This invention relates to expansion joints for railways and has for its general object the provision of a construction which includes a sliding scarf joint in the track which adapts it particularly for use as an expansion joint for bridges with fixed spans, drawbridges, lift bridges, and in other relations in which the employment of an expansion rail may be found desirable or expedient.

A more specific object of the invention is to provide a construction in which the transfer of the wheels of the railway vehicle from one side of the joint to the other takes place on one span and not between spans.

Another object of the invention is the construction of an expansion joint which on double track roads with fixed span bridges can be arranged with the point trailing, a safety factor that allows the maximum speed permitted over the structure.

A further object of the invention is to provide a massive and integral structure undercutting both elements of the joint so that the transference of the wheels from one element to the other is done without shock to either section of the joint and with a minimum pounding of the rolling equipment.

Still another object of the invention is the provision of an expansion joint in which end thrust due to contraction and expansion of the span is minimized, practically eliminating stresses in the bridge structure from this cause.

A further object of the invention is the provision of an expansion rail in which the co-operating rail members meet in a scarf joint, with means for biasing the point of one rail member laterally as their relative longitudinal movement proceeds so as to keep the joint closed, and provide a continuous bearing for the wheels, this being necessarily accomplished by a slight variation in the gage of the track.

Still another object of the invention is the provision of an expansion joint of the hinge type in which structure integral with one side of the joint overlaps the transverse line of separation at the break of the span, the parts of the joint interdigitating entirely on one side of said break.

Other objects of the invention will appear as the following description of several exemplary embodiments thereof proceeds.

In the drawings which accompany and form a part of the following specification and throughout the several figures of which the same characters of reference have been employed to denote identical parts:

Figure 1 is a plan view of an expansion rail embodying the principles of the present invention:

- Figure 2 is a horizontal section of the rail joint shown in Figure 1, taken in a plane intermediate the top and base of the joint;
- Figure 3 is a cross section taken along the line 3-3 of Figure 1;
- Figures 4, 5, 6, and 7 are, respectively, cross sections taken along the lines 4-4, 5-5, 6-6, and 7-7 of Figure 1;
- Figure 8 is a cross section taken along the line 6-6 of Figure 1;
- Figure 9 is a plan view of a modified form of the expansion joint shown in Figure 1;
- Figure 10 is a horizontal section of the expansion joint shown in Figure 9, taken in a plane intermediate the top and base of the joint;
- Figures 11, 12, 13, and 14 are sections taken, respectively, along the lines 11-11, 12-12, 13-13, and 14-14 of Figure 9;
- Figure 15 is a plan view of a modified form of expansion rail joint in which an integral guard rail is provided at the side of the joint on the outside rim to give tread rim guidance where the joints on one side are some distance away from the joints on the opposite side of the track, as, for instance, on a skew bridge;
- Figure 16 is a section taken along the line 16-16 of Figure 15;
- Figures 17 and 18 are plan views of a further modified form of the invention, the hinge type, Figure 17 showing the expansion joint closed, while Figure 18 shows it open, this form showing the constant maintenance of alinement and gage;
- Figure 19 is a side elevation showing one form of the hinge joint in open position; and
- Figure 20 is a section taken along the line 20-20 of Figure 17.

Before referring in detail to the several figures, it may be considered broadly that a joint consists of two sections, one consisting of a traffic rail, wing rail, guard rail, and base plate, cast integral, and referred to as the body section, while the other section consists of a point rail and base plate, cast integral and referred to as the point rail section.

Now, first advert to that form of the invention shown in Figures 1 and 3, a form of expansion joint is shown which is adapted particularly to be employed at the ends of fixed spans on bridge structures, although it is not restricted to this employment, but may be used in sags on railroad tracks or in any place where expansion due to variation in temperatures or from other causes would have to be taken care of. It com-
prises a base plate 1 upon which is integrally mounted a rail section 2 forming one side of the joint and a wing rail 3. Figure 5 shows that the rail 2 is supported by webs 4 and 6, the inner one 4 which together with the web 6 of the wing rail defines a gudgeon in which slides an expansion joint 8 forming the forward end of the base of the rail point 8, which co-operates with the rail 2. Figures 5, 6, and 7 show that the rail 2 is of a constant diminishing width as it approaches the middle of the span and Figure 1 shows that it comes to a point substantially at the end of the span. The rail point 8 is formed with an inclined side 9 extending at a corresponding angle to the co-operating side of the rail 3, said inclined side being adapted upon expansion of the rails to come into coincidence with the rail 2 and upon contraction of the rails to recede longitudinally leaving an opening between the inclined sides of the rail 2 and inclined rail point 8 which enlarges as the contraction of the rails increases. The sides of the extension 7 move parallel with the longitudinal direction of the rails, being guided by the webs 5 and 6 which also lie parallel to the longitudinal direction of the rails. The extension 7 snugly fits between said webs holding the end of the rail point 8 rigidly against spurious lateral movements. The extension 7 is formed with a boss 7A adapted to abut against a chuck 10 securely bolted or otherwise fixed to the wing rail 3 or to the base of the rail 2, as a stop to limit the opening movement of the joint. It will be observed from Figures 1 and 5 that the rail point 8 underlies the rail 2 and the wing rail 3 at its forward end while continuously along its outer side it underlies the wing rail 3 as may be observed from Figures 1, 5, and 6.

The rear part of the rail point 8 is formed with a web 11 between the tread and base, and with an inner side 12 of which is parallel to the longitudinal direction of the track and makes sliding engagement with the inner side 13 of the chuck 10. The opposite side of the web 11 is formed with a boss 14 making sliding engagement with the inner face of the web 4 of the rail 2. Thus the boss portion as well as the forward end of the rail point 8 is firmly held against lateral displacement or binding due to any slight misalignment between the two sides of the joint.

It will be observed that the base 1 of the rail 2 and the rail point 8 together throughout their entire range of longitudinal movement also necessarily change the gage of the track. Within reasonable limits this is not objectionable, but through extreme ranges of expansion and contraction it is preferred to construct the joint as a compromise between that form shown in Figures 1 and 2 and that shown in Figures 9 and 10 making the slope of the extension 18 somewhat less than the slope of the line of separation of the members forming the joint, so that as the joint spreads through contraction, an opening of small width will be produced between the Joint members and a slight broadening of the gage of the track to the limit of the span and not across the line of separation between adjacent spans. It will be understood that the provision of the flared wing rail 3 which as will be observed in the cross sectional figures does not rise above the level of the rail 2, makes it practicable to place the expansion joints opposite one another in the two rails of the track. These guard rails being opposite prevent the flanges of the wheels from touching the points of the point rails, thus making the passage of the wheels over expansion joints safe.

In the event that the expansion joint is used on a double track railway and one be placed opposite the other where traffic on each track is in one direction on a fixed span, it is feasible to arrange the expansion joint with the rail in a trailing direction. This imparts a factor of safety to the device which is not possible with expansion joints in which the joint members abut end to end and allows the maximum speed which is permitted over the railway. While that form of the invention illustrated in Figures 1 and 2 is thoroughly practical for all ordinary ranges of expansion and contraction, yet it is obvious that for extreme ranges the opening between the members of the joint may be excessively wide. In order to prevent a construction in which this objection would not be present, that form of the invention shown in Figures 9 and 10 and in the cross sections appended thereto has been devised which is quite similar to the modification shown in Figures 1 and 2 in that the extension 18 of the forward end of the rail point 8 is not parallel to the longitudinal direction of the rails nor is it guided parallel to said longitudinal direction, but on the contrary, its sides extend in a direction parallel to that of the spur joint and it slides in a gudgeon formed by the webs 19 and 20 which are similarly directed. The result is that as the joint opens, the rail point is moved laterally as well as longitudinally and kept in firm contact with the inclined side of the rail 2. Regardless of how great the range of expansion or contraction may be, this changed relationship of the rail point 8 is always maintained by virtue of the extension 18. In this form of invention, the boss 21 and the face 22 of the web 4 against which it slides are correspondingly sloped.

The variant of the invention illustrated in Figures 9 and 10 is also designed with the flared wing rail 3 so that two of these joints can be arranged at opposite points in a track. As in the modification previously described, they can also be used in any other desired relation with respect to the railway. It will be understood that in the form of the invention just described, the means which holds the rail 2 and the rail point 8 together throughout their entire range of longitudinal movement also necessarily change the gage of the track.

In both forms of the invention above described, an outer elevated guard rail 22 may be employed, such construction adding a factor of safety since in case of having to equip the ends of a bridge that is built on a skew, the type with the tread rim guide will give ample protection and prevent the wheel flanges from touching the point of the rail point section; however, where the expansion rail with the tread rim guide is used, it will generally be impracticable to place two similar joints at opposite points in the two rails of a railway track, for the gage of the wheels is not always uniform and there would be risk of jamming the wheels between the guard rails.

Figures 17 and 18 are drawn to a form of expansion joint particularly adapted to be employed in conjunction with the rail of the type. In this form of the invention, a heavy integral base plate 24 is adapted to be secured to the end of the span as indicated in Fig. 19 and carries an extension 25 which overhangs the end of the span. The extension includes the rail 2 and the wing rail 26 with the channel 27 between them for the passage of the flange.
overhanging extension is cut entirely through to form a passage-way for the displacement in a vertical plane of the rail point 8. The rail 2 and the rail point 8 are provided with co-operating inclined faces 25 forming a scarf joint, and the bottom part of said rail point 8 is parallel to the longitudinal direction of the track and makes sliding engagement with the adjacent wall of the slot through which the rail point operates. The cross section shown in Figure 20 indicates that the descending member 30 which carries the rail point 8 is formed with channels having upwardly flaring sides 31, 32, 33, 34 enabling the hinged member to find a seat as it comes up into horizontal position. This is to take care of any lateral lost motion or misalignment which might exist between the hinged element of the bridge and the fixed span.

While Figure 19 illustrates the hinged member 20 of the bridge carrying the point rail section, it is obvious that the relation of the parts might be reversed, and the body section be carried by the hinged member.

It will be observed that in this form of the invention as well as in the forms previously described, the joint is entirely within the bounds of a rigid integral member, the extension 25 and that therefore the parts of this joint will not be subject to undue wear nor will the railway vehicles be subjected to bounding as the wheels cross the joint.

While I have in the above description disclosed what I believe to be preferred and practical embodiments of my invention, it is to be understood that the specific details of construction as shown and described are merely by way of example and are not to be construed as limiting the scope of the invention as defined by the appended claims.

What I claim is:

1. Expansion joint comprising in combination, a base plate formed with a rail extension adapted to be secured in alinement with and to form a part of a rail, and a complementary base plate having a rail point adapted to be secured in alinement with and to form a part of a rail, said extension and said rail point having co-operating faces extending diagonally of the tread surface and adapted to coincide when said rail joint is closed incident to expansion, the base plate which carries said rail extension having a longitudinal wing rail overlapping the break between said rail extension and said rail point, but spaced therefrom to define a wheel flange channel, said rail point having a forward extension, and said rail extension and wing rail having web portions defining with the bottom part of said base plate a guideway slidably receiving said forward extension, and means for limiting the separation of said joint, the guiding surfaces of said guideway being parallel to the direction of movement of said joint parts.

2. Expansion joint comprising in combination, a base plate formed with a rail extension adapted to be secured in alinement with and to form a part of a rail, and a complementary base plate having a rail point adapted to be secured in alinement with and to form a part of a rail, said extension and said rail point having co-operating faces extending diagonally of the tread surface and adapted to coincide when said rail joint is closed incident to expansion, the base plate which carries said rail extension having a longitudinal wing rail overlapping the break between said rail extension and said rail point, but spaced therefrom to define a wheel flange channel, said rail point having a forward extension, and said rail extension and wing rail having web portions defining with the bottom part of said base plate a guideway slidably receiving said forward extension, and means for limiting the separation of said joint, said extension and said rail point having co-operating faces extending diagonally of the tread surface and adapted to coincide when said rail joint is closed incident to expansion, the base plate which carries said rail extension having a longitudinal wing rail overlapping the break between said rail extension and said rail point, but spaced therefrom to define a wheel flange channel, said rail point having a forward extension, and said rail extension and wing rail having web portions defining with the bottom part of said base plate a guideway slidably receiving said forward extension, and means for limiting the separation of said joint, said extension and said rail point having co-operating faces extending diagonally of the tread surface and adapted to coincide when said rail joint is closed incident to expansion, the base plate which carries said rail extension having a longitudinal wing rail overlapping the break between said rail extension and said rail point, but spaced therefrom to define a wheel flange channel, said rail point having a forward extension, and said rail extension and wing rail having web portions defining with the bottom part of said base plate a guideway slidably receiving said forward extension, and means for limiting the separation of said joint, the guiding surfaces of said guideway being parallel to the direction of movement of said joint parts.

3. Expansion joint comprising in combination, a base plate having inner and outer flanges and an intermediate rail point, defining between them channels on opposite sides of the rail point, the latter being adapted to be secured in alinement with a rail, a co-operating rail plate including a rail extension adapted to be secured to a rail, and a wing rail spaced from said rail extension to de-
fine a wheel flange channel, part of said rail extension and said wing rail overhanging the base plate from which they emanate so as to overlap the opposite base plate when the joint is closed.

5 said rail point having a face in a plane diagonal to the tread surface, and said overlying part of said rail extension being cut away to fittingly receive said rail point, said base plates being longitudinally separable, and the channels in the first named base plate being outwardly flared to guide the seating parts of the forward overhanging rail extension and wing rail, to a correct seating position despite slight deviations in alinement of said base plate when hinging.

10 8. Expansion joint comprising a rail divided diagonally in a plane perpendicular to the tread, base sections supporting said rail and divided transversely in a plane intersecting said rail and said rail point and extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum extent.

13. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum extent.

18. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum extent, and means for limiting the extent to which said joint may open.

21. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

24. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

27. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

30. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

33. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

36. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

39. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

42. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

45. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

48. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

51. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

54. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

57. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

60. Expansion joint comprising in combination, complementary base plates one having a rail and the other a rail point cooperating with said rail, the cooperating faces of said rail and rail point extending diagonally with respect to the tread surface of the rail, and the line of division between said rail and rail point being provided with a slide extending in front of said rail point, and the base plate carrying said rail having a guide way receiving said slide, the latter being of sufficient length to still be maintained in said guideway when the joint is open to its maximum limit.

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