Sept. 3, 1940. E. V. CAMP 2,213,239

HIGHWAY GUARDRAIL

Filed Sept. 16, 1936 3 Sheets-Sheet 1

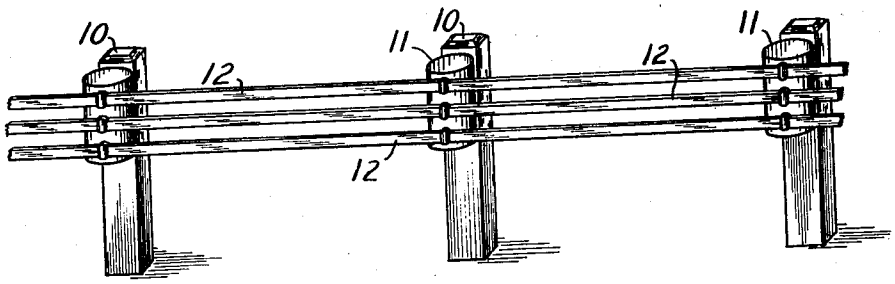


Fig. 1

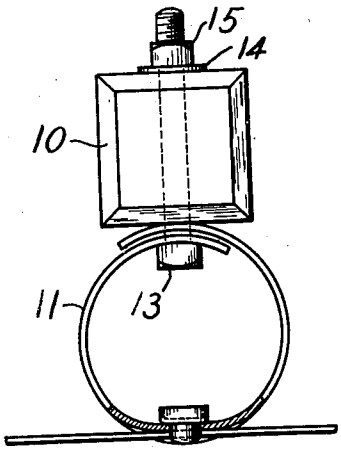


Fig. 2

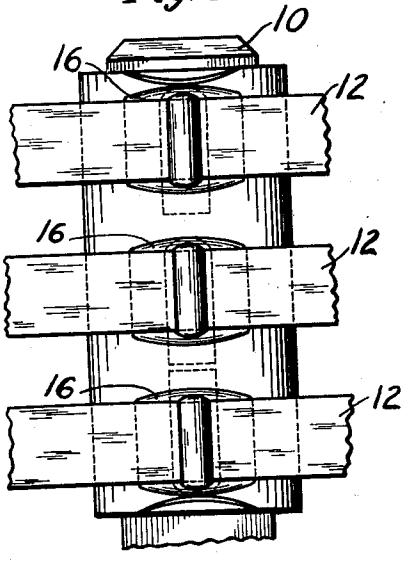


Fig. 3

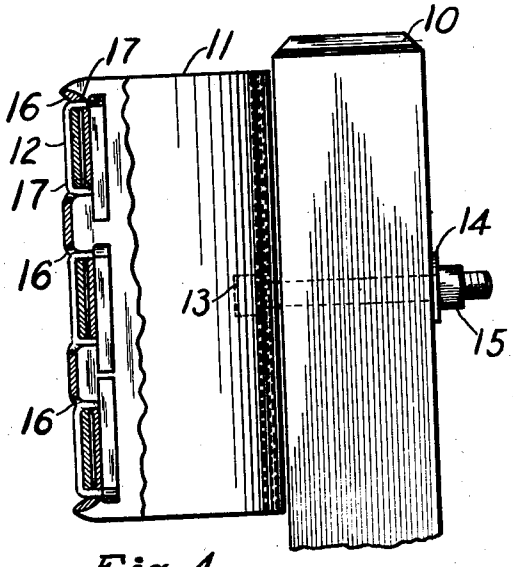


Fig. 4

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HIGHWAY GUARDRAIL

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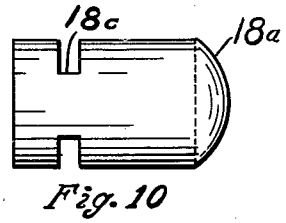


Fig. 10

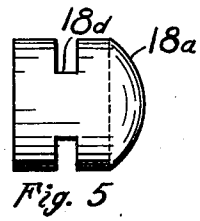


Fig. 5

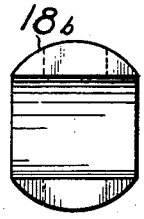


Fig. 12

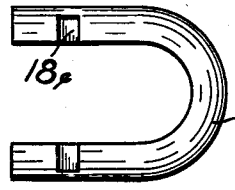


Fig. 11

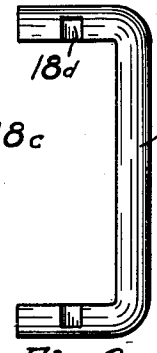


Fig. 6

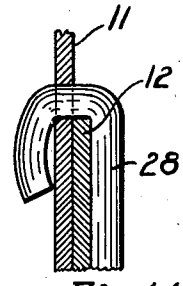


Fig. 14

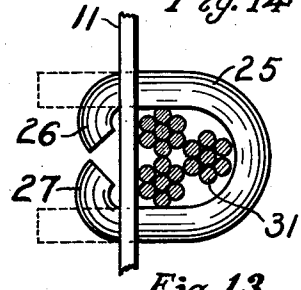


Fig. 13

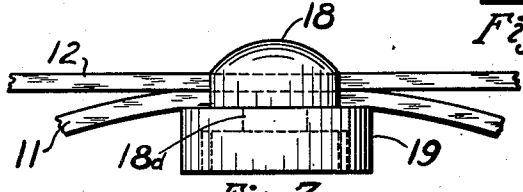


Fig. 7

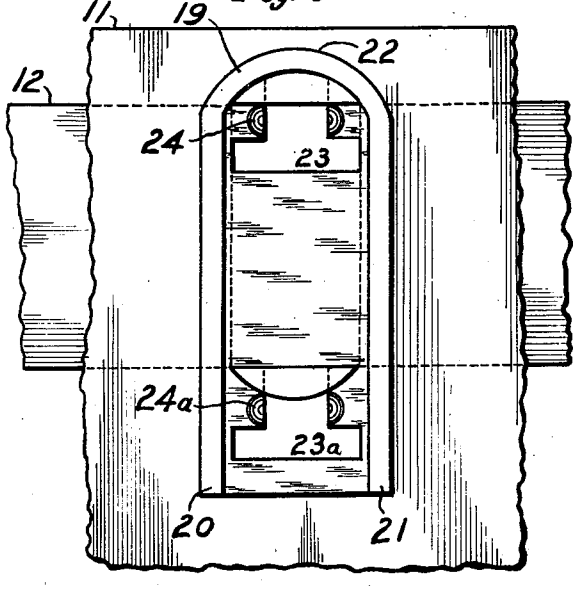


Fig 8

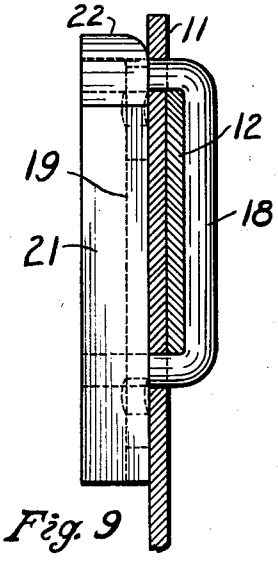


Fig. 9

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HIGHWAY GUARDRAIL

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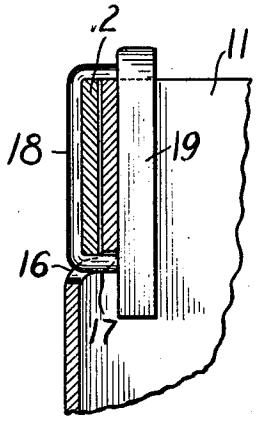


Fig. 15

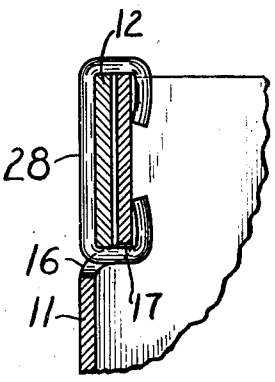


Fig. 16

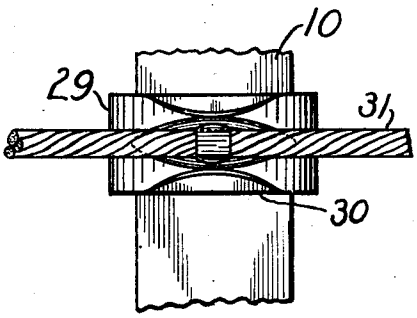


Fig. 17

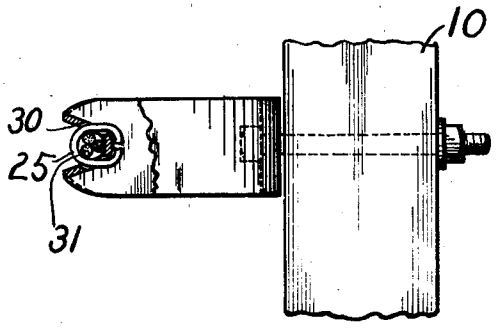


Fig. 18

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UNITED STATES PATENT OFFICE

2,213,239

HIGHWAY GUARDRAIL

Eugene V. Camp, Atlanta, Ga.

Application September 16, 1936, Serial No. 101,070

22 Claims. (Cl. 256—13.1)

This invention relates to public safety, and more particularly to a new and improved highway guardrail having as its purpose the guarding and making safe of public highways.

Heretofore various types and kinds of guardrail have been proposed, which devices have met the varying needs of changing conditions with greater or less success. Dating back a number of years is what is known as the cable road guard, such consisting essentially of a series of supports such as posts erected at spaced intervals along a highway, and one or more strands of wire cable strung along or between said posts in such a manner as to provide a barrier for the purpose of keeping a vehicle out of control, from passing through the guard and into the danger spot beyond. An objection to the cable type guard lay in the fact that it tended to glide an impacting vehicle directly into a supporting post, where the sudden impact of stopping said vehicle tended to do great injury to the occupants of the conveyance, to the vehicle itself, and to the road guard as by up-rooting or breaking off posts, and in numerous cases even passing over or under the cable to even greater disaster.

In attempting to alleviate the foregoing objections, manufacturers in recent years have adopted a cable guard comprising in combination a ring-like supporting and cushioning member such as broadly disclosed in my Patent No. 1,793,674, issued February 24, 1931; plus a series of cables associated with the front portion of said spring element in rather close spaced relationship, plus supporting means. In such a device the said spring member serves to cushion the force of an impact to the guard, and further tends to keep the impacting instrumentality from being guided into the posts as in the case of the earlier type of guard. By employing a number of cables closely spaced, the effect of a wide-faced flexible strip of sheet metal under tension is approximated to a certain degree, when the cable members are placed under longitudinal tension in the more recent guards just described.

An objection to guards of the foregoing type lies in the fact that an impacting vehicle, or portions thereof, may and do frequently pass behind the composite rail or contact member formed by the cables, and coming into contact with the spring bracket member to which said rail is attached, get "hung up" thereon in such a manner as to turn the car directly into the post, such action being attended by all the undesirable consequences of injury to occupants, car, and guard structure heretofore mentioned. In this connection it may be further mentioned that a sudden stopping of the front of a vehicle gliding in angular relationship to a plane surface such as the vertical face of a road guard, tends to skid or slide the rear of said car away from said rail, such action tending to increase the angle at which the vehicle is contacting the rail, to ninety degrees or more; which action in turn often results in the car being over-turned or going into a side roll with resultant injury to driver, passengers, and car.

An object of the instant invention is to provide a guard rail of the modern cable construction, in which, in the event of any portion of an impacting vehicle passing behind the contact member, said rail member will be released from its connection with a supporting bracket member by a force less than that required to break the rail member, thereby permitting the vehicle to pass the support without becoming seriously entangled therewith.

Another object is to provide an improved means for attaching cables to spring supports, said means consisting essentially of depressed grooves in the front faces of said spring members and clips for fastening said cables therein.

Another object is to provide improved means for supporting cable members in conjunction with buffer members.

A still further object is to provide an improved locking device intended primarily for use in conjunction with operatively disposing cable members in relation to spring supports of the foregoing nature.

Another object is to provide such a locking device which is readily adaptable to narrow strips of sheet metal, which may be used in place of cable in a guard of this type, thereby effecting certain manufacturing economies in the production of a guard rail which may be in some ways the substantial equivalent of the wide-faced sheet metal type.

Another object is to provide cheapness of construction and efficiency in operation of a locking device of the foregoing type.

Another object is to provide locking means for use in connection with cable and strip guard rails, which means are still further simplified, and accordingly susceptible of additional economies in manufacture and installation.

These and other objects made apparent throughout the further progress of this specification are made possible by means of the instant invention, a full and complete understanding of

which is facilitated by reference to the drawings herein, in which:

Fig. 1 is a fragmentary view in perspective showing a road guard of the instant type positioned along the edge of a highway, said view showing the front of said guard.

Fig. 2 is a top plan view of a post assembly in a guard rail such as disclosed in Fig. 1, said post having an offset bracket with a groove indented into its front face for receiving and supporting the impact member, which is anchored thereto by a locking means, a portion of the upper edge of said bracket being broken away to better show said construction.

Fig. 3 is a front elevational view of the structure illustrated in Fig. 2, showing multiple impact members.

Fig. 4 is a side elevational view of the structure illustrated in Fig. 3, said view being sectional in part, and with a portion of the offset bracket cut away in order to better illustrate certain features of the structure.

Fig. 5 is an enlarged top view of one of the locking means employed herein.

Fig. 6 is a side view of the element shown in Fig. 5.

Fig. 7 is an enlarged fragmentary top view illustrating the manner in which the locking element shown in Figs. 5 and 6, engages a rear element so as to fasten an impact member to a supporting spring bracket.

Fig. 8 is a rear elevational view of the structure shown in Fig. 7, further illustrating the manner in which the locking device herein functions.

Fig. 9 is a side elevational view, partially in section, showing in further detail the locking device illustrated in Fig. 8.

Fig. 10 is a top view of an element similar to that shown in Fig. 5, which element however is intended for use in connection with cable instead of steel strips as in the case of said latter device.

Fig. 11 is a side view of the structure shown in Fig. 10.

Fig. 12 is a view of the open end of the element illustrated in Fig. 10.

Fig. 13 is a side view of a simplified locking element applied in conjunction with cable, said view being sectional in part, and indicating in dotted lines the position of the locking element before crimping into position.

Fig. 14 is a side view, partially in section, showing a locking device similar to that illustrated in Fig. 13, applied however to a strip of metal instead of a cable.

Fig. 15 is a fragmentary vertical cross-sectional view of an arrangement similar to that shown in Fig. 4, in which, however, the top edge of the spring bracket is flush with the top edge of the impact member.

Fig. 16 is an enlarged view of a structure of the same general type as that shown in Fig. 15, except that the clincher type of attachment such as shown in Fig. 14, is employed instead of the locking type.

Fig. 17 is an enlarged fragmentary front elevational view of a device of the general description of that shown in Fig. 3, except that only a single impact member is employed, and a cable impact member is used in place of strips of metal.

Fig. 18 is a side elevational view, partly in section, of the structure disclosed in Fig. 17, said view being cut away in parts to show the attaching means and the groove for receiving and supporting the impact member.

Like numerals indicate corresponding parts throughout the various figures of the drawings.

Referring now to the drawings, Fig. 1, it will be seen that my invention broadly consists of a guardrail comprising a series of post or supports **10**, to which may be anchored ring-like spring brackets **11**, associated with the front of which are one or more impact members **12**, said members being shown as narrow strips of metal in the view in question.

As shown in Fig. 2, spring elements **11** are attached to posts **10** by means of bolts **13**, washers **14**, and nuts **15**. Members **11** may be of any desired shape, in keeping with their primary function of buffer elements, although the ring-like or annular contour shown in the figure has been found most practicable for use up until the present time.

Special attention is now directed to the front faces of supporting brackets **11** (Figs. 2 and 4), said faces having provided therein one or more horizontal grooves or depressions **16**, which depressions are of a depth suitable to retain therein an impact member and the head of a locking device for such, and which when used in series, are positioned one above the other in the same vertical plane. Depressions **16** are further provided with spaced apertures **17** (Fig. 4) for the purpose of receiving the ends of said locking members, which are passed over the impact elements and through said springs in a manner described more in detail hereafter. Grooves **16** may be formed in **11** in any suitable manner, as, for example, by punching with proper dies after the initial formation of the element.

Attention is now directed to the structure of the locking elements employed to attach members **12** to springs **11**. These elements consist essentially of substantially C-shaped stampings (Figs. 6 and 11) **18**, which are passed over the impact members, through the springs, and into locking engagement with sliding clamps **19**. Elements **18** may be rounded on their outer faces as at **18***a* (Figs. 5 and 10) and may have a semicircular contour **18***b* at their ends (Fig. 12). Opposite jaws of **18** and **18***c* are provided with adjacently disposed outwardly opening angular indentations **18***d* and **18***e* (Figs. 6 and 11).

Attention is now directed to sliding clamps **19**, which are preferably stamped from metal of suitable thickness, said elements being provided with inwardly extending side-walls **20** and **21** for the purpose of adding rigidity thereto, and with a sloping roof **22** conforming to the curvature of the outer end portions of elements **18** and **18***c* (see Fig. 12 for example). Locking clamps **19** are provided with a pair of generally T-shaped apertures **23** and **23***a*, coextensive in width and thickness with said end portions of **18**; the vertical portion of the T being of a width to correspond with the distance between indentations **18***d*. Adjacent to said T-shaped openings are oppositely disposed protuberances **24** and **24***a*, the function of which is explained elsewhere herein.

The operation of the locking elements just described is readily apparent, it only being necessary to pass member **18** over the impact member, through the holes provided in the spring bracket, and through T-shaped holes **23** and **23***a* of element **19**, which clamp is now driven over the ends of **18** at right angles thereto in such a manner as to securely retain the entire assem-

bly in place. That is, the indentations 18d register with the corresponding width of the narrow portion of the T-shaped opening, and as 19 is forced there-along, the two elements move into snug adjustment. In the initial stages of this locking process, raised points or surfaces 24 and 24a offer some resistance to the movement of 19, but due to the somewhat resilient nature of the metal, finally allow said passage to become completed, after which said protuberances may be said to snap back into place and provide a further effective locking means to prevent 19 from becoming dislodged from 18. The final stage of the locking together of the two elements occurs when the rounded top of 18 comes into engagement with the complementary surface of the top 22 of 19, 18 now being horizontally and vertically supported and locked against displacement in a most effective yet simple manner.

From the foregoing it is obvious that the locking element herein may be assembled with a minimum of effort, yet once in place provides a secure and effective means of connecting an impact member with a spring support, which effectiveness is further enhanced by the nature and function of grooves 16 which serve to strengthen and reinforce the connection, particularly against vertical forces or those angular to the guardrail assembly. It will further be noted that said connection presents a minimum of obstruction to the passage of a vehicle along the face of the road guard, thereby minimizing damage to car and guard, and further effectuating the theory and principle of the modern guardrail which has as its essence the guiding of a vehicle along the surface thereof and bringing it eventually back into the highway, slowing it up gradually instead of stopping it abruptly, with disastrous consequences, as in the case of older devices in the art.

In Fig. 13 is shown the employment of a somewhat simpler locking element consisting of a generally U-shaped member 25, which is passed around the impact member (either cable or strip steel), through openings provided in the spring support, and then the ends 26 and 27 of 25 are turned back or clinched in such a fashion that a snugly fitting connection is effected. Any suitable apparatus may be employed to accomplish the clinching referred to, said apparatus running from an ordinary heavy hammer or sledge, to an air hammer or clamping device capable of exerting the desired pressure against said ends.

Fig. 14 shows the employment of a locking element such as 25, said element being designated by the numeral 28, in conjunction with a strip of metal, the principle being the same as when cable is used as the impact member; the other end of the locking arrangement being identical with the end illustrated.

Fig. 15 shows a slight modification of the arrangement shown in Figs. 3 and 4, in which the top edge of the impact member lies in the same horizontal plane as the top edge of the spring bracket, locking element 18 passing over the top of said element in close-fitting engagement therewith, and being held at its back by sliding clamp 19 in the manner heretofore described. This arrangement provides a somewhat neater appearing assembly and has other advantages in connection with a feature of the instant invention that will be dwelt upon further during the progress of this specification.

Fig. 16 is a view of a structure similar to that illustrated in Fig. 15, employing, however, a locking or clamping device like that shown in Fig. 14. Such an arrangement possesses obvious advantages in the way of simplicity and economy.

Fig. 17 illustrates a modification of the instant invention in which a relatively narrow spring support 29 is employed instead of a member such as 11 (Fig. 3), said support having a longitudinally extending groove or indentation 30 (similar to 16) in the face thereof, which receives a cable 31, held in position by an attachment 25 (Fig. 13). Fig. 18 further illustrates the foregoing connection, showing in detail the manner in which the groove receives and supports the impact member.

Special attention is now called to the fact that, as stated supra, one of the prime purposes of the instant invention is to provide a guardrail of the cable or strip metal type, which will permit release of the impact member from the supporting bracket when any portion of a contacting vehicle passes behind said impact member in such a manner as to entangle the car at the post, said release to occur before the impact member breaks, in order that the guard may not be completely destroyed and the vehicle be permitted to pass there-through into the river or over the mountain-side or other danger zone beyond. In order to effect this purpose, locking members 18, 19, 25, and 28, are all fabricated with careful regard to their strength as compared with the strength of the impact member with which they are to be associated, a calculation of the relative strengths in each instance permitting a safe margin between the "pull-out" point in the case of said locking means, and the breaking point or point of failure of the impact member or members. When a guard is thus constructed, additional advantages of safety are attained, without serious sacrifice to the structure and cost of the road guard proper. Advantages in connection with grooves in the front faces of spring supports, have been previously mentioned herein.

From the foregoing it is apparent that I have disclosed a new and useful improvement in road guard construction, which improvement in its broad aspects makes possible an economical and efficient highway guardrail embodying certain new principles of construction and operation which are without precedent in the art.

While I have disclosed in detail certain forms of my invention herein, I do not intend to be bound thereby or limited thereto, but on the contrary intend that the appended claims shall be liberally construed in keeping with a fair evaluation of my contribution to public safety.

I claim:

1. A highway guardrail comprising a series of supports, ring-like spring buffer elements attached to said supports, longitudinally extending depressed grooves in the front faces of said buffers, an impact member extending from buffer to buffer and being received by said grooves therein, and means for attaching said impact members to said buffers at such points in such a manner that said attachment will fail under a rearward strain less than that required to break said impact member.

2. A highway guardrail comprising a series of supports, ring-like elements attached to said supports, longitudinally extending grooves in the front faces of said ring-like elements, an impact member extending from ring member to ring member and seating in said grooves in such a manner as to receive vertical support therefrom, and means for attaching said impact members to the rings at said points of contact.

3. A highway guardrail comprising a series of

supports, ring-like spring elements attached to said supports, longitudinally extending grooves in the front faces of said spring elements, a series of strips of metal forming impact members extending from ring member to ring member and seating in said grooves, and means for attaching said impact members to the said springs within said grooves.

4. A highway guardrail comprising a series of supports, ring-like spring elements attached to said supports, a cable extending from ring-like element to ring-like element, a longitudinally extending groove in the face of each of said ring members, and means for attaching said cable to said springs, within said grooves, said attaching means being of lesser strength than said impact cable.

5. A highway guardrail comprising a series of supports, spring supporting brackets attached thereto, an impact member extending from bracket to bracket, a C-shaped locking element passed around said impact member, through said bracket, and into engagement with anchoring means at the inside front portion thereof, said means comprising a reinforced metal plate having T-shaped openings in the face thereof for engaging opposite ends of said locking element, the narrow portion of said openings sliding in grooves in said ends provided for such purpose.

6. A highway guardrail comprising a series of supports, spring brackets anchored thereto, an impact member extending from bracket to bracket, longitudinal grooves in the front face of each bracket for receiving said impact member, a C-shaped locking element passed around said impact member in said grooves, and through holes provided at the edges of said grooves for such purpose, vertically extending outwardly facing notches on opposite sides of either end of said locking member, a clamping plate having apertures therein for receiving said ends, a narrowed portion in said apertures for engagement with the notches in said ends when said plate is forced thereover, and locking means in the form of raised surfaces adjacent said narrowed portions of said apertures for holding said ends in locked engagement with said clamping plate once such is properly adjusted to said C-shaped locking element.

7. A highway guardrail comprising a series of spuports, spring brackets anchored thereto, a longitudinal groove in the front face of each bracket, an impact member extending from bracket to bracket and seating in said grooves, substantially C-shaped locking staples passed around said impact member in each of said grooves, and through holes provided in the inner sides of said grooves for such purpose, vertically extending outwardly facing notches on opposite sides of either end of said staples, a clamping plate having apertures therein for receiving said ends, said apertures having narrowed portions for engagement with the notches in said ends when said plate is forced thereover, and raised surfaces adjacent said narrowed portions for holding said ends in locking engagement with said clamping plate once such is properly adjusted therewith.

8. A highway guardrail comprising a series of supports, spring brackets anchored thereto, a series of longitudinally extending spaced indentations on the front face of each bracket, the uppermost of which indentations adjoins the top of each bracket in such a manner that said indentation at such point has only one side, impact members extending from bracket to bracket and seating in said indentations, the top edge of the bracket in each case being even with the top edge of the uppermost impact member, and means for anchoring said impact members in said indentations.

9. A highway guardrail comprising a series of supports, a series of spring brackets anchored thereof, a longitudinally extending groove in each bracket, a cable extending from bracket to bracket and securing vertical support from said grooves, and means anchoring said cable in each groove, said means being calculated to fail under a lesser force than is required to break said cable.

10. A highway guardrail comprising a series of supports, ring-like supporting springs attached thereto, longitudinally extending grooves in said springs, and impact members extending from spring to spring and seating in said grooves, the uppermost impact member being coextensive with the upper edge of the supporting spring in each instance.

11. A highway guardrail comprising a series of supports, ring-like supporting springs attached thereto, longitudinally extending grooves in said springs, impact members extending from spring to spring and seating in said grooves, and means within each groove for anchoring said impact member to the spring at such point, said means comprising generally C-shaped locking members which are passed around the impact elements, passed through apertures provided in the rear of said grooves for such purpose, and in turn have their ends bent back against the inner-front faces of said spring elements in such a manner as to secure said impact members to said springs, the strength of said locking elements being less than that of said impact members.

12. A highway guardrail comprising a series of supports, ring-like supporting springs attached thereto, a longitudinally extending groove in one of said springs for lending vertical support to an impact member, an impact member extending from spring to spring, and means for attaching said impact member to said springs, said attaching means being calculated to fail when caught on its back-side, under a force less than that required to break the impact member per se.

13. A highway guardrail comprising a series of supports, buffer elements attached to said supports, longitudinally extending depressed grooves in the front faces of said buffers, an impact member extending from buffer to buffer and being received by said grooves therein, and means for attaching said impact members to said buffers at such points in such a manner that said attachment will fail under a rearward strain less than that required to break said impact member.

14. A highway guardrail comprising a series of supports, sheet metal buffer elements attached to said supports, longitudinally extending grooves in the front faces of said buffer elements, an impact member extending from buffer to buffer and seating in said grooves in such a manner as to receive vertical support therefrom, and means for attaching said impact members to the buffers at said points of contact.

15. A highway guardrail comprising a series of supports, buffer elements attached to said supports, longitudinally extending grooves in the front faces of said buffer elements, a series of strips of metal forming impact members extending from buffer to buffer and seating in said grooves, and means for attaching said impact members to the said buffers within said grooves.

16. A highway guardrail comprising a series of

supports, spring buffer elements attached to said supports, a cable extending from buffer element to buffer element, a longitudinally extending groove in the face of each of said buffer members, and means for attaching said cable to said buffers, within said grooves, said attaching means being of lesser strength than said impact cable.

17. A highway guard rail comprising a series of supports, supporting brackets attached thereto, an impact member extending from bracket to bracket, a C-shaped locking element passed around said impact member, through said bracket, and into engagement with anchoring means at the inside front portion thereof, said means comprising a reinforced metal plate having T-shaped openings in the face thereof for engaging opposite ends of said locking element, the narrow portion of said openings sliding in grooves in said ends provided for such purpose.

18. A highway guardrail comprising a series of supports, a series of brackets anchored thereto, a longitudinally extending groove in each bracket, a cable extending from bracket to bracket and securing vertical support from said grooves, and means anchoring said cable in each groove, said means being calculated to fail under a lesser force than is required to break said cable.

19. A highway guardrail comprising a series of supports, supporting springs attached thereto, longitudinally extending grooves in said springs, and impact members extending from spring to spring and seating in said grooves, the uppermost impact member being coextensive with the upper edge of the supporting spring in each instance.

20. A highway guardrail comprising a series of posts, supports attached thereto, longitudinally extending grooves in said supports, impact members extending from support to support and seating in said grooves, and means within each groove for anchoring said impact member to the support at such point, said means comprising generally C-shaped locking members which are passed around the impact elements, passed through apertures provided in the rear of said grooves for such purpose, and in turn have their ends bent back against the inner-front faces of said supports in such a manner as to secure said impact members to said supports, the strength of said locking elements being less than that of said impact members.

21. A highway guardrail comprising a series of supports, supporting springs attached thereto, a longitudinally extending groove in one of said springs for lending vertical support to an impact member, an impact member extending from spring to spring, and means for attaching said impact member to said springs, said attaching means being calculated to fail when caught on its back-side, under a force less than that required to break the impact member per se.

22. A highway guardrail comprising a series of supports, curved spring brackets attached thereto, said brackets having convex surfaces directed away from said supports, a longitudinal groove in each bracket, and an impact member extending from bracket to bracket and seating in said grooves, and means for securing said impact member in each of said grooves.

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