July 14, 1936. J. C. SHEPHERD 2,047,436

HIGHWAY GUARD

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Fig. 1.

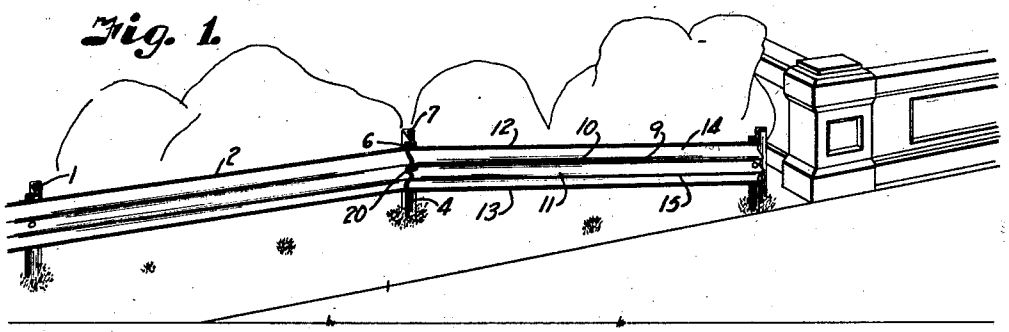


Fig. 2.

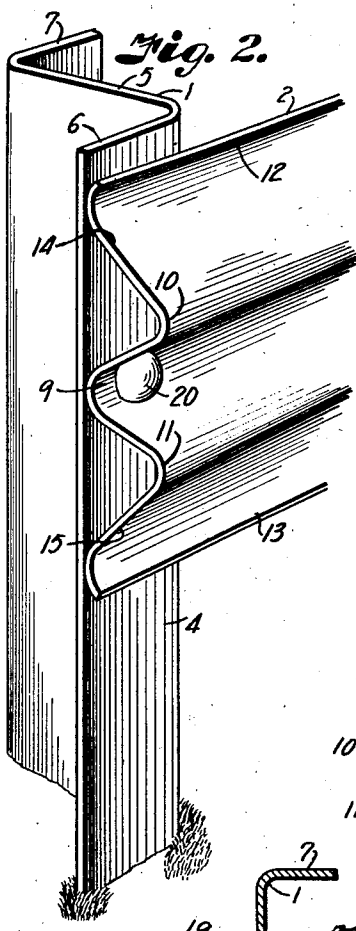


Fig. 3.

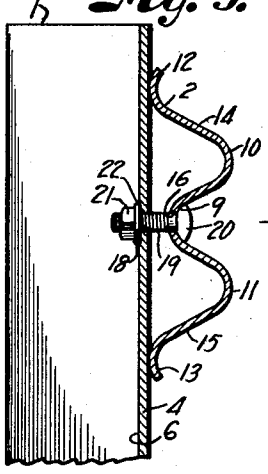


Fig. 4.

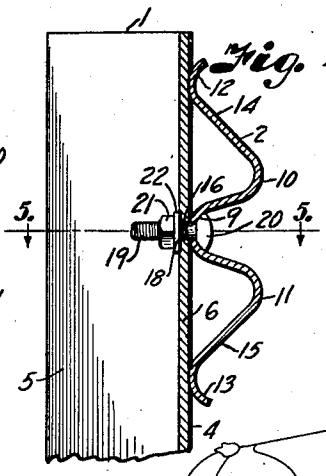


Fig. 6.

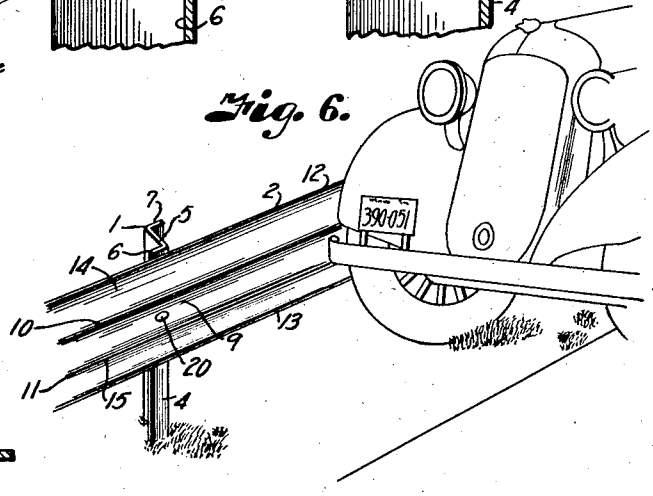
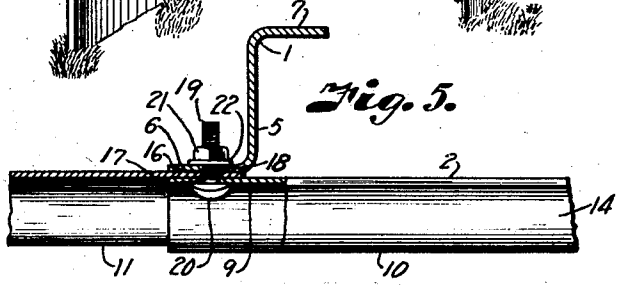


Fig. 5.



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Fig. 7.

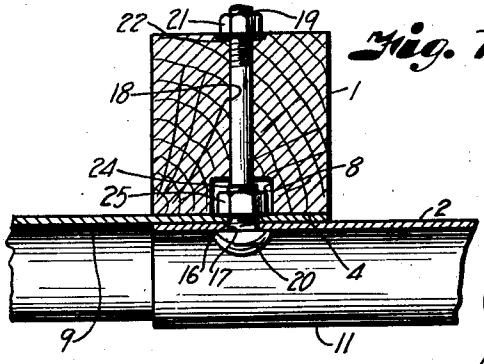


Fig. 8.

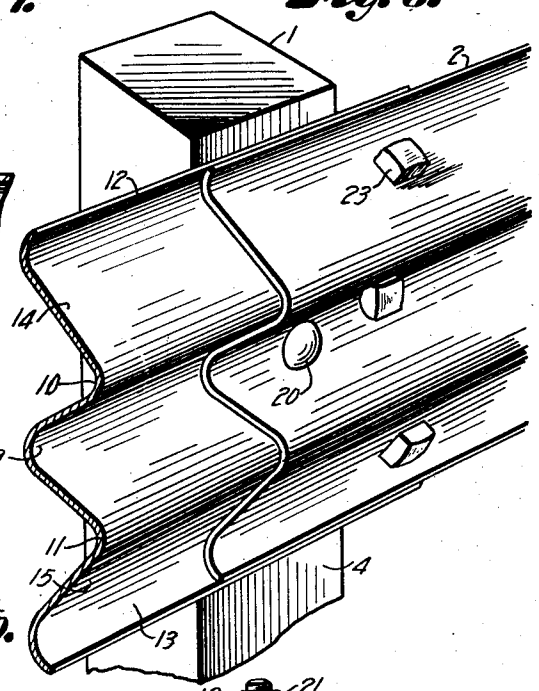


Fig. 9.

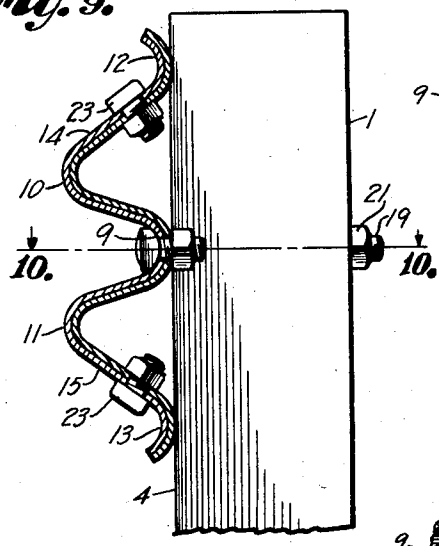


Fig. 10.

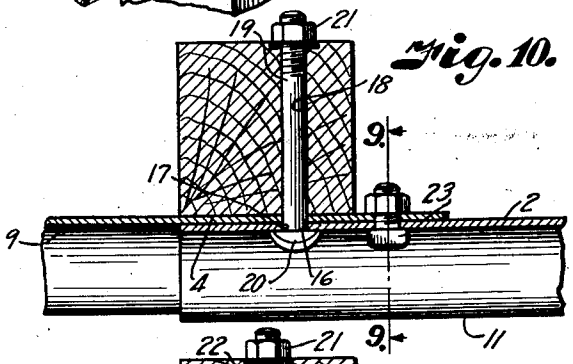


Fig. 12.

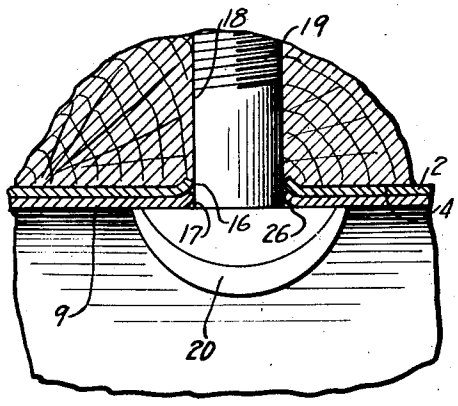
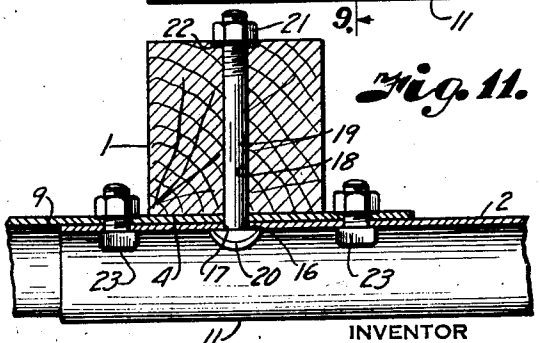


Fig. 11.



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UNITED STATES PATENT OFFICE

2,047,436

HIGHWAY GUARD

James C. Shepherd, Kansas City, Mo., assignor to Sheffield Steel Corporation, Kansas City, Mo., a corporation of Delaware

Application August 20, 1934, Serial No. 740,569

13 Claims. (Cl. 256—13.1)

My invention relates to highway guards, and more particularly to a structure of that character adapted for erection at curves, along embankments, and at other points adjacent a highway where serious injury to occupants of a vehicle and damage to the vehicle might result from accidental departure of the vehicle from the highway proper.

Guards of this character must have flexibility in some direction to absorb impact of a vehicle thereagainst, but if the guard is over-resilient an impacting vehicle may be thrown back onto the highway in the path of traffic, or overturned by reflex of the guard or, if impact of the vehicle is at a sufficient angle to the guard, the vehicle will travel along the guard to damaging impact with an adjacent post. Avoidance of one of the mentioned difficulties has been sought by spacing guard rails from the supporting posts but with such constructions the spacing elements are liable to breakage by stress of the vehicle impact against the guard rail and themselves form obstructions, as do the posts proper.

It is the principal object of my invention to provide a highway guard including rail members of substantial longitudinal rigidity which, when attached directly to supporting posts, will have sufficient yieldability through the attaching connections and give in the post settings when impact is translated from section to section of the guard rail to provide cushion for the impacting vehicle without throw-back of the vehicle in response to reflex of the rail, thereby avoiding damage and injury from initial impact or from deferred impact of the vehicle with the supporting posts or spacing elements at the post positions.

It is also an object of my invention to provide a guard rail having limited flexibility transversely of the longitudinal line of the rail for supplementing the cushioning effect provided by the mechanical yielding before mentioned.

More particularly my invention contemplates employment of a guard rail formed of sections of corrugated metal arranged in longitudinal alignment and having single point connection with the supporting posts, to provide a guideway for the hub caps of the impacting vehicles, and including side wings above and below the central guiding trough having slip contact with the supporting posts to permit the transverse flexibility of the rails by spreading of the free side wings thereof.

The foregoing and other features of improvement which I claim as my invention are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a portion of a highway equipped with a guard embodying my invention.

Fig. 2 is an enlarged detail perspective view of a portion of a guard rail of my improved construction attached to a supporting post in accordance with my invention.

Fig. 3 is a vertical section of a portion of a guard rail and supporting posts illustrating relative depth of the central or guide trough corrugation of a rail section and initial application of a rail section to its supporting post.

Fig. 4 is a view similar to Fig. 3 but showing the rail section permanently attached to a supporting post and illustrating normal spread of the side wings in response to tightening of the attaching bolt.

Fig. 5 is a plan view, partly in horizontal section, of adjacent guard rail sections having end portions overlapped and attached to a supporting post by a common attaching bolt.

Fig. 6 is a perspective view of part of a rail guard attached at an intermediate point to a supporting post and illustrating positioning of the wheel of an impacting vehicle relative to the rail.

Fig. 7 is a view similar to Fig. 5 but illustrating a different method of connecting the overlapped rail sections together and to a wooden supporting post.

Fig. 8 is a perspective view of overlapping rail sections illustrating a preferred form of attachment of the overlapping sections.

Fig. 9 is a vertical section on the line 9—9, Fig. 10.

Fig. 10 is a horizontal section on the line 10—10, Fig. 9.

Fig. 11 is a view similar to Fig. 10 but illustrating the ends of the rail sections extended beyond and connected at opposite sides of a supporting post.

Fig. 12 is a horizontal section illustrating a modified form of attachment of overlapped rail sections to a supporting post.

Referring more in detail to the drawings:

1 designates supporting posts, set in spaced relation along a highway for supporting guard rails 2 at a distance from the path of traffic indicated by the slab 3 to avoid interference with normal traffic, but sufficiently close to the slab to promptly interrupt accidental departure of a vehicle from the slab.

The posts for supporting the guard rail may be of any suitable form or material affording flat faces 4 of substantial area for bearing of the guard rail thereagainst, those shown in Figs. 1 to 5 inclusive being of heavy sheet or structural metal, Z-shaped to provide a central web 5, and parallel front and rear flanges 6, 7 so that the posts may be set with the flanges parallel with the contemplated longitudinal plane of the guard rail to provide the bearing faces 4. The wooden posts illustrated in Figs. 7 to 12 inclusive, are preferably square in cross section and may be

provided in their front faces with sockets 8 for securing nuts on the rail attaching bolts as and for the purpose presently described.

The guard rail 2 is formed in sections, each composed of a strip of sheet metal corrugated longitudinally to provide a central trough 9, shoulders 10, 11 at opposite sides of the trough, and edge wings 12, 13 formed by outward curvature of the edges of the side walls 14, 15 of the reverse corrugations at the sides of the central trough. The intermediate corrugation constituting the trough 9 is shallower than those at its opposite sides, so that when the rail sections are initially positioned against the flat faces of the supporting posts, the trough portion will be spaced from the posts by contact of the edge wings with the posts.

16 designates apertures located in the base of the trough of each rail section and adapted to register with apertures 17 in the front flanges 6 of adjacent metal posts or with bolt holes 18 in adjacent wooden posts; and 19 designates bolts adapted for projection through the apertures 16 and 17 or through the apertures 16 and bolt holes 18 for attaching the rail sections to the posts, the bolt heads 20 being preferably rounded to seat snugly in the base of the trough and the nuts 21 adapted to press washers 22 against the opposite faces of the posts or post flanges to draw the wings of the rail sections firmly against the outer, flat faces of the posts or post flanges; continued tightening of the bolts drawing the central trough portions of the rail sections toward the posts, and spreading the side shoulders to impart initial tension to the rail sections. Such single point attachment of the rail sections to the supporting posts permits the spreading action described and affords automatic adjustment of the rail sections on the supporting posts that tends to avert shearing of the bolts or tearing of the rail sections in response to vertical stresses resulting from impact of a vehicle against the rail at an upward or downward angle.

The rail sections may be made of standard length and the supporting posts spaced accordingly so that each section may be attached to adjacent posts only at its ends, or also to intervening posts intermediate the ends of the sections.

I prefer, however, to overlap ends of adjacent rail sections at the post positions and to extend the attaching bolts through the overlapped ends of the sections, as in that way load applied to any portion of the rail by impact of a vehicle at that point may be relayed from section to section throughout the length of the rail and the thrust gradually absorbed by longitudinal shift of the sections along the successive posts due to some looseness of the attaching bolts in their apertures in the rail sections and posts, and to give of the post settings in the ground, thereby providing the equivalent of a flexing of the rail to cushion the impact of the vehicle, but avoiding the undesirable rebound that would follow impact of the vehicle against a resilient rail.

The rail sections are so set on the supporting posts that the central troughs 9 will receive the hub cap of an ordinary motor vehicle when impact of the vehicle is at a forward angle to the rail, and tend to retain the cap in the trough, thereby guiding the vehicle to a line of travel parallel with the highway and tending to hold the vehicle from overturning. The corrugations in the rail sections will space the shoulders and the outer portions of the trough walls from the supporting posts to avoid impact of the vehicle wheels against the posts when the vehicle has been directed to travel along and in contact with the rail, but without sacrificing the security of direct attachment of the rail sections to the supporting posts.

When the rail sections are overlapped, the overlap is made in direction of the flow of traffic in order to avoid abutment of any part of a vehicle with the end of a rail section. Overlaps of the rail sections are preferably made at the post positions in order to permit attachment of two rail sections to a post with a single bolt and to provide backing of the post for the underlapped portions of a rail section adjacent that to which thrust has been imparted.

Regardless of where the overlap occurs, I prefer to connect the overlapped ends of adjacent rail sections by bolts 23 that are extended through the bottom of the trough portions 9 and through the side walls 14, 15 of the outer corrugations in order further to avoid any abutment in the path of travel of a vehicle along the rail. It is preferable to extend overlap of the sections at both sides of a post and provide a series of connecting bolts 23 at each end of the overlap, as in this way any tendency of one rail section to rock on the other is obviated by the series of bolts at the opposite sides of the post.

Function of the connecting bolts 23 may be combined with those of the attaching bolts 19 by forming a thread 24 (Fig. 7) on the shank of the attaching bolt adjacent the head 20, so that nuts 25 may be employed to clamp overlapped ends of the rail sections together. When this form of connection is employed, the posts are provided with the sockets 8 to receive the nuts 25 and permit the lapped portions of the rail sections to lie flat along the posts.

In a further modified form of the invention (Fig. 12) the overlapped portions of rail sections may merely be clamped to the posts by the heads of the attaching bolts 19, burrs 26 left on the metal sections from the bolt hole punching being drawn into the faces of the posts to provide anchorage.

Assuming a guard rail constructed and mounted as described to be struck by a motor vehicle out of control, the impact, except in most unusual cases, would be with the vehicle traveling at at least a slight forward angle so that there would be a tendency to deflect the vehicle to a line of travel parallel with the rail. If the impact is from some part of the body, bumper or fender of the vehicle against the rail, such part of the vehicle would contact one or both of the shoulders of the rail at the sides of the central trough, and the major effect of the blow would be to force the rail inwardly, thereby effecting a pull on both ends of the contacted rail section that would be immediately relayed to adjacent rail sections and supporting posts and on through the series of sections and supporting posts; each section yielding some slack and each post setting yielding according to the pull on it so that the load of the impact would be gradually absorbed by the entire guard instead of by the individual rail section and its immediately adjacent supporting posts, lag in absorption of the impact providing resistance to the thrust and yielding of the immediate and successive sections cushioning of the thrust, without the disadvantage of a too rigid resistance on the one hand or a rebound

resiliency on the other hand. Some additional cushioning effect would also be imparted by transverse spread of the unanchored side corrugations of the rail.

If the vehicle be under sufficient headway to continue travel after deflection by the guard, the guard will, because of its inherent longitudinal rigidity, provide a gradual guideway for the vehicle to and past the adjacent post position, the corrugations serving as spacers between the vehicle and post.

What I claim and desire to secure by Letters Patent is:

1. A highway guard including spaced supports, a guard rail comprising a band corrugated longitudinally to form a relatively shallow trough and deep rail portions having contact faces at the same side of the rail in spaced parallel planes, the faces of the rail portions having sliding contact with the supports at opposite sides of the trough portion, and fastening means on the supports extending through the base of the trough portion adapted for drawing the contact face of the trough portion against the supports to attach the band to the supports and tension the rail portions in sliding contact with the supports.

2. A highway guard including spaced supports, a band having spaced edge portions contacting said supports and an intermediate portion normally outset from the supports, and means securing the band to the supports and adapted for drawing said intermediate portion toward the supports.

3. A highway guard including a support, a guard rail comprising a metal band corrugated longitudinally to form a trough between adjacent rail portions, means on the support adjustably carrying the band for movement toward the support, and means on the rail portions contacting the support for effecting expansion of the rail in response to movement of the band toward the support.

4. A highway guard including a support, a guard rail comprising band sections corrugated longitudinally to form a trough and outwardly facing rail portions at the sides of the trough having inwardly extending wing sections of greater depth than said trough, and means passing through the bottom of said trough and secured to the support for adjusting the trough relatively to said support whereby the wing sections are expanded to impart initial tension to the rail portions.

5. A highway guard including spaced supports, a guard rail formed of metallic band sections corrugated longitudinally to form a trough between outwardly facing rail portions and inwardly facing convex lips at opposite edges of the band sections extending inwardly beyond the trough, and means extending through the bottom of the trough for attaching the band sections to the supports and permitting free sliding movement of the edge lips on the supports in response to thrust on the rail portions.

6. A highway guard including spaced supports, a guard rail comprising band sections corrugated longitudinally to form a relatively shallow trough and deep rail portions having free sliding contact with the supports at the sides of the trough to normally space the trough from the support, and means on the supports for drawing the trough toward the support.

7. A highway guard including a support, a guard rail comprising band sections corrugated longitudinally to form a relatively shallow trough and deep rail portions at the sides of the trough, means for mounting the band sections on the support, and extensions on the rail portions having free sliding contact with the support for expanding the rail in response to thrust on the band sections.

8. A highway guard including spaced posts, a guard rail comprising band sections having overlapping ends and corrugated longitudinally to form a shallow trough and deep rail portions having free sliding contact with the posts, and means extending through the overlapping ends of the band sections at the base of the trough to secure the band sections to the posts.

9. A highway guard including in combination with spaced supports, corrugated band sections overlapped at their ends in nested relation, and means connecting corresponding outer walls of the overlapped sections to effect synchronous spreading of the sections transversely of the band sections in response to lateral thrust on said band sections.

10. A highway guard including in combination with spaced supports, corrugated band sections overlapped at their ends in nested relation, means connecting corresponding outer walls of the overlapped sections to effect synchronous spreading of the sections transversely of the band sections in response to lateral thrust on said band sections, and means extending through a trough portion of said sections intermediate said walls providing single point attachment of the sections to each of said supports.

11. A highway guard including in combination with spaced posts, metallic band sections each corrugated longitudinally to form relatively shallow central trough portions and deep side wing portions, end portions of adjacent sections being overlapped at a side of a post, means extending through corresponding side walls of the band sections for connecting said sections, and means extending through the bottoms of overlapped trough portions of said sections for providing single point attachment of said sections to the posts.

12. A highway guard including in combination with spaced posts, metallic band sections each corrugated longitudinally to form relatively shallow central trough portions and deep side wing portions, end portions of adjacent sections being overlapped at a side of a post, means extending through corresponding side walls and through the bottoms of the trough portions of the band sections for connecting said sections, and means extending through the bottoms of overlapped trough portions of said sections for providing single point attachment of said sections to the posts.

13. A highway guard including in combination with spaced posts, aligning metallic band sections having longitudinal corrugations to form relatively shallow central trough portions and deep side wing portions, end portions of adjacent band sections being overlapped adjacent one of said posts, a bolt including a head, a shank extending through said post to adjustably secure the band sections to the post and having a threaded portion adjacent the head extending through said overlapping end portions of adjacent band sections, and a nut on the bolt for cooperating with said head to secure the band sections together.

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