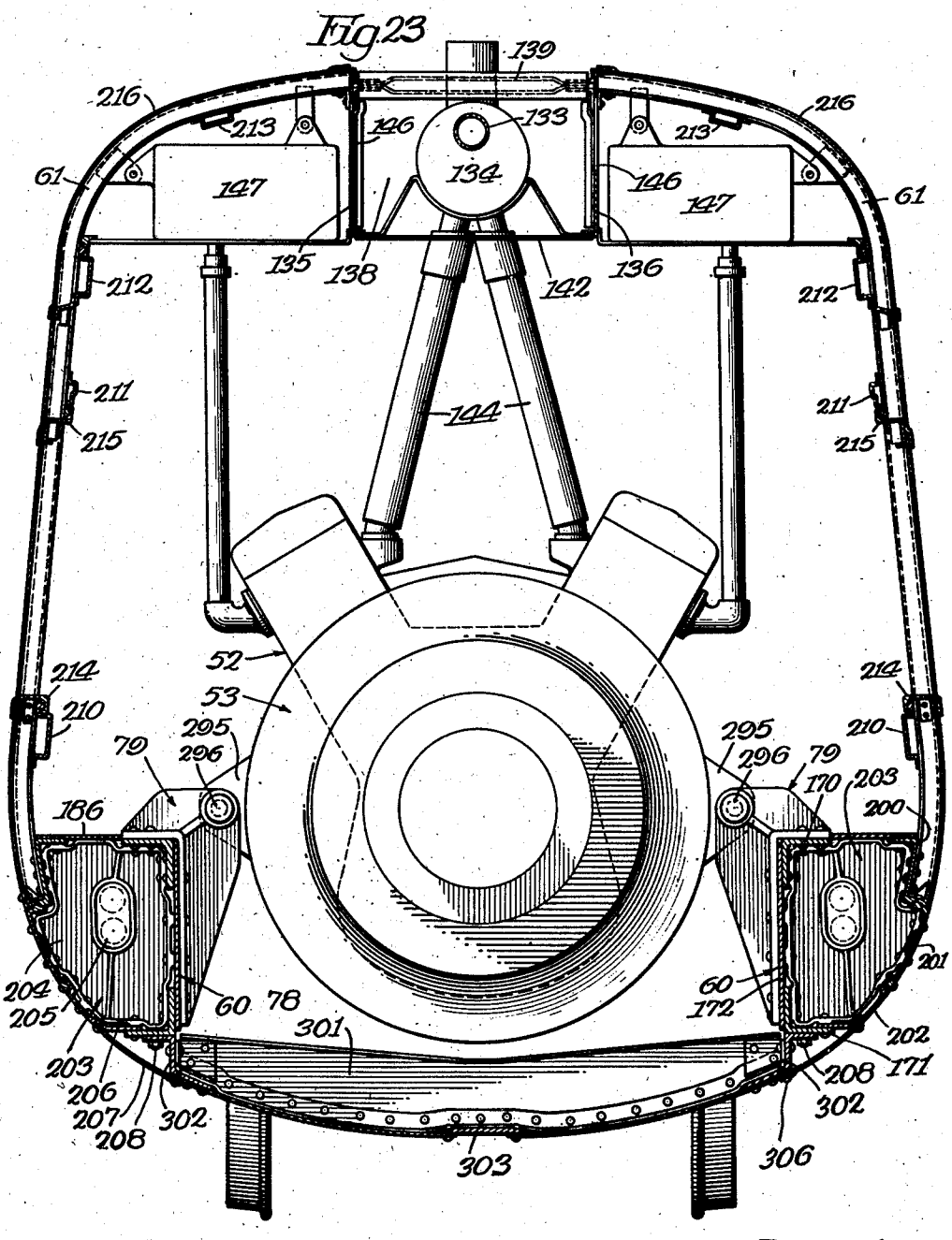
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RAILWAY CAR

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Fig 23



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Feb. 13, 1940. M. P. BLOMBERG ET AL 2,190,144

RAILWAY CAR

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Fig. 24

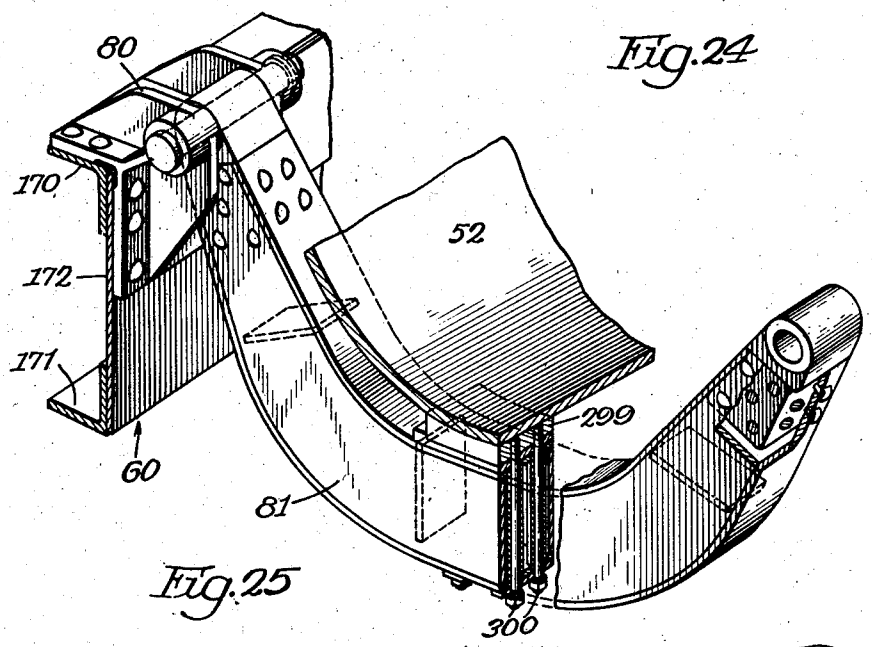
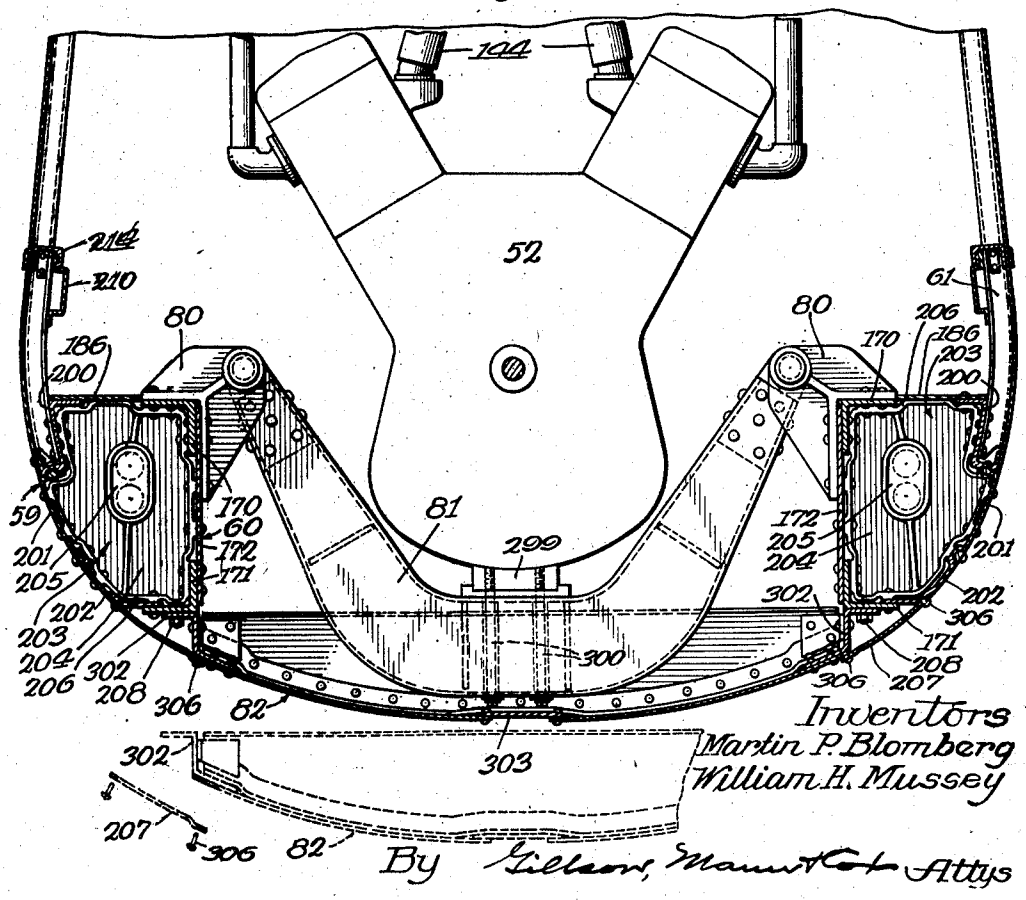


Fig. 25



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RAILWAY CAR

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Fig. 26

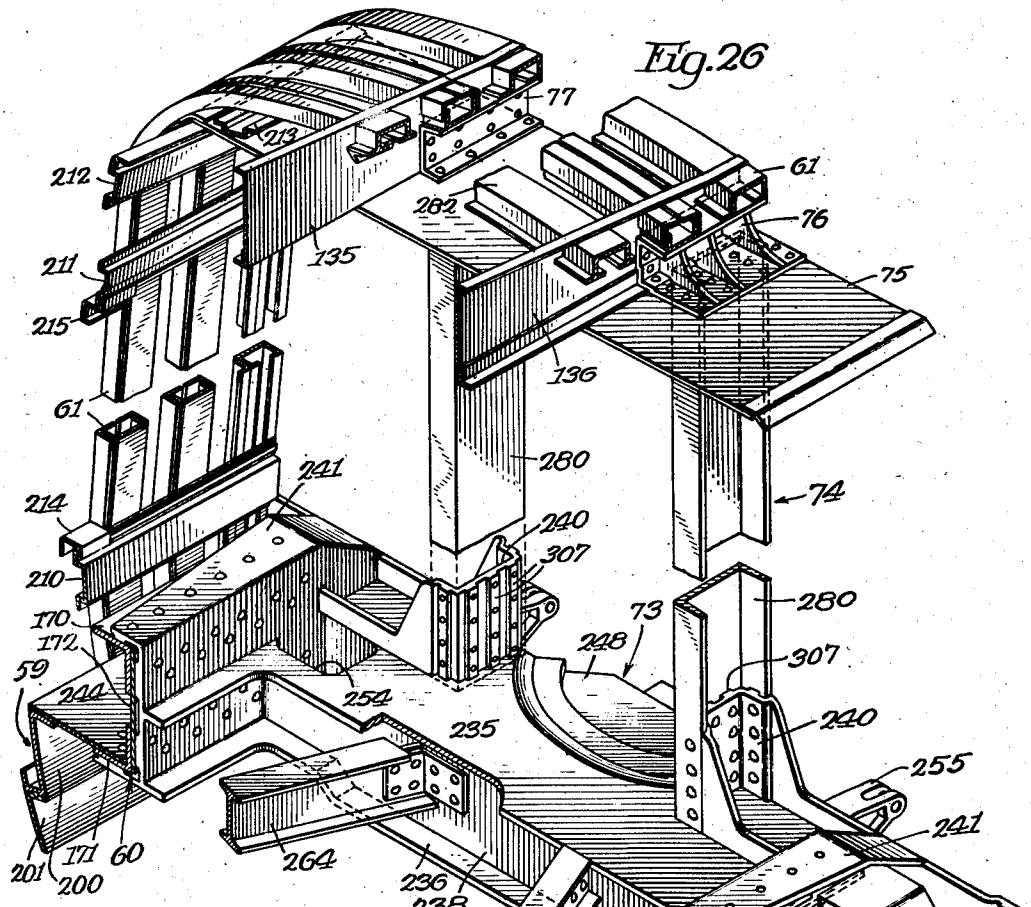
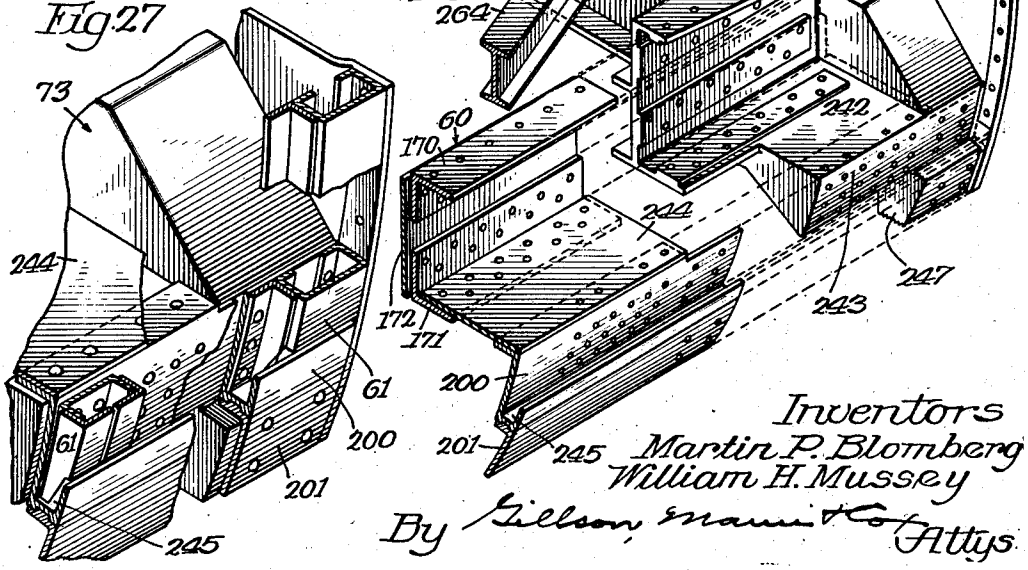


Fig. 27



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RAILWAY CAR

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Fig. 29

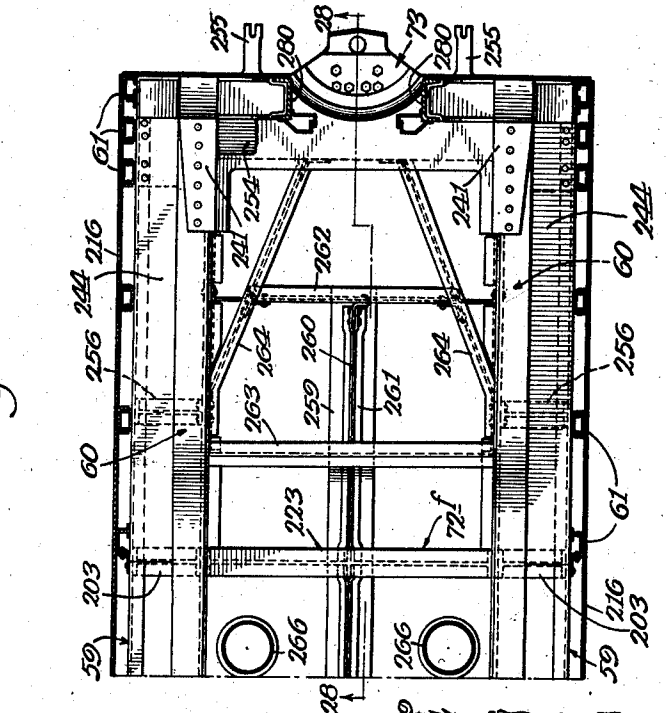
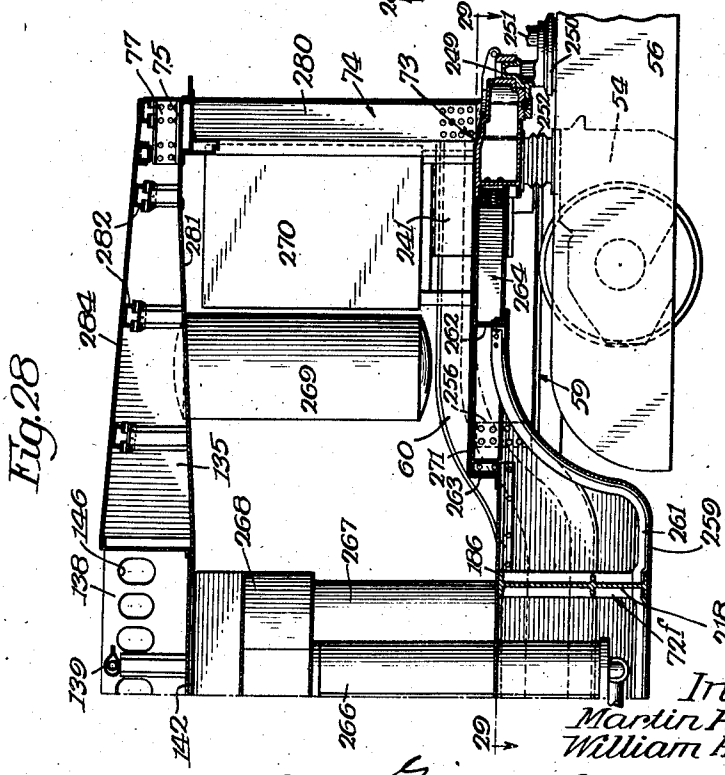


Fig. 28



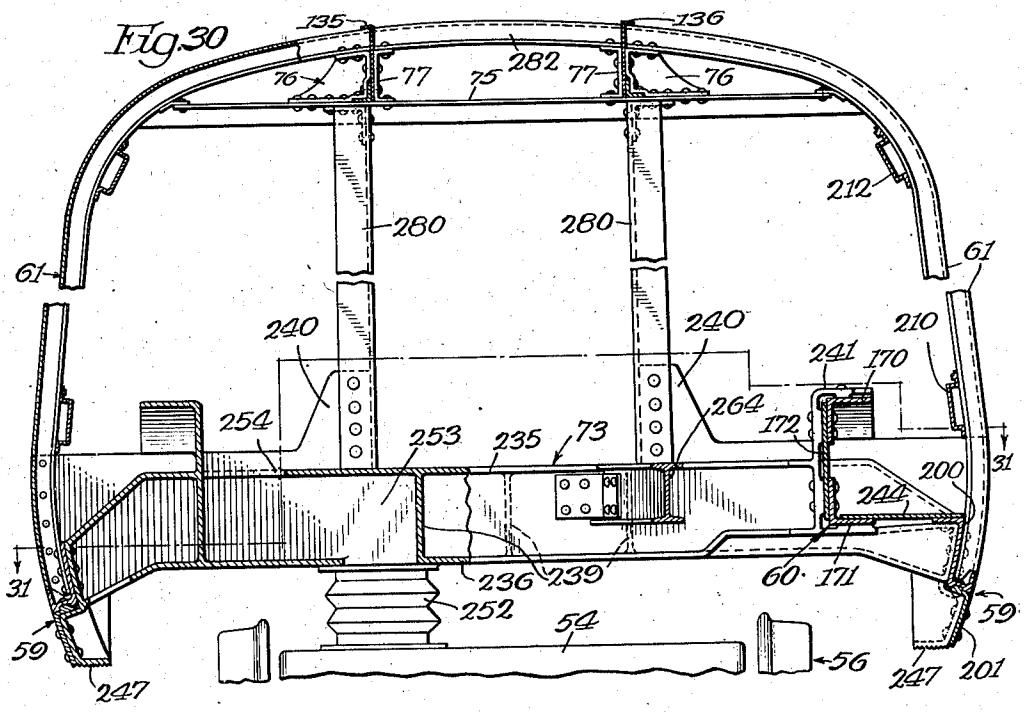
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RAILWAY CAR

Filed July 20, 1935 14 Sheets-Sheet 13

Fig. 30



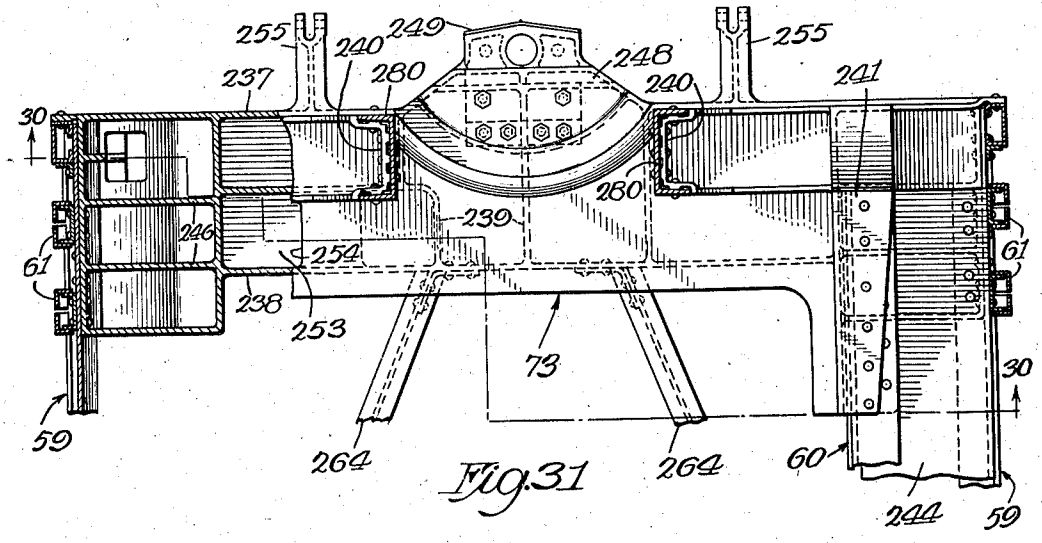


Fig. 31

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RAILWAY CAR

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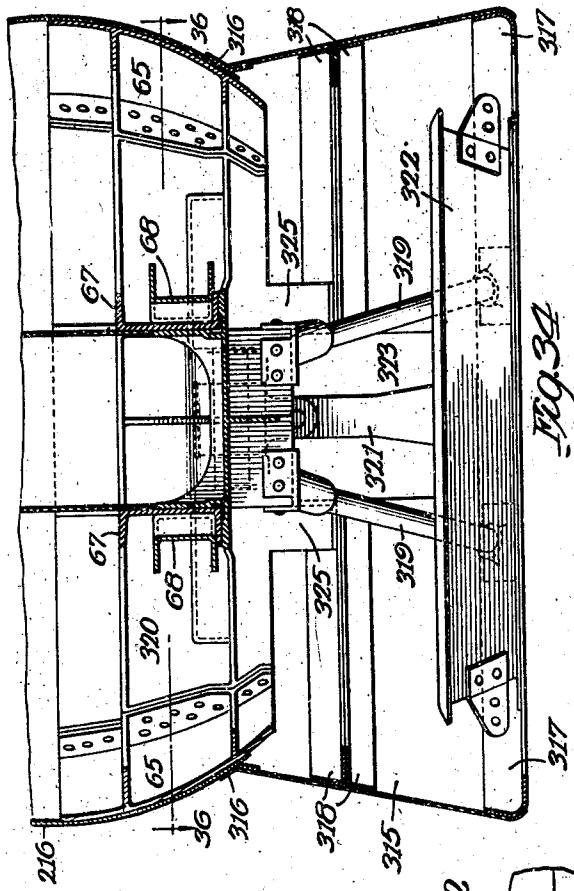


Fig. 34

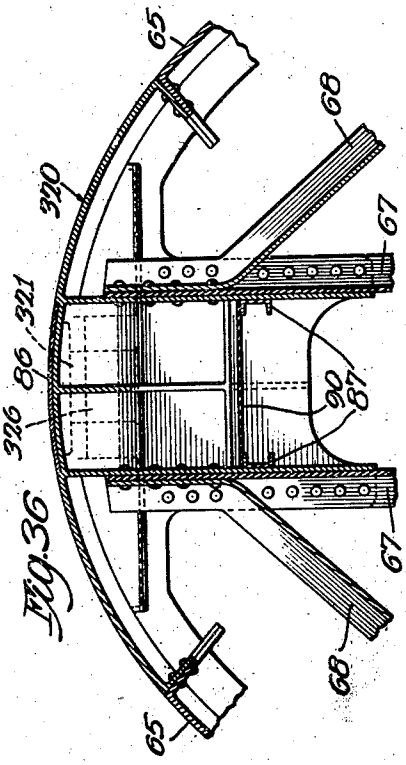


Fig. 36

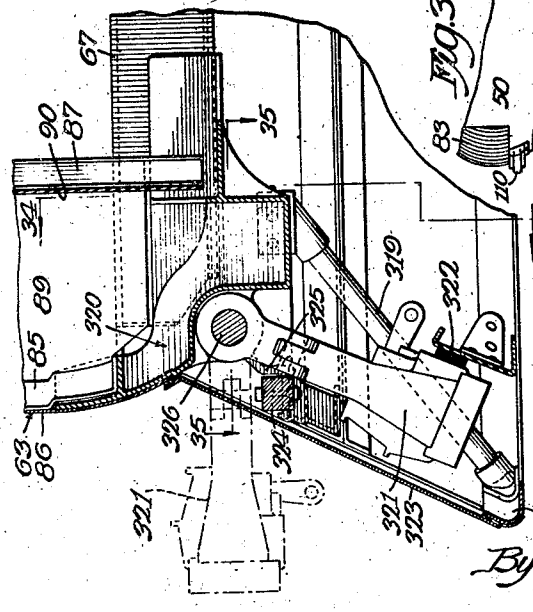


Fig. 33

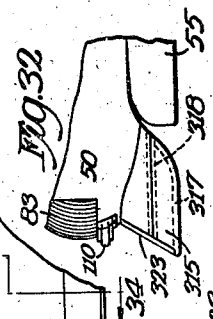


Fig. 32

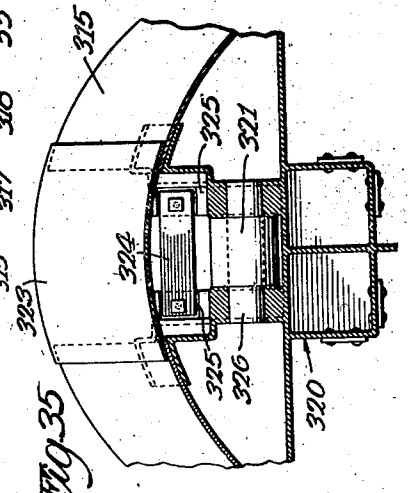


Fig. 35

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Patented Feb. 13, 1940

2,190,144

UNITED STATES PATENT OFFICE

2,190,144

RAILWAY CAR

Martin P. Blomberg and William H. Mussey, Chicago, Ill., assignors to Pullman-Standard Car Manufacturing Company, Chicago, Ill., a corporation of Delaware

Application July 20, 1935, Serial No. 32,336

4 Claims. (Cl. 105—414)

This invention relates to railway cars of the type disclosed in the application of Martin P. Blomberg, Serial No. 717,420 which are characterized in part by their use of vertical, trapezoidal framework in place of a heavy underframe, as customary, the vertical trapezoidal framework being of sufficient strength to carry substantially the entire car load. The shell of the car is built up from ribs and longitudinal framing members, and serves to supplement the main framework and provide the necessary factor of safety for practical purposes.

The present invention departs from the framing shown in the above identified application by employing heavy side girders in place of a center sill and providing a relatively large engine well between the side girders in the central portion of the car. The purpose of this arrangement and of the specific framework that is used in adapting it to sound car building practice is to enable engines of greater horse power rating to be used; to mount the engine in such manner that the center of gravity of the car as a whole is materially lowered, thus making the car safer for high speed travel; to mount the engine on a three-point suspension; to have the side girders act not only as a support for the engine, but also as protection for the sides of the car; to provide an engine mounting which permits the engine to be bodily removed from the car body for repair or replacement with minimum cost and labor; to suspend the engine from the car body in such a way that more room is provided in the car body for other equipment; and to otherwise improve the construction of cars of this type without unduly increasing the cost and labor of manufacture.

Further and other objects and advantages will become apparent as the disclosure proceeds and the description is read in conjunction with the accompanying drawings, in which—

Fig. 1 is a side, elevational view of a streamline, articulated car powered by a car section, made in accordance with this invention;

Fig. 2 is an enlarged, side, elevational view of the forward or power section of the car, a portion being broken away to illustrate the manner in which the engine may be removed from the car body;

Fig. 3 is a diagrammatic, perspective view of the car framework for the power section, the bottom closure pan being shown displaced from the car body;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a perspective view of the front engine bracket;

Fig. 6 is a horizontal, sectional view through the front end of the power car, taken on the line 6—6 of Fig. 8;

Fig. 7 is a horizontal, sectional view taken through the central portion of the power car, the section being taken on the line 7—7 of Fig. 20, the engine being shown in elevation;

Fig. 8 is a vertical, longitudinal, sectional view through the front end of the power car, the section being taken on the line 8—8 of Fig. 6;

Fig. 9 is a perspective view of a portion of the nose framework showing particularly the manner in which the coupler casting is connected to the other framing members;

Fig. 10 is a vertical, sectional view taken on the line 10—10 of Fig. 8;

Fig. 11 is a fragmentary, sectional view taken on the line 11—11 of Fig. 6;

Fig. 12 is a fragmentary, sectional view taken on the line 12—12 of Fig. 13;

Fig. 13 is a fragmentary, perspective view showing the manner in which the rear nose castings connect with other framing members;

Fig. 14 is a fragmentary, sectional view taken on the line 14—14 of Fig. 15;

Fig. 15 is a fragmentary, sectional view taken on the line 15—15 of Fig. 14;

Fig. 16 is a transverse, sectional view through the car taken on the line 16—16 of Fig. 6;

Fig. 17 is a perspective view of the body bolster showing particularly the connection between the body bolster and the side girders;

Fig. 18 is a fragmentary, vertical, sectional view taken on the line 18—18 of Fig. 20;

Fig. 19 is a vertical, sectional view taken on the line 19—19 of Fig. 18;

Fig. 20 is a vertical, longitudinal, sectional view through the center portion of the car, the engine being shown in elevation and the section being taken on the line 20—20 of Fig. 7;

Fig. 21 is a transverse, sectional view taken on the line 21—21 of Fig. 6;

Fig. 22 is a fragmentary, detail, sectional view taken on the line 22—22 of Fig. 21;

Fig. 23 is a sectional view through the car body looking at the generator end of the engine, the section being taken on the line 23—23 of Fig. 20;

Fig. 24 is a perspective view of the engine cradle which supports the rear end of the engine;

Fig. 25 is a transverse, sectional view showing the manner in which the engine is supported on the cradle;

Fig. 26 is a perspective view showing the end

framework, portions being broken away to better illustrate the construction;

Fig. 27 is an enlarged detail view showing the manner in which the various framing members connect with the extremities of the end sill;

Fig. 28 is a vertical, sectional view through the rear portion of the power car, the section being taken on the line 28—28 of Fig. 29, the car truck and the equipment within the car being shown in elevation;

Fig. 29 is a horizontal, sectional view of the rear portion of the power car, the section being taken on the line 29—29 of Fig. 28;

Fig. 30 is a transverse, sectional view taken on the line 30—30 of Fig. 31;

Fig. 31 is a plan section of the end sill and its connections, the section being taken on the line 31—31 of Fig. 30;

Fig. 32 is a side, elevational view showing a modified form of apron or windbreaker for the nose of the car;

Fig. 33 is an enlarged detail section along the center line of the car;

Fig. 34 is a sectional view taken on the line 34—34 of Fig. 33;

Fig. 35 is a horizontal, sectional view taken on the line 35—35 of Fig. 33; and

Fig. 36 is a horizontal, sectional view taken on the line 36—36 of Fig. 34, looking downwardly.

The car shown in the drawings and hereinafter specifically described has been chosen for the purpose of illustrating the invention, but it will be understood that the invention may be variously modified within the scope of the appended claims, which are to be construed as broadly as the prior art will permit.

In building multi-section high speed cars or trains, it is desirable to have the leading section, or car, contain most, if not all of the power units necessary for operating the train equipment and accessories. When the composite car or train is of considerable length, a problem arises as to the manner in which the prime mover should be mounted in the leading or power section, it being necessary to take into consideration the question of properly locating the center of gravity of the car; of providing an engine mounting that enables the car framework to stay within certain maximum deflection limits without necessitating the use of extremely heavy framework; and of making provision for the ready removal of the engine in case extensive repairs or replacement are required. All of these problems as well as others are solved in the car of this invention as will appear from the specific description that follows:

General Organization

The power car is of streamline form having a rounded nose 50 with an operator's cab 51 above (Figs. 1 and 2), and an ovate, cross sectional form (Fig. 23). The car is powered by a 16 cylinder, 1200 H. P. Diesel engine 52, which drives a tandem-arranged generator 53 supplying current to traction motors 54 (Figs. 8 and 16) on the forward truck 55 and first articulated truck 56 (Fig. 1). The car is adapted to be used as the forward section of a multi-section articulated car, as shown in Fig. 1.

The framework of the power car in the embodiment shown is characterized by having the main longitudinal framework members at the apices of a triangle, and connected at one end by nose framework and at the other end by end framework so that in side elevation, the principal car framework is trapezoidal and in cross section triangular. This frame-work is sufficient to carry substantially the entire car load, the other framework being used to build up the shell of the car and to furnish the necessary factor of safety.

The engine 52 is adapted to be raised in position and lowered through the bottom of the car, as shown in Fig. 2. The car framework is such that the engine and generator may be removed from the car and replaced by another engine generator set with a minimum amount of labor and loss of time.

The most important elements of the power car framework are as follows: The top girder 57; side girders 58, comprising side sills 59 and main longitudinal girders 60; ribs 61 connecting the top girder to the side girders; nose framework 62 joining the forward ends of the side girders to the top girder and comprising a ridge beam 63, a front nose casting 64, intermediate nose castings 65, rear nose castings 66, buff sills 67, diagonal braces 68, forward end sill 69 extending between the two rear nose castings, and heavily reinforced twin ribs 70 extending from side girder to side girder; a body bolster 71; a plurality of cross braces 72 extending between the side girders; a rear end sill 73; door end posts 74; an anti-telescoping plate 75 atop the door end posts; and brackets 76 and 77 for connecting the top girder 57 to the end framework.

The engine 52 is supported in an engine well 78 in the mid portion of the car by front engine brackets 79, rear engine brackets 80, and a cradle 81. When the engine is in place, a bottom closure pan 82 is bolted to the car framework for preserving the streamline form of the car. A plurality of longitudinal framing members which will be described later connect the ribs 61 together and assist in making the body rigid.

Nose framework

The nose framework is best shown in Figs. 3, 6, 8–10, 12–15, inclusive.

The framework of the car nose is influenced by four considerations: First, the nose should be shaped so that it offers a minimum resistance to air. Second, it is desirable to take in air through the nose for cooling the engine and generator. Third, the nose should be shaped so that the operator's cab is protected in the event of collision; and fourth, collision shocks should be transmitted effectively to the remainder of the car framework.

These various objectives are accomplished with the nose framework of this invention by making the nose more or less semi-circular in front elevation and parabolic in plan; by providing grilles 83 on opposite sides of the ridge beam 63 for taking in air for cooling the engine and generator; by placing the operator's cab 51 as high as possible and set back a sufficient distance so that the forward part of the nose will take the impact of collision, and by providing heavy framework for carrying the stresses of collision to the side girders of the main framework.

The front nose casting 64 is the hub of the nose framework, the casting being provided with suitable flanges for attachment to the intermediate nose castings 65, the buff sills 67, the diagonal braces 68 and the ridge beam 63 (see Fig. 9). The front nose casting is also formed with a pocket 84 to receive a coup'er bar not shown. The casting is suitably reinforced by gussets according to good engineering practice.

The ridge beam 63 is composed of front angles 85 connected by a heavy plate 86 of sheet metal,

and rear channels 87 extending from the buff sill 67 to the intersection of the inclined floor framework 88 of the cab with the front angles 85. Heavy gusset plates 89 and a rear plate 90 are secured to the channels 87 for reinforcing the nose structure and tying the ridge beam securely to the underframework of the nose structure.

The cab structure consists of upper and lower semi-circular members 91 and 92, respectively, connected at their ends to twin ribs 70 and at intermediate portions by carlines 93. The space between the upper and lower members 91 and 92 is divided into a plurality of windows by spacers 94, and numerous ribs 95 connect the ridge beam 63 and the lower member 92 of the cab structure with the intermediate nose castings 65 and the rear nose casting 66.

Spacers 112 between the twin ribs 70, together with the outside sheathing partially indicated at 96 which is securely riveted to the two ribs assist in transmitting stresses from the nose structure to the top sills and to other longitudinal framing members.

The rear nose castings 66 join the side girders to the intermediate nose castings 65, the diagonal braces 68 and the buff sills 67 through the forward end sill 69. The greater part of collision stresses is, therefore, transmitted through this member, and its size is made adequate for this function.

Each of the two rear nose castings 66 is irregularly shaped and consists of a main body portion 97 to which the two channels 98 and 99 and an anti-telescoping plate 111 (which together constitute the forward end sill 69) are secured; a curved side portion 100 which constitutes an extension of the side sill 59, and intermediate nose casting 65; a ledge portion 101 upon which the main longitudinal sill 60 rests; a raised portion 102 to which the web of the main longitudinal sill 60 is secured; and various gusset flanges for providing reinforcement where necesary. The channel 98 of the forward end sill 69, and the diagonal braces 68 are secured to the forward faces of the main body portion 97 (see Fig. 13). The rear channel 99 of the forward end sill 69 is mated with an inward extension 105 from the body portion 97. A cross beam 106 joins the rear faces of the raised portions 102, the latter having an inwardly extending ledge 107 to which a metal sheet 108 is secured (Fig. 16) constituting the lower wall of a duct which carries air for cooling the engine room.

All connections between the rear nose casting and the several framing members which are joined at the casting are accomplished by riveting, welding, or any other suitable method.

Beneath the car nose is an apron or windbreak 109 which divides the air stream and minimizes air turbulence beneath the car. The apron also serves as a fender to keep objects from getting beneath the car, although a bumper 110 is provided for making the impact.

Front platform

Before describing in detail the framework of the front platform, i. e., the body framework above the forward truck 55, it may be helpful to describe briefly the internal arrangement of the car and mention some of the equipment which is mounted within the car.

Referring to Figs. 8 and 16, it will be seen that the operator's cab 51 is somewhat above the floor level 115 at the engine room door 116 (Fig. 6), the metal sheet 108 which extends between the ledges 107 of the rear nose castings, and the floor 117 in the vicinity of the auxiliary engine generator sets 118 and 119 (Fig. 6). It will also be observed that the forward portion of the cab floor 88 is inclined (Fig. 8). This arrangement permits twin blowers 120 to be mounted beneath the inclined portion 88 of the cab floor for drawing air through the grilles 83, from whence it passes rearwardly through the space between the cab floor and the floor sheet 108 and then escapes into the engine room through a honeycomb platform 121 at the rear of the engine cab and through openings 122 at the rear of the honeycomb platform.

The auxiliary engine generator sets 118 and 119 are mounted side by side on the front platform, the former having its generator to the front and the latter having its generator to the rear in order to better balance the car. Each engine generator set is adapted to drive one of the blowers 120 through a belt drive 123, and shaft 124, the latter being supported within the duct space beneath the cab by a pillow block 125. A fan guard 126 encloses the belt drive for safety.

The auxiliary engine and generator sets supply the entire car with electricity for operating the lighting equipment, air conditioning equipment, controls, and the like. One of them also furnishes electricity for one of the air compressor units, generally designated 127. The other one is supplied with electricity from the main generator 53.

Access to the operator's cab 51 is had through a door 128 which opens on to the honeycomb platform 121 mounted by a step 129 at one side. The platform is guarded by a railing 130.

The exhaust pipes 131 of the auxiliary engines 119 and 120 are joined overhead at 132 with a larger pipe 133 which in turn is connected to the muffler 134 of the Diesel engine 52.

The top girder 57 is the main longitudinal framing member in the roof of the car, and comprises top sills 135 and 136 which are joined at intervals by spacers 137, those in the exhaust well 138 being streamlined, as indicated at 139. In front of the exhaust well, the top sills are connected by top and bottom plates 140 and 141 and at the exhaust well, the lower portions of the top sills are joined by a plate 142 which is suitably apertured, as indicated at 143, to accommodate the exhaust pipes 144 and permit the muffler 136 to be mounted in the exhaust well 138. The sides of the top sills 135 and 136 are also apertured, as indicated at 146, to allow air which has been introduced into the engine room through the grilles 83 to escape to the outside atmosphere. Preferably, the engine radiators 147 are mounted adjacent these apertures on the roof of the car so that the air passing the apertures will effectively cool the radiators (Fig. 23).

The body bolster 71 is best shown in Fig. 17 and comprises a casting having a top web 155, bottom web 156, vertical webs 157 and 158 and a plurality of interconnecting webs, generally indicated at 159. Adjacent to the ends of the body bolster are reinforced wings 160 to which the main longitudinal sills 60 are adapted to be secured. The reinforcement of the wings is accomplished by integral gussets 161.

Attached to the underside of the bolster is the usual body center plate 162, which is adapted to rest upon a truck center plate 163, carried on the truck bolster 164 of the forward truck 55. A center pin 165 passes through the body bolster,

the center plates and the truck bolster for giving the body a swivel action on the truck.

The truck constitutes no part of the invention herein claimed, and it is sufficient to say that it is preferably of the swing motion type, such as shown in Car Builder's Dictionary, 1931, at page 783 (published by Simmons-Boardman Publishing Company, New York). The trucks are preferably equipped with skirts 166 for reducing air resistance in the vicinity of the trucks.

The traction motors 54 (Figs. 8 and 16) are cooled by air drawn through flexible bellows connections 167 from the engine room. As customary, a small blower, not shown, is mounted in the traction motor for drawing the air into the motor and keeping it cool. The lower part of the bellows has a sliding connection with the motor to accommodate movement of the traction motor with reference to the car body, and the bellows furnishes the necessary flexibility for relative vertical movement. The bellows associated with the front traction motor of the forward truck 55 communicates through a duct 168 with the space between the honeycomb platform 121 and metal plate 108, and the bellows connection associated with the rear traction motor communicates through a duct 169 (Fig. 11) with the engine room proper (Figs. 6 and 11).

The forward ends of the main longitudinal sills 60 are not as deep as at the mid-portion of the car because their bending moments are relatively small at their forward ends. These sills comprise top and bottom angles 170 and 171, respectively, connected by a steel plate or web 172. The sills terminate at the rear nose castings 66 (see Fig. 13), to which they are securely anchored, and rest on the body bolster (see Fig. 17) to which they are also securely anchored.

The forward ends of the main longitudinal sills 60, in addition to their anchorage with the rear nose casting 66 and the body bolster 71 are also connected to the side sills 59 by spacer castings 173 (Figs. 3 and 21) shaped to interfit with the main longitudinal sill 60 and the side sill 59. The casting has a central opening 174 for carrying pipes and conduits and a leg 175 of the casting rests against and is secured to the inside faces of the side sill, as best shown in Fig. 21.

The two front cross braces 72*a* and 72*b* are placed at intervals corresponding to the location of the spacer castings 173 and each comprises a casting having a vertical web 176 provided with openings 177 and 178 flanked by flanges 189. The vertical web 176 has a marginal flange 180 to the top of which the front platform floor 181 is secured. The sides of the cross braces are secured to the main longitudinal sills 60 by the same rivets that secure the spacer castings 173 to those sills.

The cross braces 72*a* and 72*b* are connected at the bottom by angles 182 and a plate 183, the latter curving downwardly, as best shown in Fig. 8, after passing the cross brace 72*b* and extending rearwardly to the engine well 78. The plate 183 provides a suitable surface for attaching sheathing 184 (Fig. 8) which closes the bottom of the underframe in the vicinity of the trucks. This sheathing assists materially in reducing air resistance beneath the car.

The rear portion of the front platform floor 181 is supported by a Z-bar 185 (see Fig. 8) which in turn rests upon the floor 186 of the main engine room.

Intermediate framing

In the mid-section of a car, the side girders are relatively deep because the engine load is applied to this portion of the girders. It is necessary to have the engine load approximately midway between the center bearings of the forward truck 55 and first articulated truck 56 in order to properly distribute the weight between the two trucks. Then, too, by mounting the engine midway between the trucks, it is possible to drop the framework and provide a low center of gravity for the car.

It will be noted by referring to Fig. 4 that the side sills 59 which are composed of a plurality of sections 200, 201 and 202 are straight and substantially continuous from the rear end sill casting 73 to the front end sill casting 69. The main longitudinal sills 60, however, have their front and rear portions at a higher level than their intermediate portions in order to clear the trucks and yet are continuous from rear end sill to front end sill.

The cross-sectional shape of the intermediate portions of the side girders is best shown in Fig. 25. The main longitudinal sill as before comprises top and bottom angles 170 and 171 secured to a web 172, the web, however, being somewhat deeper than it is at the front platform. The composite side sill 59 is joined to the main longitudinal sill by a plurality of spacer castings 203, each of which has a main web 204 provided with an opening 205 through which piping and conduits are passed, the entire casting being surrounded by a marginal flange 206 which provides suitable riveting surfaces. The side sill section 200 is rivetted to the spacer castings 203, floor 186, ribs 61 and side sill section 201; the latter is riveted to the side sill section 200, the spacer castings 203 and the side sill connection 202; and the latter is riveted to the side sill section 201, spacer castings 203, the lower angle 171 of the main longitudinal sill, and a closure sheet 207 which screens the bolts 208 securing the bottom pan 82 to the side girders.

The floor 186 is preferably provided with a plurality of circular openings 226 in order to reduce weight and ventilate the pipes carried within the side girders.

In addition to the side girders and top girder, other longitudinal framing members help to carry some of the longitudinal stresses. These framing members are best shown in Fig. 23 and include belt rails 210, window header stringers 211, deck stringers 212 and roof stringers 213. In addition, at the windows there are window sills 214 and window headers 215.

The entire shell of the car is covered with sheathing 216 which serves not only to give the car a smooth finish, but also as a stress member, particularly adapted to resist torsional stresses.

At the front of the engine well are cross braces 72*c* and 72*d*, each of which consists of a relatively large casting having a web 218, openings 219 and 220 flanked with flanges 221, a vertical flange 222, and a marginal flange 223. Each casting is secured at the sides to the main longitudinal sill 60. Since spacer castings 203 are used between the main longitudinal sills 60 and side sills 59 at intervals corresponding to the location of the cross braces 72*c* and 72*d*, the understructure is strongly braced at the front of the engine well 78.

The two rear cross braces 72*e* and 72*f* are similar to the cross braces 72*c* and 72*d*, and need not be further described. It may be pointed out, however, that the inner cross braces 72*d* and 72*e* are provided with inwardly extending flanges 224 and 225 for attaching the pan 82 to the car framing.

Rear platform

The rear ends of the main, longitudinal sills **60** turn upwardly at the truck **56** and rest upon the rear end sill casting **73**. The casting comprises a box-like structure having upper and lower webs **235** and **236**, a rear web **237**, a front web **238**, numerous inside webs generally designated **239**, door end post lugs **240** and wing projections **241**, the latter being adapted to receive the main, longitudinal sills **60** and furnish a rigid anchorage for the side girders to the end sill. The portions of the end sill which extend beyond the winged projections **241** constitute ledges **242**, upon which the main longitudinal sills **60** rest. The top flange of the upper side sill section **200** also rests on the ledge **242** and its web is riveted to the end faces **243** of the end sill. The intermediate section **201** of the side sill is also secured to the end sill casting, as best shown in Fig. 26. A plate **244** connects the top flange of the upper side sill section **200** with a horizontal flange of the lower angle **171** of the main longitudinal sill **60**.

It will be observed by referring to Fig. 27 that the channel **245** provided in the upper side sill section **200** is adapted to receive the ribs **61** and permit them to be riveted to the side sill and the end casting.

The top and bottom webs **235** and **236** extend rearwardly with the winged projections **241** to furnish gusset reinforcements for the latter. The ledge **242** is in reality a continuation of the lower web **236** and the box-like structure beneath the ledge **242** is heavily reinforced with transverse webs **246** to furnish a solid construction at the point where the side girder ties in with the end sill. The small downward projections indicated at **247** at the ends of the end sill are used for jacking pads.

The rear central portion of the end sill is stepped, as indicated at **248** to receive the vestibule connection which provides a protected passageway between the first and second sections of the articulated car. A female body center plate **249** is secured to the underside end sill casting and is adapted to seat within a truck center plate **250** carried on the truck bolster, not shown, of the articulated truck **56**. A male center plate **251** secured to the adjacent car section fits within the female center plate **249** in much the same manner as shown in the British patent to Gresley 4,512 of 1907.

The front traction motor **54** of the articulated truck **56** is cooled by air drawn through a bellows connection **252** which communicates by a passage **253** with the interior of the car. The opening of this passage into the car interior is indicated at **254** (Fig. 26).

The arms **255** projecting rearwardly from the end sill casting are used for resiliently tying the end sill to the truck bolster in order to yieldingly support the car in true horizontal position. The form of this stabilizer constitutes no part of this invention, and further description is deemed unnecessary.

Referring now to Fig. 4, there is shown a detail of the side girder just in front of the first articulated truck **56**. The spacer casting **256** connects and properly spaces the main longitudinal girder **60** with the side sill structure **59** and has an upward extension **257** reinforced by gusset **258** for giving lateral support to the main longitudinal sill at the higher level.

A curved plate **259** reinforced by opposed angles **260** and **261** extends from the cross brace **72e** to a transverse floor support beam **262**, and being secured at intermediate points to the cross brace **72f** and another floor support **263**. The plate in intended primarily for providing a suitable fastening surface for the bottom sheathing, and in this respect corresponds with the similar plate **183** at the forward end of the car.

A pair of diagonal braces **264** are secured to the main longitudinal sills **60** just in the rear of the floor support **263** and converge rearwardly to the end sill **73** where they are secured by suitable fastening means, as shown in Fig. 29. The floor support **262** strengthens the diagonal braces **264** between their ends in addition to furnishing an anchorage for the sheathing plate **259** and angles **260**.

The rear portion of the car houses the oil coolers, generally designated **266** (Fig. 28) fuel tank **267**, water tank **268**, air tanks **269** (one on each side of the passageway), battery boxes **270**, which are also arranged one on each side of the passageway.

The floor of the passageway is indicated at **271** and rests upon the floor supports **262** and **263**. There is a slight step down from the floor **271** to the floor **186** in the intermediate portion of the car.

Relatively large channel bars **280** are used for the door end posts and they frame into the upstanding lugs **240** which are integral with the end sill casting **73**.

At the top, the door end posts are joined by an anti-telescoping plate **75** and the ends of the top sills **135** and **136** rest on the plate **75** and are securely anchored to the door end posts by brackets **76** and **77**.

The top girder tapers downwardly in the rear of the exhaust well **138** and this portion of the girder has top and bottom plates **284** and **281**, respectively. The ribs are in effect carried from side sill to side sill by providing spacers **282** (Fig. 30) between the top sills **135** and **136** at intervals corresponding to the spacing of the ribs.

Engine mounting

The engine, generator and sub-base weigh approximately 40,000 pounds, so the importance of keeping its center of gravity low and of providing suitable supporting means for the engine and generator is obvious.

By using framework of the type that has been described, it is possible to provide an engine well **78** in the mid-portion of the car without interrupting the continuity of the principal longitudinal framing members. Furthermore, it is possible to mount the engine with a three-point suspension which is very desirable from the standpoint of reducing vibration.

The generator **53** which is constructed as an integral part of the engine generator set, is provided with a plurality of lugs **295** adapted to interfit with the front engine brackets **78** and be secured in place by heavy high-grade steel pins **296**. The engine bracket **78** is best shown in Fig. 5, and comprises horizontal and vertical portions adapted to engage the top and horizontal webs of the main longitudinal sill, respectively, vertical gussets **297** for strengthening the supporting means and longitudinally inclined gussets **298** for resisting longitudinal forces caused by collision, sudden stoppage, etc. The bracket is securely riveted to the longitudinal sill **60** and is made of sufficient size to resist all stresses to which it is subjected.

The rear engine brackets **80** are substantially the same as the front engine brackets **78** and

between them is suspended a cradle 81 adapted to support the rear end of the engine, the latter being provided with a boss 299 in which studs 300 are screwed for fastening the engine to the cradle (see Fig. 25).

After the engine has been mounted in place, the bottom closure pan 82 (Fig. 3) is lifted to its place and bolted to the side girders. The pan consists of a plurality of arcuate cross pieces 301 having their ends connected with Z-bars 302 and their intermediate portions connected by a plate 303 which in effect is a continuation of the sheathing plates 183 and 259. The Z-bars 302 are adapted to engage the lower angles 171 and be bolted thereto by bolts 208 (Fig. 25). The top flanges 304 of the two end members 301 are adapted to engage the inwardly extending lugs 224 and 225 of the cross braces 72*d* and 72*e* and be secured thereto by bolts 305 (Fig. 18).

In addition to serving its normal function of closing the bottom of the engine well, and providing a smooth streamline finish beneath the car, it also serves as a stress member in resisting rotation of the side girders. By referring to Fig. 25, it is apparent that the weight of the engine is tending to rotate the left side girder clockwise, and the right side girder counterclockwise, and the pan 82 acts as a tension member in resisting this tendency for the side girders to rotate.

The plate 207 which completes the streamline form of the car belly and screens the bolts 208 from view is preferably secured in place by screws 306 in order that it may be easily removed whenever it is desirable to remove the engine.

As many as possible of the framing members are made of extruded aluminum in order to conserve weight, although where exceptional strength is necessary, steel members or steel castings are employed. Preferably, the castings are formed with enlargements wherever they are to be riveted to some other member. For example, the door end post 240 has a plurality of ribs 307 through which the lines of rivets are passed. By providing these ribs, it is unnecessary to machine the casting except at the contacting surface, thus leaving the remainder of the casting with the tough skin which forms during the casting process. The strength of the casting in this way is not impaired by the machining process.

A modified form of apron or windbreaker is shown in Figs. 32–36. In this form, the apron instead of being vertical inclines forwardly and sidewardly and has the advantage of clearing the track somewhat more effectively.

The apron comprises a metal sheet 315 secured to the nose castings by an angle 316 and reinforced at the bottom and at an intermediate height by angles 317 and 318, respectively. Extending rearwardly from the peak of the apron are two relatively heavy tubular members 319 which have their forward ends secured to the angle 317 and their rear ends securely anchored to the front nose castings 320.

This latter casting is somewhat different from the one previously described in that it is adapted to support a horizontally pivoted coupler bar 321 which when in its inoperative position rests on a stop 322 completely enclosed within the apron 315. The pivot pin is indicated at 326. The front of the apron is provided with a removable plate 323 which wnen removed permits the coupler bar to be raised to the position shown in dotted lines in which position, it is supported by a bar 324 detachably secured to arms 325 which are integral with the front nose casting 320. The casting 320, as before, is provided with the necessary flanges and attaching surfaces for attachment to the intermediate nose castings, the ridge beam, the buff sills, the diagonal braces, etc. (see Fig. 36). The bar 324 is also adapted to hold the coupler bar in inoperative position.

We claim:

1. In a railway car of the class described, main longitudinal framing including a side sill and a girder adjacent thereto at each side of the car, an end sill, wing projections and ledges rigid with the outer ends of said sill, said wing projections receiving the ends of said girder and secured thereto, and said side sills resting on said ledges, and diagonal rigid brace members between said girders and the central portion of said end sill.

2. In a car, a side girder at each side of the car, a plurality of motor supporting members, each member comprising a cradle having upwardly and outwardly extending arms, brackets secured to the upper inner corners of said girders and extending upwardly and inwardly therefrom, means for pivotally connecting said arms to said brackets, a motor seated in said cradles, and a plurality of tension members for connecting the lower portions of said girders together.

3. In a railway car, main longitudinal framing including a side frame member and a girder member at each side of the car, a substantially rectangular casing member between and rigidly secured to said girder members. a spacer block member between said girder and side frame members at each side of said car, the upper surfaces of said members being in the same horizontal plane, and a floor supported on said members.

4. In a railway car of the class described, main longitudinal framing including a side sill and a girder adjacent thereto at each side of the car, an end sill, wing projections and ledges rigid with the outer ends of said end sill, said wing projections receiving the rear ends of said girders and secured thereto, and said side sills resting on said ledges, diagonal rigid brace members between said girders and the central portion of said end sill, nose castings rigidly secured to the forward ends of said side sill and girder at their forward ends at each side of the car, forward end sill members rigidly secured to said castings, said framing being free of longitudinal members paralleling said girders between said end sill and said forward end sill members, motor supporting brackets secured to and extending upwardly from the inner upper edges of intermediate portions of said girders, tie members connecting the lower inner edges of said girders, a motor supported from said brackets, a curved forward nose casting having its rear ends rigidly connected to said first named nose castings, and buff sills and brace members between said forward nose casting and said forward end sills whereby buffing forces applied to said forward nose casting will be transferred to said first named end sill through said side sills and girders.

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