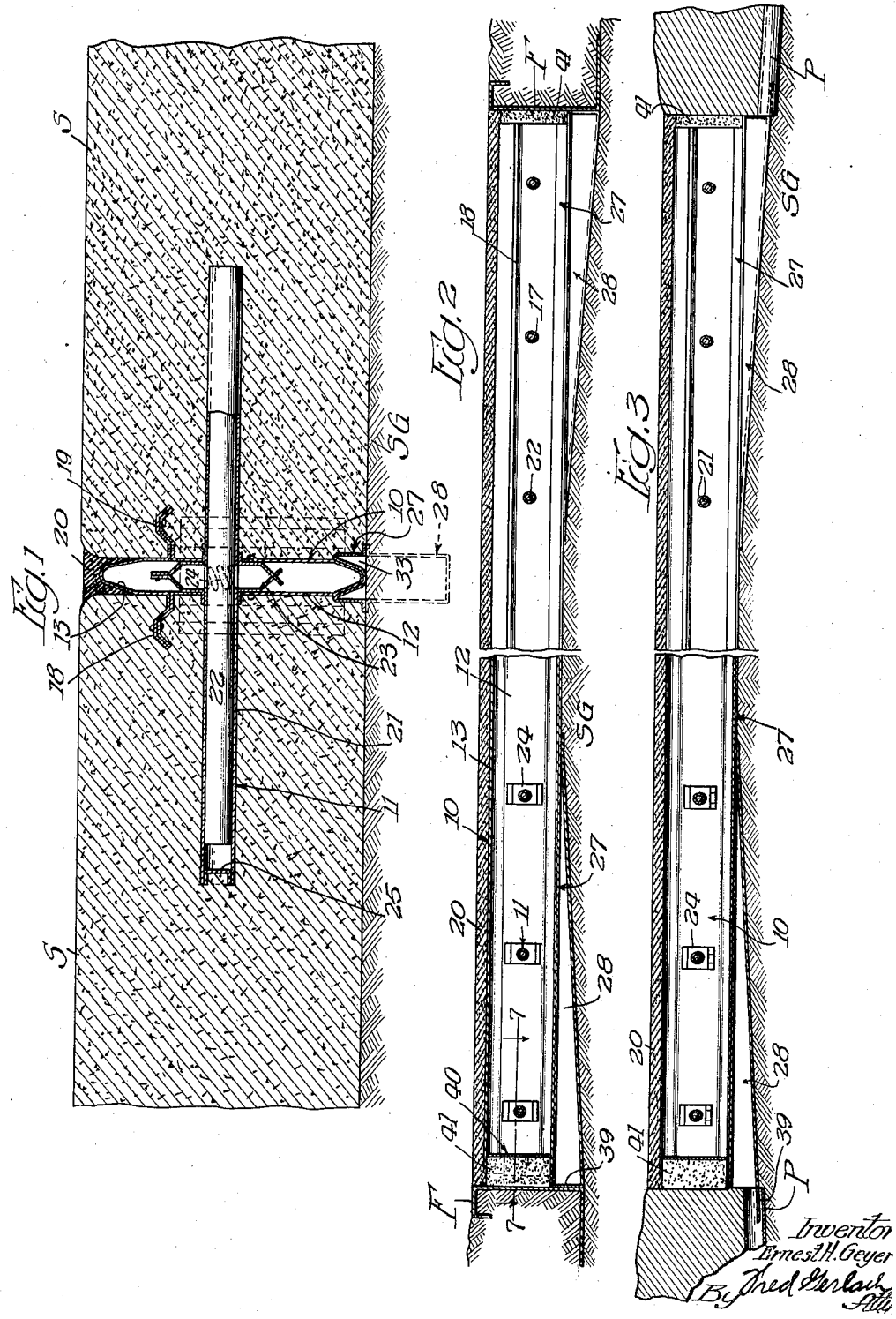
July 16, 1940. E. H. GEYER 2,208,000

JOINT FOR CONCRETE SLABS

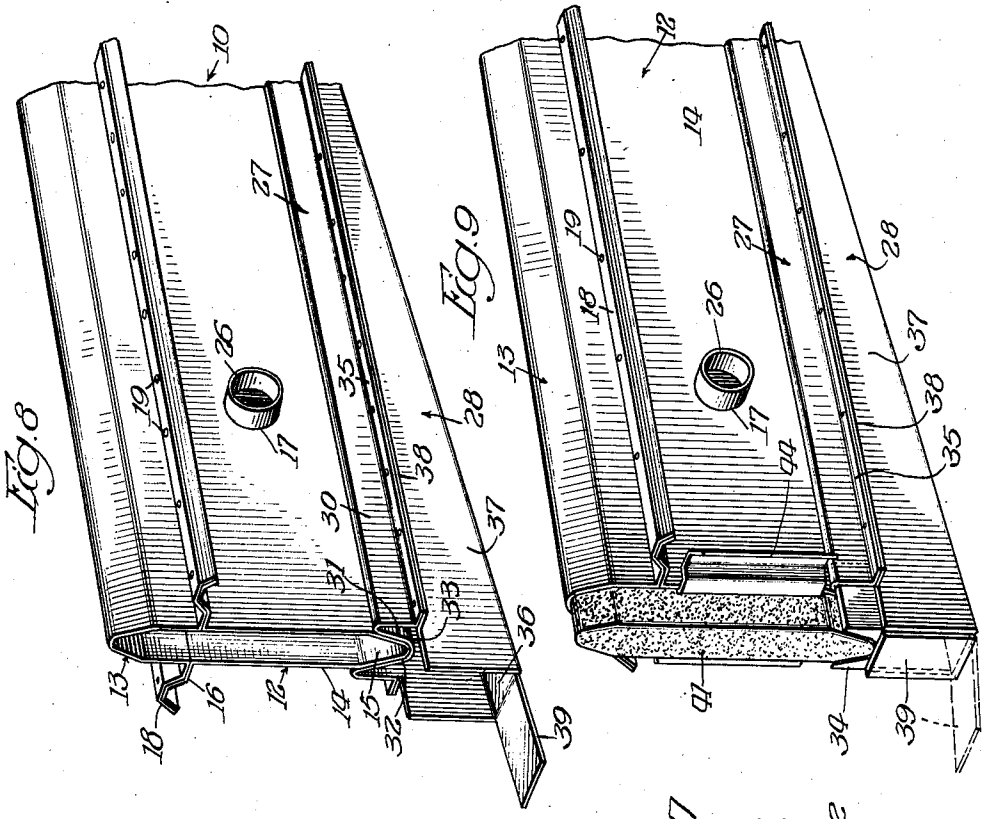
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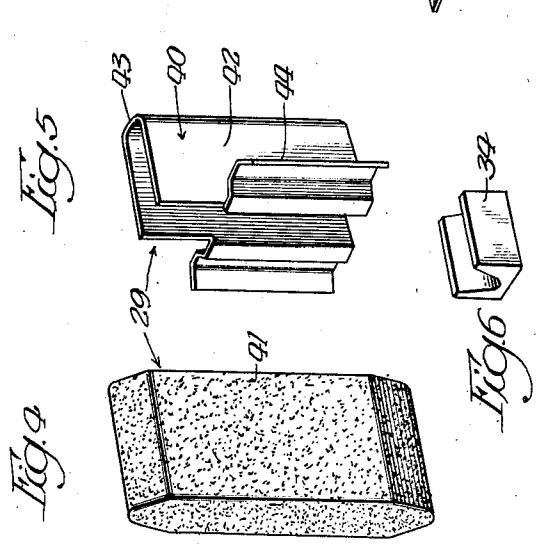


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JOINT FOR CONCRETE SLABS

Filed Sept. 30, 1937 2 Sheets-Sheet 2





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Patented July 16, 1940 2,208,000

UNITED STATES PATENT OFFICE

2,208,000

JOINT FOR CONCRETE SLABS

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Application September 30, 1937, Serial No. 166,501

11 Claims. (Cl. 94—18)

The present invention relates generally to joints for concrete slabs. More particularly the invention relates to that type of joint which is adapted for use between a pair of adjoining roadway forming slabs on a subgrade, operates as a load transfer unit and at the same time permits the slabs to move to and from one another in response to expansion and contraction, and comprises (1) an elongated hollow sheet metal structure which is adapted to fit between the slabs and to contract and expand in connection with expansion and contraction of the slabs and forms in effect an elastic seal between the slabs; and (2) a set or series of laterally spaced load transfer elements which are in the form of sleeves and dowel rods in the sleeves and have the central portions thereof extending through the hollow structure and their end portions projecting from opposite sides of the structure and adapted for embedment in the slabs.

One object of the invention is to provide a joint of this type which in addition to the elongated hollow sheet metal structure and the load transfer elements comprises a novel drain for conducting or guiding to the sides of the subgrade any water which accumulates under the joint.

Another object of the invention is to provide a joint of the last mentioned character in which the drain is disposed beneath and coextensive with the hollow structure and has a central open top channel in which the bottom portion of the hollow structure fits and also has a pair of laterally spaced side legs which have out-turned flanges along the bottom margins thereof for supporting the drain and hollow structure on the subgrade and preventing them from tilting laterally during pouring of the concrete in connection with the formation of the slabs.

Still another object of the invention is to provide a joint of the type and character under consideration in which the ends of the drain along the bottom portion of the hollow structure have wedge shaped troughs which are arranged or positioned with the large ends thereof facing outwards, fit upon the beveled or inclined side portions of the subgrade, and serve to conduct water from the end portions of the drain to drain pipes at the sides of the subgrade.

A further object of the invention is to provide a joint of the type and character last mentioned in which the wedge-shaped troughs at the ends of the drain under the hollow structure have tongues which are adapted during pouring of the concrete at the sides of the joint to close the outer or large ends of the troughs against the inflow of concrete and are further adapted after formation of the slabs, that is, setting of the concrete and removal of the roadway side forms to be bent outwards into a position wherein they serve as a centering medium for the inner ends of the drain pipes at the sides of the subgrade.

A still further object of the invention is to provide a joint of the aforementioned type which includes novel means for closing the ends of the elongated hollow structure.

In addition the invention contemplates as one of its objects the provision of a concrete slab joint which is generally of new and improved construction, may be manufactured at a comparatively low and reasonable cost, and is not only more efficient than previously designed joints for the same purpose and of the same general character but also is an improvement upon and has certain advantages over the joint which is shown in and forms the subject matter of United States Letters Patent No. 2,095,060, granted to me October 5, 1937.

Other objects of the invention and the various advantages and characteristics of the present concrete slab joint will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion thereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a vertical transverse sectional view of a joint embodying the invention;

Figure 2 is a view partly in side elevation and partly in longitudinal section showing the joint in place on the subgrade with the ends thereof in abutment with the roadway side forms;

Figure 3 is a similar view showing the joint after removal of the side forms from the ends thereof and after setting of the concrete and application of the drain pipes to the tongues on the wedge-shaped troughs at the ends of the drain;

Figure 4 is a perspective of one of the composition type compressible plugs which constitute part of the means for closing the ends of the hollow structure against inflow of concrete during formation of the slabs at the sides of the structure;

Figure 5 is a perspective of one of the flange equipped sheet metal end closures which consti-

tute another part of the closing means for the ends of the hollow structure;

Figure 6 is a perspective of one of the U-shaped composition type compressible plugs which serve to close the ends of the drain against the inflow of concrete during the concrete pouring operation;

Figure 7 is an enlarged horizontal sectional view taken on the line 7—7 of Figure 2 and illustrating the manner in which the composition type compressible plugs and the flange equipped sheet metal end closures coact to form the end closing means for the hollow structure of the joint;

Figure 8 is a perspective of one end of the hollow structure showing such end without its compressible type composition plug and flange equipped sheet metal end closure and illustrating the manner in which the tongues on the wedge-shaped troughs at the ends of the drain are adapted to be bent outwards into a position wherein they serve as a centering medium for the inner ends of the drain pipes at the sides of the subgrade; and

Figure 9 is another perspective view of such one end of the hollow structure showing the compressible plug and sheet metal end closure for such end in their operative position and showing the manner in which the U-shaped compressible plugs serve to close the ends of the drain and also the manner in which the tongues at the outer or large ends of the wedge shaped troughs operate during pouring of the concrete at the sides of the structure to close the ends of the trough against inflow of concrete.

The joint which is shown in the drawings constitutes the preferred embodiment of the invention. It is shown in connection with a pair of roadway forming concrete slabs S on a subgrade SG and comprises an elongated hollow structure 10 and a set or series of laterally spaced load transfer elements 11. The slabs S with which the improved joint is shown are positioned in adjoining relation, and the subgrade SG on which the slabs are disposed has beveled or downwardly inclined side portions, as shown in Figures 2 and 3. The slabs S are formed by pouring concrete at the sides of the joint and between side forms F at the sides of the subgrade, as well understood in the art.

The hollow structure 10 is adapted to fit between the opposed faces of the slabs and serves as hereinafter described, as an elastic seal between the two slabs whereby the passage of dirt, water and other foreign matter between the slabs is precluded. It is of uniform height from one end thereof to the other and consists of a one-piece U-shaped sheet metal lower member 12 and a one-piece inverted U-shaped sheet metal upper member 13. The height of the hollow structure 10 corresponds substantially to the height of the slabs S and the length is slightly less than the width of the slabs, as shown in Figures 2 and 3. The lower member 12 consists of a pair of laterally spaced side walls 14, a bottom wall 15, and a pair of outwardly extending top flanges 16. The side walls 14 are held by the bottom wall 15 in laterally spaced relation. They embody in the upper portions thereof equidistantly spaced pairs of aligned holes 17 and are adapted as shown in Figure 1 to abut directly against the opposed faces of the slabs S. The bottom wall 15 is V-shaped and straight and permits the side walls 14 to move toward and away from one another in response to expansion and contraction of the slabs. The top flanges 16 of the lower member 12 are the same in length as the side walls 14 and extend upwardly, outwardly and then downwardly. They are adapted for embedment in the slabs S and due to their cross-sectional design become interlocked with the slabs after pouring of the latter and hence cause the side walls 14 of the lower member 12 to move in harmony with the opposed faces of the slabs in connection with expansion and contraction of the slabs. The upper member 13 overlies the lower member 12 and is the same in length as the latter. It serves as a cap or top closure for the lower member of the hollow structure and embodies integral outwardly extending bottom flanges 18. The latter extend upwards, outwards, and then downwardly and conform to and rest on the top flanges 16 of the U-shaped lower member 12. Rivets 19 extend through the outwardly extending portions of the flanges 16 and 18 and serve to hold the upper and lower members in connected relation. The bottom flanges 18 of the upper member form troughs to prevent seepage of water around the top flanges 16 and downwards across the side walls 14 of the lower member 12, and are adapted for interlocking embedment in the slabs S and to cause the side walls of the upper member 13 of the hollow structure to contract and expand in harmony with expansion and contraction of the slabs. The top wall of the upper member 13 is adapted to support a plastic filling 20 so that the top face thereof is substantially flush with the top faces of the slabs S.

The load transfer elements 11 are adapted to transfer load from one slab to the other and consists of one-piece sheet metal sleeves 21 and metallic dowel rods 22 in the sleeves. The central portions of the sleeves extend through the pairs of aligned holes 17 in the upper portions of the side walls 14 of the U-shaped lower member 12 of the hollow structure and are supported or carried by pairs of coacting spreader plates 23. The end portions of the sleeves project from opposite sides of the hollow structure 10 and are adapted for embedment in and to become bonded to the slabs S. The central portions of the sleeves are weakened by way of slots 24 so that they will readily expand or distend or rupture and thus permit the end portions to move to and from one another in response to expansion or contraction of the slabs. The outer extremities of the sleeves are closed by means of sheet metal caps 25 which are suitably secured in place to prevent concrete from flowing into the sleeves during pouring of the slabs. The slots 24 are located within the hollow structure and hence are protected against concrete passing therethrough into the sleeves. Pairs of coacting spreader plates 23 are disposed in the hollow structure and are so arranged and formed that they urge the sides of the structure outwards into contact or engagement with the opposed faces of the slabs. They correspond in number to the sleeves of the load transfer members and have integral out-turned annular bearing forming flanges 26 which extend through the holes 17 in the side walls 14 of the member 12 and fit snugly around the central portions of the sleeves. The dowel rods 22 are slightly shorter than the sleeves and are greased or otherwise lubricated so that they slide relatively to the sleeves and hence permit of load transfer from one slab to the other while at the same time they permit the slabs to expand and contract.

In addition to the elongated hollow structure 10 and the sleeve and dowel rod type load transfer elements 11, the joint comprises an elongated sheet metal drain 27 and a pair of sheet metal wedge-shaped troughs 28, and in addition end closing means 29 for the structure 10.

The drain 27 underlies and is coextensive with the V-shaped bottom wall 15 of the lower member 14 of the hollow structure 10. It is of M-shaped cross-section and consists of a pair of laterally spaced side legs 30 and a V-shaped central leg 31. The leg 31 corresponds in height to the side legs 30 of the drain and defines a central open top channel 32 in which the V-shaped bottom wall 15 of the lower member 12 of the hollow structure fits snugly. The V-shaped central leg 31 and the wall 15 are welded or riveted together in order to hold the hollow structure in connected relation with the drain. The side legs 30 of the drain are formed integrally with and depend from the upper side margins of the leg 31 and define with said side leg a pair of downwardly facing channels 33 at opposite sides of the central channel 32. These channels 33 run from one end of the hollow structure to the other and serve to guide or conduct to the sides of the subgrade SG any water which accumulates under the joint or the adjacent portions of the slabs S. The ends of the channels are plugged against the inflow of concrete during pouring of the slabs S by way of a pair of U-shaped compressible type composition plugs 34. These plugs project outwardly from the ends of the drain 27 and the inner ends thereof are wedged or jammed within the inner ends of the channels 33 so that they are fixedly secured in place. The lower margins of the laterally spaced side legs 30 of the drain embody integral out-turned flanges 35 which serve to reinforce the drain against flexing sidewise. The central portions of the out-turned flanges 35 are adapted to rest on the crown or central portion of the subgrade SG, as shown in Figures 2 and 3, and serve not only to support the drain and hollow structure on the subgrade but also to prevent them from tilting laterally during pouring of the concrete in connection with the formation of the slabs S. By reason of the fact that the drain 27 extends from one end of the hollow structure 10 to the other the structure is effectively reinforced and has in effect a bottom wall of double thickness.

The wedge-shaped troughs 28 underlie the end portions of the drain 27 and assist such portions in draining to the sides of the subgrade SG the water accumulating or collecting under the joint. They are U-shaped in cross-section and consist of flat bottom walls 36 and triangular sides 37 and are arranged so that the large ends thereof face outwards. The side walls 37 are spaced apart a distance corresponding to the distance between the side legs 30 of the drain 27 and have integral out-turned top flanges 38 which underlie and are welded or riveted to the flanges 35 along the bottom margins of the side legs of the drain. The troughs 28 overlie the beveled or inclined side portions of the subgrade SG and their length corresponds to the width of such portions. They constitute fillers or partitions between the top surfaces of such portions of the subgrade and the end portions of the drain 27. The taper of the troughs corresponds to the bevel of the side portions of the subgrade and hence the troughs constitute partitions whereby concrete at one side of the hollow structure is prevented from flowing from one side of the hollow structure to the other during pouring of the slabs S. The outer or large ends of the troughs project beyond the ends of the hollow structure and drain, as shown in the drawings, and are adapted to abut against the side forms F during pouring of the concrete for the slabs. The inner ends of the bottom walls 36 of the troughs join the inner ends of the out-turned flanges 38 with the result that there is substantially no space between the contiguous portions of the drain and the subjacent portions of the subgrade. The outer ends of the bottom walls 36 of the troughs are extended to form integral tongues 39. These tongues are adapted to extend upwards and close the outer or large ends of the troughs during pouring of the concrete (see Figures 2 and 9) and are further adapted after formation of the slabs S and removal of the side forms F of the subgrade SG to be bent outwards and downwards into a position wherein they are substantially coplanar with the bottom walls 36 of the troughs and form a centering medium for the inner ends of drain pipes P at the sides of the subgrade. The length of the tongues 39 corresponds to the height of the large ends of the side walls 37 of the troughs and hence the tongues effectively close the outer ends of the troughs and prevent inflow of concrete during pouring of the concrete. When the tongues are bent upwards into their trough closing position the upper ends thereof underlie the outer ends of the U-shaped plugs 34 at the ends of the drain 27. The tongues 39 are adapted to fit within the inner ends of the drain pipes P, as shown in Figure 3, and serve to direct or conduct water from the troughs 28 to the pipes.

The end closing means 29 for the hollow structure 10 serves to prevent the concrete from flowing into the ends of the structure during pouring of the slabs S and consists of a pair of sheet metal end closures 40 and a pair of composition type compressible plugs 41. The end closures 40 are U-shaped, as shown in Figure 5, and consist of a pair of laterally spaced side walls 42 and V-shaped inner end walls 43. They fit within the ends of the hollow structure 10, as shown in Figure 9, and are arranged or positioned so that the outer or free edges of the side walls thereof are flush with the end edges of the structure. The V-shaped inner end walls 43 of the end closures are placed under compression when the end closures are shifted into place with the result that they urge the side walls 42 outwards into contact with the sides of the hollow structure 10 and assist the spreader plates 23 in causing said sides of the structures to move outwards in harmony with the opposed faces of the slabs S. The side walls of the end closures are provided along the outer margins thereof with integral out-turned flanges 44. These flanges extend generally at right angles to the sides of the hollow structure and are adapted for embedment in the slabs S. They extend from the central portions of the outer side margins of the side walls 42 to the bottom edges of said side walls and are of channel shaped cross-section so that they become interlocked with the slabs S after hardening of the latter and hence cause the side walls 42 of the end closures to move inwards and outwards in response to expansion and contraction of the slabs. As shown in Figure 9 of the drawings, the flanges 44 are disposed beneath the out-turned top flanges 16 along the upper margins of the side walls 14 of the U-

shaped lower member 12 of the hollow structure 10. The plugs 41 correspond in cross-section to the interior of the hollow structure 10 and assist the end closures 40 of the closing means 29 in preventing inflow of concrete with respect to the hollow structure. They are longitudinally aligned with the hollow structure and are adapted readily to compress in response to expansion of the slabs S. The inner portions of the plugs 41 fit between the side walls 42 of the end closures 40 and form a substantially elastic seal for the ends of the hollow structure. The outer portions of the plugs 41 overlie the U-shaped plugs 34 and the outwardly projecting large ends of the troughs 28 serve to close the spaces between the ends of the hollow structure 10 and the side forms F at the sides of the subgrade SG during pouring of the concrete for the slabs S. The outer lower corners of the plugs 41 fit within the U-shaped plugs 34, as shown in Figure 9. By employing the composition type compressible plugs 41 the ends of the hollow structure 10 are effectively sealed, and by employing the sheet metal flange equipped end closures 40 the end portions of the sides of the hollow structure are caused to move inwards and outwards in response to expansion and contraction of the slabs S.

In installing or applying the joint the hollow structure 10 is first placed transversely across the subgrade SG and arranged so that the central portions of the out-turned flanges 35 of the drain 27 rest on the crown or central portion of the subgrade. After so positioning the hollow structure the load transfer elements 11 are assembled with respect to the hollow structure by inserting the sleeves 21 with the dowel rods therein through the bearing forming flanges 26 of the spreader plates 23. Thereafter the ends of the hollow structure are sealed by driving or hammering the sheet metal end closures 40 into place and inserting the inner portions of the plugs 41 into the end closures. After insertion of the plugs 41 in the end closures 40 the U-shaped plugs 34 are inserted into the ends of the drain 27 and the tongues 39 are bent upwards so as to close the outer or large ends of the troughs 28. Thereafter the roadway side forms F are placed in abutment with the tongues 39 and the outer end faces of the plugs 41, as shown in Figure 2, and concrete is poured into the spaces at opposite sides of the hollow structure and between the forms F. Upon the setting or hardening of the concrete the resultant V-shaped slabs, as shown in Figure 1, abut against the sides of the hollow structure and have embedded therein the top flanges 16 of the U-shaped lower member 12 of the hollow structure and the bottom flanges 18 of the inverted U-shaped cap or upper member 13. In addition the slabs have embedded therein the end portions of the sleeves 21 of the load transfer elements and the out-turned channel type flanges 44 of the end closures 40. After formation of the slabs S that is, hardening or setting of the concrete, the side forms F are removed and the tongues 39 at the outer or large ends of the trough 28 are swung outwards and downwards. Thereafter the drain pipes P are placed on the sides of the subgrade SG in alignment with the tongues and moved inwardly until the inner ends thereof extend around such tongues. At the conclusion of the pipe laying operation the portions of the roadway at the sides of the slabs S are filled in, as shown in Figure 3. When the joint is in its assembled position with respect to the slabs S the dowel rods 22, which are slidably mounted in the sleeves 21, transmit load from one slab to the other and at the same time permit of ready expansion and contraction of the slabs. In addition, the hollow structure 10 with the plastic filling 20 along the top thereof serves as an effective seal between the opposed faces of the slabs. In the event any water accumulates beneath the central portion of the joint as the result of rain or flood such water is permitted to flow via the channels 33 in the drain 27 to the troughs 28 and from the troughs outwards to the drain pipes P at the sides of the subgrade SG.

The herein described joint efficiently and effectively fulfills its intended purpose and not only is extremely durable and capable of long life but also may be manufactured at a low and reasonable cost. It may be readily assembled at the place of use and contemplates a quick and ready drainage of any water accumulating under the central portion thereof.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent is:

1. A joint for a pair of adjoining roadway-forming concrete slabs on a subgrade, comprising in combination an elongated compressible structure adapted to fit between the opposed faces of the slabs and form a seal therebetween, and a separately formed coextensive sheet metal drain of truly M-shaped cross-section positioned longitudinally of and under the structure and adapted to overlie and rest upon the subgrade and having the central leg thereof defining an open top channel in which the bottom of the structure fits snugly and its side legs defining with the central leg a pair of downwardly facing channels at the sides of the open top channel and in communication with the subjacent portion of the subgrade for permitting any water accumulating under the joint to drain to the sides of the subgrade.

2. A joint for a pair of adjoining roadway-forming concrete slabs on a subgrade, comprising in combination an elongated hollow structure adapted to fit between the opposed faces of the slabs and form a seal therebetween and embodying a pair of laterally spaced slab engaging sides and a continuous V-shaped bottom, between the bottom margins of the sides, and a separately formed coextensive sheet metal drain of truly M-shaped cross-section positioned longitudinally of and under the structure and having the central leg thereof defining an open top V-shaped channel corresponding in shape and size to the V-shaped bottom of the hollow structure and; in which said bottom fits snugly and is secured and having its side legs defining with the central leg a pair of downwardly facing channels at the sides of the open top channel and in communication with the subjacent portion of the subgrade for permitting any water accumulating under the joint to drain to the sides of the subgrade and provided along the bottom margins thereof with integral out-turned flanges for engaging the subgrade and holding the drain and hollow structure against tilting during pouring of the concrete for the slabs.

3. A joint for a pair of roadway-forming concrete slabs on a subgrade with beveled sides, comprising in combination a straight elongated hol-

low structure of substantially uniform height from end to end and adapted to fit between the opposed faces of the slabs and form a seal therebetween, a pair of wedge-shaped troughs positioned beneath the end portions of the structure and with the large ends thereof facing outwards and adapted to occupy and fill the spaces between said end portions of the hollow structure and the beveled sides of the subgrade and to conduct any water accumulating under the central portion of the joint to laterally extending drain pipes on the sides of the subgrade, and means connected to said large ends of the troughs adapted to engage and interlock with the inner edge of said drain pipes and hold the pipes in alignment and communicating relation with the troughs.

4. A joint for a pair of roadway-forming concrete slabs on a subgrade with beveled sides, comprising in combination an elongated straight compressible structure of substantially uniform height from end to end adapted to fit between the opposed faces of the slabs and form a seal therebetween, a pair of wedge-shaped sheet metal troughs positioned beneath the end portions of the structure and with the large ends thereof facing outwards and adapted to occupy and fill the spaces between said end portions of the structure and the beveled sides of the subgrade and to permit any water accumulating under the central portion of the structure to drain to the sides of the subgrade, and tongues connected to and formed integrally with said large ends of the troughs and adapted normally to extend outwards and fit within the ends of laterally extending drain pipes on the sides of the subgrade and hold the pipes in connected and communicating relation with the troughs.

5. A joint for a pair of roadway-forming concrete slabs on a subgrade with beveled sides, comprising in combination an elongated straight compressible structure of substantially uniform height from end to end and adapted to fit between the opposed faces of the slabs and form a seal therebetween, a pair of wedge-like sheet metal U-shaped troughs positioned beneath the end portions of the structure and with the large ends thereof facing outwards and adapted to occupy and fill the spaces between said end portions of the structure and the beveled sides of the subgrade to permit any water accumulating under the central portion of the structure to drain to the sides of the subgrade, and tongues on said large ends of the troughs adapted during pouring of the concrete for the slabs to extend across and close the outer ends of the troughs against the inflow of concrete and upon setting of the concrete to be bent outwards and form a centering medium for the inner ends of laterally extending drain pipes on the sides of the subgrade.

6. A joint for a pair of adjoining roadway-forming concrete slabs on a subgrade, comprising in combination an elongated compressible structure of substantially uniform height from end to end adapted to fit between the opposed faces of the slabs and form a seal therebetween, a separately formed substantially coextensive drain under the structure adapted to overlie and rest upon the subgrade and having a longitudinal downwardly facing channel for permitting any water accumulating under the joint to drain to the sides of the subgrade, and means adjacent to the ends of the drain adapted to engage and interlock with the inner ends of laterally extending drain pipes on the sides of the subgrade and to hold such pipes in longitudinal alignment with the drain.

7. A joint for a pair of adjoining roadway-forming concrete slabs on a subgrade with beveled sides, comprising in combination an elongated straight compressible structure of substantially uniform height from end to end adapted to fit between the opposed faces of the slabs and form a seal therebetween, a separately formed substantially coextensive drain under the bottom of the structure adapted to have the central portion thereof rest on the central portion of the subgrade and having a longitudinal downwardly facing channel therein for permitting any water accumulating under the central portion of the joint to drain towards the sides of the subgrade, and a pair of wedge-shaped troughs beneath the end portions of the drain and with the large ends thereof facing outwards and adapted to occupy and fill the spaces between said end portions of the structure and the beveled sides of the subgrade and to receive water from the downwardly facing channel of the drain and conduct the same to the sides of the subgrade.

8. A joint for a pair of adjoining roadway-forming concrete slabs on a subgrade, comprising in combination an elongated compressible structure adapted to fit between the opposed sides of the slabs and form a seal therebetween, a straight separately formed coextensive sheet metal drain of truly M-shaped cross-section positioned longitudinally over and under the structure and having the central leg thereof defining a V-shaped open top channel in which the bottom of the hollow structure fits and having its side leg defining with the central leg a pair of downwardly facing channels in communication with the subjacent portion of the subgrade for permitting any water accumulating under the central portion of the joint to drain towards the sides of the subgrade, and a pair of wedge-like U-shaped sheet metal troughs with open large ends positioned beneath the end portions of the drain and with said large ends facing outwards, and adapted to occupy and fill the end spaces between said end portions of the structure and the beveled sides of the subgrade and to receive water from the downwardly facing channels of the drain and conduct the same to the sides of the subgrade.

9. A joint for a pair of adjoining roadway-forming concrete slabs on a subgrade with beveled sides, comprising in combination an elongated straight compressible structure of substantially uniform height from end to end adapted to fit between the opposed faces of the slabs and form a seal therebetween, a separately formed coextensive sheet metal drain of M-shaped cross-section positioned longitudinally of and under the structure and having the central leg thereof defining an open top channel in which the bottom of the structure fits and having its side legs defining with the central leg a pair of downwardly facing channels at the sides of the open topped channel for permitting any water accumulating under the joint to drain to the sides of the subgrade and provided along the bottom margins thereof with integral out-turned flanges, and a pair of wedge-like sheet metal U-shaped troughs beneath the end portions of the drain and with the large ends thereof facing outwards, having integral out-turned flanges along the top margins of the sides thereof in abutment and connected relation with the out-turned flanges of the side

legs of the drain and adapted to occupy and fill the spaces between said end portions of the structure and the beveled sides of the subgrade and to receive water from the ends of the downwardly facing channels of the drain and conduct the same to the sides of the subgrade.

10. A joint for a pair of adjoining roadway-forming concrete slabs, comprising in combination an elongated comparatively narrow open ended sheet metal hollow structure adapted to fit between the opposed faces of the slabs and form a seal therebetween, U-shaped sheet metal end closures fitting snugly in the ends of the structure and having along the outer margins of the side wall thereof integral out-turned channel equipped flanges extending outwards across the end edges of the hollow structure and at substantially right angles to the sides of the latter and adapted for embedment in and to become interlocked with the slabs so that said side walls together with the end portions of the walls of the structure are caused to move apart in response to contraction of the slabs, and compressible plugs fitting in the end closures and extending from the top wall of the hollow structure to the bottom wall.

11. A joint for a pair of adjoining roadway-forming slabs on a subgrade, comprising in combination an elongated comparatively narrow open ended hollow structure adapted to fit between the opposed faces and form a seal therebetween, compression type compressible blocks aligned with the ends of the structure and having the inner portions thereof fitting within and serving to close said structure ends, a separately formed sheet metal drain of M-shaped cross-section positioned longitudinally of and under the structure and adapted to overlie and rest upon the subgrade and having the central leg thereof defining an open top channel in which the bottom of the hollow structure fits and its side legs defining with its central leg a pair of downwardly facing channels at the sides of the open top channel for permitting any water accumulating under the joint to drain to the sides of the subgrade, and U-shaped compressible plugs disposed at the ends of the drain and having the inner portions thereof fitting in the end portions of the downwardly facing channels and their outer portions underlying and fitting around the bottom portions of the first mentioned plugs.

ERNEST H. GEYER.