Dec. 14, 1937. E. E. HALL 2,102,528

EXPANSION JOINT

Original Filed Oct. 27, 1933 3 Sheets-Sheet 1

Fig. 1.

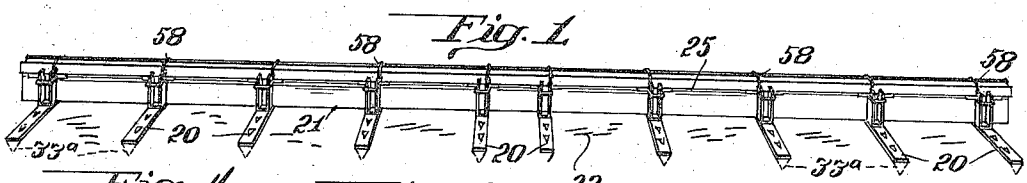


Fig. 4.

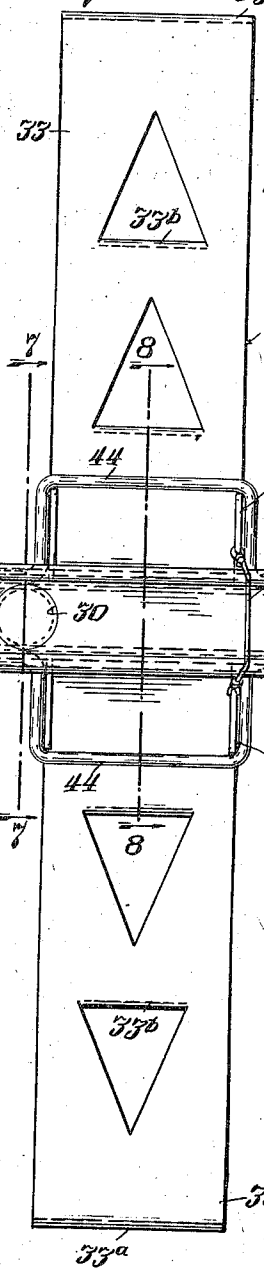


Fig. 2.

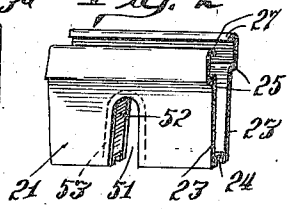


Fig. 3.

Fig. 5.

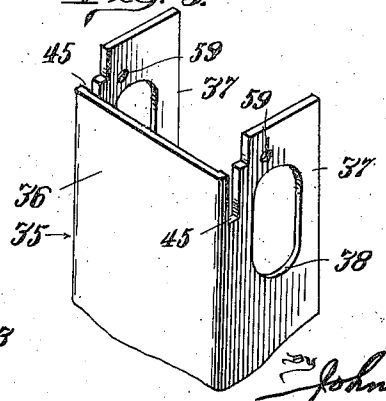


Fig. 6.



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Fig. 7.

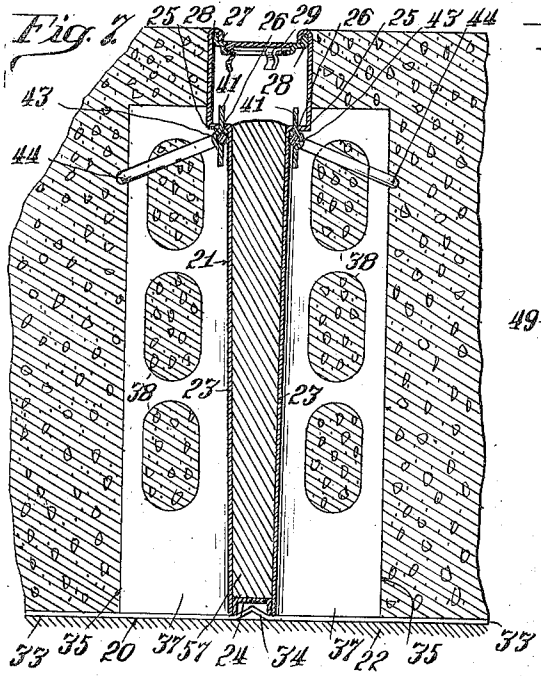


Fig. 8.

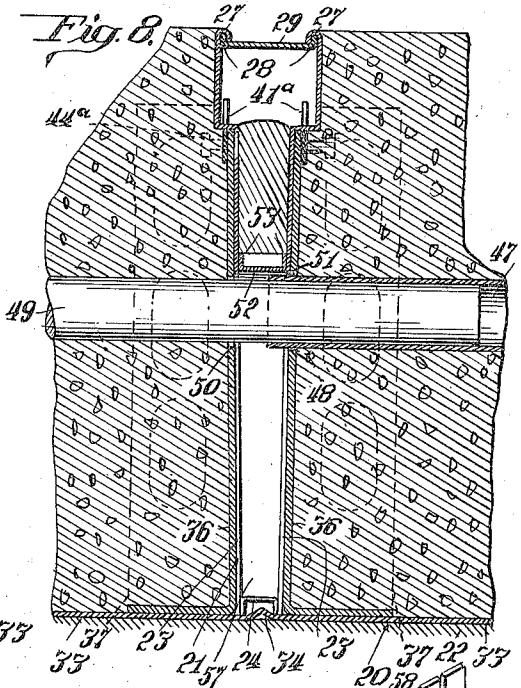


Fig. 11.

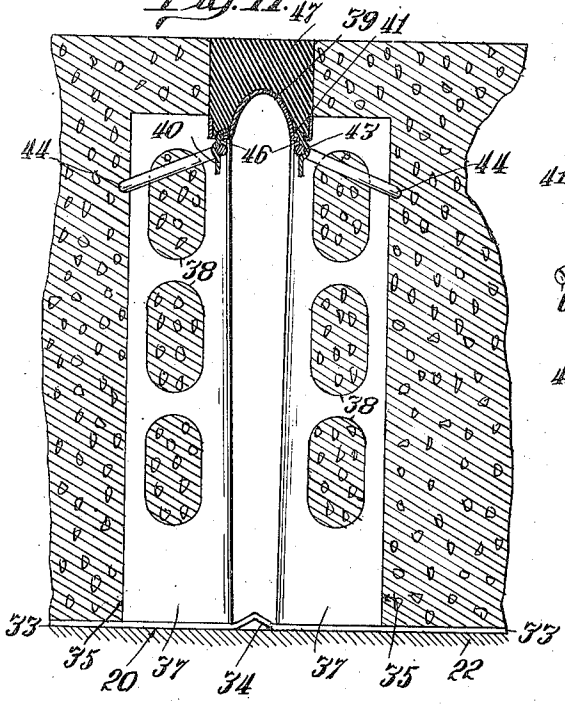


Fig. 9

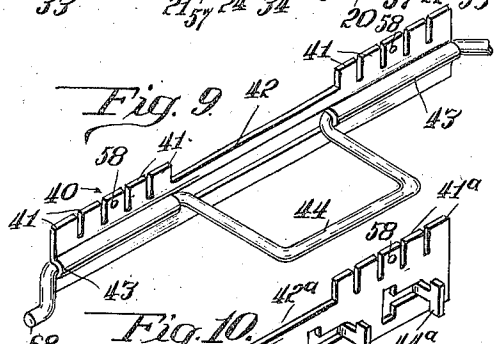


Fig. 10.

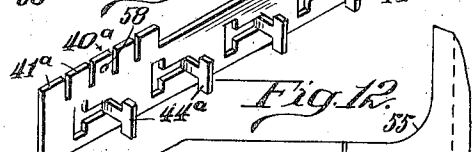


Fig. 12.

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Fig. 13.

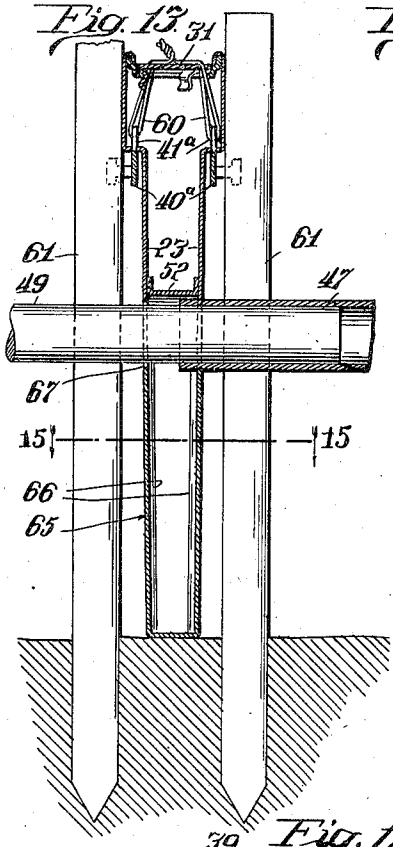


Fig. 14.

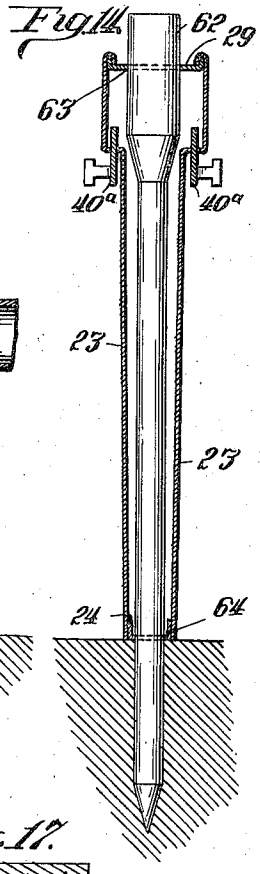


Fig. 15.

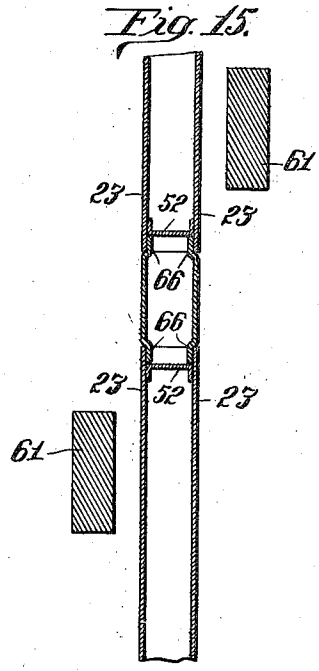


Fig. 17.

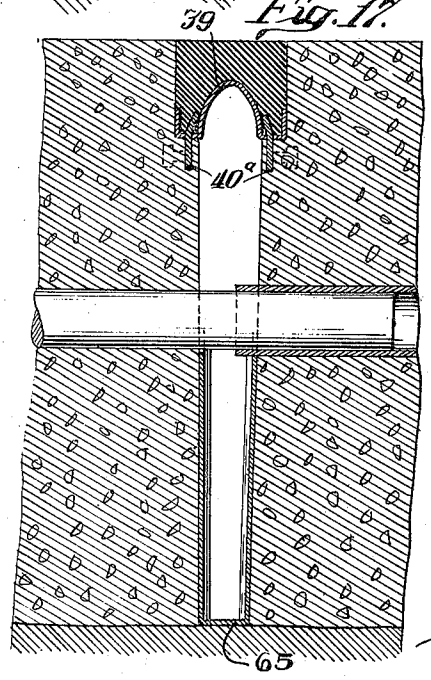
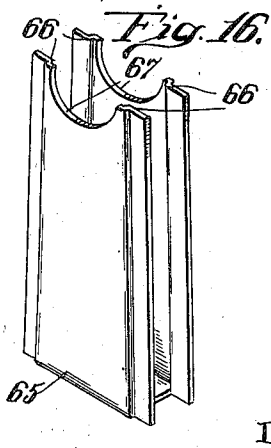


Fig. 16.



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Patented Dec. 14, 1937 2,102,528

UNITED STATES PATENT OFFICE

2,102,528

EXPANSION JOINT

Eric E. Hall, Chicago, Ill., assignor to James H. O'Brien, Chicago, Ill.

Application October 27, 1933, Serial No. 695,470
Renewed March 1, 1937

19 Claims. (Cl. 94—18)

My invention is concerned with concrete roads, etc., and methods of and apparatus for constructing the same, and is designed primarily to produce a road, or similar structure, that shall have so-called expansible joints of simple construction that will be effective in operation, and that can be cheaply constructed and readily repaired.

To these ends, it comprises a novel completed road or pavement, a novel method of constructing the same, and novel apparatus employed in said method.

To illustrate my invention, I annex hereto three sheets of drawings in which the same reference characters are used to designate identical parts in all the figures, of which,—

Fig. 1 is a perspective view of the apparatus employed in constructing the road in position ready for the concrete to be poured;

Fig. 2 is a perspective view of a portion of a form employed in carrying out my invention, but on a larger scale;

Fig. 3 is a perspective view, on a still larger scale, of the same form, together with one of the shoes used to support the same while the concrete is being poured;

Fig. 4 is a top plan view of the parts shown in Fig. 3;

Fig. 5 is a perspective view of a portion of one of the supporting shoes;

Fig. 6 is a perspective view of one of a series of removable caps used in the form;

Fig. 7 is a vertical sectional view of the form and one of the supporting shoes after the concrete has been poured, with one form of an alternative insert shown in section slightly to the right of line 7—7 of Fig. 4;

Fig. 8 is a vertical sectional view similar to Fig. 7, but through the center of the supporting shoe and showing a different form of insert in section on the line 8—8 of Fig. 4;

Fig. 9 is a perspective view of the form of insert shown in Fig. 7;

Fig. 10 is a perspective view of the form of insert shown in Fig. 8;

Fig. 11 is a vertical section similar to Fig. 7, but with the form removed and the closing strip in place;

Fig. 12 is a top plan view of a portion of a road showing how an intersection may be completed when my invention is employed;

Fig. 13 is a view in section similar to Fig. 8, but showing a different form;

Fig. 14 is a sectional view of the modified form showing a different means for securing the form in place;

Fig. 15 is a horizontal section on the line 15—15 of Fig. 13;

Fig. 16 is a perspective view of an element employed in the modified form; and

Fig. 17 is a sectional view similar to Fig. 11, but showing the modified form.

In the construction of concrete roads, they are ordinarily made in slabs extending along the length of the road, and which may have a length of from thirty to ninety feet, depending upon the construction. To take care of the longitudinal expansion and contraction of these slabs due to variation of temperature, they must be separated by so-called expansible joints which permit the ends of the slabs to approach each other when they expand under the heat of the summer, and to separate when they contract in the cold of the winter, and my invention is concerned primarily with such a joint.

In Fig. 1, I show the supporting shoes 20 for the removable form 21 resting on the hard ground base 22 upon which the concrete is poured to form the slabs. The form 21 is preferably of a length to extend entirely across the road, and preferably consists of a pair of symmetrical sheet-metal plates 23, separated at their lower ends by a distance equal to the desired average width of the joint, and connected by the sheet-metal channel 24, which may be spot-welded or otherwise secured in place. Near the top of the form, these plates have the horizontal offsets 25, which have the slots 26 therein for a purpose to be described. The upper edges of the plates are preferably turned over to form the hooked flanges 27, best shown in Fig. 3, the hooks of which receive the upturned edges 28 of the strip 29 forming the closed top, which strip is secured in place by spot-welding or as may be otherwise desired. Located at suitable intervals in the strip are preferably circular apertures 30, through which suitable tools may be inserted, so that when the form is to be withdrawn, after the concrete has set sufficiently, workmen at each end and at suitable intervals between may insert tools in the apertures 30 and lift the form out by a direct upward pull. To close these holes during the pouring of the concrete, I employ the closing caps 31, one of which is shown in perspective in Fig. 6, and each of which may consist of a circular disk provided with three or more spring prongs 32 adapted to engage the edges of the aperture 30 and hold the cap in place, while permitting its easy removal when it is desired to lift the form out of the concrete.

Each of the shoes 20 preferably has a base strip

33 of sheet metal, which has the bend 34 in its center, which bend extends upward into the space formed by the channel 24 of the form. This bend is employed so that the standards of the shoe may approach and recede due to the action of heat and cold without breaking the base strip or offering any serious resistance to the movement of its parts. The ends 33a are preferably pointed and turned down to enter the soil, and I preferably also stamp downward four or more pointed tongues 33b for the same purpose, thus securing the shoes firmly in place. On either side of the bend 34 is secured a standard 35, which consists of a preferably heavier sheet-metal trough, rectangular in cross section, and having the sometimes imperforate bottom portion 36, and the sides 37 having the perforations 38 therein through which the concrete passes to anchor the shoes in place when it sets.

To hold the cover strip 39 in place when the road is finally completed, I employ suitable inserts 40, which consist of bars, preferably of copper, which have preferably two series of projections 41 extending above the main body so as to form a recess 42 between them. These projections 41 extend upward through the previously mentioned slots 26 in the offsets 25 of the form, and suitable means are provided to hold these inserts in place when the concrete is finally set, one form being shown in Figs. 7 and 9, and another form in Figs. 8 and 10. In the form shown in Fig. 9, a semicircular groove 43 is formed in the body of the insert, and co-operating with the groove is the wire bail 44, which preferably takes the shape shown in Figs. 4 and 9, the central portion of the bail fitting over the upper ends of the standards 35, as shown in Figs. 7 and 11. The standards 35, as best seen in Fig. 5, have the upper portion of the bottom of the trough 36 cut away and a portion of the sides 37 similarly cut away, and also the recess 45 provided to receive the central portion of the body of the inserts 42.

In the form shown in Fig. 10, instead of employing grooves 43 and the bails 44, I stamp out of the body of the insert a series of T-shaped tongues 44a, which serve precisely the same purpose as the bails 44.

To enable the contractors to assemble the complete set of shoes for a joint with the form in place at the side of the road, and not interfere with the progress of mixing and pouring the cement, the parts thus assembled at the side of the road are held together so they can be lifted bodily by a series of wires 58 which have their ends held in place in the small holes 59 in the top of the shoes 35, by twisting them, as clearly shown in Fig. 3.

With the parts assembled, as thus shown, the form 21 is placed at the proper place in the road, and it is held securely enough in place so that the concrete can be poured, and fill up to the top of the form 21, and after the concrete is sufficiently set and the wires clipped, the form can be lifted up as previously described. When the form is thus removed, the cross section of the concrete appears as in Fig. 11, except that, of course, the cover piece 39 is not then in place. This cover piece 39 consists of a strip of sheet metal, preferably copper, bent into the cross section shown in Fig. 11, and having the elongated slots 46 therein of the proper location and length to receive the projections 41 or 41a, as the case may be, of the inserts 40 or 40a, and after the cover piece is in place, one or more of the projections 41 and 41a of each of the series is bent over, as seen in Fig. 11, to hold the cover piece 39 in place, and over this cover piece is inserted the customary mastic or other material to complete the joint.

Where dowels are employed, as shown in Figs. 2 and 8, the sleeve portion 47 has its end passed through an aperture 48 formed in the standard of the shoe 20, and the rod portion 49 passes through an aperture 50 in the opposite shoe. When these dowels are employed, the form 21, as shown in Fig. 2, must have the U-shaped recesses 51 therein to permit the form to be lifted out with the dowels left in place. To prevent any possible entry of the concrete to the interior of the form at these recesses 51, I close them, as it were, by securing within the form at each of them, a shallow sheet-metal channel 52 bent to form a U and having the vertical flanges 53 thereof rigidly secured by spot-welding or otherwise to the inner sides of the plates 23 immediately adjacent the recesses 51. I preferably employ these recesses 51 and channel pieces 52 in all the forms, as when the dowels 47, 49 are not used, they are of great value in stiffening the form 21, and insuring its retaining its shape in use.

In the use of the forms, especially if the channel pieces 52 are not used, I may possibly insert between the plates 23 of the form, a wooden strip 57, which will serve to add rigidity to the form.

An advantageous feature in the use of my form resides in the fact that at the intersection of roads when they are widened, the joint may be made as perfect as elsewhere. As indicated in Fig. 12, by the lines 54, on account of the use of form rails, not herein shown and described, to form the longitudinal sides of the slabs, it is necessary to pour the concrete at the intersections so as to keep the road at the intersections just as narrow as elsewhere. After the concrete is set and the rails removed, the four angular additions 55 are added, and the joint 56 is extended through the additions, and each of the cover strips 39, when they are put in place, will extend the entire length of the joint, making each of them as perfect as the shorter joints in the narrower portions. It will also be obvious that if the strips 39 ever need replacing, it will be a simple matter to remove the mastic 47 and straighten up the bent-over projections 41, so the old strips 39 can be removed and replaced by new ones. When so replaced, other projections 41 than those previously bent over can be turned down if the previously used ones have been injured.

In some cases, I may prefer to use a substantially cheaper construction, such as is shown in the modification illustrated by Figs. 13 to 17, inclusive, wherein the supporting members 20 are entirely omitted, and the inserts 40 or 40a, as the case may be, are supported directly by the form, instead of by the supporting members. In this case as seen in Figs. 9 and 10, I have a perforation 58 in preferably each of the tongues 41 or 41a, as the case may be, and I form a couple of holes 59a diametrically opposite and near the edges of the covers 31, as seen in Fig. 6, there being two of the covers 31 suitably spaced apart for each of the inserts 40 or 40a. Before the form is put in place, one of each of the sets of tongues 41 or 41a has a wire 60 passed through it, as indicated in Fig. 13, and the wire and tongues are passed through the associated slot 26 to bring the inserts in place, and the two associated wires are brought up through the ap-

ertures 59 in the cover cap 31, and the ends of the two wires are brought together and twisted tightly so as to secure the inserts in place.

To hold the form in place, I may use a plurality of ordinary stakes 61 driven into the ground base at suitable intervals, or I may employ a special form of stake 62, as indicated in Fig. 14, the enlarged upper end of which fills the aperture 63 having the same shape as the corresponding cross section of the stake in the top 29 of the form, and having its reduced lower end extending through the aperture 64 located in the channel 24 forming the bottom of the form and having its shape corresponding to the cross section of the associated part of the stake. When the concrete has been poured, the stakes 61 will have to be withdrawn before the concrete is set, while the stake 62 can remain until the form is to be removed in the customary manner.

Where the dowel tube 47 and rod 49 are to be employed, as illustrated in Figs. 13, 15, 16 and 17, it becomes necessary to provide a stamping 65, shown in perspective in Fig. 16, and which preferably consists of a strip of sheet metal bent into the U-shaped form shown and with its vertical edges offset, as seen at 66, so that they can fit inside of the sides 23 of the form, as shown in Fig. 15, to prevent the concrete when poured on one side of the form from pushing the stamping out of place. Where the channels 52 are employed, as they may be in this modification, they will be set back far enough from the edges of the opening 51 to accommodate the offsets 66. The ends of the stamping 65 are curved, as shown at 67, on the proper radius to fit snugly against the tube 47 and the rod 49 to prevent the entrance of the concrete into the form. If the insert shown in Fig. 9 is employed, the ends 68 thereof will fit against the outer sides 23 of the form and hold the bail portion proper projected substantially as seen in Figs. 7 and 11. When the concrete is finally set, the wires 60 are clipped above the cover cap 31, and the caps can then be lifted out, and the wires 60 removed before the form is withdrawn, so that the ultimate effect is the same as if the form shown in Figs. 1 to 11 had been employed. When the wires are withdrawn, then the form can be lifted out and the cover strip 39 put in place as before.

While I have shown and described my invention as embodied in the form which I consider best adapted to carry out its purposes, it will be understood that it is capable of modification, and that I do not desire to be limited in the interpretation of the following claims except as may be necessitated by the state of the prior art.

What I claim as new, and desire to secure by Letters Patent of the United States, is:

1. In apparatus of the class described, the combination with a metallic form having recesses in its bottom to accommodate dowels, of a series of members adapted to fit in said recesses and having their upper portions complementary to the cross sections of the dowels to prevent concrete from entering the form through the recesses while permitting the withdrawal of the form leaving the dowels and members in place.

2. As a new and useful article of manufacture, an insert for use in concrete roads for securing the cover strips in the joints consisting of a strip of readily bendable metal having a plurality of tongues projecting above the body thereof and adapted to be bent over one at a time so that different ones may be used at different times with different co-operating cover strips.

3. As a new and useful article of manufacture, a supporting shoe adapted to be embedded at intervals in the joints of a concrete road and consisting of an elongated base strip having a pair of upwardly extending standards near the center thereof and having at their upper ends means for supporting metal securing members and accurately positioning them in a removable form.

4. As a new and useful article of manufacture, a form for use in making joints in concrete roads and adapted to be withdrawn when the concrete is set consisting of a hollow metal bar having substantially horizontal offsets near its top enlarging its upper portion, and having slots in the offsets to co-operate with inserts to be placed therein while the concrete is being poured, said inserts remaining in the concrete when the form is withdrawn.

5. As a new and useful article of manufacture, a form for use in making concrete roads consisting of a hollow metal bar having inverted U-shaped openings in its bottom to accommodate dowel bars, each of said openings being closed by a channel bar bent in a U-shape and secured within the form.

6. In apparatus for the purpose described, the combination with a hollow metal form having openings in its bottom of a substantially inverted U-shape to accommodate dowel bars, of closures therefor consisting of sheet-metal strips bent in substantially a U-shape and fitting in the form openings.

7. In apparatus for the purpose described, the combination with a hollow metal form having openings in its bottom of a substantially inverted U-shape to accommodate dowel bars, of closures therefor consisting of sheet-metal strips bent in substantially a U-shape and fitting in the form openings, the vertical edges of said strips being inwardly offset for the purpose described.

8. As a new and useful article of manufacture, an insert for use in concrete structures consisting of a strip of sheet metal having a plurality of projecting T-shaped lugs stamped out of the body thereof and having a plurality of tongues formed on the upper edge thereof.

9. In an insert for use in concrete structures a strip of sheet metal having aligned grooves at its ends connected by a slot, together with a bail having parts thereof cooperating with the grooves and the bail proper extending through the slot.

10. The method of forming a gap between the ends of slabs in a concrete road for the purpose described which consists in (1) securing in place a hollow metal form extending across the road having metal securing members at intervals extending through the sides of the form and secured therein and supported thereby; (2) pouring the concrete; (3) releasing the connections between the securing members and the form when the concrete has set sufficiently; and (4) lifting out the form leaving a portion of the securing members embedded in the concrete.

11. The method of forming a gap between the ends of slabs in a concrete road for the purpose described which consists in (1) securing in place a hollow metal form extending across the road having metal securing members at intervals extending through the sides of the form and secured therein; (2) pouring the concrete; (3) releasing the connections between the securing members and the form when the concrete has set sufficiently; and (4) lifting out the form leav-

ing a portion of the securing members embedded in the concrete and the remaining portions projecting from the ends of the slabs and adapted to co-operate with a subsequently inserted metal gap-covering strip.

12. In a road-bed or similar surface, the combination with a pair of separated slabs, of metal securing members embedded in their adjacent edges and having portions thereof projecting from said edges, and a strip of metal having a cross section capable of lateral expansion bridging over the gap between the slabs and removably secured at its edges to said members by moving relatively thereto portions of the securing members projecting from the slabs.

13. In a road-bed or similar surface, the combination with a pair of separated slabs having horizontal offsets in their adjacent edges, of metal securing members embedded in their adjacent edges and having portions thereof projecting upwardly from said offsets and forming tongues, and a strip of metal having a cross section capable of lateral expansion bridging over the gap between the slabs and having slots in its edges which are secured to said members by their tongues extending up through said slots.

14. In a road-bed or similar surface, the combination with a pair of separated slabs, of metal securing members partly embedded in their adjacent edges and having a plurality of tongues projecting from said edges, and a strip of metal having a cross section capable of lateral expansion bridging over the gap between the slabs and having slots in its edges which are secured to said members by having some of the tongues thereof extending through said slots and bent over to hold it in place.

15. As a new and useful article of manufacture, a hollow metallic form for use in concrete construction having horizontal offsets forming a widened portion near its top with spaced apertures in said offsets to receive metallic securing members adapted to be partially embedded in and remain in the concrete.

16. As a new and useful article of manufacture, an insert for use in the edges of slabs of concrete roads, consisting of a strip of readily bendable sheet-metal the main body of which is adapted to be embedded in the slabs and having tongue portions projecting above the main body thereof and out of the concrete and having lateral projections from the main body to anchor it in the concrete.

17. As a new and useful article of manufacture, a supporting shoe adapted to be embedded at intervals in the joint of a concrete road and consisting of an elongated base strip having a pair of narrow upwardly-extending standards near the center thereof having at their upper ends means for supporting metal securing members and accurately positioning them in a removable form, and having a bend in the base strip between the standards.

18. An article of manufacture as described in claim 17 in which the standards are perforated to anchor them in the concrete.

19. An article of manufacture as described in claim 17 in which the base strip has downwardly projecting tongues adapted to penetrate the soil.

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