March 23, 1937. B. BAUER 2,074,320

COMBINATION WRAPPING

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Fig.1.

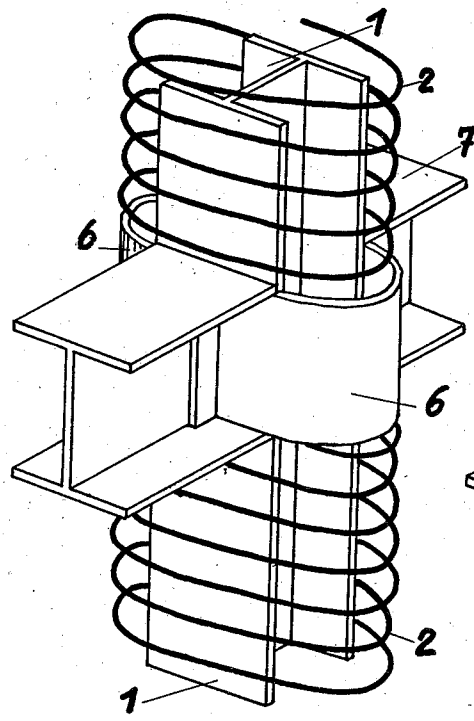


Fig.2.

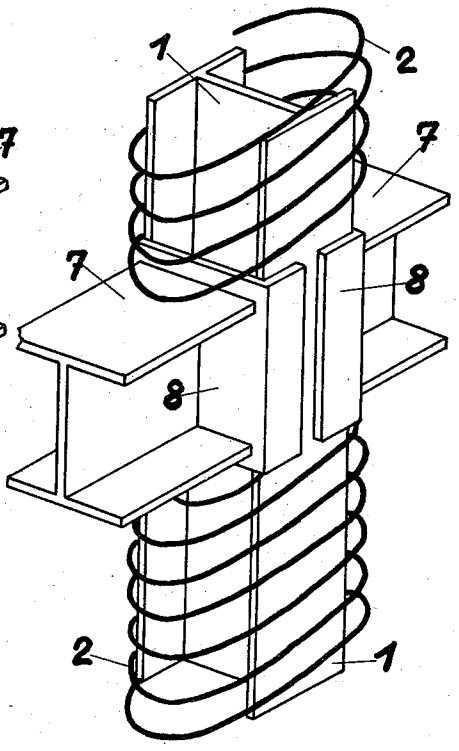
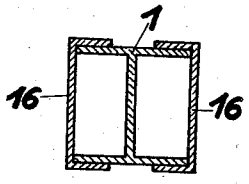


Fig.3.



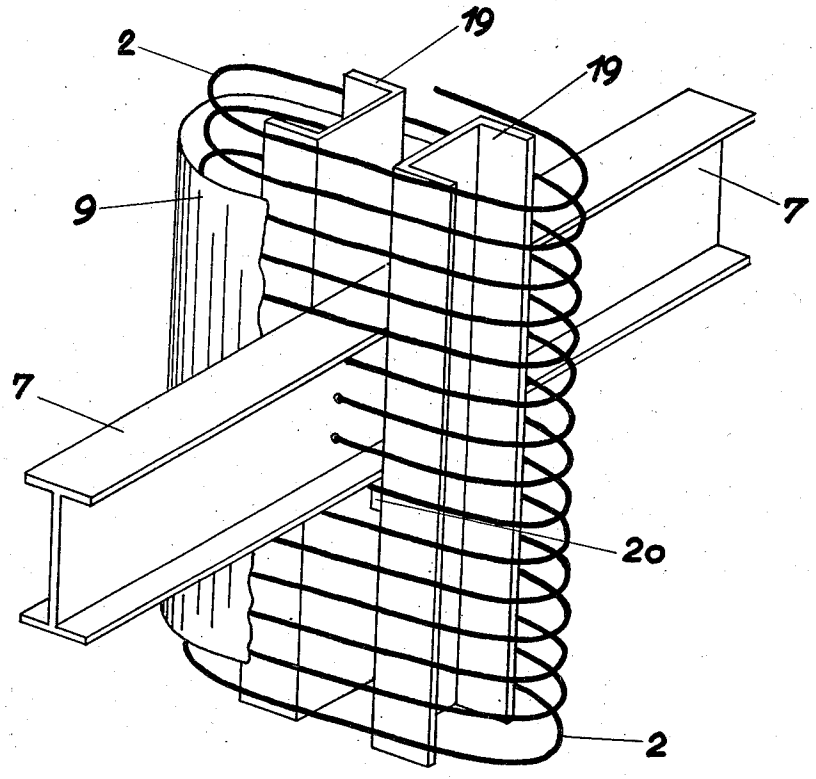
Bruno Bauer
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COMBINATION WRAPPING

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Fig. 4.



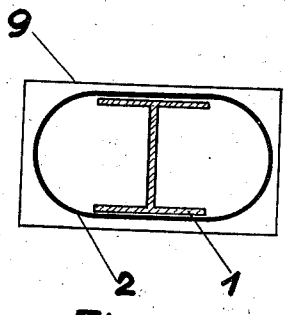


Fig. 5.

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COMBINATION WRAPPING

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Fig. 6.

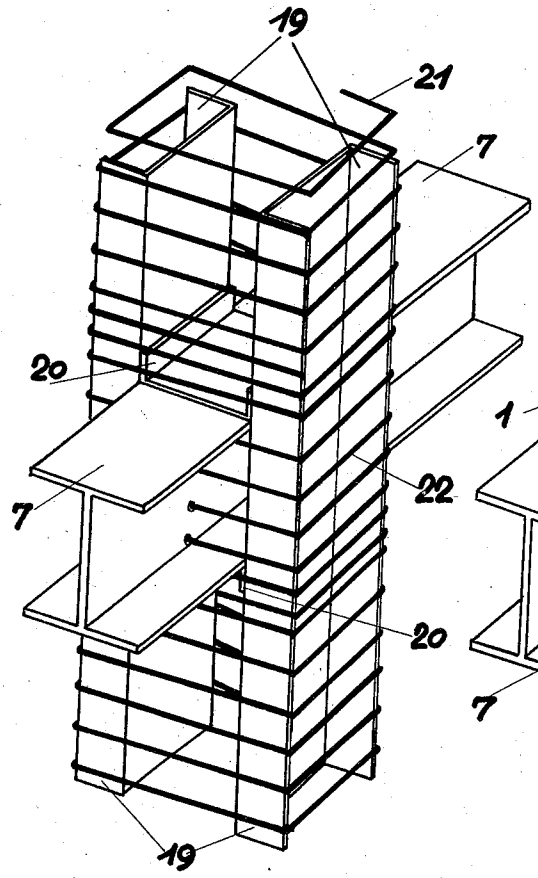


Fig. 7.

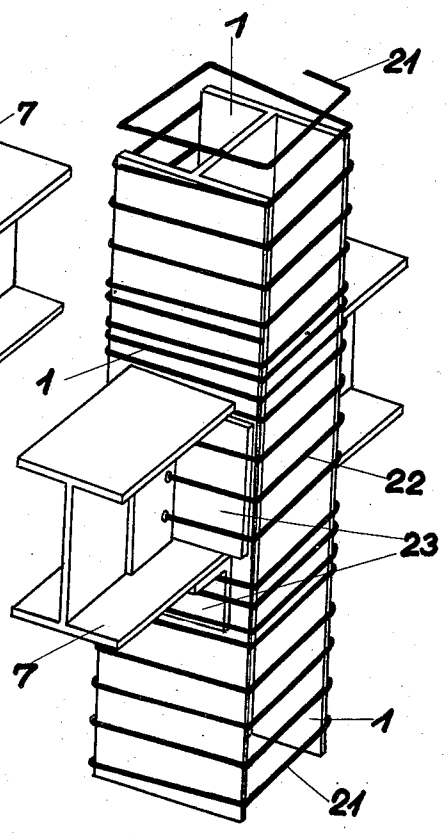


Fig. 8.

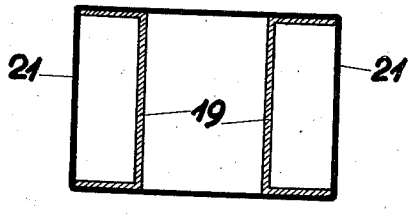
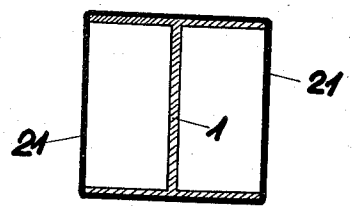


Fig. 9.



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COMBINATION WRAPPING

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Fig. 10.

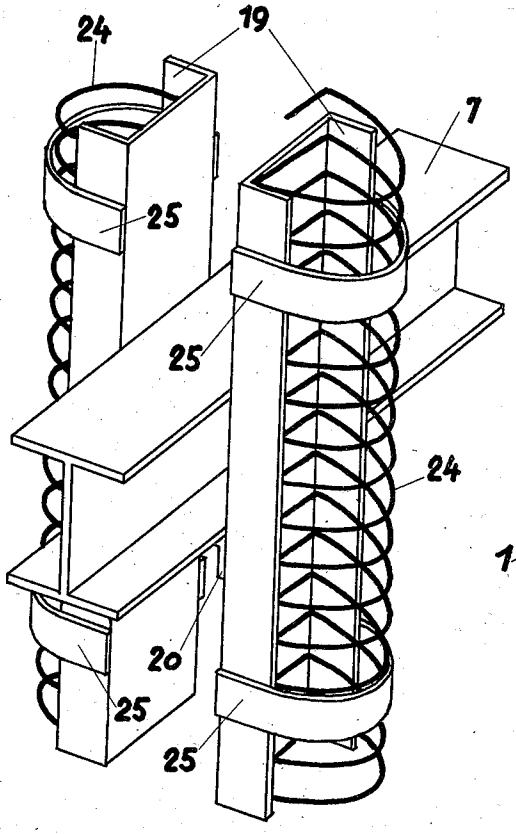


Fig. 12.

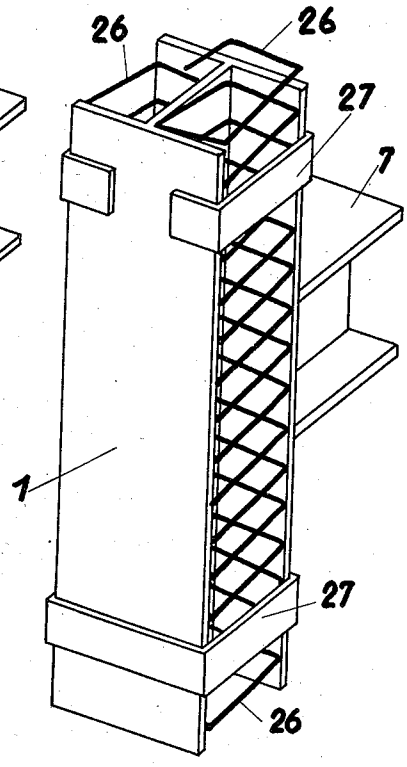


Fig. 11.

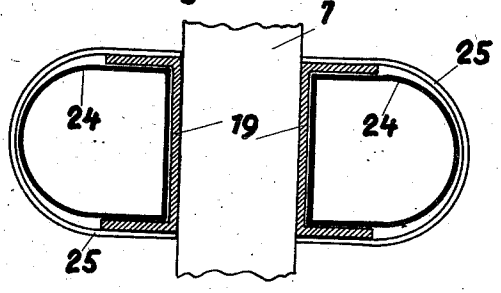
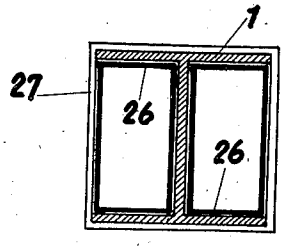


Fig. 13.



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UNITED STATES PATENT OFFICE

2,074,320

COMBINATION WRAPPING

Bruno Bauer, Vienna, Austria

Application June 12, 1933, Serial No. 675,436
In Germany March 20, 1933

7 Claims. (Cl. 72—76)

This invention relates to a new and improved type of non-bending reinforcing skeleton for wrapped ferro-concrete columns.

With the employment of rolled section iron for the making of non-bending reinforcing skeletons for wrapped ferro-concrete columns the excessive cross-sectional area of column resulting from the use of circular spiral wrapping has proved to be a drawback. A further drawback results from the fact that, when rolled iron sections are employed in any of the usual and known arrangements, the unitary cross-section of the column is divided up into separate portions. This subdivision not only hampers the building of the column (during the pouring stage) but also, as a more serious consequence, very considerably reduces the supplementary bearing strength of the concrete.

The arrangement provided by the present invention, by virtue of the particular type of wrapping reinforcement or reinforcing cage employed and owing to the particular manner of its application to or embodiment in the column, avoids such internal division of the ferro-concrete column. The total cross-sectional area of the column is also very considerably diminished by this novel type of wrapping reinforcement.

The particular type of wrapping reinforcement provided by the present invention lies against the flanges of the reinforcing girders and semi-circularly embraces each of the open sides of the latter forming the longitudinal members of the reinforcing skeleton. By virtue of this arrangement of the wrapping reinforcement, the bearing concrete cross-section is divided up into two portions only, and the formation of segments adjacent the girder flanges which are difficult to pour is thereby entirely avoided. A further form of construction provides an angular wrapping reinforcement. The angular or polygonal wrapping reinforcements heretofore known have proved unsatisfactory as compared with those of circular cross-section, since under the influence of the pressure of the concrete while still in the plastic state these wrapping reinforcements are bulged outwards and caused to assume a more or less round shape before they become capable of exercising any carrying effect. In the reinforcement according to the present invention, this drawback is obviated by an arrangement for the stiffening of the corners or angles of polygonal wrapping members, so that the outward bulging of the sides of the latter is effectively prevented. This stiffening of the angles is preferably effected by means of the rolled section irons serving as the longitudinal members of the main reinforcement. The carrying concrete cross-section is thus bounded by the rigid main reinforcing members, and partly by the wrapping reinforcement.

Examples of forms of construction embodying the invention are shown in the accompanying drawings, in which:

Figs. 1, 2, 4 and 5 show a type of wrapping reinforcement which lies closely upon the outer surface of the flanges of the rolled girders constituting the longitudinal reinforcing members, and which embraces the open sides of these girders semi-circularly. Figs. 1 and 2 and Fig. 4 show in perspective a knot-point in the reinforcing skeleton in which the uprights are of ferro-concrete and the joists of section iron. Fig. 5 is a cross-sectional view of a ferro-concrete column in which the longitudinal reinforcing member consists of a T-girder and is provided with the described type of wrapping reinforcement.

Fig. 3 is a cross-sectional view of a ferro-concrete column which is reinforced with an H-girder and two U-section irons.

Figs. 6 to 9 show examples of rectangular wrapping reinforcement. Figs. 6 and 7 show in perspective the knot-points in a reinforcing framework or skeleton for a structure comprising ferro-concrete columns and girder joists. Figs. 8 and 9 are corresponding cross-sectional views.

Fig. 10 shows in perspective, and Fig. 11 in cross-section the arrangement of semi-circular reinforcing spirals in the open sides of U-section members as longitudinal reinforcing members.

Figs. 12 and 13 show the arrangement of rectangular reinforcing spirals in the open sides of an H-girder, in perspective and in transverse section, respectively.

In the form of construction shown in Figs. 1 and 2 the longitudinal reinforcement is in the form of an H-girder 1. This H-section girder is provided with a wrapping 2 which lies close against the outside face of the flanges of the girder, and embraces semi-circularly the open sides thereof. In the form shown in Fig. 5 the joist 7 in the form of rolled section iron is welded directly or otherwise attached to the H-section girder 1. In order to insure the continuity of the wrapping reinforcement 2, a casing section in the form of a section of semi-circular tubing 6 is welded on at the point of attachment of the girder 7 where the wrapping reinforcement is interrupted. The wrapping reinforcement 2 itself is attached to

the girder 1 by adhesion welding, and it is of no consequence for the carrying power of the wrapping reinforcement should the latter become burnt through at certain points of its attachment to the girder since the bearing power is exerted only by the semi-circular portions thereof.

In the form of construction shown in Fig. 2 the connection of the floor carrying girder 7 to the reinforcing girder of the column is effected at an angle differing by 90° from that of the form shown in Fig. 1, and is in this case effected with the interposition of U-section irons 8. These U-section irons 8 also serve as the bridging pieces for preserving the continuity of the wrapping reinforcement 2 across the points of intersection in the framework. The shape of these irons 8 can, of course, be adapted to that of the wrapped cross-section.

In the form of construction shown in Fig. 3 the supplementary carrying action of the concrete in the column is insured by an arrangement whereby the open sides of the longitudinal member 1 are boxed in by means of U-section irons 16. By virtue of this arrangement the carrying concrete cross-section is divided merely into two portions.

In the form shown in Fig. 4 there are employed as longitudinal reinforcing members two U-section irons 19 with their open sides facing outwardly. In order to provide a unitary reinforcing skeleton, these U-section irons 19 are surrounded by a wrapping 2 which lies against the flanges of the girders and embraces their open sides semi-circularly.

The wrapping reinforcement may also be in the form, for example, of semi-circularly bent metal sheets fastened over the open sides of the girders. The main horizontal bearers 7 may be simply passed between the two girders 19, and attached thereto, for example by means of U-section irons 20. The middle portion of the cross-section is regarded as non-carrying since, owing to the above described arrangement of the main horizontal bearers 7 satisfactory pouring of this middle portion is scarcely possible. The formation of hollow spaces in the concrete, on setting, is unavoidable. The shell holding means 9 consist in this case of suitably bent sheet metal.

Fig. 5 shows a cross-section of the form of construction shown in Figs. 1 and 2, respectively, the cross-sectional shape of the column being rectangular owing to the shape of the shell holding means. The shell holding means 9 may also be employed as a casing or falsework for the pouring of the column.

In the forms of reinforcing skeleton shown in Figs. 6 to 9 polygonal wrapping reinforcement 21 is employed. The form shown in Fig. 6 corresponds substantially to that of Fig. 4. As longitudinal reinforcing members I again employ two U-section irons 19, the main horizontal bearer 7 being attached therebetween, for example by means of U-section irons 20. In this form of construction there is employed a wrapping plate 22 which bridges over the interruption in the wrapping reinforcement 19 at the point of intersection of the frame members and thus preserves the continuity of the wrapping reinforcement. The polygonal wrapping reinforcement 21 lies close against the flanges of the U-section girders, and is thus stiffened to such an extent that even with the employment of comparatively flexible wire for this purpose there is no possibility of outward bulging. The polygonal wrapping reinforcement becomes therefore effective as a carrier. In calculating this form of construction only those two concrete sections are considered as carrying loads which are enclosed on three sides by the U-section girders 19 and on the fourth side by the wrapping reinforcement 21. The intermediate portion of the cross-section is not considered as carrying any load. Fig. 8 is a cross-sectional view of the form of construction shown in Fig. 6.

The form of construction shown in Figs. 7 and 9 consists of an H-section girder with polygonal wrapping reinforcement 21 for the provision of a reinforcing skeleton for a ferro-concrete column. In this form of construction also the wrapping reinforcement 21 may be regarded as carrying loads, since two sides of the wrapping reinforcement are so supported and stiffened by the flanges of the H-section girder that the two remaining sides may assume a carrying function without becoming bulged. The attachment of the main horizontal bearers 7 may be effected, for example, by means of angle irons 23. The continuity of the wrapping reinforcement is preserved by the provision of a bridging plate 22.

For the purpose of stiffening the polygonal wrapping reinforcements in accordance with the present invention it is of course possible to employ rolled section iron of any other shape, or to employ the same in any other suitable arrangement, for example two U-section irons with their open sides facing inwardly, or four angle irons suitably braced, etc.

In the skeleton shown in Figs. 10 and 11 there are employed as reinforcing members two U-section irons 19 with their open sides facing outwardly and between which the main horizontal bearer 7 is passed and attached, for example, by means of U-sections 20.

In this form of construction the reinforcing spirals 24 are fitted into the open sides of the U-section irons 19. On three sides these spirals 24 bear against the iron sections, while on the fourth side they are caused to extend or bulge outwardly. The erection of the reinforcing skeleton may be carried out with particular ease in this instance. After the setting up of the longitudinal main reinforcing members 19 the main horizontal bearers 7 are attached thereto, and a rigid framework is thus obtained. The reinforcing helices 24 are made separately and attached in the finished state to the main longitudinal reinforcing members, for example by means of straps 25.

The reinforcing skeleton shown in Figs. 12 and 13 is erected and fitted together in a similar manner. In this form of construction two polygonal reinforcing helices 26 are arranged in the open sides of an H-section girder 1. The concrete column reinforced and encased in this manner may be subjected to particularly heavy strains, since the wrapped reinforcement is rendered particularly taut and rigid owing to the fact that it lies close against the sides of the rolled section iron main reinforcing members in the described manner.

I claim:

1. A ferro-concrete column, comprising flanged longitudinal irons, and a reinforcing cage of non-circular transverse section contacting the flanges of the irons, and a concrete enclosure, the load carrying cross section of the concrete being surrounded partly by said flanges and partly by said reinforcing cage.

2. A reinforcing skeleton for ferro-concrete

constructions, comprising horizontal rolled section iron girders, vertical concrete columns including rigid longitudinal irons, and a reinforcing cage of non-circular transverse section contacting said longitudinal irons, said reinforcing cage surrounding substantially all the concrete in the vertical column and retaining its shape at maximum loads on the column.

3. A reinforcing skeleton for ferro-concrete constructions, comprising horizontal rolled section iron girders, vertical concrete columns including flanged longitudinal irons, and a reinforcing cage contacting the flanges of the irons, substantially all the concrete in a column being surrounded partly by said flanges and partly by the reinforcing cage, the latter retaining its shape at maximum loads on the column.

4. A reinforcing skeleton for ferro-concrete constructions, comprising horizontal rolled iron girders, vertical concrete columns each including a longitudinal iron in the path of a girder, a reinforcing cage on each longitudinal iron, and a member at least partly surrounding a longitudinal iron and attached to a girder.

5. A reinforcing skeleton, according to claim 4, and in which said member consists of a tube section surrounding the longitudinal iron and bridging the interruptions in the reinforcing cage.

6. A reinforcing skeleton for ferro-concrete constructions, comprising horizontal rolled iron girders, vertical concrete columns each including two longitudinal irons between which said girders pass, reinforcing cages on said longitudinal irons, and a spacing member for two irons of a column fastened to the horizontal girder.

7. A reinforcing skeleton for ferro-concrete constructions, comprising horizontal rolled iron girders and vertical concrete columns including flanged longitudinal irons, in which the load carrying cross-section of the concrete is surrounded by a reinforcing cage, constituted partly by the longitudinal irons and partly by semicircular coils which contact substantially on three sides with the flanges of the longitudinal irons and surround the open carrying surfaces.

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