J. F. GOLDING.
REINFORCEMENT FOR CONCRETE.
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1,142,087. Patented June 8, 1915.

Witnesses

By

Inventor

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By

Attorney

N. N. Low
To all whom it may concern:

Be it known that I, John F. Golding, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Reinforcement for Concrete, of which the following is a specification.

In my Patent No. 815,157, dated March 15th, 1908, I described, in combination with a body of concrete and as a means for reinforcing the same, a metal bar surrounded by the concrete and formed with a continuous longitudinal groove, and supplemental members secured in such groove.

My present invention consists in certain improvements upon the above described concrete reinforcing bar, such improvements consisting principally or partly in a reinforcing bar formed with lateral grooves, and shear members passing from one side of the bar to the other and having longitudinally extending portions seated in the grooves and secured therein; also in a reinforcing bar formed with opposite longitudinal grooves the lips of which are bent inward, and a supplemental member looped and passing from side to side of the bar and having its ends secured behind the bends of the lips; also in combining with the grooved bar supplemental rods or bars situated in such grooves and extending past that point of the bar; ordinarily the middle, which is to be subjected to the greatest tension strain, thereby in effect increasing the cross section of the bar and its tensional resistance at the point where it is particularly required; also in forming the supplemental members, or two of them, integral with or attached to the said supplemental rods which are situated in the grooves of the main bar as above described, so that the main bar is strengthened at its middle and the strains which are carried to the main bar by the said loops are directly opposed to each other through the medium of the rods lying in the grooves of the main bar; also in extending the outer ends of certain of the supplemental looped members horizontally outward parallel with and toward the ends of the main bar, thereby forming a reverse reinforcement as more particularly hereinafter described.

In order to make the invention more clearly understood I have shown in the accompanying drawing means for carrying the same into practical effect, without limiting my improvements, in their useful applications, to the particular constructions which, for the purpose of example, I have illustrated.

In said drawings—Figure 1 is a perspective view of a concrete reinforcing bar and rigidly attached web members in position for use, embodying my improvements. Fig. 2 is a perspective view of one half of a bar having a different arrangement of web members, and showing the latter in position for shipment. Fig. 3 is a perspective view of the half bar shown in Fig. 2, with the web members raised into position for use. Fig. 4 is a perspective view on a larger scale showing a portion of the bar. Fig. 5 is a perspective view showing on a larger scale the manner of attaching a web to the bar. Fig. 6 is a section on line VI of Fig. 5. Fig. 7 is a plan view of a web suitable for attachment to the bar.

Referring to the drawings, 1 indicates a bar, which may be termed the main tension bar, and which may be of any desired diameter, length and material. Preferably it is rolled steel. I have found sizes ranging from sixteen hundreds of a square inch in area to two and a quarter square inches in area meet most of the requirements of practice in the reinforcement of concrete girders, beams, slabs and walls. The main bar is formed with grooves or recesses at its sides, indicated at 2. Said grooves may be of various arrangement, that shown being the most convenient in practice where the grooves are directly opposite to each other. They are preferably parallel with the axis of the bar and continuous from end to end of the latter and adapted to form pockets on opposite sides of the bar. This shape is convenient and economical for rolling. The said grooves or recesses form lips 3, four in number. At 7 are shown supplemental rods or bars arranged in the grooves or recesses 2, extending for a distance longitudinally of the bar and attached to the latter at or near their ends. Various means of attachment may be employed, but I prefer that illustrated in which the main bar or the lips 3 thereof are compressed as indicated at 6 to clamp the supplemental rods tightly and form points of attachment with the main bar. I prefer the described mode of attachment, by compressing the lips 8 as described, because in that way the attachment may be...
so secure that it will resist a strain which would disrupt the supplemental rod. The compression at the point 6 may be effected by any suitable means, preferably by direct acting power press and dies adapted to the top and bottom contours of the main bar. At the points where the lips of the main bar are compressed as described there are formed lateral pockets in which the ends of the shear members are secured. A reinforcing bar is thus formed which is adapted to be applied so that the greatest tensional strain imposed by the concrete will come at the middle or median point of the bar or between the said points of attachment of the supplemental rods, with a saving of metal along the remaining portions of the bar toward its ends where less tensional strain is ordinarily imposed, and where that amount of metal which is required at the middle point or points of greatest strain would be superfluous.

By median or middle point of the main bar I intend that point at which the greatest stress occurs. Ordinarily, but not always, this point is at an equal distance from each end of the bar. The conditions of the reinforcement may be such that the stresses imposed along one end of the bar are superior to the stresses imposed along the other end, in which case the point of greatest stress may be nearer to one end of the bar than to the other end.

The attachment described, of the ends of the supplemental rods 7 within the grooves of the main bar, makes such rods in effect, for the purpose of transmitting longitudinal tension strains, integral with the bar so that the sectional areas of the rods may be added to the sectional area of the main bar at its middle in estimating the resistance of the composite bar to tensional strains.

5 indicates supplemental members secured in the grooves of the bar. Any suitable means may be adopted for this purpose, but I prefer that already described, consisting in compressing the lips of the bar upon those portions of the supplemental members that are situated in the said recesses or grooves. Those supplemental members which are nearest to the supplemental rods 7 are preferably made integral with or attached to the latter so that these supplemental members and the said rods are continuous from the extreme outer ends of the supplemental members to and through the said rods 7. The supplemental members are bent or turned at their outer ends so as to interlock with the concrete, preferably in the form of loops 8. The parts 5 may be of any desired number and length in their extent away from the bar to the loops 8 according to the construction which is to be reinforced. From two to ten such supplemental members are convenient for most constructions. I have illustrated ten, five at each half of the bar.

The construction described is adapted for providing a reverse reinforcement of efficient character in a very simple and economical manner. For this purpose I make all or certain of the supplemental members of extra length beyond that which is required by the depth of the beam or other body of concrete and bend such extra portion down into a position substantially parallel with the main bar and preferably extending beyond its ends, as illustrated at 9. All of the supplemental members might be so bent down and extended for reverse reinforcement. In the construction illustrated only two of the supplemental members are thus extended. The arrangement is preferably such that when two of these bars are laid one beyond the other and in substantially the same plane, or laid substantially in line with the other but not necessarily abutting, and embedded in the concrete, with their ends resting on a column or girder for instance, the said reverse reinforcing portions 9 will lap past each other and be in effect interlocked with each other by the concrete in which their loops 8 are embedded and the inclosed concrete is looped by the loops. The supplemental members should stand at an angle of about forty-five degrees to the main bar and closer together as the end of the bar is approached, according to known principles, to properly resist the shear strains which increase toward the supports.

The reverse reinforcement shown covers at each end about one quarter of the bar.

The general construction of reinforcing bar herein described is especially adapted for convenient shipment, as all of the supplemental members may be assembled with the bar in the positions shown in Fig. 2 where they lie down substantially parallel with the bar and the whole structure occupies little space, affords no rough or sharp edges and is convenient for handling. The limbs of the supplemental members where they pass around the lips of the main bar and into the grooves 2 are formed with bends 10 so that they fit the side contour of the bar and readily come into place in assembling. Furthermore the supplemental members are preferably initially formed so that their limbs tend to spring toward each other closer than the total width of the main bar. When they are applied to the main bar the said limbs are first forced slightly apart and thereafter they will spring toward each other into the grooves and maintain their position during the described pressing operation. The main bar, having the pressed portions 6, the ends of which form shoulders, acts as a deformed bar in engaging the concrete against dis-
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1. A metal reinforcement for concrete and other purposes, the combination of a main bar formed with longitudinal and continuous grooves at its opposite sides, supplemental or shear members secured at desired points along the bar, and a continuous supplemental or shear member forming a loop at a distance from the bar for interlocking with the concrete, and having its central portion secured within the grooves of the bar, and having the lips of the grooves compressed upon said portions, the said portions extending past the median part of the bar which is to be subjected to the greatest stress.

3. In a metal reinforcement for concrete and other purposes, the combination of a main bar formed with longitudinal and continuous grooves at its opposite sides, supplemental or shear members secured at desired points along the bar, and a continuous supplemental member or rod having its middle portion arranged and secured within the grooves of the main bar at opposite sides of the same, the lips of the grooves being compressed upon said middle portions, and having its end portions extended from the bar in the form of loops adapted to interlock with the concrete, the said loops being at opposite sides of the median portion of the bar.

4. In a metal reinforcement for concrete and other purposes, the combination of a main bar formed with longitudinal grooves at its opposite sides, supplemental shear members secured along the bar between the lips of the said grooves and by compression of the said lips, the said shear members extending to a distance from the bar in the form of loops adapted to interlock with the concrete, the inner ends of said loops being bent around two oppositely extending lips of the main bar and into the grooves of the same at its opposite sides to the points where the shear members are secured; substantially as set forth.

5. In a metal reinforcement for concrete and other purposes, the combination of a main bar formed with longitudinal and continuous grooves at its opposite sides, supplemental or shear members connected at desired points along the bar, supplemental or shear members having their ends situated in the said grooves and having portions extending to a distance from the main bar to be embedded in the concrete and transmit stresses therefrom to the main bar, two of such supplemental members being situated at opposite sides of that point of the main bar at which occurs the maximum stress and having central portions arranged in the grooves of the bar, on which portions and ends of the supplemental members the material of the bar at the sides of its grooves is forcibly compressed to form a permanent and complete union between the bar and said supplemental members, substantially as set forth.

2. In a metal reinforcement for concrete and other purposes, the combination of a main bar formed with longitudinal strains. Also the forming of the bar with continuous longitudinal grooves or recesses gives a large amount of skin surface acted upon by the rolls of the rolling mill and increases the tension strength of the main bar. It is to be further noticed that the described manner of attaching the supplemental members involves no transverse cutting or perforation of the main bar and does not reduce its cross sectional area. The supplemental members are rigidly attached and transmit all their strains directly to the main bar. I have demonstrated that the attachment of the supplemental members to the main bar will not be broken or affected by a tension strain on the supplemental member which will disrupt it. That is to say, the supplemental member will break before its ends will be pulled out from the groove of the main bar. The length of the supplemental member in its extent away from the main bar is unlimited, and the spacing of the supplemental members along the bar can be made scientifically correct according to the construction to be reinforced. The supplemental members do not depend upon a frictional engagement with the concrete but interlock therewith by means of their loops.

I do not herein claim: a metallic reinforcement for concrete having a main tension bar formed with lateral grooves, and shear members having longitudinally extending portions seated in said grooves and clips embracing said end portions and securing them in said grooves between said members to form reinforcements for said bar. Such construction does not unite the shear members so that they are practically integral with the main tension bar.

What I claim is:

1. As a reinforcement for concrete and other purposes, the combination of a main bar formed with longitudinal and continuous grooves at its opposite sides, supplemental shear members connected at desired points along the said bar, such supplemental or shear members having their ends situated in the said grooves and having portions extending to a distance from the main bar to be embedded in the concrete and transmit stresses therefrom to the main bar, two of such supplemental members being situated at opposite sides of that point of the main bar at which occurs the maximum stress and having central portions arranged in the grooves of the bar, on which portions and ends of the supplemental members the material of the bar at the sides of its grooves is forcibly compressed to form a permanent and complete union between the bar and said supplemental members, substantially as set forth.

2. In a metal reinforcement for concrete and other purposes, the combination of a main bar formed with longitudinal and continuous grooves at its opposite sides, supplemental or shear members secured at desired points along the bar, and a continuous supplemental or shear member forming a loop at a distance from the bar for interlocking with the concrete, and having its central portion secured within the grooves of the bar, and having the lips of the grooves compressed upon said portions, the said portions extending past the median part of the bar which is to be subjected to the greatest stress. 
of lateral pockets on opposite sides of the bar, and stirrup shaped shear rods each shear rod having its ends bent in the same direction and inserted in pockets on opposite sides of said bar, and the edges of the bar at said pockets being compressed upon the said ends of the shear rods, substantially as set forth.

7. In a metal reinforcement for concrete and other purposes, a main tension bar having grooves on its opposite sides, and supplemental shear rods having their ends situated in the grooves of the bar and held therein by the compression of the lips of the grooves upon the ends of the supplemental shear rods, certain of said shear rods being in the form of continuous loops the outer portions of which are extended out beyond the ends of the bar to form reverse reinforcement; substantially as set forth. In testimony whereof I affix my signature, in presence of two witnesses.

JOHN F. GOLDING.

Witnesses:

N. CURTIS LAMMOND,

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