No. 815,617. PATENTED MAR. 20, 1906.

W. MUESER.

MATERIALS OF CONSTRUCTION.

APPLICATION FILED OCT. 13, 1904.

Fig:1.

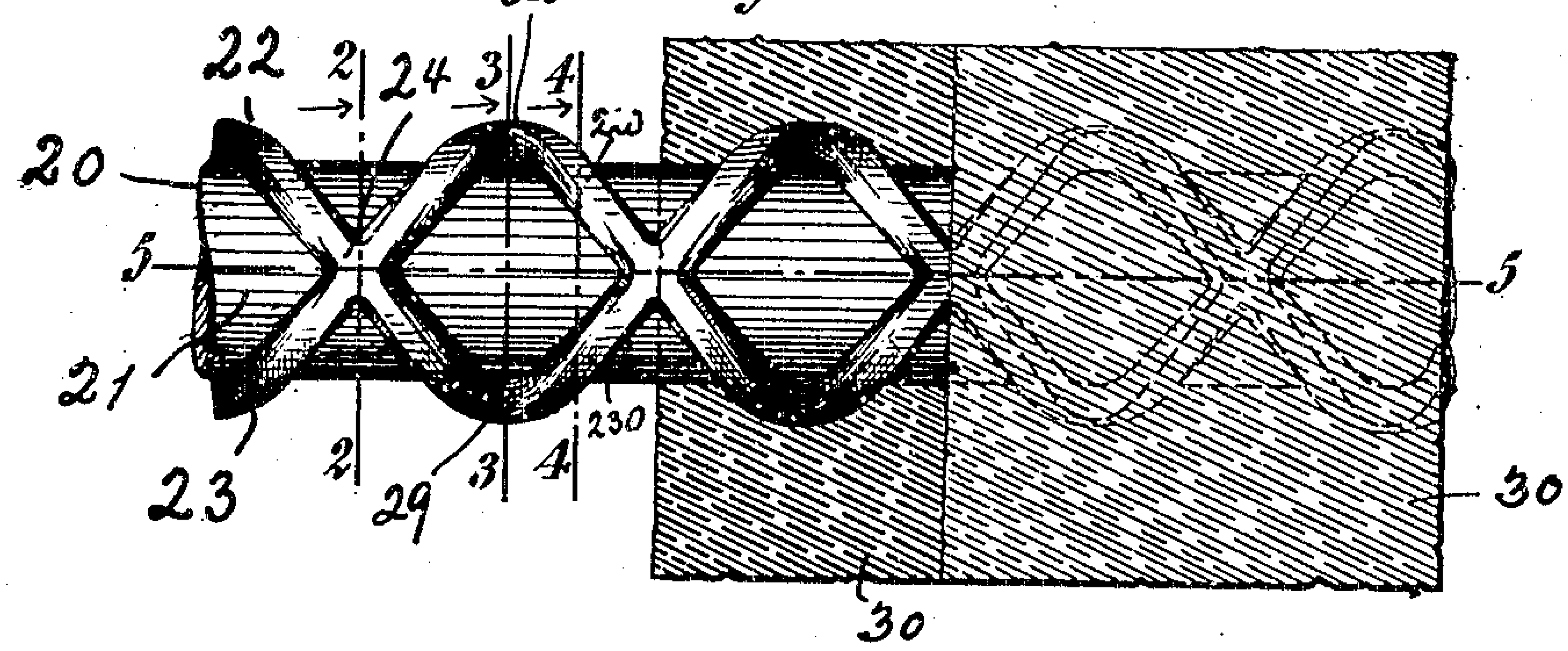


Fig:2.

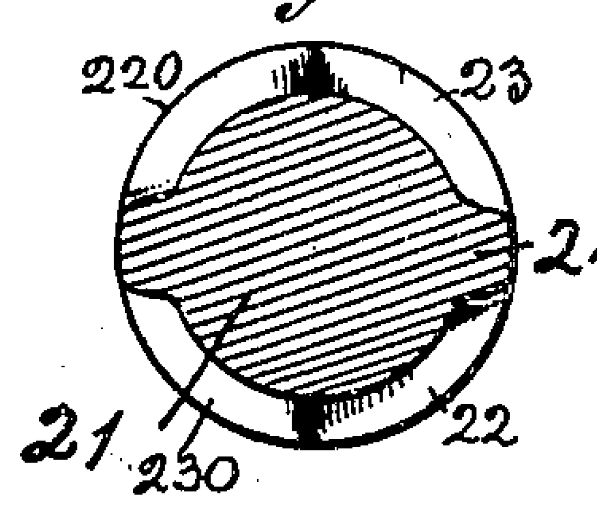


Fig:4.

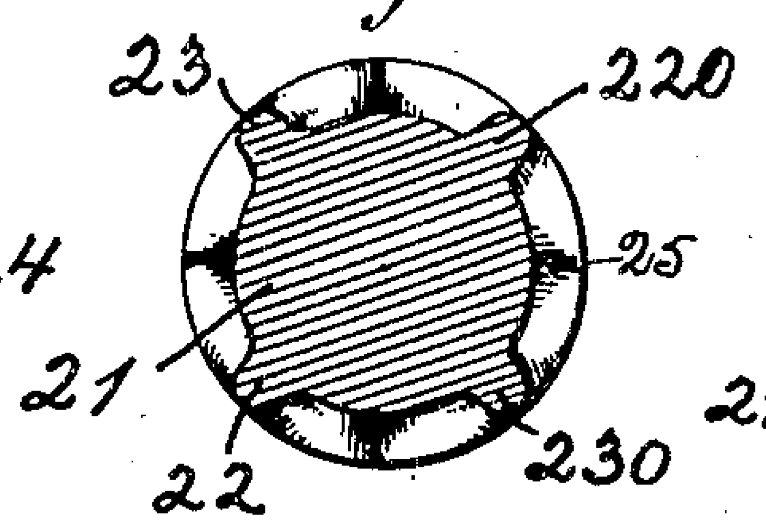


Fig:3.

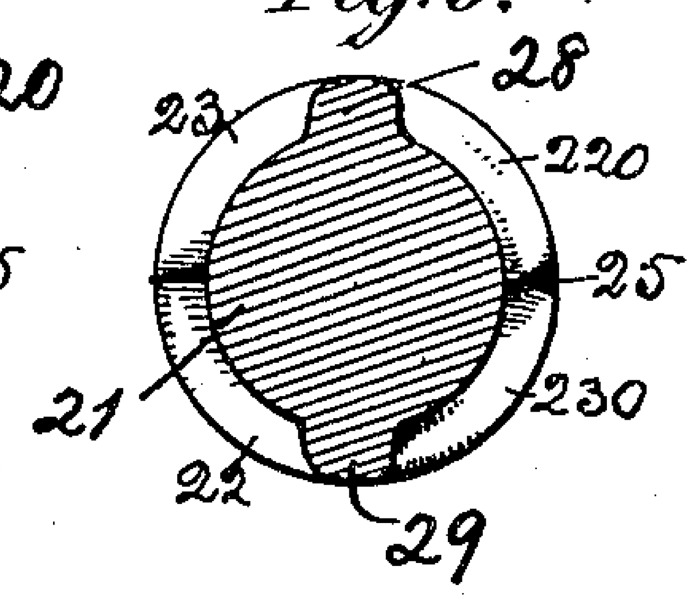


Fig:5.

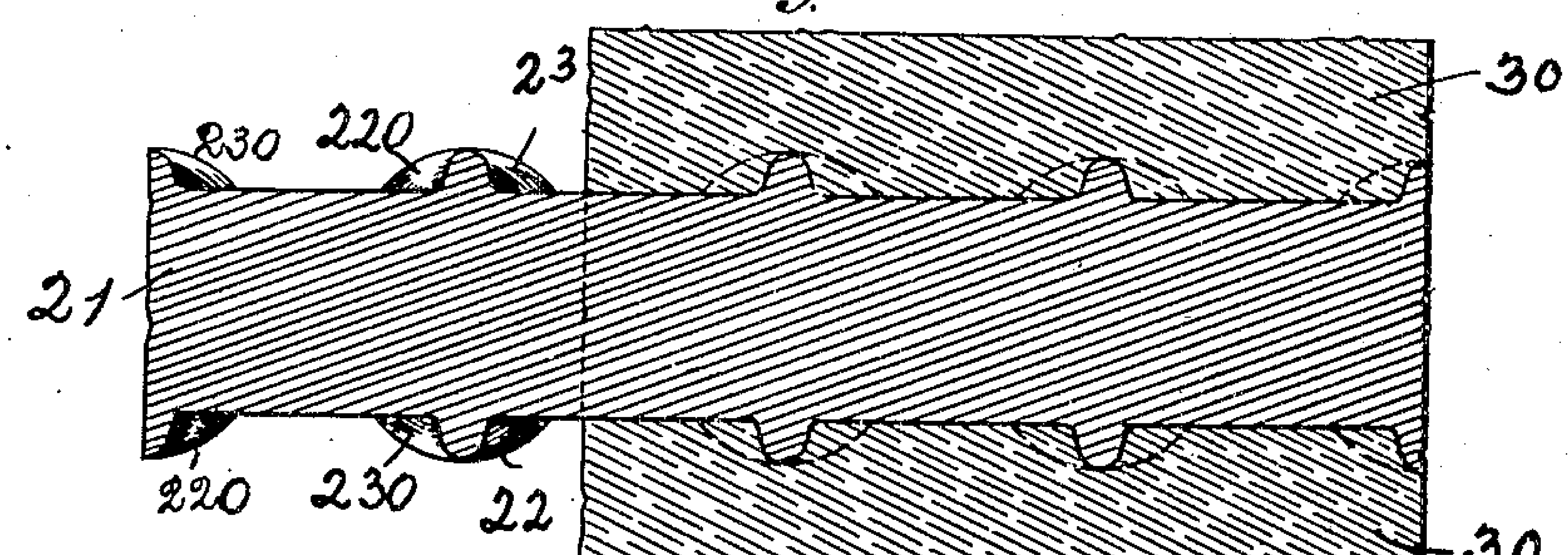
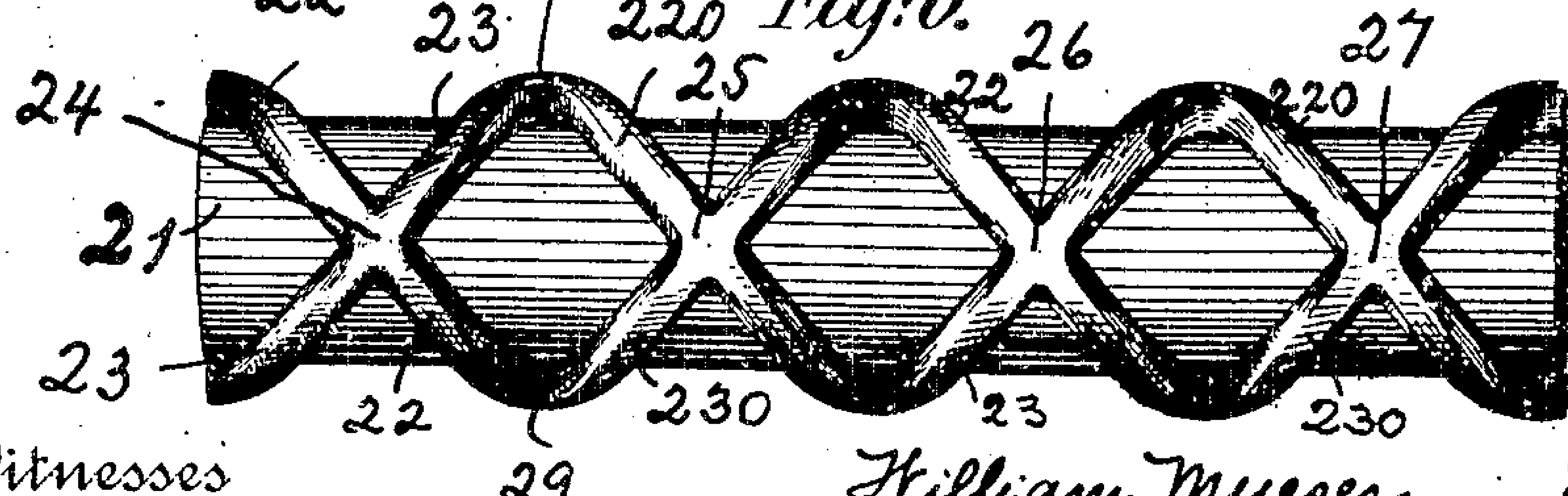


Fig:6.



Witnesses
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WILLIAM MUESER, OF NEW YORK, N. Y.

MATERIAL OF CONSTRUCTION.

No. 815,617. Specification of Letters Patent. Patented March 20, 1906.

Application filed October 13, 1904. Serial No. 228,342.

To all whom it may concern:

Be it known that I, WILLIAM MUESER, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Materials of Construction, of which the following is a specification.

My invention relates to concrete-steel construction, and its novelty consists in the construction and adaptation of the parts, as will be more fully hereinafter pointed out. In structures of this class the ideal to be attained is to provide a core or bar of steel in a surrounding envelop of concrete, each so fashioned with respect to the other that the strength of the unit throughout shall be uniform and so interlocked that no separation or rupture can occur between the metal and its plastic envelop and no sliding or slipping can take place between their contacting surfaces. Engineers have sought to solve this problem by providing steel bars with depressions and elevations arranged in numerous forms; but so far as known to me such bars if they meet the requirement of substantially uniform ultimate or breaking strength they have no uniform elongation, or stretch under stress, or are of such shape that they are difficult to manufacture, or have sharp corners and edges which cut into the surrounding envelop when strained, or have some bad quality, such as a tendency to slip or twist.

I have invented a form of bar to be used in combination with a concrete envelop as a unit of construction which I believe possesses the ideal advantages above referred to and has none of the disadvantages stated. In brief, it consists of a core of steel comprising a longitudinal body provided externally with continuous ribs wound spirally around the body of the bar in opposite directions and intersecting at regular intervals. The cross-section of the rib outside of the body of the bar is tooth-shaped. The concrete being placed in between the diamond-shaped depressions formed by the intersecting spiral ribs and also surrounding the entire surface of the bar, the latter is held in place without being permitted to be twisted or rotated or pulled out under any strain which will not rupture the body of the bar itself.

In the drawings, Figure 1 is a longitudinal elevation of a bar embodying my invention, showing the concrete envelop in section in two planes, the outline of the bar being shown dotted where it is concealed. Fig. 2 is a transverse section on the plane of the line 2 2 in Fig. 1. Fig. 3 is a similar section on the plane of the line 3 3 in Fig. 1. Fig. 4 is a similar section on the plane of the line 4 4 in Fig. 1. Fig. 5 is a longitudinal central section through the bar and its envelop on the plane of the line 5 5 in Fig. 1, and Fig. 6 is an elevation of the bar without its surrounding envelop.

In the drawings, 20 is a bar of metal which has been rolled or otherwise shaped into the form shown in Figs. 1 and 6. It is composed in this instance of a substantially cylindrical body 21 and is provided externally with one or more spiral ribs or projections, as at 22 220, running around the body in one direction, and one or more ribs or projections, as at 23 230, running around the body in an opposite direction, the ribs intersecting those running in the opposite direction at substantially regular intervals, as at 24, 25, 26, 27, 28, and 29, at what are practically right angles. The ribs 22 220 and 23 230 are preferably made continuous and integral with the body of the bar. The ribs themselves may be made of any approved form in cross-section; but the preferable form somewhat resembles that of the teeth of ordinary cog-wheel gearing, as shown in Fig. 4. If the bar be cut by several planes at right angles to its longitudinal axis, as shown in Figs. 2, 3, and 4, it will be noticed that the cross-sectional areas of the ribs at their intersections 24, 28, and 29, for instance, as shown in Figs. 2 and 3, are about equal to their cross-sectional areas when cut separately by a similar intersecting plane, as shown in Fig. 4. Wherever the two spiral ridges meet, the angle between the ridges is rounded out just enough to make the areas of the intersections 28 and 29, as shown in Fig. 3, equal to areas of the separate ribs 22 and 23 of any cross-section, as shown in Fig. 4. In other words, the cross-sectional area of the bar, including that of the body and ribs, is substantially constant at all points along its length. From this it follows that the bar is of substantially uniform strength throughout. It will be understood, of course, that each bar is embedded in a concrete envelop 30.

This form of bar has several advantages:

First. The spiral ribs can be made as high as may be desired and so as to develop the full strength of the bar without losing its uniform strength or any of the other advantages that this bar possesses. By developing the full strength of the bar I mean that it shall be so firmly held in its envelop that it is impossible to pull the bar out of the surrounding concrete envelop and that if the effort is made the bar itself must rupture, but not pull out. It is evident, therefore, that I can make the ribs high enough to effect the result absolutely; but whatever the relative height of the ribs to the diameter of the bar the cross-sectional area remains uniform, and therefore also the strength. The importance of this advantage will be seen if it is remembered that bars which have heretofore been used have been provided with corrugations or projections for the purpose of gaining a hold on the surrounding envelop, but which were of such shape that the uniformity of the area of the cross-section was destroyed, resulting in a loss of metal of from five to twenty per cent., or, in other words, the metal projections used for engaging the envelop did not add to the strength of the bar itself, or only partially so. This being not the case in my bar, it has the further advantage that—

Second. On account of the uniformity of the cross-sectional area every particle of metal in the bar contributes to the working strength of the bar, and my bar must, therefore, be the most economical.

Third. For the same reason my bar is of uniform ultimate or breaking strength.

Fourth. Another advantage still more important than the uniform breaking strength of my bar is the uniform elongation under working stresses and before the elastic limit of the metal in the bar is reached—that is, if my bar is, in tension or compression, in its longitudinal axis, as it would be when actually used in building construction—all equal intervals between any two cross-sections of the bar elongate or shorten a like amount. The cause of this uniformity of elongation can be explained as follows: If we consider two closely-adjoining cross-sections of the bar, we have in either the circular area of the bar and in addition four projections representing the cross-section of the four ribs. The only difference between these two sections is to be found in the location of the four projections relative to the center part of the bar, two and two of the projections nearing each other a certain amount. If we consider a third cross-section, equally distant from the second as the second is from the first, we find the same condition repeated—that is, two and two projections have again neared each other an equal amount and as much as was the case between the first and second sections. So on, if consecutive cross-sections equally distant from each other are considered, we find that two and two projections consecutively come closer and closer together at perfectly uniform ratio until each two of the projections meet, which point represents the crossing-points of the spirals, and as soon as each two projections meet, having formed one projection of substantially double width, they separate again and in consecutive cross-sections they go farther and farther apart at the same ratio as they were nearing each other until the cross-section at the next point where the two spiral ribs cross is reached, and so on. It is therefore quite evident that when this bar is rolled the rolls of the mill must exert exactly the same pressure in rolling a part of the bar which lies between any two cross-sections above discussed. In other words, on account of the similar character of all cross-sections of the bar and on account of the uniform ratio of change in location of the projections representing the spiral ribs the metal must flow through the rolls perfectly uniformly and under the same amount of pressure. Since, therefore, the character and amount of pressure which are necessary to form any part of the bar are uniform, it is clear that the bar must have uniform elongation. We know from experience that other forms of bars do not have this advantage, because on account of their form one section of the bar has to be pressed much harder and differently in manufacture than many other sections, and frequently there are sudden changes in form of adjoining sections which prevents a uniform flow of the metal through the rolls. The matter of uniform elongation is very important in practice, as the bars naturally are not used up to the breaking-point, but inside of the elastic limit of the material.

Fifth. Another advantage follows from the reasoning just above made, together with the fact that there are two spiral continuous ribs which at all points form the same angle with the longitudinal center line of the bar, which is that the ribs provide a continuous uniform hold of the same character for the surrounding concrete envelop along the full length of the bar, while other forms of bars provide a hold on the surrounding concrete only at shorter or longer intervals.

Sixth. The double spiral counteracts effectively any tendency to twist or turn under stress.

Seventh. My bar has no sharp edges or corners, which under stress would have a tendency to cut into the concrete envelop, but that, on the contrary, it will be noticed that while the whole surface of the bar is easily and effectively engaged by the concrete envelop there are no sharp corners to induce cutting.

What I claim as new is—

1. A bar adapted to be used as a core to be embedded in concrete comprising a regularly-formed central body provided with external projecting ribs extending a substantial part of the length of the body, one of said ribs extending diagonally around the body in one direction and another of said ribs extend-

ing diagonally around the body in an opposite direction and intersecting the first rib.

2. A bar adapted to be used as a core to be embedded in concrete comprising a regularly-formed central body provided with external projecting ribs extending a substantial part of the length of the body, one of said ribs extending diagonally around the body in one direction and a plurality of said ribs extending around the body in an opposite direction and intersecting the first rib.

3. A bar adapted to be used as a core to be embedded in concrete comprising a regularly-formed central body provided with external projecting ribs extending a substantial part of the length of the body, a plurality of said ribs extending diagonally around the body in one direction and a plurality of said ribs extending diagonally around the body in an opposite direction and intersecting the first-named plurality of ribs.

4. A bar adapted to be used as a core to be embedded in concrete comprising a regularly-formed central body provided with external projecting ribs extending a substantial part of the length of the body, one of said ribs extending diagonally around the body in one direction and another of said ribs extending diagonally around the body in an opposite direction and intersecting the first rib, the transverse section at the intersection of the ribs being increased to produce along the whole bar a substantially uniform cross-section.

5. A bar adapted to be used as a core to be embedded in concrete comprising a regularly-formed central body provided with external projecting ribs extending a substantial part of the length of the body, one of said ribs extending diagonally around the body in one direction and a plurality of said ribs extending diagonally around the body in an opposite direction and intersecting the first rib, the transverse section at the intersection of the ribs being increased to produce along the whole bar a substantially uniform cross-section.

6. A bar adapted to be used as a core to be embedded in concrete comprising a regularly-formed central body provided with external projecting ribs extending a substantial part of the length of the body, a plurality of said ribs extending diagonally around the body in one direction and a plurality of said ribs extending diagonally around the body in an opposite direction and intersecting the first-named plurality of ribs, the transverse section at the intersection of the ribs being increased to produce along the whole bar a substantially uniform cross-section.

Witness my hand this 11th day of October, 1904, at the city of New York, in the county and State of New York.

WILLIAM MUESER.

Witnesses:
HERMAN MEYER,
ALAN McDONNELL.