R. J. GRACE.

METALLIC REINFORCING BAR FOR CONCRETE CONSTRUCTION.

APPLICATION FILED APR. 22, 1908.

942,202. Patented Dec. 7, 1909.

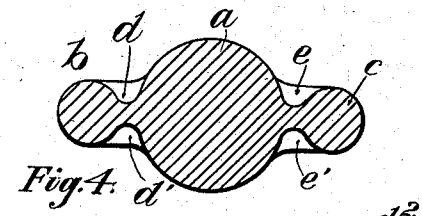

Fig. 4.

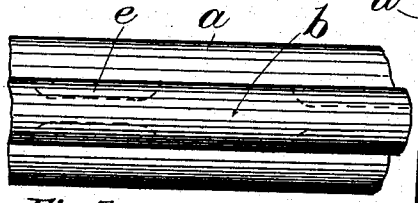

Fig. 5.

Fig. 3.

Fig. 1.

Fig. 2.

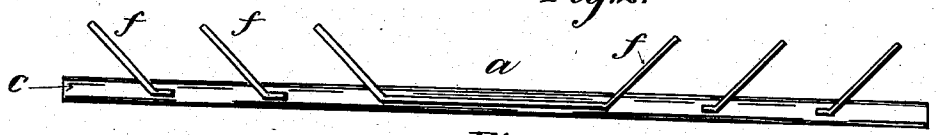

Fig. 6.

Witnesses:
A. D. Gerking
Cecil Long

Inventor:
Richard J. Grace
by Z. J. Geisler
Atty.

UNITED STATES PATENT OFFICE.

RICHARD J. GRACE, OF PORTLAND, OREGON.

METALLIC REINFORCING-BAR FOR CONCRETE CONSTRUCTION.

942,202. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed April 22, 1908. Serial No. 428,633.

To all whom it may concern:

Be it known that I, RICHARD J. GRACE, a citizen of the United States, and a resident of Portland, in the county of Multnomah and State of Oregon, have invented a certain new and useful Improvement in Metallic Reinforcing-Bars for Concrete Construction, of which the following is a specification, reference being had to the accompanying drawings as constituting a part thereof.

This invention relates in particular to that certain system of reinforced concrete construction of beams and arches now commonly in use, in which the metallic reinforcing member comprises a longitudinal bar or main member having a plurality of uprightly extending members, rigidly attached to the main bar or member at points intermediate the ends thereof and constituting diagonal members auxiliary to the main member. Heretofore it has been discovered that one of the most convenient methods for making such reinforcing metallic member was to use a metal bar made with lateral webs along both sides, out of which the diagonal members are sheared and struck up. But this method of construction introduced inherent weakness, for it is well known that when a cut or shear has once been made in a material, and the separate parts are subjected to considerable stress, there is a tendency of the shear being extended by the further tearing of the parts apart.

To prevent such undesirable action and result is the purpose of my invention. To this end my improved metallic reinforcing member is made with increased cross section at the point where the shear or separation from the main body of the auxiliary members terminate, whereby the ultimate strength, proportional to the average cross section of the auxiliary member, is developed before a rupture between the auxiliary member and the main body can take place.

My method of procedure for obtaining the result referred to is more readily understood by an inspection of the accompanying drawings, and the description thereof hereinafter contained.

Figure 1 is a perspective elevation of my improved metallic reinforcing member, a portion of one of the lateral webs thereof being cut apart and sstruck up, as in practice, to obtain the integral diagonal auxiliary members; this figure also showing a cross section of the main body of the bar in its original condition; Fig. 2 is a partial side elevation, also representing the lateral web of the main body of the bar nearest the viewer as cut and bent in oblique position, to provide one of the auxiliary diagonal members referred to; Fig. 3 is a section taken on line A—A of Fig. 1; Fig. 4 is a section taken on line B—B of Fig. 1; Fig. 5 is a side elevation of my improved reinforcing bar with the lateral web still remaining in its original uncut condition; and Fig. 6 is a diagrammatic side elevation, on a reduced scale, representing one of my improved reinforcing bars with the lateral webs thereof struck up into diagonal auxiliary members, as below more fully described.

Referring to the letters as designating the parts described: The reinforcing member *a* may be rolled in the shape shown by the cross section, so as to provide at its sides integral lateral web-portions *b*, *c*. The cross section construction of the body of the bar *a*, in its entirety is best understood from an inspection and comparison of the cross sectional views, Figs. 3 and 4. Approximately at the point of union between the lateral web-portions *b*, *c*, with the main body of the bar *a*, I provide a series of alined depressions or cavities *d*, *e*, and preferably provide such depressions or cavities in both the under and top surfaces of the bar *a*, as shown by the depressions lettered *d*, *d'*, *e*, *e'* in Fig. 4. The depressions or cavities *d*, *e*, and their counterparts, *d'*, *e'*, serve a two-fold purpose. In the first place they facilitate the shearing or cutting of the lateral sections *b* from the main body of the bar *a*, to obtain a series of auxiliary diagonal members *f*, for the purpose mentioned; and, incidentally, the depressions *d*, *d'*, *e*, *e'* on the uncut portion of the body of the bar *a*, and the half cavities d^2, d^3, d^4, on the diagonal auxiliary members provide the means for effecting a strong mechanical bond with the concrete enveloping said members; that is to say, the portion of the concrete entering said cavities interlocks with the shoulders of said cavities, thereby holding both the main and the auxiliary members of the bar against sliding displacement, and causing a unification of resistance of the metal and concrete to the stresses to which the composite mass may be subjected. The shear or cut, by which the lateral portion of the main body

of the bar *a* is separated to obtain the integral auxiliary diagonal members, must terminate in one of the depressions or cavities *d*, *e;* that is, just in front of an uncut portion (*g*) of greater cross section area, and proportionately increased strength, whereby is effectively resisted any tearing-apart action, generally induced by the stresses imposed upon the juncture of the two separated parts.

While I have shown the cavities *d*, *e*, as being spaced apart, I do not, however, limit myself to such construction, since the cavity might be extended the full length of the auxiliary diagonal members to be cut from the main body of the bar *a;* the cut or shear, however, must terminate in front of a portion like *g*, of increased cross section to fulfil the purposes described. The object in not making the cavities *d*, *e*, the full length of said auxiliary diagonal members is to provide cavities d^2, d^3, d^4, and obtain the beneficial results thereof described. However, it is evident that a similar result may be obtained even though the cut faces of the main body of the bar and said auxiliary diagonals be not made with depressions; for the functions of said cavities may be accomplished by twisting, roughening or otherwise adapting the surfaces of said parts to afford a hold to and interlock with the enveloping concrete mass. The body of the main bar *a* and its lateral extensions may in fact be shaped as considered desirable for the particular work in hand; but whatever its shape, if made in accordance with the scheme in my invention, it will be better adapted to effectively furnish in one unit-bar the resistance desired to all the tensile, compressive, shearing, torsional or bursting stresses encountered in reinforced concrete construction.

The cross-section areas between the depression are constant, that is, uniform, except as to the slight variations caused in the forming of the depressions by the rolling process. In short, it may be said that there are two cross-section areas: a maximum common to all planes lying between depressions, and a minimum common to all planes through those portions having depressions.

While I have described what I consider the most practical way of constructing my bars, I desire it understood that the particular depressions shown along the shearing line are merely of relative importance, and that similar relative conditions may be obtained in any manner which will leave a cross-section of greater area at the termination of the shears separating the auxiliary members from the main body, than the cross-section of the sheared parts.

Of course, it is not essential, although desirable, that the lateral web-portions extend along both sides of the body of my bar.

I claim:

1. A reinforcing bar for concrete consisting of a body made with a laterally projecting web, longitudinally spaced portions of greater cross-section area at intervals along the web, and auxiliary members sheared from said web portions of the main body, the shear of said auxiliary members terminating in front of said web-portions of greater cross-section area.

2. A reinforcing bar for concrete consisting of a body made with a laterally projecting web having a series of depressions along the line of union between the main body and said web, and auxiliary members sheared from said web-portions of the main body along the line of said depressions, said shears terminating in front of the said undepressed web-portions of greater cross-section area.

3. A reinforcing bar for concrete consisting of a body made with a laterally projecting web having a series of depressions along the line of union between the main body and said web, auxiliary members sheared from said web-portions of the main body along the line of said depressions, said shears terminating in front of the said undepressed web-portions of greater cross-section area, and said depressions in the body of the bar and its said auxiliary members being arranged to constitute shoulders adapted to prevent the displacement of said body portion and its auxiliary members in the concrete enveloping the same.

RICHARD J. GRACE.

Witnesses:
S. S. HUMPHREY,
CECIL LONG.