No. 788,942. PATENTED MAY 2, 1905.

E. G. PERROT.

BUILDING CONSTRUCTION.

APPLICATION FILED NOV. 19, 1904.

3 SHEETS—SHEET 1.

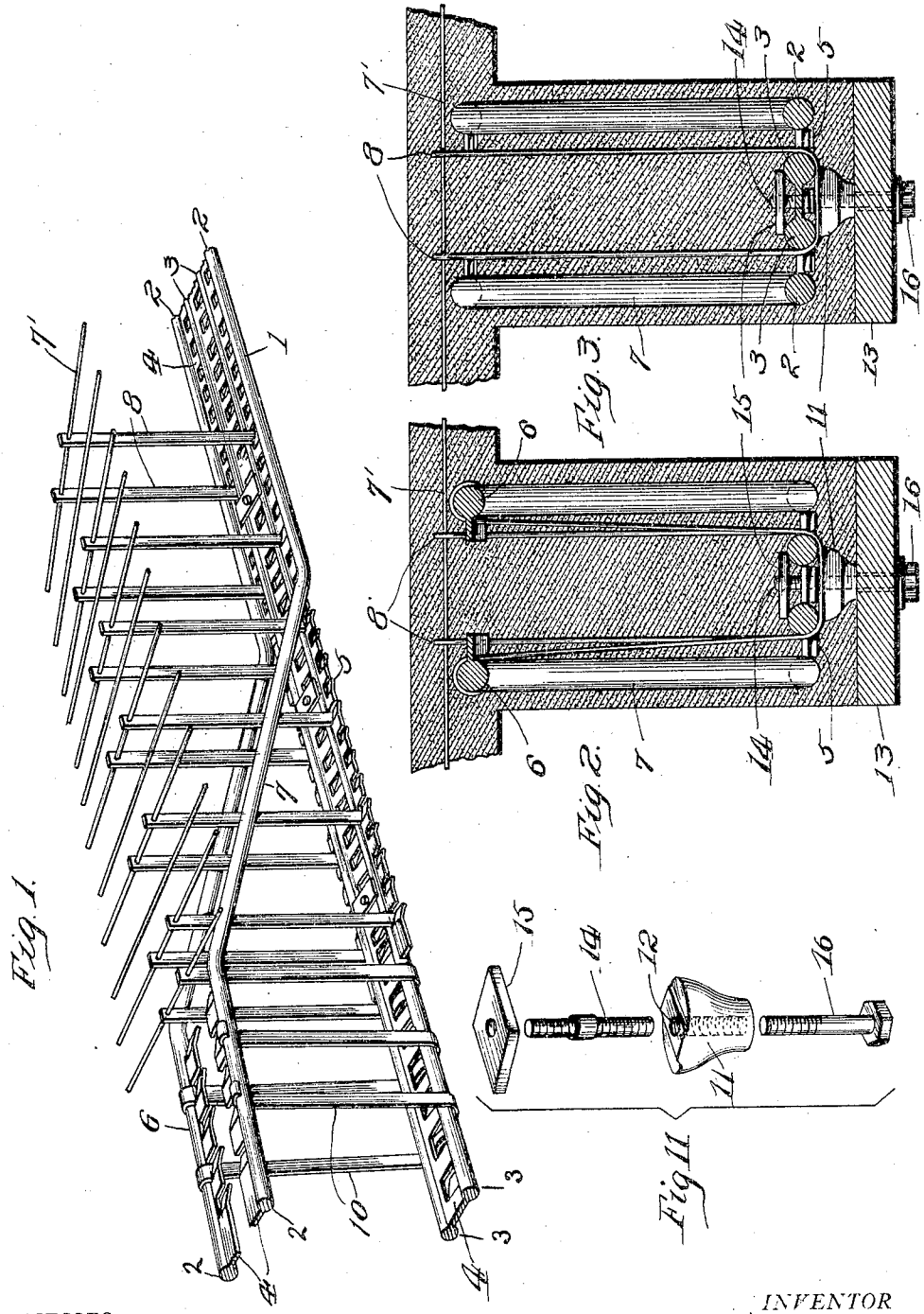


Fig. 1.

Fig. 3.

Fig. 2.

Fig. 11.

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BY Howe, Vaill & Ellis,

ATTORNEY.

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3 SHEETS—SHEET 2.

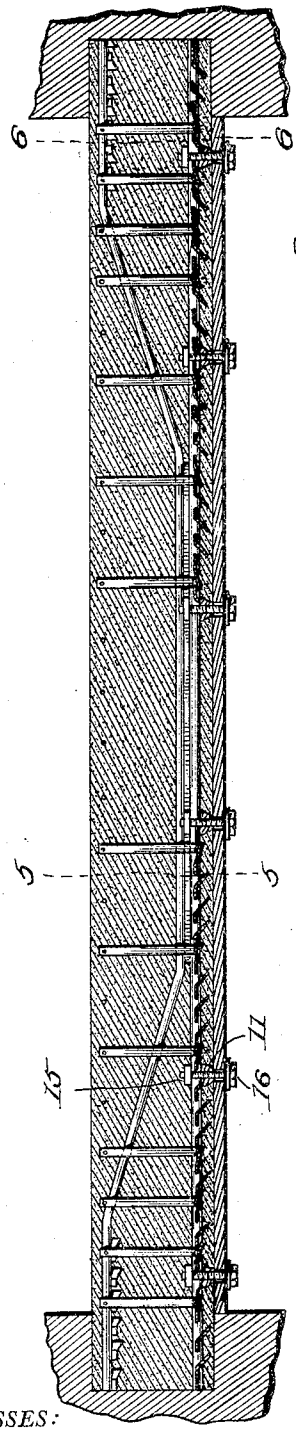


Fig. 4.

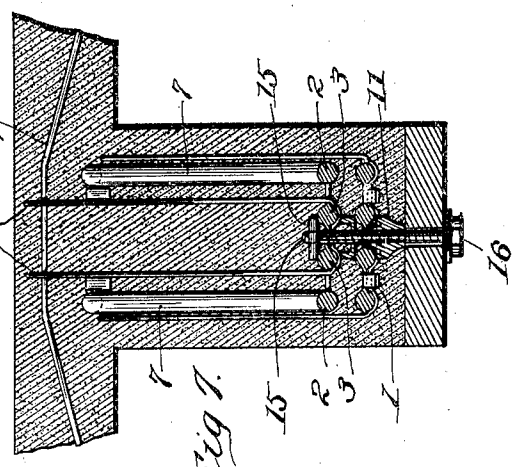


Fig. 7.

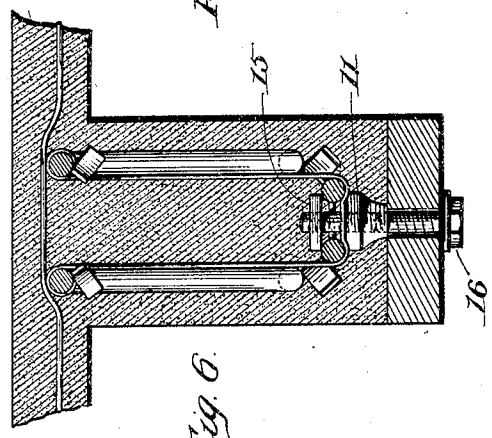


Fig. 6.

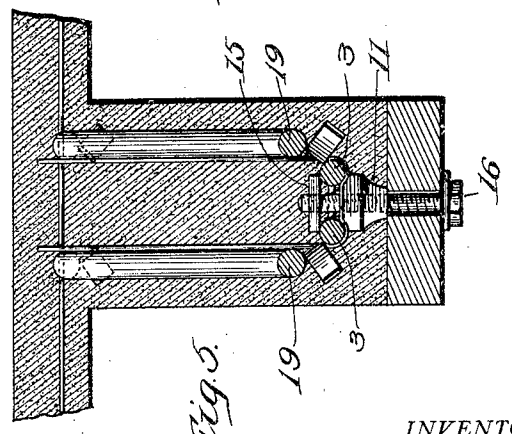


Fig. 5.

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3 SHEETS—SHEET 3.

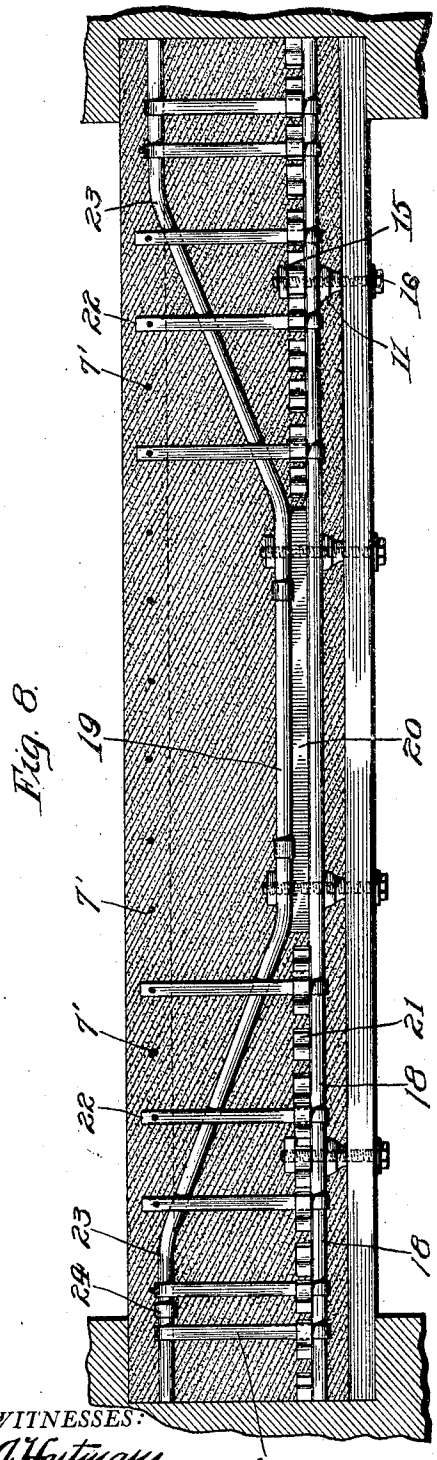


Fig. 8.

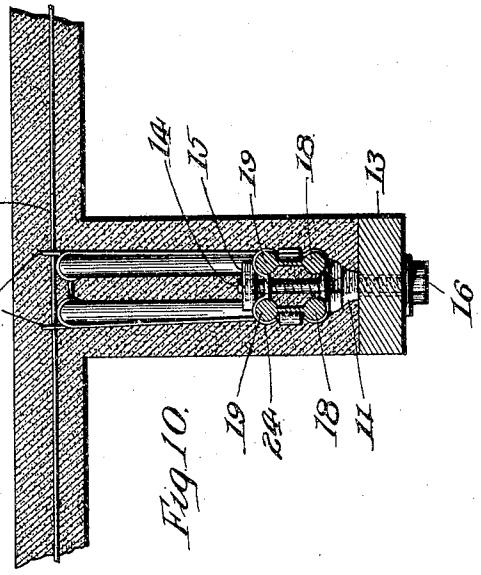


Fig. 10.

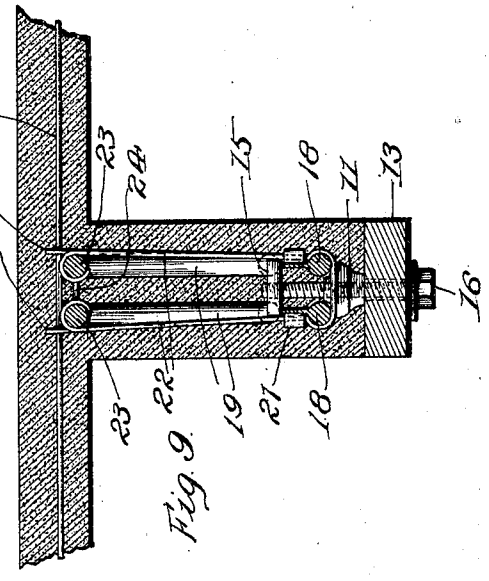


Fig. 9.

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No. 788,942. Patented May 2, 1905.

UNITED STATES PATENT OFFICE.

EMILE G. PERROT, OF PHILADELPHIA, PENNSYLVANIA.

BUILDING CONSTRUCTION.

SPECIFICATION forming part of Letters Patent No. 788,942, dated May 2, 1905.

Application filed November 19, 1904. Serial No. 233,411.

To all whom it may concern:

Be it known that I, EMILE G. PERROT, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Building Constructions, and Particularly in Means for Reinforcing Cementitious Parts—Such as Beams, Arches, &c.—of which the following is a full, clear, and complete disclosure.

One object of my invention is to provide reinforced or composite concrete and metal constructions by which a trussed effect of the reinforced parts may be obtained and so that the same, together with the cement or concrete, will correspond as nearly as possible to the trussed action of steel beams and supporting parts in the usual building constructions without the disadvantages of having to join the reinforcing parts by rivets or other means at the time when said reinforcing parts are placed in position or embedded in the cement.

A further object of my invention is to provide bars or reinforcing elements which may be adapted for use in different places and in different characters of structural formations without material changes except in size, number, and the proportions of the elements.

A further object of my invention is to provide such a construction in connection with the stirrup or minor members that the same are accurately held in position in relation to the main members during the formation of the cementitious body and during transportation from the manufactory to the building in which they are to be used.

A further object of my invention is to provide such a reinforcing means that the same may be made in the final form in which it is to be used in the beam or structural part and will constitute a unitary reinforcing truss or frame which may be made complete at the place where the steel or other metal is manufactured or shaped and shipped bodily to the locality where a particular building is being constructed and then immediately placed in position without any additional bending or manipulation by the unskilled workmen who cast or form the cementitious parts of the building.

A further object of my invention is to provide means in connection with the reinforcing elements such that the cement is caused to adhere firmly to said elements and such that under the action of heat due to accidental fires in the building will not allow the cement to become separated from and so expose the reinforcing elements to the action of intense heat. This feature of my invention is also particularly adapted to allow the replacing of the cement covering of the beams or other parts, especially the lower or outer surface of the same, should the said coverings become cracked and disintegrated under the action of intense heat.

Briefly, my invention comprises the use of main reinforcing elements or bars connected by webs, said webs being sheared or punched in certain portions to form transversely-extending lugs, said web also being sheared longitudinally at certain portions to allow the reinforcing elements to be separated and to be disposed in different parts of the cementitious body.

My invention also comprises the use of minor elements or stirrups which, owing to the formation of the main members or bars and their connected parts, will be held accurately in position and will allow the reinforcing elements or frame to be assembled into a unitary frame or girder which may be immediately placed within the molds for forming the cementitious body without further manipulation at the place where the building is being constructed.

For a full, clear, and exact description of these embodiments of my invention, reference may be had to the following specification, and to the accompanying drawings, forming a part thereof, in which—

Figure 1 is a perspective view of the reinforcing-frame assembled and indicating the relation with the reinforcing elements of the floor-slab of the building. Fig. 2 is a transverse sectional view taken adjacent one end of the beam where the reinforcing elements are separated from each other. Fig. 3 is a similar sectional view taken at the central portion of the beam where the reinforcing elements are united. Fig. 4 is a central longi-

tudinal sectional view of a beam, showing another form of the reinforcing frame or truss in position therein and indicating the relation of the same to the supporting-sockets. Fig. 5 is a transverse sectional view taken on the line 5 5 of Fig. 4. Fig. 6 is a similar transverse sectional view taken on the line 6 6, Fig. 4. Fig. 7 is a transverse sectional view taken adjacent the center of a beam having a reinforcing-frame similar to that shown in Fig. 1, but showing an additional set of main reinforcing elements. Fig. 8 is a longitudinal sectional view of a beam embodying another form of reinforcing-frame. Figs. 9 and 10 are transverse sectional views thereof, taken adjacent one end and adjacent the center, respectively. Fig. 11 is a detailed view showing the parts of the device or socket for supporting the reinforcing-frame detached.

Referring to the drawings, the numeral 1 indicates the main reinforcing member, which is preferably composed of bars 2 2 and 3 3, which are connected by integral webs 4. Each web 4 is preferably first provided at the desired portions with stamped or sheared out-lugs or tongues 5, said tongues being of any desired shape, but preferably rectangular and integral with the web at one side. The tongues 5 may be sheared from the webs 4 for their entire lengths or may be omitted in certain portions where it is desired to give greater tensile strength to the reinforcing elements. After the webs have been stamped or punched in the manner just described the outside members 2 2 are sheared from the webs for a certain proportion of their length from the ends inward toward the center and are bent to extend transversely and then parallel with the members 3 3 in order to form the upper main reinforcing elements, as indicated at 6 and 7. The web 4 and lugs 5 are preferably sheared from the inner bars 3 3 and allowed to remain attached to the outer bars 2 2 at their ends instead of being attached to the bars 3 3, as they are adjacent the diverging portions of the reinforcing elements. This gives the ends of the upper portions of the main reinforcing members a firm anchorage in the cement and prevents them from slipping longitudinally under the stress or tension upon the bars 2 2. When the main reinforcing members have been formed as thus described, the minor members or stirrups are then placed in position. These minor members are preferably in the form of U-shaped strips which at the central portions of the beam are inserted through the openings made by the punched-out lugs, as indicated by 8, from which they extend upwardly to engage the transverse reinforcing elements of the floor-slabs, as indicated at 7'. When the strips 8 have been passed through the openings in the webs, the adjacent tongues are bent or hammered down upon the strips and with the web form clamps or anchorages which holds the said stirrups loosely but accurately in position transversely of the main reinforcing elements. The stirrups 8 are held in position in this manner at their lower portions, but those adjacent the outer parallel ends of the main reinforcing members after engaging the lugs projecting from the central web and after passing around the bars 3 3 extend upwardly and through the openings formed by the sheared-out portions of the web 4, attached to the upper parallel portions 6 of the reinforcing-bars 2 2, as indicated by the numeral 10. The ends of the stirrups are then bent around the said parallel portions 6, and thereby retain the latter accurately in their positions relative to the lower reinforcing-bars 3 3. The reinforcing elements 7' of the floor-slabs are not placed in position until the frame has been inserted in the mold at the place where the building is being constructed; but in other respects the parts are assembled in the complete form so as to constitute a unitary frame which may be easily transported and placed in position.

The sockets which I prefer to use with reinforcing-frames of different kinds are constructed as follows: The numeral 11 indicates a block or casting through which passes centrally a screw-threaded hole or opening 12. The outer end of this casting is adapted to engage the longitudinal members of the reinforcing-frame, while its lower end is adapted to rest upon the upper surface of the mold or facing 13 of the beam or other support. A screw-threaded stud 14 passes into the screw-threaded opening 12 for a part of its length, and the upper end of said stud is adapted to receive a plate or nut 15, having a screw-threaded opening 16 therein. This plate or nut 15 is adapted to engage the upper side of the reinforcing-bars and when screwed firmly into position holds the said bars rigidly in engagement with the casting 11. As means for securing the casting or block 11 in position in relation to the mold or facing 13 I provide screws or bolts 16, which pass through openings in said mold and enter the remainder of the screw-threaded opening in the block 11.

In placing the frame in position within the mold the blocks 11 are first screwed firmly in position by means of the bolt 16, and the screw-threaded studs 14 are then inserted in the upper portion of the screw-threaded openings 12. The reinforcing-frame is then placed over said studs 14, said frame being made to accommodate said studs by having the adjacent sheared-out tongues 5 removed, thereby leaving a hole for the passage of the stud 14. The nut or plates 15 are then screwed firmly in position, and the reinforcing members are ready to have the cement placed in the mold and tamped in position. It is obvious that by elongating the screw-threaded stud 14 the same may be made to accommodate any number of vertically-superimposed reinforcing elements, as indicated in Fig. 7. When the cement of a

beam has been allowed to sufficiently harden, it is evident that the bolt 16 may be removed and the mold thereby disengaged from the structural element or beam, or if it is desired to have the lower portion of the mold form a yielding facing for the beam to which shaft-hangers, &c., may be attached the sides only of the mold are removed and the bottom 13 still allowed to be retained in position by the bolt 16.

It is obvious that the screw-threaded opening 12 may not extend continuously through the casting 11, but may consist of two independent screw-threaded sockets, the advantage of the continuous opening being that it is more easily formed. It is also obvious that a single block or casting may be provided with a plurality of openings or sockets 12 to receive a corresponding number of bolts 16 and studs 14.

In Figs. 4 to 6, inclusive, I have shown a modified form of reinforcing-frame, which is in general the same as that first described; but instead of having the main longitudinal reinforcing-bars all in a single plane the outside bars 17 are bent upwardly, so that the adjacent webs extend at angles to the horizontal. This manner of arranging the main bars allows the same amount of reinforcing metal to be used in a beam or other structural part, but with a considerable reduction in the width of said part.

In Fig. 8 I have shown a form of reinforcing-frame which instead of consisting of four connected bars consists of pairs of bars 18 and 19, connected by webs 20, which are provided with the stamped-out lugs or tongues 21 where the ends of the bars are separated and also at the central portions, if desired. These lugs are also adapted to engage the stirrups 22. The stirrups 22 are bent inwardly around the bars 18 and then extend upwardly to engage the reinforcing-bars 7 of the floor-slabs. The bars 19 and 20 are separated at their ends to form the upper reinforcing member of a beam or other structural part which may have some of the lugs or tongues attached thereto, as above described in connection with the first form, and the parallel portion 23 is held in position by having the outer stirrups or strips 22 bent or clamped around said bar. The frame is supported and held in position within the mold by sockets in a manner similar to that above described, with the exception that the upper nut or plate 15 may engage the webs of the bars at those portions of the frame where the bars are separated instead of engaging directly with the bars themselves. Where the bars are still connected by the web, as at the central portion of the beam, the block or casting 11 engages the lower pair of bars, while the nut or plate 15 rests upon the upper pair of bars 19, as indicated in Fig. 10. As an additional means for holding the pairs of bars 18 and 19 the correct distance apart before the frame is inserted in the mold and before the same is engaged by the supports I provide short transverse strips or bands 24, the ends of which are bent about the adjacent parallel bars 23 or 19.

In Fig. 7 I have shown a modification which is similar to that shown in Figs. 1, 2, and 3, with the exception that I employ two series of reinforcing elements, each series consisting of four bars connected by webs. In this form only the bars of one series may be divided or separated from the web to form the upper reinforcing members of the beam, while the bars of the other series extend parallel throughout their lengths. In this form it is necessary only to have the sheared-out lugs or tongues formed in the webs of the lower series of bars.

It will now be seen that in addition to producing a reinforcing structure or frame in each of the modifications described I have provided means whereby the concrete is firmly held in position upon the lower side of the beam, so that in case of fire the tongues or lugs will still hold sufficient concrete between them to protect the main reinforcing elements from the immediate heat of the flames which will effectually prevent the reinforcing elements from becoming weakened or warped owing to the heat. Furthermore, should the lower surface of the beam have to be replaced after a fire the concrete or cement remaining between the lugs or tongues may be chipped away so as to expose the lower surface of the reinforcing elements after which a fresh covering of cement may be placed in position and allowed to harden. The lugs will then effectively and firmly anchor such new coating or facing in position in the same manner that the original facing was held in position, although the new facing may not form an absolutely adhesive contact with the older remaining portions of the cement. This twofold advantage is of great importance and appears to be an entirely new feature in connection with reinforced concrete constructions.

Having thus described my invention it will be obvious that other changes may be made in the form, arrangement, and proportion of parts without departing from the spirit and scope of my invention; but

What I claim, and desire to protect by Letters Patent of the United States, is—

1. In a unitary reinforcing means for a cementitious body, the combination with main reinforcing-bars connected by webs, of minor elements, and means carried by said webs and formed of a portion thereof for holding said minor elements loosely but definitely in position transversely of the main elements.

2. In a unitary reinforcing means for a cementitious body, the combination with main reinforcing-bars connected by webs, of minor

elements, and lugs carried by said webs for holding said minor elements definitely in position.

3. In a unitary reinforcing means for a cementitious body, the combination with main reinforcing-bars connected by webs, of minor elements, and lugs sheared from said webs for holding said minor elements in position and forming an anchorage for the cement or other material.

4. In a unitary reinforcing means for a cementitious body, the combination with main reinforcing-bars connected by webs, of minor elements, and sheared-out lugs carried by said webs for forming an anchorage for said main elements in the cement and for causing said cement to adhere more permanently to said main elements.

5. In a unitary reinforcing means for a cementitious body, the combination with main reinforcing members connected by webs, of sheared-out lugs carried by said webs to form an anchorage in said cement and to retain said cement more permanently in position, said webs being detached longitudinally at certain portions to allow a separation of said bars so that the same may form upper and lower reinforcing elements, said separated bars having some of said lugs adhering thereto.

6. In a unitary reinforcing means for a cementitious body, the combination with main reinforcing-bars connected by webs, of sheared-out downwardly-projecting lugs carried by said webs to form an anchorage for said elements and to hold the facing of cement more permanently in position, said webs being detached from their outer ends toward the central portion of said bars to allow a separation of the bars to form spaced-apart reinforcing elements, said separated bars having some of said lugs adhering thereto.

7. In a unitary reinforcing means for a cementitious body, the combination with main reinforcing-bars connected by webs, of minor elements, and lugs carried by said webs for holding said minor elements in position, said webs being detached at their outer ends toward the central portion of said bars to allow a separation of said bars, the outer ends of certain of said minor elements being permanently connected with said separated bars.

8. In a unitary reinforcing means for a cementitious body, the combination with main reinforcing members connected by webs, of minor elements, and lugs carried by said webs for holding said minor elements definitely in position, said webs being detached longitudinally at the ends of said members toward the center thereof to allow a separation of said members to form spaced-apart reinforcing elements, the ends of said minor elements being clamped about said separated elements.

9. In a unitary reinforcing means for a cementitious body, the combination with main reinforcing members connected by webs, of minor elements and lugs carried by said webs for holding said minor elements definitely in position, said webs being detached longitudinally at the ends of said members toward the center thereof to allow a separation of said members to form spaced-apart reinforcing elements, said separated members having some of said lugs adhering thereto and engaging said minor elements adjacent their ends to retain the same in position longitudinally of said members.

10. In a unitary reinforcing means for a cementitious body, the combination with main reinforcing-bars connected by webs, of minor elements, and lugs carried by said webs for holding said minor elements definitely in position, said webs being detached longitudinally at the ends of said bars toward the center thereof to allow a separation of said bars to form spaced-apart reinforcing elements, said webs being so detached as to retain some of said lugs adjacent the outer ends of certain of said separated bars, other of said lugs being retained adjacent the central portion of other of said bars.

In witness whereof I have hereunto set my hand this 18th day of November, A. D. 1904.

EMILE G. PERROT.

Witnesses:

JOHN P. RUTHERFORD,

EDW. W. VAILL, Jr.