June 16, 1931. H. M. SMITH 1,809,870

CONCRETE REENFORCEMENT

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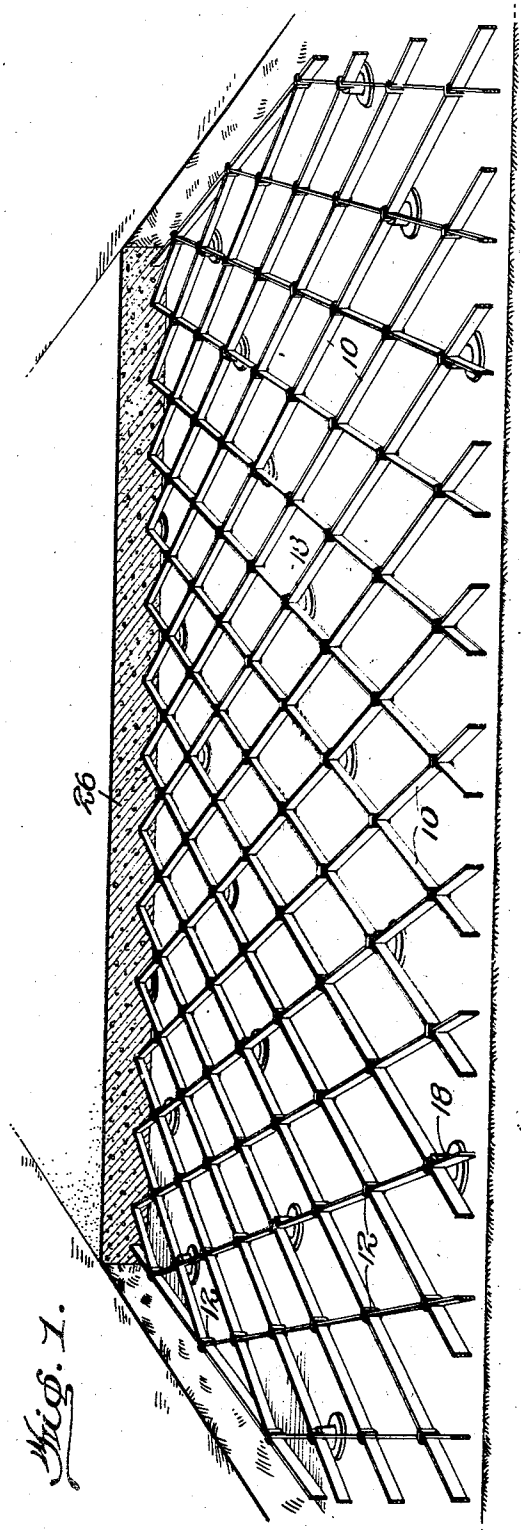


Fig. 1.

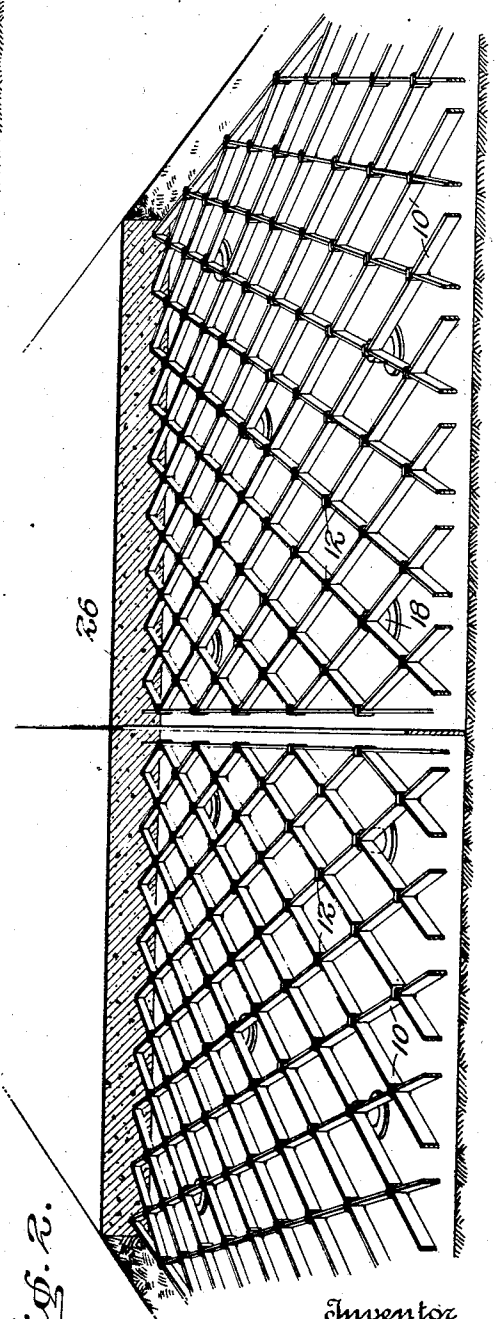


Fig. 2.

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Fig. 3.

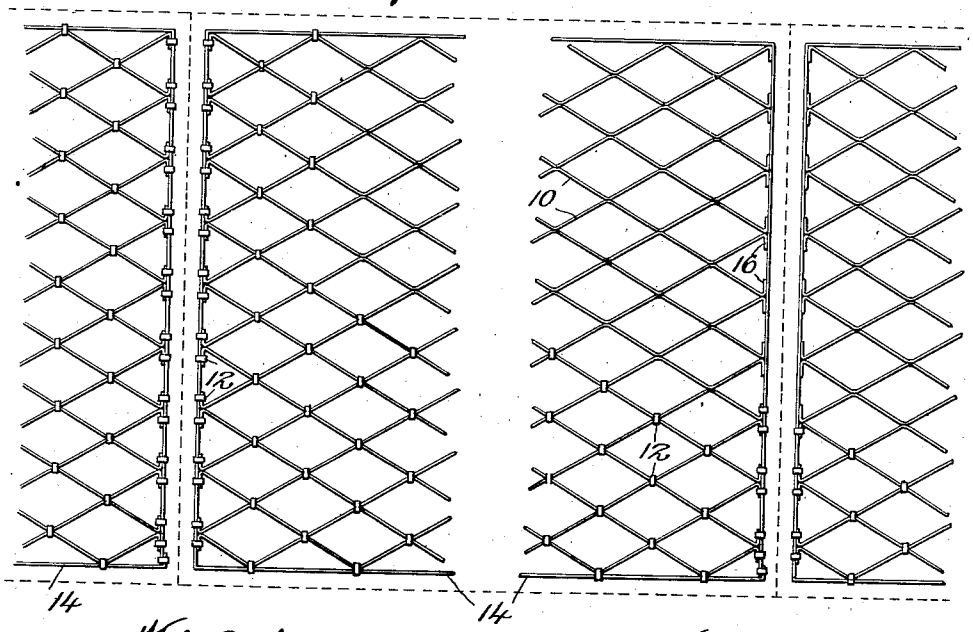


Fig. 4.

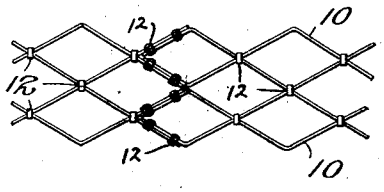


Fig. 5.

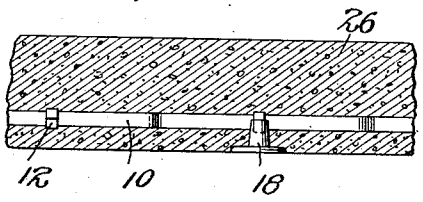


Fig. 6.

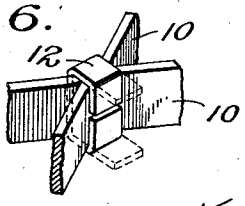


Fig. 7.

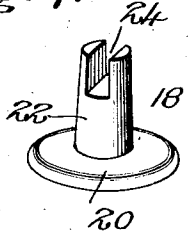


Fig. 9.

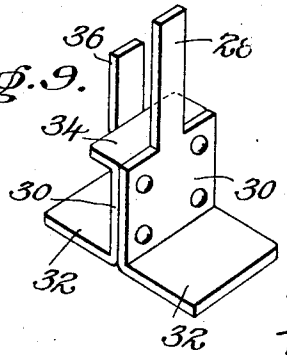
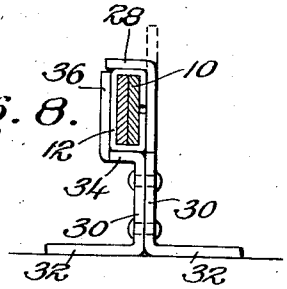


Fig. 8.



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Patented June 16, 1931

1,809,870

UNITED STATES PATENT OFFICE

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CONCRETE REENFORCEMENT

Application filed November 16, 1927. Serial No. 233,580.

My invention relates to metallic reenforcements for concrete and has particular reference to improvements in metallic reenforcements especially adapted for use in connection with concrete roads, floors, pavements and the like, my purpose, generally speaking, being to provide a reenforcement which is relatively cheap and easy to produce and which is thoroughly reliable and efficient in use.

More particularly it is my purpose to provide reenforcement parts so constructed that they may be assembled into reinforcing units of practically any desired size and shape.

It is also my purpose to provide means of a simple, inexpensive easily applied nature for securing the reenforcement parts of my invention in assembled relation.

During the construction of a concrete road, floor, pavement or the like the reenforcement unit or units therefor constructed in accordance with my invention are adapted to be so supported that when the concrete hardens the reenforcement will be embedded therein in a predetermined position so as most effectively to reinforce the same, and it is my further purpose to provide means of a novel nature to so support the reenforcement units that they will be held during pouring of the concrete and during the period required for it to harden against movement from its predetermined position.

With the foregoing and other purposes in view, my invention consists in the novel features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawings and defined in the appended claims.

In the drawings, wherein like characters of reference denote corresponding parts in the different views:—

Fig. 1 is a perspective view partly in section showing one manner of using the reenforcement of my invention in constructing a road, floor, pavement or the like;

Fig. 2, a view similar to Fig. 1 showing another manner of using the reenforcement of my invention in constructing a road, floor, pavement or the like;

Fig. 3, a top plan view showing the manner in which the reenforcement units of my invention are assembled and the manner in which they are adapted to be arranged with respect to one another;

Fig. 4, a detail view showing the manner in which the reenforcement parts or units are adapted to be connected together to form continuous reenforcements;

Fig. 5, a sectional view through a fragment of a concrete road, floor, pavement or the like showing my reenforcement embedded therein;

Fig. 6, a detail perspective view showing the manner in which the reenforcement parts of my invention are secured in assembled relation;

Fig. 7, a perspective view showing one form of supporting chair employed in connection with my improved reenforcement;

Fig. 8, a sectional view showing another form of supporting chair employed in connection with my improved reenforcement; and

Fig. 9, a perspective view of the chair shown in Fig. 8.

A reenforcement according to my invention is composed essentially of one or more metallic, preferably steel bars 10 of considerably greater depth than width in cross section and of any suitable or desired length, each bent throughout its length into a continuous series of substantially V-shaped formations adjacent ones of which are disposed oppositely with respect to one another.

To form a reenforcement unit from two or more of the bars 10 the bars are positioned side by side with the apexes of their V-shaped formations against one another and clips 12, normally of substantially C-shape, as shown by dotted lines in Fig. 6 of the drawings, then are bent around said apex portions as shown by full lines in Fig. 6 to secure the bars to one another. Is this way the bars 10 may be assembled into continuous reinforcement units of any desired width and of a length corresponding to the length of the bars 10 and if it is desired to connect two or more reenforcement units thus formed in end to end relation, so as to produce in effect a single reenforcement unit continuous in

length, this may be done, as illustrated in Fig. 4, by arranging the end portions of the bars of one unit in overlapping relation to the end portions of the bars of another unit and securing said end portions in such overlapping relation by any suitable means such as rivets, by welding or by means of the clips 12. In such a continuous reenforcement structure which comprises a plurality of bar units spliced together as illustrated in Fig. 4 each element joint comprises an open V shaped terminal on one unit end and a polygonal or diamond shaped terminal on the adjacent coacting unit to bring the related joint bars into parallelism to enable the operator to fasten them together by the application of the clips 12, or in any other suitable manner. This construction effects a series of element joints located in the same transverse section of each unit joint and at substantially right angles to the side bars 14. Any reenforcement unit consisting essentially of two or more of the bars 10 secured together in the manner stated by means of the clips 12 may be and preferably but not necessarily is strengthened by a preferably continuous straight bar 14 bent to engage the sides and ends of the unit as shown in Fig. 3, the ends of said bar 14 being arranged in overlapping relation and secured in such relation by any suitable means such as rivets, by welding or by means of the clips 12, the sides of said bar being secured by the clips 12 to the apex portions of the V-shaped formations of the bars 10 against which it is disposed, and the end portions of the bars 10 being bent to lie flat against the inner faces of the end portions of said bar 14, as indicated at 16, and being secured thereto by the clips 12 or in any other suitable or desired manner.

My reenforcement units are adapted to be supported so that when cementitious material such as concrete is poured thereover and allowed to harden, the reenforcement units will become embedded in the concrete thus to reinforce the same, a simple yet efficient means of supporting the units consisting of chairs 18 constructed as shown in Figure 7, each comprising a preferably flat, circular base 20 and a column 22 rising centrally therefrom, having formed in its upper end a recess 24 of any suitable depth and of sufficient width to receive a clip 12 when the latter has been bent to a position as shown in full lines in Fig. 6 fastening the apex portions of the V-shaped formations of two adjacent bars 10 together. The reenforcement units are arranged in desired relation upon the bottom of the excavation or upon the surface over which the road, pavement or the like is to be constructed and the chairs 18 then are arranged at desired intervals beneath the units with abutting apex portions of the bars 10 of the units seated in the recesses 24 of the chairs, the units thus being supported at a desired elevation above the surface over which the road, pavement or the like is to be constructed, so that when the cementitious material 26 is poured over the reenforcement units and allowed to harden the reenforcement units will become embedded in the cementitious material at a predetermined height, so as to most efficiently reinforce the same.

Under certain conditions the bars 10 constituting the reenforcement units may have a tendency to bulge upward at different points resulting in undesirable undulations in the units, and in order to assure that such undulations shall not remain in the units after the concrete has been poured over them, I may employ chairs for supporting the units constructed as shown in Figures 8 and 9, the essential difference between the chair of Fig. 9 and the chair of Fig. 7 being that the former includes a tongue 28 adapted to be bent over the top of the bars 10 beneath which the body portion of the chair is disposed, so that the bars 10 cannot bulge upward or be raised without lifting the chair with them, it being manifest that when concrete is poured over a reenforcement unit supported by chairs as shown in Fig. 8, the weight of the concrete upon the relatively broad base of the chair will hold same against the surface over which the road, pavement or the like is being constructed and the reenforcement unit thus will be held at a predetermined elevation above such surface, according to the height of the chairs, and even though the reenforcement units be normally bulged upward at different points, the pouring of the concrete thereover will act by its weight through the chairs to draw the bulged portions of the unit back to flat form and retain the unit in that form until the concrete has hardened.

A supporting chair having the advantages of the chair illustrated in Figures 8 and 9 may be constructed in any desired manner. I prefer, however, to form same from two plates 30, 30 secured together by rivets or other suitable fastening means and having their lower end portions 32, 32, bent outward to provide a relatively broad flat base. One of the plates is reduced in width at its upper end to provide the tongue 28 while the other at a suitable height is bent outward as at 34 to provide a seat for the reenforcement unit adapted to rest thereon, said portion 34 terminating in an upwardly directed tongue 36 adapted for cooperation with the tongue 28 to fasten the chair to reenforcement unit, the tongue 36 being adapted to engage one side of the portion of a unit supported by the chair, the tongue 28 being adapted to enter to fasten the chair to a reenforcement unit, and the upper end portion of the tongue 28, which tongue is longer than the tongue 36, being adapted to be bent over the top of the portion of the unit supported by the chair,

all as clearly shown in Figure 8 of the drawings.

It has been found in practice that a reenforcement constructed in accordance with my invention, with the bars 10 set on edge with respect to the vertical and embedded in a concrete road, pavement, floor or the like below the neutral axis thereof adds approximately 60% to the inherent tensile strength of the concrete, prevents cracking of the concrete due to expansion and contraction under changing temperatures and thus insures long life of the structure.

A road, pavement, floor or the like may be reinforced by a single continuous unit as described in connection with Fig. 4, or by a number of separate units arranged in end to end relation, as shown in Fig. 3 of the drawings, the unit or units as the case may be, when employed in connection with relatively narrow roads, pavements or the like being substantially the full width of the latter. On the other hand if the road, pavement, floor or the like is relatively wide, it may be reinforced by two continuous units of the type shown in Fig. 4 arranged side by side, or by two series of separate units arranged side by side with the units of each series in end to end relation, as indicated in Fig. 2 of the drawings. Irrespective of what arrangement of reinforcing units may be employed they enable the road, pavement or the like to be poured at one and the same time to its complete depth without sacrificing strength or durability, which manifestly is a vast improvement over the present practice of pouring the concrete in superimposed layers, a practice which has heretofore been deemed necessary to reduce the tendency of the concrete to crack due to changing temperatures and which obviously results in a structure which is relatively weak in proportion to its thickness.

From the foregoing description considered in connection with the accompanying drawings it is believed that the construction, the manner of use and the various advantages of my invention will be clearly understood. I desire to point out, however, that departures from the structures herein illustrated may be resorted to within the spirit and scope of my invention as defined in the appended claims.

I claim:

1. A reenforcement unit for concrete consisting of a number of bars each bent to include a plurality of substantially V shaped formations along its length, said bars being arranged with the apex portions of their V shaped formations in abutting relation, clips bent around the abutting apex portions of said bars securing them together as a reenforcement unit, and a plurality of chairs disposed beneath said reenforcement unit and adapted to support same at an elevation, each of said chairs having a seat thereon which is accessible from above said chair, whereby said reenforcement unit may be mounted upon said chairs as a reenforcement unit, and each of said chairs being provided with a lug which is adapted to be bent over the top of one of the bars of the reenforcement unit after arrangement of said unit upon said chair seat.

2. Means for reinforcing concrete consisting of a plurality of reinforcing units, each of said units consisting of a plurality of bars, the bars of said units being bent into a continuous series of substantially V shaped formations, the end portions of the bars of one unit being flared to effect an overlapping relation with the reversed V formation of the bar ends of the adjacent unit, and means securing the overlapping end portions of said units together.

3. Means for reinforcing concrete consisting of a plurality of reinforcing units, each of said units consisting of a plurality of bars rigidly secured together, the bars of said units being bent into a continuous series of substantially V shaped formations, the end portions of the bars of one unit being bent to form an open V on one unit and a substantially closed V on the adjacent unit, and clips for securing said open and closed V bar sections together.

4. A continuous structure for reinforcing concrete consisting of a plurality of reinforcing units each of said units composed of a plurality of bars, the bars of said units being bent into a continuous series of substantially V shaped formations, said units being arranged end to end and having joints uniting said units one with another, each of which unit joints comprises a series of element joints located in the same transverse section of such unit joint, and each element joint including a terminal on one unit and a cooperating element on the other unit to effect parallelism between the cooperating bar sections of the adjacent joints.

5. A continuous structure for reinforcing concrete consisting of a plurality of reinforcing units, each of said units composed of a plurality of bars, the bars of said units being bent into a continuous series of substantially V shaped formations, said units being arranged end to end and having joints uniting said units one with another, each of which unit joints comprises a series of element joints located in the same transverse section of such unit joint, and each element joint including a V shaped terminal on one unit and the reverse formation on the other unit to effect parallelism between the cooperating bar sections of the adjacent joints.

In witness whereof I have hereunto affixed my signature this 14th day of November, 1927.

HARRY M. SMITH.