July 7, 1925. 1,545,148

A. E. LINDAU

REENFORCEMENT FOR CONCRETE AND ROAD EMBODYING THE SAME

Filed Nov. 5, 1921

Fig. 1.

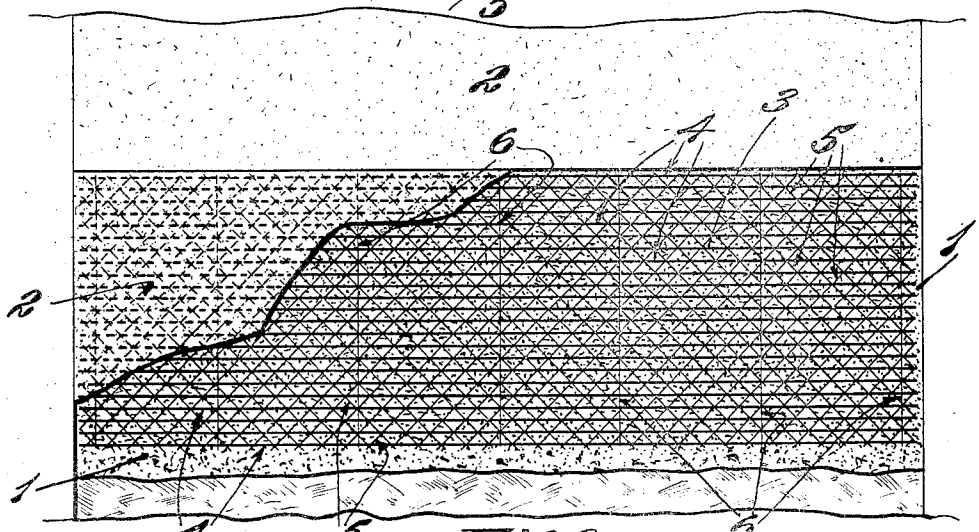


Fig. 2.

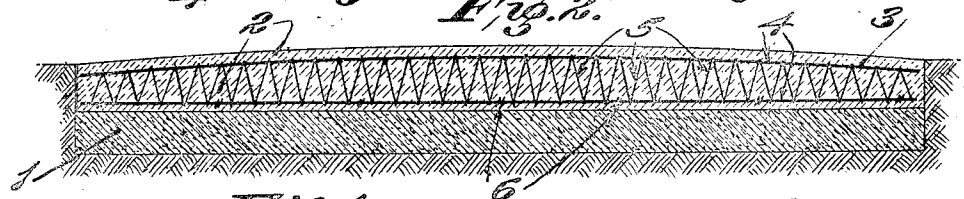


Fig. 4.

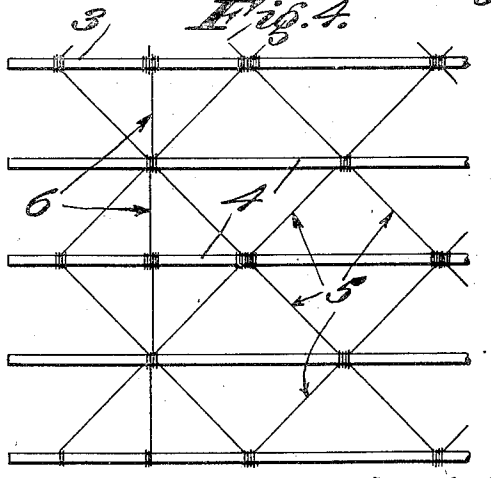
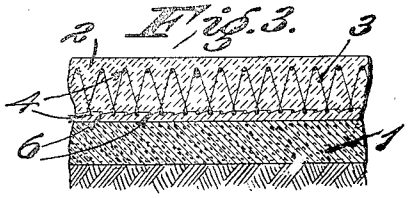


Fig. 3.



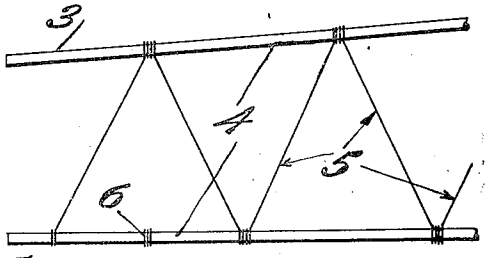


Fig. 5.

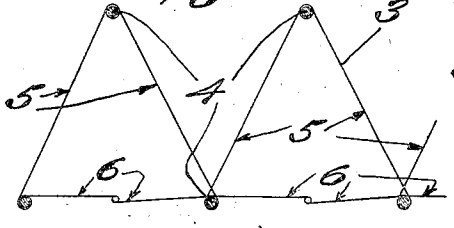


Fig. 7.

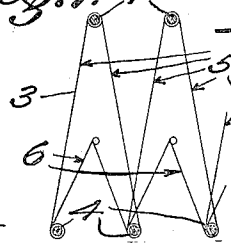


Fig. 6.

Inventor:
A. E. Lindau,
by Cornell Cornell
his Attorneys.

Patented July 7, 1925. 1,545,148

UNITED STATES PATENT OFFICE.

ALFRED E. LINDAU, OF COOK COUNTY, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO KALMAN STEEL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE.

REENFORCEMENT FOR CONCRETE AND ROAD EMBODYING THE SAME.

Application filed November 5, 1921. Serial No. 513,011.

To all whom it may concern:

Be it known that I, ALFRED E. LINDAU, a citizen of the United States, and a resident of the county of Cook, State of Illinois, have invented a new and useful Improvement in Reenforcements for Concrete and Road Embodying the Same, of which the following is a specification.

My invention relates to reenforcement for concrete especially reenforced concrete roads and has for its principal objects to provide for the proper reenforcing of the concrete, to facilitate the handling of the reenforcement, to insure the proper positioning of the reenforcement, and to prevent the displacement thereof during the building operation.

The principal object of the present invention is to devise a reenforcement which can be made and shipped cheaply enough for economical use, which will facilitate and reduce the cost of properly placing the reenforcement, and whose parts will resist displacement during the building operation. It consists principally in a fabric of parallel rods with alternate rods connected together. It also consists in a frame-work comprising parallel rods arranged at different levels and trussed together. It also consists in a collapsible frame-work consisting of a fabric of parallel rods wherein successive rods are disposed at different levels and alternate rods are connected together by jointed links. The invention consists principally in a concrete road reenforced as hereinafter described; it also consists in the method of handling, positioning and maintaining the reenforcement hereinafter described; it also consists in the parts and operations hereinafter described and claimed.

In the accompanying drawing wherein like numerals refer to like parts wherever they occur,

Fig. 1 is a plan view of a reenforced concrete road embodying my invention, showing different stages of the building of the road as hereinafter specified;

Fig. 2 is a transverse section through the finished road;

Fig. 3 is a fragmentary longitudinal section thereof;

Fig. 4 is an enlarged fragmentary plan view of the road reenforcement in its open or expanded condition;

Fig. 5 is a side view of the reenforcement;

Fig. 6 is an end elevation thereof; and

Fig. 7 is an end view of the reenforcement partially closed.

My road comprises a base 1 of any suitable construction, upon which is laid a layer 2 of reenforced concrete, this layer being preferably separated at intervals by suitable expansion joints into separate slabs or blocks. After the base or foundation is laid, the reenforcement 3 is properly positioned and the plastic concrete is applied so as to embed the reenforcement therein.

The reenforcement 3 preferably comprises a fabric or frame-work of rods 4 connected by links 5, the rods being disposed at two levels and all the rods of each level being substantially parallel with the other rods of the same level. Each of the rods of one level is connected by links with two adjacent rods of the other level, except that the rod at each end of the frame has only one such link connected thereto. The links are pivotally connected to the rods so that each frame is collapsible into a bundle wherein the rods of each level lie close alongside one another with the links spacing apart the rods of the different levels.

In its simplest form, the reenforcement may consist of a continuous sheet of fabric wherein each rod is connected by pivotal links to the rods on each side thereof. Such a sheet of fabric may be shipped in the form of a roll, or folded into a knock-down bundle; and it may be formed into a two-layer reenforcement by raising each alternate rod to the desired level. While this sheet fabric has the advantage of simplicity, it does not make ample provision for properly spacing apart the bars at either level or for resisting displacement during the application of concrete. To overcome this disadvantage, alternate rods of the fabric, that is to say

successive rods at the same level, are connected together by two-part links 6 that are hinged together at the middle. Such two-part links permit the frame or unit to be collapsed after the manner of an accordion fold and, when they are opened up, serve to properly space the rods that they connect. On account of the triangular or trussing arrangement of the links or spacing members, all of the rods are properly positioned and maintained in such position during application of the concrete. In their open position, the jointed links 5 lie in the plane of the rods that they connect and in use, they extend longitudinally of the road; and they may be arranged to connect the lower rods or the upper rods or both series of the rods. For a fuller description of the reenforcement, reference is made to my co-pending application Serial No. 511,736 executed of even date herewith.

In practical operation, a suitable base or foundation is first constructed, and then a bundle or unit of reenforcement of the kind above described is placed with its reenforcing rods extending crosswise of the road, and this reenforcement is spread or opened out and positioned so as to bring the rods into two levels, one of which will be in the lower region of the concrete and the other of which will be in the upper region of the concrete when such concrete is applied thereto. In placing the reenforcement, any suitable blocks or spacing devices may be used for raising the lower rods of the unit far enough above the foundation to be adequately embedded in the concrete that is to be applied later. A second frame or unit is laid alongside the first and so on; and, if longitudinal reenforcement is desired, it is readily applied in the form of rods 6 exending across the frames or units and preferably tied to some of the rods thereof to keep such longitudinal rods from becoming displaced during the pouring of the concrete. Such longitudinal rods may be disposed either in the upper or in the lower region of the concrete or in both regions according to the requirements of the particular road. After the reenforcement is properly positioned, the concrete is poured in a layer thick enough to fully embed the same, and with its upper surface suitably crowned for drainage purposes.

The transverse rods are preferably long enough to extend the full width of the reenforced portion of the road without splicing; and the extent of a given frame or unit longitudinally of the road is determined mainly by matters of convenience in shipping and handling bundles thereof and by economic considerations.

Among the advantages of my invention are the following: It affords great latitude in designing the reenforcement; it facilitates and insures the proper placing of the reenforcement and its remaining in place during the application of the concrete; it enables the reenforcement to be bundled suitably for shipment and with rods long enough to extend the full width of the road or of the portion of such width requiring reenforcement; and, as each bundle furnishes all the reenforcement required for the full width of the road, most or all of the labor of splicing sections of reenforcement together may be dispensed with, especially as longitudinal reenforcement, when needed, can be provided for by additional rods, that may be tied to the frames to prevent displacement during the pouring of the concrete or may be left untied, if desired.

While the construction hereinbefore described is specially adapted for reenforcing concrete roads, it may also be used for reenforcing other constructions, such, for instance, as floor slabs, walls and the like; and in such uses, it may be supplemented with additional elements designed with particular reference to the stresses anticipated in the structure requiring reenforcement. In this connection, it is noted that the links 2 assist materially in taking care of the shearing stresses and that the jointed links increase the tensile strength of the structure in a direction transverse to the main reenforcing rods; and when it is desired to increase such tensile strength both in the upper and lower portion of the structure, jointed links may be used at both the upper and lower levels of the reenforcing structure.

Obviously my invention admits of considerable variation from what is above described.

What I claim is:

1. A reenforced concrete road comprising a suitable base and a layer of reenforced concrete thereon, the reenforcement comprising an upper group of parallel rods arched endwise and extending crosswise of the road, a lower group of parallel rods extending crosswise of the road, and spacing members disposed in triangular form and trussing said rods together.

2. A reenforced concrete road comprising a suitable base and a layer of reenforced concrete thereon, the reenforcement comprising an upper group of parallel rods arched endwise and extending from side to side of the road, a lower group of parallel rods extending from side to side of the road, and spacing members connecting the upper and lower rods together, said spacing members being disposed obliquely with relation to said bars at their points of attachment.

3. A reenforced concrete road comprising a suitable base and a layer of reenforced concrete thereon, the reenforcement comprising an upper group of parallel rods extending crosswise of the road, a lower group of parallel rods extending crosswise of the road, and spacing members arranged in triangular form and trussing said rods together.

4. A reenforced concrete road comprising a suitable base and a layer of reenforced concrete thereon, the reenforcement comprising an upper group of parallel rods extending crosswise of the road, a lower group of parallel rods extending crosswise of the road, spacing members disposed in triangular form and trussing said rods together, and rods extending longitudinally of said road.

5. A reenforced concrete road comprising a suitable base, a layer of reenforced concrete thereon, an upper group of rods, a lower group of rods and trusses connecting the rods together.

6. A reenforced concrete road comprising a suitable base, a layer of reenforced concrete thereon, an upper group of rods, a lower group of rods and links connecting the upper rods to the lower rods in a continuous fabric.

7. A reenforced concrete road comprising a suitable base, a layer of concrete thereon, an upper group of rods, a lower group of rods, means connecting the upper rods to the lower rods, and means insuring the proper spacing of the lower rods relatively to each other.

8. A collapsible reenforcement for a road bed which consists of upper and lower rods in trussed relation which are united transversely thereof by means which may be flexed for the purpose of collapsing the same for storage and shipment, and which may be extended for use as a reenforcement.

9. A collapsible reenforcement for a road bed which consists of upper and lower rods in trussed relation which are united transversely thereof by a two part link hinged together which may be flexed for the purpose of collapsing the same for storage and shipment, and which may be extended for use as a reenforcement.

10. Reenforcement for concrete comprising two groups of rods and spacing members therefor, some of said spacing members connecting the rods of one group with the respective rods of the other group, and other of said spacing members connecting together adjacent rods of one of said groups, each of the intermediate rods of said last mentioned group being connected by spacing members to two other rods of its own group and to two rods of the other group.

11. A collapsible reenforcement for concrete comprising a series of substantially parallel rods in one plane, a second series of substantially parallel rods in a different plane, a series of links connecting the respective rods of one series with the rods of the other series, and a second series of links connecting adjacent rods of one series, said last mentioned links consisting of sections hinged together.

12. A collapsible reenforcing fabric comprising parallel rods, links pivotally connecting together successive rods of said fabric, and links connecting alternate rods together, said last mentioned links consisting of sections hinged together whereby said fabric can be opened out into a self-spacing two-level reenforcement.

13. A self-spacing reenforcement comprising a fabric composed of parallel rods and links pivotally connecting together successive rods, and links pivotally connecting alternate rods together, said last mentioned links being shorter than the combined distances between said alternate rods and the intermediate rods and consisting of sections hinged together.

14. Two-level reenforcement comprising substantially parallel rods at one level, substantially parallel rods at another level, and spacing members therefor, the adjacent rods at one level being connected together and each being connected to two rods substantially parallel therewith at the other level.

15. Reenforcement for concrete roads comprising an upper group of parallel rods, a lower group of parallel rods extending in substantially the same direction as said first mentioned rods, and pivotal links trussing said rods together, the horizontal links being jointed.

16. Reenforcement for concrete roads comprising an upper group of parallel rods arched endwise, a lower group of parallel rods extending in substantially the same direction as said first mentioned rods, and pivotal spacing members trussing said rods together, the horizontal spacing members being jointed.

17. Reenforcement for concrete roads comprising an upper group of parallel rods arched endwise, a lower group of parallel rods extending in substantially the same direction as said first mentioned rods, and spacing members trussing said rods together, said spacing members being obliquely disposed with relation to said rods.

18. Reenforcement for concrete roads comprising an upper group of parallel rods, a lower group of parallel rods, extending in substantially the same direction as said first mentioned rods, and spacing members some of which connect together the rods of said lower group and others of which are disposed obliquely to the rods and connect the

rods of the lower group with those of the upper group, the spacing members being disposed in triangular form, and a third group of rods connected to and disposed transversely of the rods of one of the other groups.

19. Reenforcement for concrete roads comprising an upper group of parallel rods, a lower group of parallel rods extending in the same general direction as said first mentioned rods, spacing members disposed in triangular form and connecting said rods together, a third group of rods disposed crosswise of the rods of said other group, and clips securing the rods of the third group to rods of one of the other groups.

Signed at Buffalo, New York, this 31st day of October, 1921.

ALFRED E. LINDAU.