

Nov. 3, 1942.

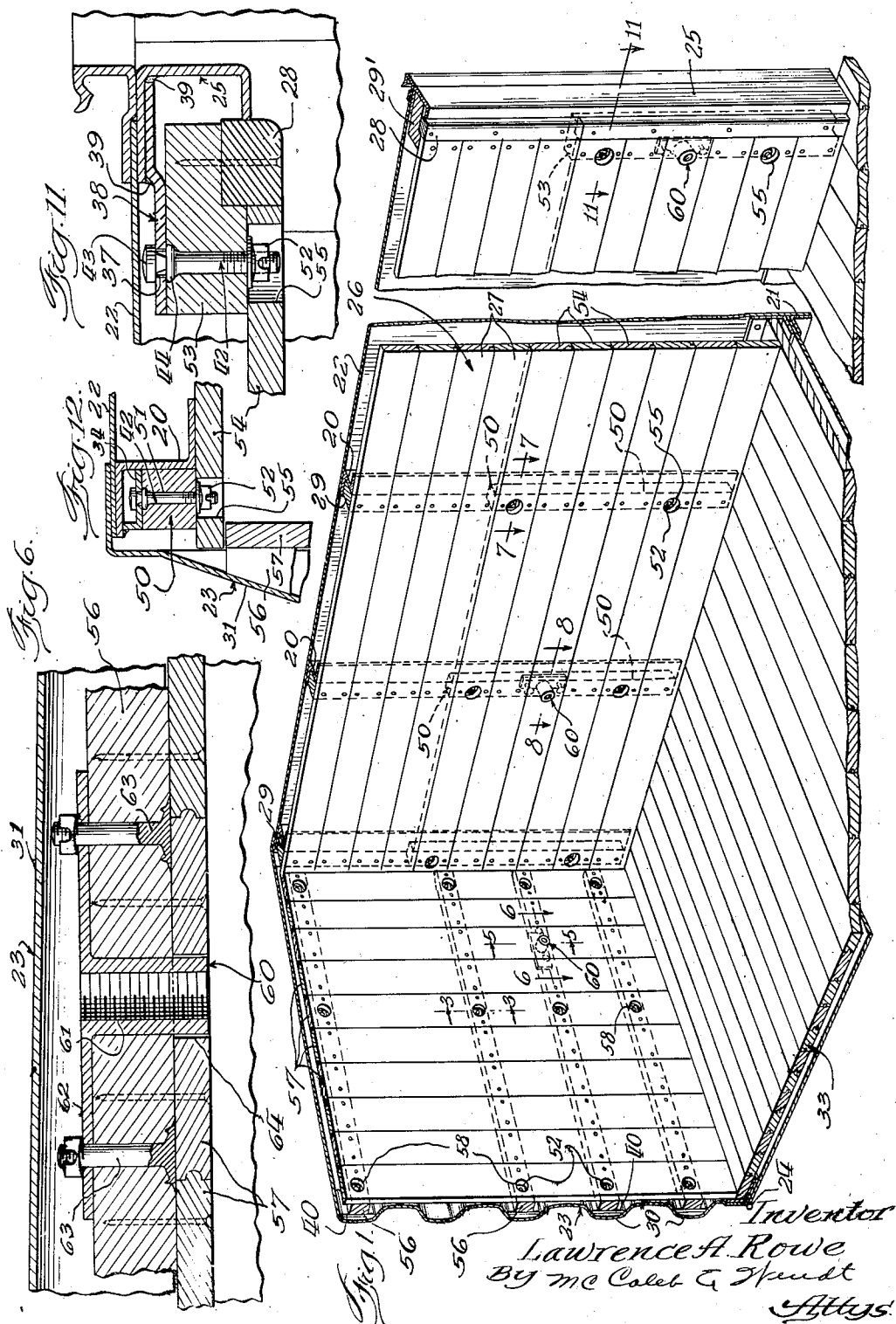
L. A. ROWE

2,300,449

REMOVABLE LINING FOR BOX CARS

Filed Sept. 28, 1940

3 Sheets-Sheet 1



Nov. 3, 1942.

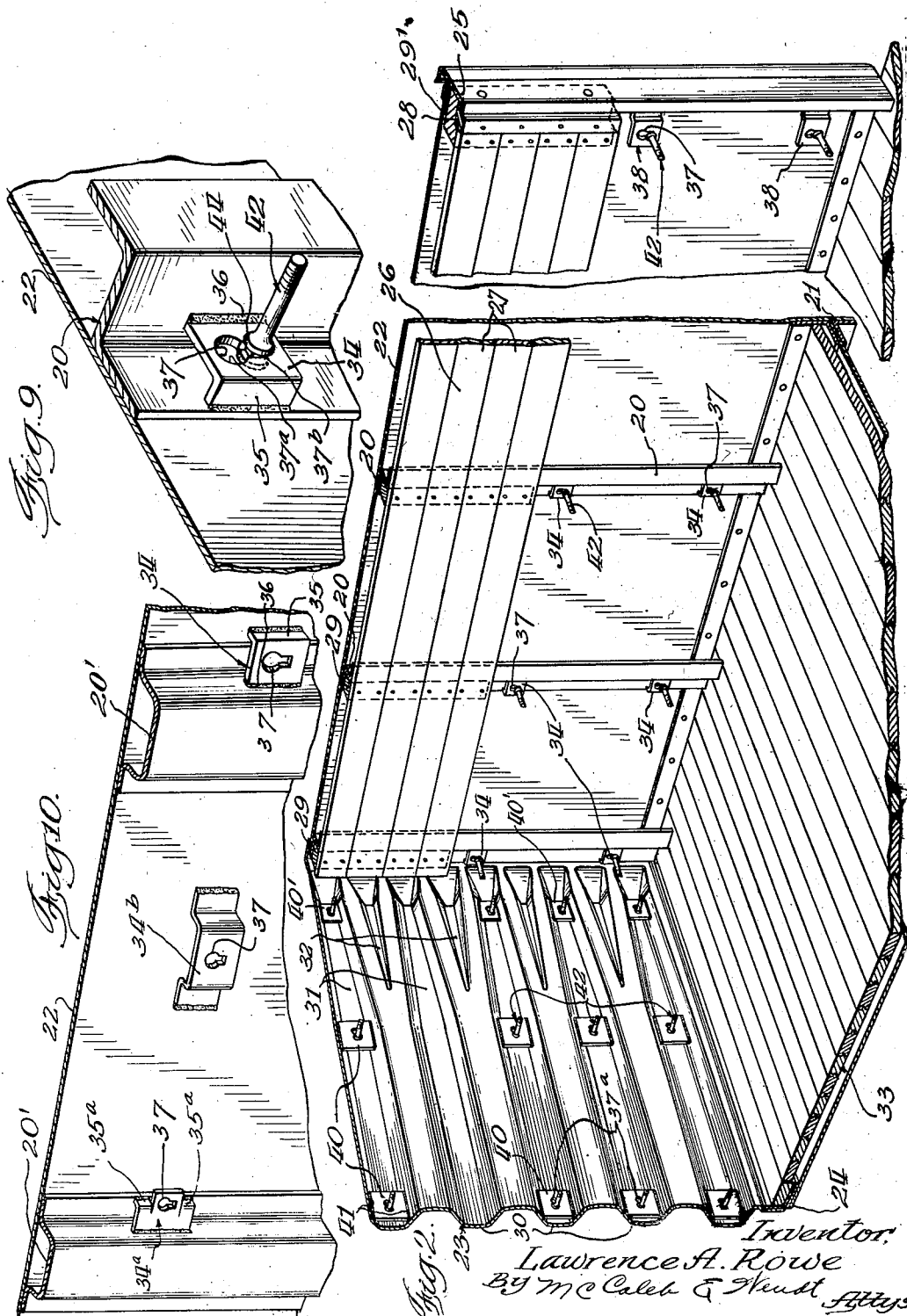
L. A. ROWE

2,300,449

REMOVABLE LINING FOR BOX CARS

Filed Sept. 28, 1940

3 Sheets-Sheet 2



Inventor,
Lawrence A. Rowe
By McCaleb & Hunt Attorneys

Nov. 3, 1942.

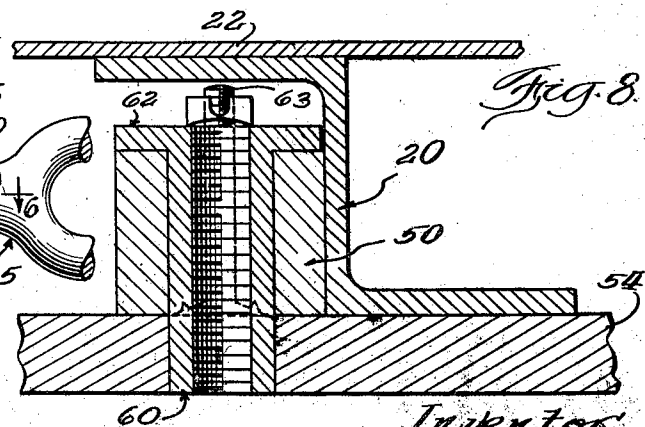
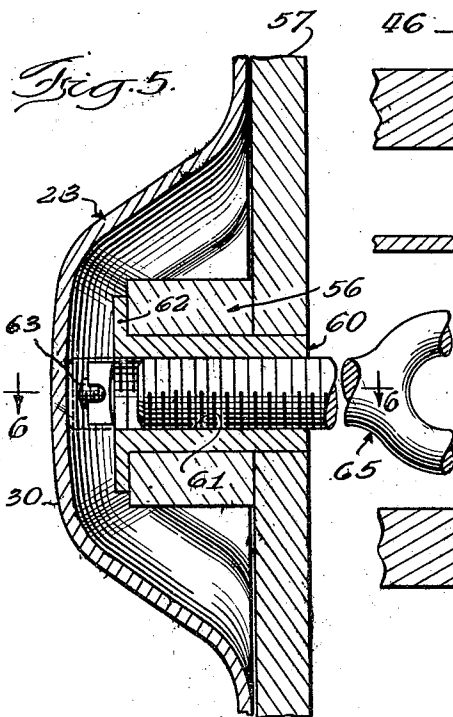
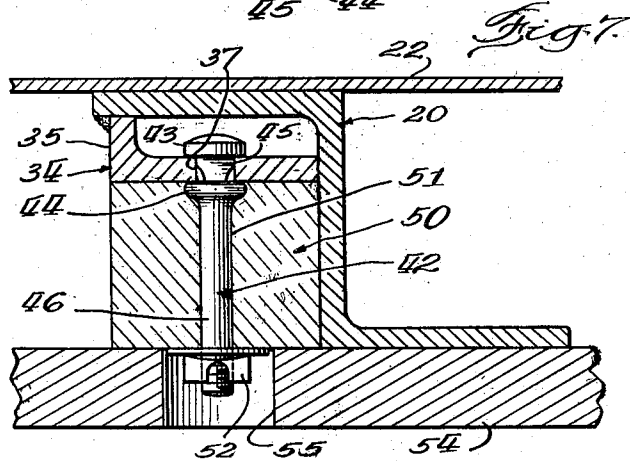
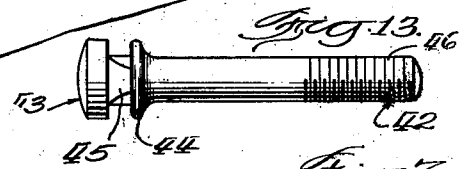
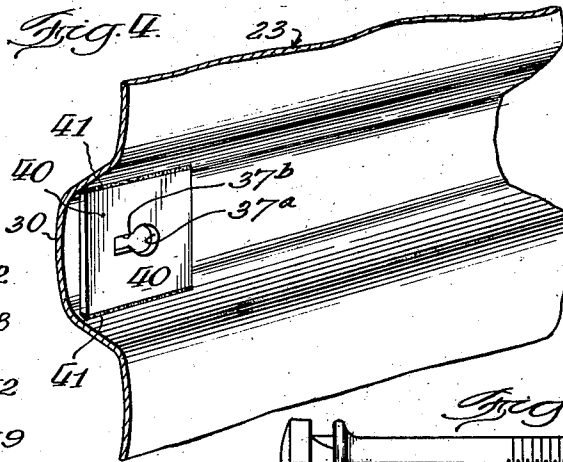
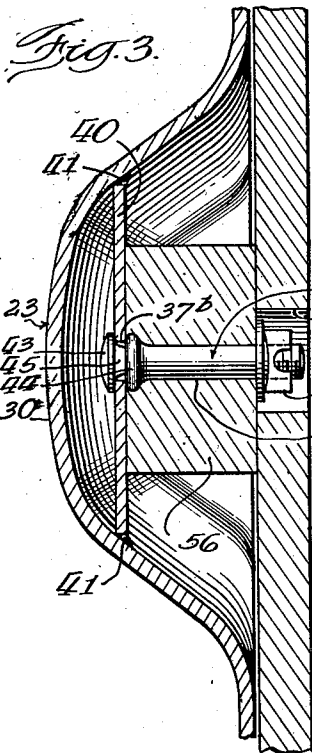
L. A. ROWE

2,300,449

REMOVABLE LINING FOR BOX CARS

Filed Sept. 28, 1940

3 Sheets-Sheet 3



Inventor
Lawrence A. Rowe
By McCall & Hunt Attys

UNITED STATES PATENT OFFICE

2,300,449

REMOVABLE LINING FOR BOXCARS

Lawrence A. Rowe, Oak Park, Ill., assignor to
MacLean-Fogg Lock Nut Company, Chicago,
Ill., a corporation of Illinois

Application September 28, 1940, Serial No. 358,765

13 Claims. (Cl. 105—423)

My invention relates to removable lining for box cars.

The inability readily to remove and replace the linings of box cars has resulted in considerable losses in railroad freight operations and in the maintenance of rolling stock. When grain, flour, cement, sawdust, fertilizer, lime, brick, peat moss, and the like are shipped in box cars, the fine particles or dust content of the material will be set in circulation in the air within the car through agitation in loading or unloading, and by agitation due to the frequent jars and impacts suffered by box cars. This is especially true in the case of bulk shipments, but it applies to many packaged shipments as well, either because the packages are not airtight, as in the instance of flour barrels and cement sacks, or because, whether airtight or not, some packages have broken open. A greater or less amount of such dust and fine particles—depending upon the nature of the material and how it is packaged, if at all—will get into the space between the lining and the wall or sheathing of the car. Even though the interior of the car is brushed down and the floor swept out after such shipments, the material behind the lining continues to accumulate.

In the instance of grain or other farinaceous material, such dust settlements are favorable breeding places for weevils, and the detection of any weevil justifies a flour shipper, for example, in rejecting an empty box car and puts the railroad to considerable expense in locating and switching a substitute weevil-free car. Any accumulation of food dust also offers a haven for insects and rodents. If dust accumulations be of a decomposable nature, the odor of its subsequent decomposition may render the car unfit for many purposes. Somewhat similarly, many kinds of dust accumulations will absorb odors of previous shipments and render the car unfit for shipments of many food products susceptible of odor contamination.

Another difficulty resulting from long continued accumulation of deposits is the weight of the accumulation behind the lining which often reaches 300 or 400 pounds. Since the load in many cars is determined by weighing the loaded car and deducting the tare or "lightweight" of the car as stenciled on its exterior, the shipper often actually receives 300 or 400 pounds less material than he pays for.

Still another and very important objection to the accumulation of material behind the lining is that, whether or not the substance is per se

absorbent, in granular form, it will retain moisture. Lying up against the exposed structural metal or metal sheathing of the car, the moisture-laden material will considerably hasten the rusting from within, with attendant premature expense of repairing or rebuilding the car. This is especially serious when the car has been carrying salt shipments. Also, the difficulty in fully removing the lining discourages keeping the inner surfaces of the metal parts of the car well painted to resist corrosion.

The principal object of my invention, therefore, is to provide ready removability for the lining so that the lining can be removed and the accumulated material completely cleaned out at sufficiently low cost to promote regular and frequent cleaning behind linings. It is not sufficient to provide access merely near the floor, because with the horizontally corrugated sheet metal end walls now customarily employed in box cars, the horizontal corrugations and the horizontal furring strips to which the linings are nailed afford so many horizontal shelves on which dust settles. Even the practice of ripping an occasional lining plank from its furring strips to blow compressed air behind the lining, even though setting much of the dust again in agitation, does not effectively remove the dust accumulations. Another advantage of readily and completely removing the lining is that a suction cleaner may be used for removing the dust deposits, as distinguished from using compressed air which again sets the dust in circulation throughout the car.

As subordinate objects, my invention achieves a number of desirable features in connection with the removability. Among these features are:

My removable mounting of the lining is applicable to both new and existing box cars of usual and standard construction. That is, it does not require the partial rebuilding of the box car to adapt it to the removable lining mounting, nor does it require any change in the present design of box car construction.

The lining boards, together with the furring strips to which they are nailed, are removed as a unit. There is no removal of individual lining boards, no nail pulling or renailing, and no destroying or injuring of any lining board. Even when a lining panel is removed, the furring strips are close to the ends of the boards so that free or unanchored ends of the boards are avoided in the removed panel.

No holes are required through the outer sheathing of the car, and consequently the mounting of the lining does not give rise to any ingress of

rain, as is often the case with mounting bolts which pass through holes in the sheathing and which, although initially watertight, eventually rust and leak.

The removal and replacement of the lining may be done by one workman working wholly within the car and without the necessity of holding or turning a wrench on the exterior. An incidental advantage to this feature is that the cleaning of cars behind linings may be accomplished in transit while they are being "dead headed" back to the shipping point.

Although a number of bolts are employed for anchoring each lining panel to the car, it is not necessary to remove and replace the bolts or even to handle them, thus saving considerable time on the part of the workman.

On the other hand, if, for any reason, the anchor bolts become bent in the course of removing or replacing the lining, they can readily be removed and replaced with new bolts by a simple dislodging or lodging hammer blow and without the necessity of any chiseling, riveting or welding.

The parts employed in my removable mounting are in the nature of a number of relatively small pieces—bolts, nuts, small plates, and the like, so that it is feasible to package all of the hardware needed for removably mounting the lining in a given standard design of box car in a small carton or package easily handled by railroad supply departments.

The wood used for the lining—the lining planks and the furring strips—may be either the same as, or have but very slight changes over, the various wooden pieces now employed in standard linings. This permits the use of the same stock lumber pieces for my removable lining that are used in the present more or less permanent linings. I contemplate, however, that composition or multi-ply sheets of suitable rectangular shape may be used in lieu of the plank boards, for the lining.

No structure of the mounting means protrudes beyond the face surface of the lining, and but little metal employed in the lining mounting is exposed.

Provision is made for readily getting an anchorage on the lining panel for pulling it out of place, or, if necessary, for positively jacking it out of place, all without the use of any elaborate equipment or special tools.

In my removable lining, the furring strips are, in general, held a spaced distance from the outside metal sheathing and also from those portions of the frame posts which lie against the sheathing so that air is free to circulate between the wood and those metal portions which are directly exposed to the outside temperature to the sheathing. In this way moisture condensing on the inside of the sheathing is kept out of contact with the wood and soon evaporated by circulation of the air. In the present usual lining, the wood furring strips and other wood parts frequently lie against the inside surface of the metal sheathing or against post flanges in surface contact with the sheathing, so that moisture is retained by the wood in contact with the metal and results in early corrosion of the metal and rotting of the wood.

In general, my lining, although readily removable, involves but a minimum of structural change over the present practice, and adapts itself to the present car construction without any change, and the hardware employed to effect my removable mounting is simple, inexpensive, and of small

pieces readily installed. Above all, my removable lining meets all of the requirements for practical railway use.

The foregoing, together with further objects, features and advantages of my invention, are set forth in the following description of specific embodiments thereof and are illustrated in the accompanying drawings wherein:

Fig. 1 is a perspective view of an inside bottom corner of a standard steel framed and steel sheathed box car embodying my removable lining, the corner illustrated being formed by a vertical cut along the longitudinal center line of the car and by a horizontal cut about five feet above the floor;

Fig. 2 is a similar view, but with the lining removed;

Fig. 3 is a detailed vertical section through one of the corrugations in the car end, taken at the region of a mounting bolt on the line 3—3 of Fig. 1;

Fig. 4 is a view similar to Fig. 3, but thrown into perspective and before application of the bolt, furring strip and lining;

Fig. 5 is a view similar to Fig. 3, but taken at the region of a pull-out socket along the line 5—5 of Fig. 1;

Fig. 6 is a fragmentary plan section taken on the lines 6—6 of Figs. 1 and 5;

Fig. 7 is a fragmentary plan section taken on the line 7—7 of Fig. 1 on the side of the car at the region of a mounting bolt;

Fig. 8 is a section similar to Fig. 7, but taken at the region of a pull-out socket along the line 8—8 of Fig. 1;

Fig. 9 is a perspective view of the parts illustrated in Fig. 7, but with the lining and furring strip removed;

Fig. 10 is a fragmentary perspective section of the side of the car illustrating modified forms of mountings for the mounting bolts;

Fig. 11 is a plan section through the door post at the region of an anchoring bolt, taken on the line 11—11 of Fig. 1;

Fig. 12 is a detailed plan section through the corner of the car showing the same corner parts as are shown in sectional perspective in Fig. 1; and

Fig. 13 is an elevation of one of the mounting bolts.

Referring to Figs. 1 and 2 and especially to Fig. 2, a box car of standard steel frame and sheathing construction is illustrated. The side wall is framed by spaced side posts 20, which extend vertically from the side sill 21 to the side plate at the top of the wall. The side posts are shown as of Z-shaped cross-section (save in the modification of Fig. 10). The steel sheathing 22 lies against, and is secured to, the outer flanges of the side posts. The car has a virtually one-piece horizontally corrugated sheet metal end 23 secured at its lower edge to the end sill 24 and at its upper edge to the end plate. Its lateral edges are flanged to embrace the ends of the sheathing and are secured to the corner side post. The side door opening is laterally defined by a door post 25 of channel-shaped cross-section, which also serves as one of the side posts in framing the car.

As indicated by a comparison of Figs. 1 and 2, only the lower three feet or so of the side lining is shown as removable, although I contemplate that the entire side may be removably mounted if desired in certain cases. It will be understood that the fixed panel 26 of the lining extends to

the full height of the lining, which is generally to the full height of the wall. In the fixed portion 26 of the side lining, the lining boards 27 extend horizontally from the end to the door post nosing 28 and are nailed to fixed furring strips 29 bolted to the webs of the Z-posts 20 and at one end nailed to the fixed furring strip 29' bolted to the web of the channel-shaped door post 25. The reason it is ordinarily not necessary to make more than the lower three feet or so of the side lining removable is that the exposure of the lower three feet of the wall is sufficient to remove all accumulations and there are no shelf-like surfaces thereabove in the side lining on which dust can accumulate. Therefore, it is easily cleaned out by a compressed air or suction nozzle.

The steel end 23 illustrated is the usual specific form of horizontally corrugated end. It has vertically spaced outwardly pressed corrugations 30 extending across the entire width of the end but tapering, as indicated at 31, as they approach the side walls. These long corrugations 30 are alternated with short corrugations 32 extending inwardly from the lateral margins of the end. It will be understood that the tapers 31 in which the long corrugations 30 terminate are tapers both in the vertical height of the corrugations and in the depth of the corrugations.

The usual wood floor 33 is shown.

The box car construction and the fixed lining construction, in so far as described above, are of the usual standard design.

For a clearer disclosure of my removable lining and its mounting, I shall describe it in the sequence of its installation. Collar bolt brackets 34 are mounted on the side posts 20, as shown in Fig. 2. Fig. 9 is a detail showing one of the brackets 34 and the manner of its mounting. The bracket is a small rectangular plate having an offset lateral flange 35. One edge of the bracket is welded, as at 36, to the web of the Z-shaped side post. The edge of the offset flange is welded to the outer flange of the Z-shaped side post. In this way the plate of the bracket lies parallel with the side wall, and more specifically parallel with the outer flange of the post, but a spaced distance inwardly therefrom as determined by the offset flange. The function of the offset is to preserve enough space between the bracket and the outer flange of the side post to give ample clearance for the head of the mounting bolt. The bracket 34 is perforated by a keyhole-shaped slot 37.

In the instance of the door post, as is indicated in the lower right-hand corner of Fig. 2 and shown in greater detail in Fig. 11, I prefer to use a modified bracket 33. It is a plate of the same height but longer and welded, as indicated at 39, to the inside surface of the outer flange of the channel-shaped door post 25. The bracket 38 is likewise perforated by a keyhole-shaped slot 37. If the outer flange of the door post 25 is not thick enough to give the required clearance for the head of the bolt to be mounted in the bracket, the bracket may be slightly offset, as shown in Fig. 11.

Because there are no vertical framing posts for the car end 23, the collar bolt brackets to be mounted at the end are arranged and secured somewhat differently. Thus, the collar bolt brackets 40 for the end, as illustrated in Fig. 2, are simple rectangular plates perforated by keyhole-shaped slots. They are of such a height that when they are set into the corrugations par-

allel with the plane of the end, their top and bottom edges will contact the converging upper and lower walls of the corrugations 30 at a region where the brackets are spaced somewhat inwardly of the bottoms or valleys of the corrugations. This is best shown in Figs. 3 and 4. The brackets are mounted in place by welding 41 along their upper and lower edges. The brackets 40 and their mountings, although very simple, serve securely to anchor the brackets fixedly upon the car end 23 and to preserve an ample space behind the brackets for accommodating the heads of the collar bolts. As will be seen from Fig. 2, the brackets near the ends of the corrugations, that is, near the corner of the car, are of lesser height with their upper and lower edges in slightly converging relation, to accommodate the narrowing or tapering of the corrugations.

The welding of the collar bolt brackets 34 and 40 to the interior of the car is the only structural change or addition required in the car for my removable lining. They are easily permanently installed. Their addition is in the nature of a superficial but permanent application of some pieces of hardware.

One of the collar bolts 42 is shown in detail in Fig. 13. The collar bolt 42 comprises: a head 43; an annular collar 44 axially spaced therefrom by a distance equal to the thickness of the plate stock of the bracket; a squared neck 45 between the head and collar; and a shank 46 threaded inwardly from the opposite end.

Each keyhole-shaped slot 37 in the collar bolt brackets has a head or circular opening 37a a little larger in diameter than the diameter of the head of the bolt, so that the head of the bolt may be passed therethrough, and a depending slot 37b, the width of which is the same as the inter-face diameter of the squared neck of the bolt. Thus, to anchor a collar bolt 42 in one of the brackets, the head of the bolt is passed through the keyhole and then the bolt is laterally tapped with a hammer near its collar to drive the neck into the slot 37b, with which it makes a driving fit. At the same time the opposed faces of the head and collar make a binding fit with the surfaces of the plate adjoining the slot whereby rigidly to anchor the bolt in true normal to the plane of the bracket.

The squared neck precludes turning of the bolt. Thus, all of the bolts are so anchored that they extend horizontally inwardly at right angles to the side wall or end, as the case may be, as shown in Fig. 2. Fig. 2 also shows how the interior of the car appears when the removable portion of the lining has been removed.

After the collar bolt brackets have been installed in the car and after the collar bolts have been anchored in their brackets, the furring strips for the removable portions of the lining are next installed. For the removable side lining vertical furring strips 50 are employed. They lie along the side posts 20, extending from the floor up to the bottom edges of the fixed side lining 26. The fixed furring strips 29 of the latter do not extend below the lining boards for the fixed portion 26, and the removable furring strips 50 are placed beneath the fixed furring strips 29. The vertical furring strips 50 have predrilled holes 51 spaced in accordance with the spacing of the collar bolt brackets 40 which, as shown, means one bolt hole near each end. The furring strips are applied so that the bolts extend through the holes, and then the bolts are clamped against the brackets 34 by nuts 52. The outer faces of the

furring strips 50 lie against the faces of the brackets 34, and thereby are spaced a considerable distance from the outer flanges of the Z-shaped side posts 20 and from the sheathing 22. In this way air circulation is permitted between the wooden furring strips and the metal outside wall of the car, so that condensation will not be retained by contact of the wood with the resulting rusting or rotting.

In the instance of the door post, the associated furring strip 53 is preferably somewhat wider so that its width may include the nosing strip 28 partially recessed into and nailed to the furring strip. The width of the furring strip, however, is preferably not such as to overlies the inner or short leg of the channel-shaped door post 25.

After the vertical furring strips for the removable portion of the side lining have been bolted in place, the several tongued and grooved lining boards 54 are nailed to the furring strips. The boards extend from the car end to the nosing 28. Holes 55 are provided in those of the lining boards 54 which pass the bolts 42, whereby to receive the nuts 52 and provide access thereto by a socket wrench.

The furring strips 56 for the end lining lie and are placed within certain—but usually not all—of the long corrugations 30 in the car end. The furring strips are tapered toward their ends in the usual manner to accommodate the taper of the corrugations. The end furring strips 56 are provided with horizontal holes 59 spaced as required to receive the collar bolts 42 anchored in the end brackets 40.

An end furring strip 56 is mounted by holding it horizontally crosswise of the car at the elevation of the corrugations which are to receive it. Then the furring strip is moved horizontally toward the end of the car until the bolts 42 enter and pass through the holes 59. Then the nuts 52 are applied to clamp the furring strip firmly in place.

After the end furring strips are bolted in place, the end lining boards 57 are nailed thereto. The end lining boards extend vertically from floor to top and in practice are also tongued and grooved. Some of the end lining boards are provided with holes 58 where they pass the bolts, for reception and exposure of the nuts 52.

If the location of the plates 40 is maintained within rather accurate limits by the use of a simple jig, the furring strips may be entirely prepared at a wood working shop, with the bolt holes properly located therein. In fact, a certain number of the lining boards may have the nut holes preformed therein also. This is particularly feasible because about one out of every four lining boards will have several holes in it, whereas the other lining boards will have none.

It will be noted from Figs. 1 and 12 that at each corner of the car, where the lateral margin of the end lining juxtaposes the end margin of the side lining, the end lining overlies both the fixed and removable portions of the side lining. This is an important detail. Because the end lining does not necessarily extend all of the way to the top and may not reach any abutment at the top preventing its moving upwardly, it is not entirely safe to arrange the keyholes 37 in the end brackets 40 with their slots depending from their heads, as is done in the instance of the side brackets 34. Otherwise, it might happen that the entire end lining would be subjected to a strong upward push, which would dislocate the bolts from their anchorages in the brackets. To avoid this possibility, I arrange the keyholes in the end

brackets 40 to lie with their slots horizontally—some to the right and some to the left. This precludes dislodging the bolts from their anchorages by an upward movement of the entire end lining. On the other hand, there is no possibility of the bolts becoming dislodged from their keyhole anchorages in the end brackets 40 by a lateral shifting of the end lining—that is, by a shifting sideways of the car—because the lateral edges of the end lining lie against the end margins of the side linings with such a tight fit as to preclude any substantial lateral shifting.

In the instance of the side brackets 34, on the other hand, the keyholes may be arranged with their slots depending vertically, because upward vertical shifting of the removable portion of the lining is precluded by its upper edge abutting the lower edge of the fixed portion 26. Or, such bodily shifting of the panel may be avoided by arranging the slots associated with that panel in various directions.

Another advantage for the lining overlapping arrangement at the car corners is that it makes it conveniently possible to mount only the lower part of the side lining removably and leave the upper part fixed. This could not very well be done if the overlapping arrangement were the reverse of that shown, because then all of the side lining would have to be removed for the end lining to be pulled out.

I optionally, but preferably, provide a pull-out anchorage whereby a convenient grasp may be obtained upon a removable lining section to pull it inwardly from the wall so that it can be removed far enough for cleaning. My preferred form of pull-out anchor 60 is shown incorporated in the removable lining sections. The general locations are indicated in Fig. 1. One is placed near each end of the removable side lining at a midpoint of its height. In the end lining one pull-out anchor is provided near each corner of the entire end lining. The detail of the pull-out anchor and its application to the end lining is shown in the vertical and plan sections of Figs. 5 and 6. It comprises a threaded socket 61 formed by a tubular extension of a back plate casting 62, which lies along the back side of an end furring strip and is secured thereto by bolts 63. The threaded socket 61 preferably is opened through the back of the casting. The tubular socket 61 is somewhat longer than the thickness of the furring strip, so that it may pass through a hole 64 in the lining board to expose the socket 61 to the interior of the car without protruding beyond the face of the lining. It will be understood that if the pull-out anchors are to be included, they are bolted to their furring strips before the furring strips are mounted. The pull-out anchors are placed intermediate the holes for the mounting bolts 42 so that the back plates 62 and the nuts for their attaching bolts 63, which protrude behind the furring strips, are well away from the regions of the brackets 34 and 40 which lie directly against the back faces of the furring strips.

The operation of removing the lining is as follows: All of the nuts 52 are removed from the end lining. Then the end lining—the vertical lining boards together with the furring strips to which they are nailed—are pulled inwardly away from the car end, together with a swinging movement about one of the lateral edges, so that the end lining, although still vertical, occupies an oblique position. The removed end lining may

be taken out of the car or, more conveniently, temporarily leaned against some other wall.

If the pull-out anchors 60 are provided, this operation is greatly simplified. An eye bolt 65 is screwed into each of the four pull-out anchors 60 in the end lining. Rope ends are tied in the eyes. By pulling on the ropes a workman may exert considerable direct force in pulling in the lining. By pulling only ropes leading to one lateral edge, the oblique swinging of the end is easily accomplished. By pulling on all four ropes, the end lining may be pulled inwardly but still kept parallel with the car end. Or, by pulling ropes leading only to the bottom anchors, or only to the top anchors, the lining may be tilted forwardly or rearwardly as desired or required for any particular maneuvering.

In the event there should be an unusual binding or resistance to pulling in the lining, some or all of the eye bolts may be threaded through the anchor until the eye bolt protrudes far enough beyond the back of the anchor to contact the car end itself, as indicated by dotted lines in Fig. 5. In this way the eye bolt acts as a screw jack for positively forcing the lining away from the end of the car. A cross rod may be slipped through the eye for convenient leverage in turning an eye bolt.

After the end lining is removed, the bottom portion of the side lining is removed in a similar manner. The nosing strip 28 at the end of the removable section of the lining, together with the door post furring strip 53, comes out as an integral part of the removable lining. In case the pull-out anchors 60 are used, eye bolts are employed with them in a similar manner. In the event the eye bolts are used as screw jacks, they bear against the outer flanges of the side posts 29. Thus, there is no danger of bellying out the lighter sheathing by employing the eye bolts as screw jacks. Incidentally, in the instance of the pull-out anchors for the end linings, although the use of the eye bolts as screw jacks will come directly against the sheet metal of the car end 23, it is not apt to distort the sheet metal because it is rendered amply rigid by the corrugations therein.

It will be seen that when the linings are removed, they are in large panels in which the lining boards and their furring strips are permanently nailed in assembled relation, and the furring strips continue to act as stiffening reinforcements for the removable linings. The pull-out anchors 60, if employed, are removed as integral parts of the lining. The bolts are left anchored in their brackets on the car walls. Thus, in the removal of the linings, the only pieces to be handled are the large lining panels themselves and a pocket full of nuts 52 and their washers.

Not only are the car walls exposed down to the floor for the removal of any accumulated dust deposits, but the back sides of the linings are exposed where they too can be cleaned. The larger accumulations of dust may be swept or brushed out along the floor and any remaining deposits may be blown out with an air hose. Or a suction cleaner may be employed to avoid recirculating any dust. The air hose or suction cleaner may be run up behind the fixed portion of the side lining and be relied upon to remove any dust accumulations, since there are no shelf-like places upon which dust deposits could accumulate behind the fixed upper portion of the side lining. It will be understood, however, that

the upper portion of the side lining may be removable also by the same mounting means, either as a separate panel or as a high panel unitary with the lower portion. As shown, the removable portions of the car lining constitute six panels—two end panels and four side panels.

Not only are the car walls and the backs of the removable linings exposed for cleaning, but the inner surfaces of the car walls and their frames are fully exposed for convenient repainting of any areas that indicate the start of rusting. The removal of the lower portions of the side linings also makes it convenient at the same time to replace any floor boards, which is otherwise a difficult task because the ends of the floor boards extend beneath the lining.

If any fumigating of the car should be required, it can best be done while the linings are removed. Fumigation does not so effectively reach behind linings while they are in place.

Especially if the pull-out anchors are employed, the lining panels may be pulled away from their walls sufficient to clear the bolts before the panels are turned obliquely, and for this reason there is little chance of the bolts being bent. But if it is found that any bolts are bent, before putting the linings back, any such bolt can readily be replaced by dislodging it from the slot of its mounting bracket by a hammer blow near the collar, and a new bolt substituted.

In replacing the linings, the removable portion of the side lining is first brought into parallelism with the wall, and then moved outwardly against the wall with the protruding bolts 42 passing through their holes in the vertical furring strips, and then the nuts are applied to pull the lining back into place. After the side linings are in place, the end linings are similarly applied.

My construction of a removable mounting for the linings is so arranged that in the initial installation of the lining it is built up in place, and the lining more accurately fits its place and its mounting bolts than would be the case if the lining panel had to be preformed in its entirety and then mounted in the car for its initial installation. Thus, my furring strips are first separately mounted on their mounting bolts and clamped in position thereon by the nuts. Thus, the bolt holes in each furring strip are accurately aligned with the mounting bolts. Also, each furring strip is accurately spaced from all of the other furring strips as required for its particular mounting bolts. This takes care of any inaccuracies in the installation of the brackets 34 and 40, and also for any eccentricities in the spacing or off-vertical inclination of the side post in the construction of that side of that particular car. In the instance of the end, the horizontal furring strips are also individually mounted so that they come at the right position relative to the brackets and corrugations and are placed as required by my peculiarities thereof. It is only after these furring strips have been bolted in place that they are assembled into integral parts of the lining panel by the nailing thereto of the lining boards. Once the lining boards are nailed to the furring strips, the furring strips are thereafter permanently maintained in their original installed positions. As a consequence, the lining panels may repeatedly be removed and replaced, and still each time they are replaced their bolts will be positioned so that they easily fall into their bolt holes and the lining strips will always be so arranged that they

fit easily back into their original positions. It would be difficult to realize in practice such an easy refitting of linings if the furring strips and lining boards were prefabricated units installed in the car after prefabrication. Yet, in accordance with my invention, the individual pieces of wood—the planks and furring strips—may be prefabricated, leaving only the nailing, as the final step in assembling the panels, to be done on the job.

I have previously alluded, especially in connection with the side walls, to the feature that the wooden furring strips are spaced out of contact with the sheathing and those flanges of the side posts which lie directly against the sheathing, since the sheathing and those flanges are the places where condensation is most likely to occur. By keeping the furring strips spaced from those metal parts, the condensation is not absorbed by the wood and held in contact with the metal, so that the rusting of the metal is not hastened nor is the rotting of the wood encouraged. In the instance of the end linings, the furring strips are similarly spaced away from contact with the corrugated car end. As shown in Figs. 3 and 5, I prefer to make the furring strips of such thickness that their inner faces are one-sixteenth or one-eighth of an inch inwardly from the inner face of the corrugated car end. In this way I insure vertical air circulation between the lining planks and the car end as well as between the furring strips and the car end, so that a thin but definite path for vertical air circulation is insured. This vertical air circulation tends to keep the wood from rotting and also keeps the sheet metal of the car end from rusting. The unimpeded air circulation behind both the side and end linings is also valuable in discouraging many types of insect and bacterial life.

The usual practice in framing the sides of steel sheathed box cars is to employ side posts of Z-shaped cross-section, as shown in the figures heretofore discussed. It is a not infrequent practice, however, to use U-bars of channel shape with the legs of the channel turned outwardly to lie against the inside of the sheathing, as shown in the side posts 20' in the modification of Fig. 10. If the furring strips are to come at the side posts, as previously disclosed, the collar bolt brackets cannot be formed and mounted in quite the same manner as shown in Fig. 9, for example, because the outer flanges of the channel-shaped side posts 20' are not as wide as the outer flange of the Z-shape side post 20 of Fig. 9. At the right-hand end of Fig. 10, I have shown how the same bracket 34 may be installed. The left-hand end of the plate portion is welded in the same way, but the offset flange 35 is welded to the sheathing rather than to the flange of the post. It is not necessary that the offset flange 35 be any deeper. If the flange 35, even in the installation of Fig. 9, be a little deeper than actually required for clearance of the head of the bolt, the same bracket 34 may be used in installing my lining whether the side post be of the Z-shaped or channel-shaped type.

At the left-hand end of Fig. 10, I have indicated a modified form of bracket 34a in which the welded mounting may be entirely upon the post, which would have the advantage that the bracket would not be disturbed should one panel of the sheathing have to be replaced. In this form, the offset flange 35a is not vertically continuous, but rather in the form of backwardly

offset ears, which do not interfere with the proper positioning of the keyhole and still may be welded directly to the flange of the post.

In some designs of box cars, and especially where channel-shaped posts are employed, it is the practice, in installing fixed linings, to put the furring strips intermediate the side posts rather than at the side posts. In order to adapt my removable mounting to such linings without disturbing that practice, I have shown, in Fig. 10, a bracket 34b placed intermediate the posts and welded directly to the inside surface of the sheathing. In plan, this modified bracket 34b may preferably have a shape like the channel shape of the posts 20', except on a smaller scale and with the web of the channel but slightly offset from the sheathing, as required to give clearance for the bolt head. I might mention, however, that the placing of the furring strip intermediate the side posts is not the most desirable practice. One objection is that any impact of a sliding load against the lining is resisted by the middle of the sheathing panel instead of being resisted directly by the side posts. The practice of placing the furring strip intermediate the side posts in cars employing channel shaped posts has been the difficulty in bolting the furring strips to the channel shaped posts without adding the thickness of the furring strip to the thickness of the post, which would narrow the overall inside dimension of the lined car. By my invention, however, the furring strips can be mounted at the posts and within the thickness of the posts, and thereby the furring strips may be placed at the side posts where they properly belong.

The removable mounting of my lining does not involve any holes through the sheathing or car end, and consequently it does not give rise to any situation where, as a result of rusting of bolt heads or rivets or the loosening of nuts, any path is opened up for the ingress of rain. Also, because none of the attaching means extends through the car wall, all of the original installation, as well as subsequent removal and replacement of the lining, may be done wholly from within the car—even to the replacement of damaged bolts.

It is of considerable practical advantage that all of the hardware—that is, everything except the wooden boards and the furring strips—required for the installation of the lining in accordance with my invention are small pieces which readily lend themselves to being packaged in a small carton which is easily handled through supply departments and easily carried to the car for installation, and yet the hardware in that package will serve to install the lining in any usual standard box car. Also, from the standpoint of manufacture, there are only seven different kinds of pieces of hardware required: The plate brackets 40, the smaller plate brackets 40', the L-shaped brackets 34, the door post brackets 38, the bolts 42, the nuts 52, and their washers. They are all simple inexpensive parts. Even when the pull-out anchors are used, the pull-out anchor castings are relatively small so that they can likewise be packaged in the carton.

I claim:

1. In a box car having steel sheathed walls and wooden lining panels therefor consisting of furring strips set into the thickness of the wall and lining boards nailed to the strips, hardware for removably mounting the lining panels on the wall, which hardware consists of sets of horizon-

tally and vertically spaced individual small plate brackets rigidly welded to the walls and disposed parallel with their associated walls and in bolt head clearance relation thereto but positioned outwardly of the inner plane of their associated walls by substantially the thickness of the furring strips, keyholes through the brackets, a set of individual collar bolts wholly within the steel sheathing of the walls, each comprising a threaded shank, a head at one end, a collar axially spaced therefrom, and a flattened neck between the head and collar, one of the collar bolts being non-rotatably and rigidly but removably mounted in each bracket with its squared neck in the subslot of the keyhole and the faces of the head and collar firmly engaging the respective faces of the plate bracket whereby the bolts extend inwardly at normals to their respective anchoring walls for extending through holes in the furring strips, and inwardly exposed nuts on the ends of the bolts for clamping the furring strips.

2. The method of installing and subsequently removing and replacing wooden linings for steel walled box cars, which consists in rigidly welding small keyholed plate-like brackets, at vertically and horizontally spaced positions, on inside faces of the walls, but at regions thereof spaced about one to three inches outwardly of their inner planes and with bolt head clearance space behind the keyholes, removably mounting collar bolts in the respective brackets by passing their heads through the keyholes and driving the bolts transversely to seat their necks in the subslots of the keyholes and press the faces of their heads and collars against the respective faces of the brackets whereby non-rotatably and rigidly to mount the bolts with their threaded ends extending horizontally inwardly at normals to their supporting walls, drilling bolt holes through the strips at spacing conforming to spacing of the brackets, shifting the furring strips outwardly but parallel with their associated walls upon previously mounted of the bolts to cause the bolts to penetrate the bolt holes, threading nuts on the bolts to clamp the bolt-penetrated furring strips to the walls, nailing lining strips to previously mounted of the furring strips at right angles thereto and with the boards lying against the inner faces of the furring strips and inwardly of the said inner planes of the steel walls, leaving holes in the lining boards to receive and expose the nuts for access from within the car; subsequently removing the lining as unitary panels by unscrewing the nuts to free the ends of the bolts, pulling the furring strips—with their lining boards still nailed thereto—inwardly from their mounting bolts but leaving the bolts mounted in their brackets, removing the panels from their walls; and subsequently reversing the removal operation to replace the lining panels without having removed the boards from their strips.

3. The method of installing and subsequently removing and replacing a wooden lining for a steel walled box car—where the inner faces of the walls have parallel inward regions extending across the wall alternating with parallel outward regions—which consists of rigidly and non-rotatably mounting bolts by their head ends at vertically and horizontally spaced intervals upon the inside of the wall at said outward regions with the bolts wholly inwardly of the exterior of the wall and extending horizontally inwardly at normals to the mounting wall, preforming bolt holes in furring strips, applying the strips to the walls

to lie outwardly of the said inward regions with the previously mounted bolts penetrating their bolt holes, threading nuts on the ends of the bolts to clamp the strips, nailing lining boards to the inner faces of the previously applied strips crosswise thereof—whereby to fix and subsequently maintain the associated strips in their positions relative to each other as originally determined by their bolts—leaving holes in the boards inwardly to expose the nuts for wrench access; subsequently removing the nuts and inwardly pulling from the bolts the nailed-together boards and strips as a unitary lining panel, removing the panels from the wall; and subsequently replacing the panel without having removed the bolts from the wall or the boards from their strips, and rethreading the nuts on the bolts again to clamp the panels to the wall.

4. In the side wall framing of a box car, a vertical side post of Z cross-section having an outer flange parallel with the wall, and a collar bolt mounting bracket L shaped in plan section, the distant lateral edge of the long leg lying against, and welded to, the web of the post and the lateral margin of the short leg lying against, and welded to, the free margin of the outer flange, whereby the short leg spaces the long leg inwardly from the outer flange to provide a bolt head clearance therebetween; and a keyhole slot in the long leg adapted removably and rigidly to mount the head end of a horizontally inwardly extending collar bolt, the long leg being set back about one to three inches from the inner flange of the post to accommodate the thickness of a furring strip.

5. An end wall for a box car comprising a sheet steel end having horizontal reinforcing corrugations extending thereacross, horizontally spaced sets of collar bolt mounting brackets fixed in some of the corrugations on the inner side of the end, each bracket consisting of a plate, parallel with the plane of the end, having its upper and lower edges against, and welded to, more or less non-vertical walls of its associated corrugation, with the plate set back about one to three inches from the inner face plane of the corrugated end to accommodate the thickness of a furring strip extending along the corrugations but still leaving a bolt-head clearance space between the plate and end, and a keyhole in the plate, a collar bolt rigidly mounted in the keyhole with its threaded shank extending inwardly beyond the inner plane of the corrugations and at a normal to the plane of the end, and a nut threaded on the end of the shank beyond said plane.

6. In a box car having a horizontally corrugated sheet steel end with horizontal furring strips disposed within certain of the inwardly opening corrugations and vertical lining boards nailed to the furring strips, means for mounting the lining on the car end for removal and replacement thereon as a panel without removing the boards from their furring strips, the mounting means comprising plate brackets disposed in the corrugations with their upper and lower edges welded to the car end and their faces disposed parallel with the car end but set outwardly from the inner plane of the car end sufficiently to accommodate the thickness of the furring strips, keyhole-shaped slots in the brackets, bolt head clearance space between the brackets and car end, collar bolts rigidly mounted in the brackets, each collar bolt having a flattened neck, of strength comparable with that of its shank, set into the narrow portion of one of the keyhole-shaped slots to hold the bolt

against turning, the head and collar presenting facing annular shoulders in firm surface contact with the respective sides of the plate bracket rigidly to hold the bolt with its threaded end extending horizontally inwardly, and holes in the furring strips through which the bolts pass, nuts on the bolts for clamping the furring strips, the nuts lying outwardly of the inner face of the lining boards but being exposed to wrench access from within the car.

7. In a box car, a side wall comprising horizontally spaced vertical side posts and steel outer sheathing secured thereto and sets of vertically spaced brackets mounted on the inner face of the sheathing in vertical rows intermediate the posts, each bracket comprising a strip of plate stock bent to present, in plane, an outwardly flanged channel section with the outward flanges lying flatwise against the sheathing and rigidly fixed thereto, and a keyhole in its web for removably and rigidly mounting the head end of a horizontally outwardly extending collar bolt.

8. A lining panel for a box car wall, the lining comprising spaced parallel furring strips and lining boards nailed crosswise to the inner faces thereof, a set of horizontally and vertically spaced bolts anchored at their head ends on the wall and extending horizontally inwardly from the wall independently of the lining, holes in the strips through which the bolts protrude, nuts on the bolts for clamping the strips to the bolts, the nuts being inwardly exposed for wrench access, and a pullout anchor for the lining panel comprising a threaded socket secured to one of the furring strips, the socket being inwardly exposed.

9. A wooden lining panel for the wall of a box car and means for mounting it on the wall, the lining comprising spaced parallel furring strips and lining boards nailed thereto crosswise thereof and at the inner side thereof, the mounting means comprising bolts rigidly anchored at their head ends on the wall and extending horizontally inwardly from the wall and passing through the furring strips, nuts on the bolts for removably clamping the lining panel to the bolts, and a pullout anchor for the lining panel, the anchor comprising a horizontal tubular portion extending through one of the furring strips and exposed inwardly of the lining for reception of a bolt, a back plate carried by the tubular portion at its rear end and lying along the outer side of the furring strip, and means for clamping the back plate to the furring strip.

10. The combination of claim 9, wherein a screw is threaded into the socket and protrudes outwardly thereof and rests against the wall whereby the screw may serve as a screw jack to force the lining panel inwardly from the wall.

11. Mounting means for removably mounting lining panels, consisting of spaced furring strips with lining boards nailed transversely thereto on the inner side thereof, to the wall of a box car, comprising a multiplicity of individual bracket plates fixed on the inside of the car walls, key-

holes in the bracket plates, collar bolts rigidly mounted in the keyholes and extending inwardly to receive the lining by passing through the furring strips which are clamped thereto by nuts threaded onto the bolt ends inwardly of the inner faces of the strips, each collar bolt having a neck, of strength comparable with the shank, non-rotatably seated in the narrow portion of the keyhole, presenting a shoulder face opposing the back side of the bracket plate and its collar presenting a shoulder engaging the other side of the bracket plate pinchingly to hold the shoulder face of the head in firm flatwise contact with the back side of the bracket plate.

12. In a box car, a side wall comprising horizontally spaced vertical steel posts and steel outer sheathing secured thereto, the posts, in plan section, including flanges lying against and parallel with the sheathing whereby the flange and the adjoining sheathing constitute superposed plates, and transverse flanges extending inwardly at right angles thereto, and individual vertically spaced collar bolt mounting brackets disposed against the sides of the respective posts, each bracket being L-shaped in plan section, the distant lateral edge of its long leg lying against, and welded to, the transverse flange of its post and the lateral margin of its short leg lying against, and welded to, the inner face of one of said plates, whereby the short leg spaces the long leg inwardly from said plates to provide a bolt head clearance therebetween, and a slot in the long leg adapted removably and rigidly to mount the head end of a horizontally inwardly extending collar bolt, the long leg being set back a substantial distance from the inner flange of the post to accommodate at least a substantial portion of the thickness of a furring strip mounted by the bolts.

13. A box car having a side wall formed by side posts and an outer sheathing and a lining formed by horizontally spaced vertical furring strips and horizontal lining boards nailed to the inner sides thereof, mountings for removably fixing the lining on the inside of the wall comprising horizontally spaced vertical rows of bolts rigidly mounted at their outer ends upon the wall independently of the lining, wholly inwardly of the sheathing, and extending horizontally inwardly through holes in the furring strips, nuts on the bolts for removably clamping the strips thereto, the nuts being inwardly exposed for wrench access, the lining upon removal of the nuts being inwardly removable as a panel from the wall leaving the bolts inwardly extending and rigidly mounted, the bolts being collar bolts mounted in keyhole slots in bracket plates fixed to the wall outwardly of the furring strips, each collar bolt having a flattened neck, of strength comparable with its shank, inserted in the narrow portion of the keyhole, and the head and collar presenting annular shoulders facing each other and making firm contact with the respective sides of the bracket.

LAWRENCE A. ROWE.