P. E. & R. L. BERTIN.

METHOD OF MANUFACTURING CONCRETE REINFORCING FRAMES AND THE PRODUCT THEREOF.

APPLICATION FILED JULY 23, 1906.

929,748.

Patented Aug. 3, 1909.

2 SHEETS—SHEET 1.

Fig. 4

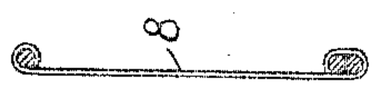


Fig. 6

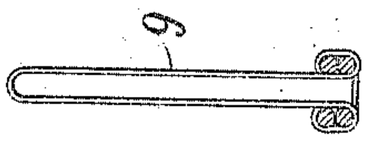


Fig. 7

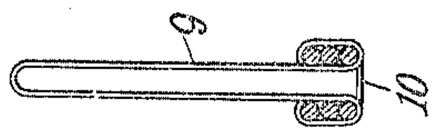


Fig. 5

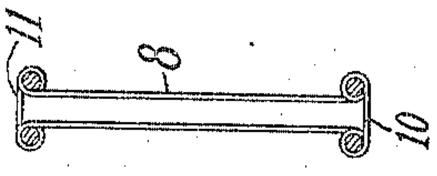


Fig. 1

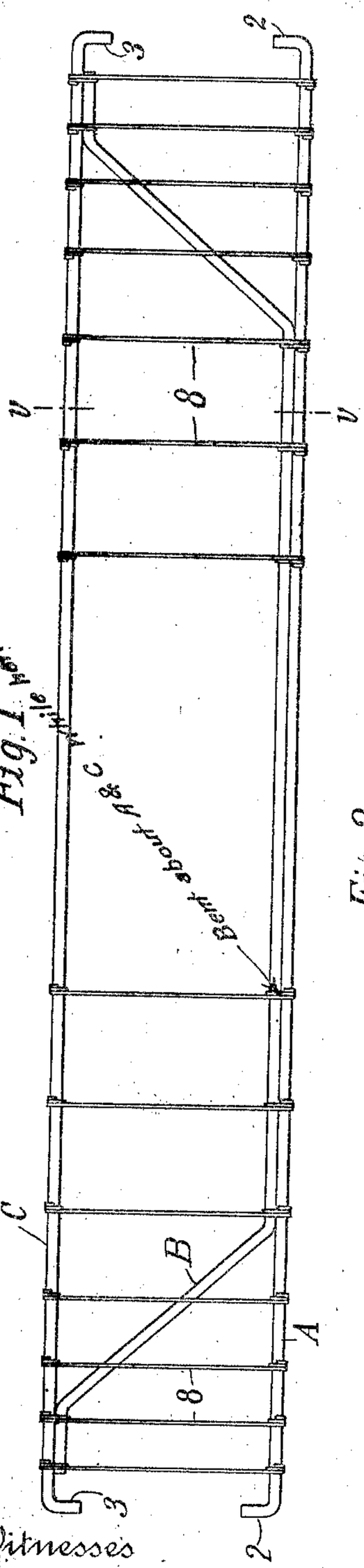


Fig. 2

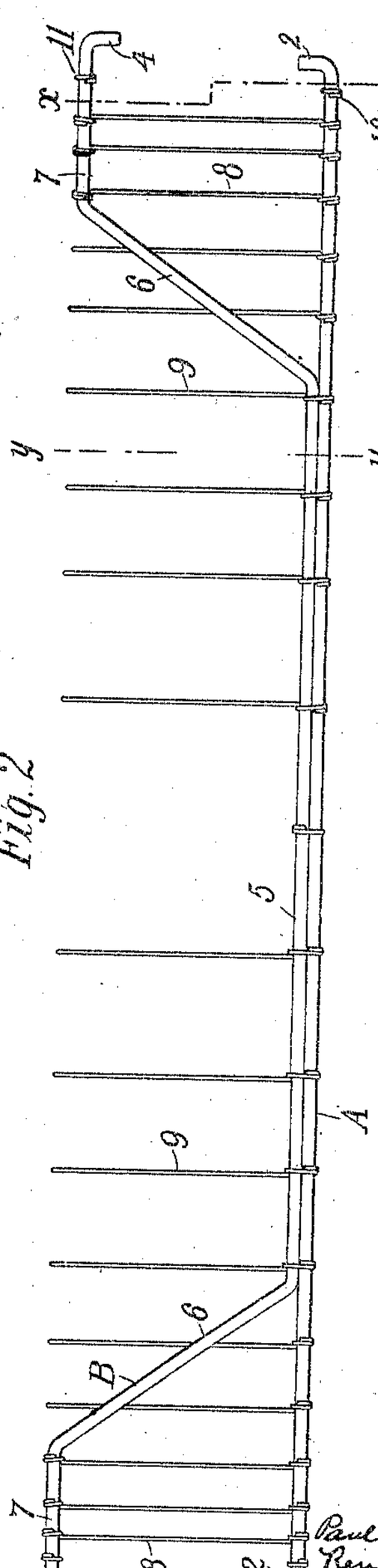
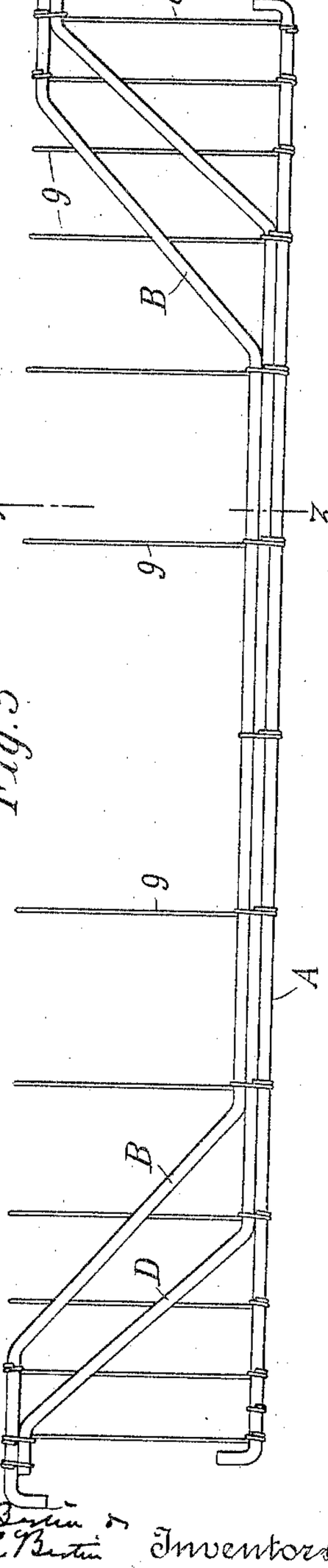


Fig. 3



Witnesses

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Fig. 10

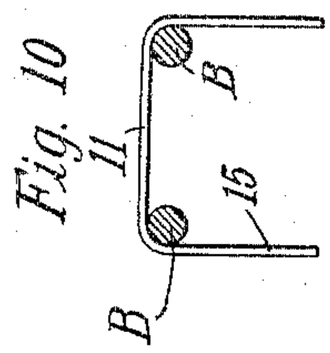


Fig. 9

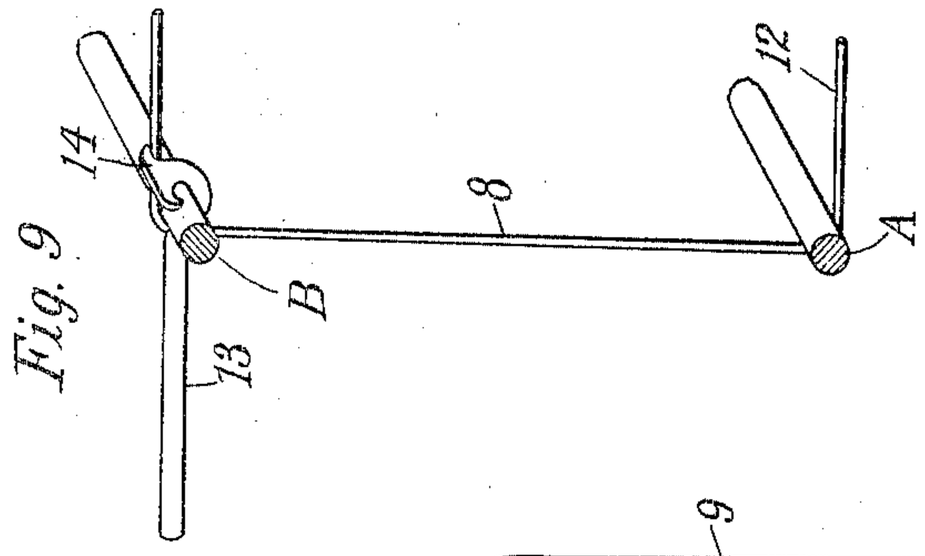


Fig. 11

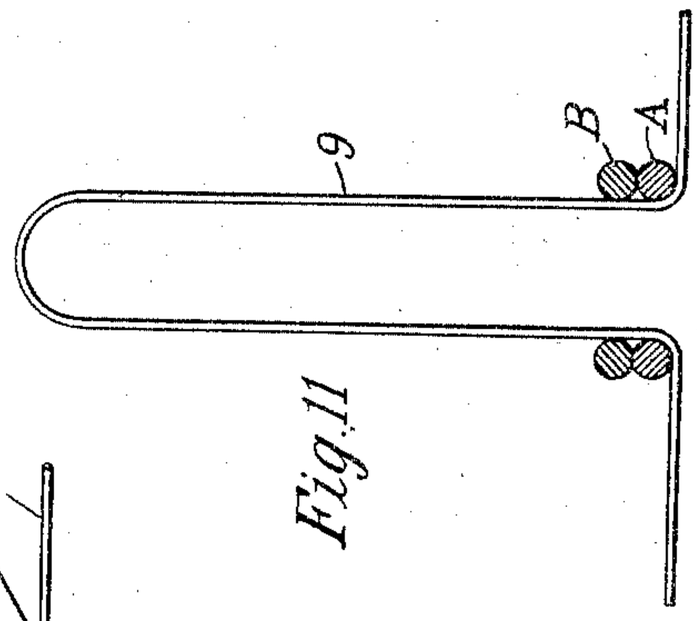
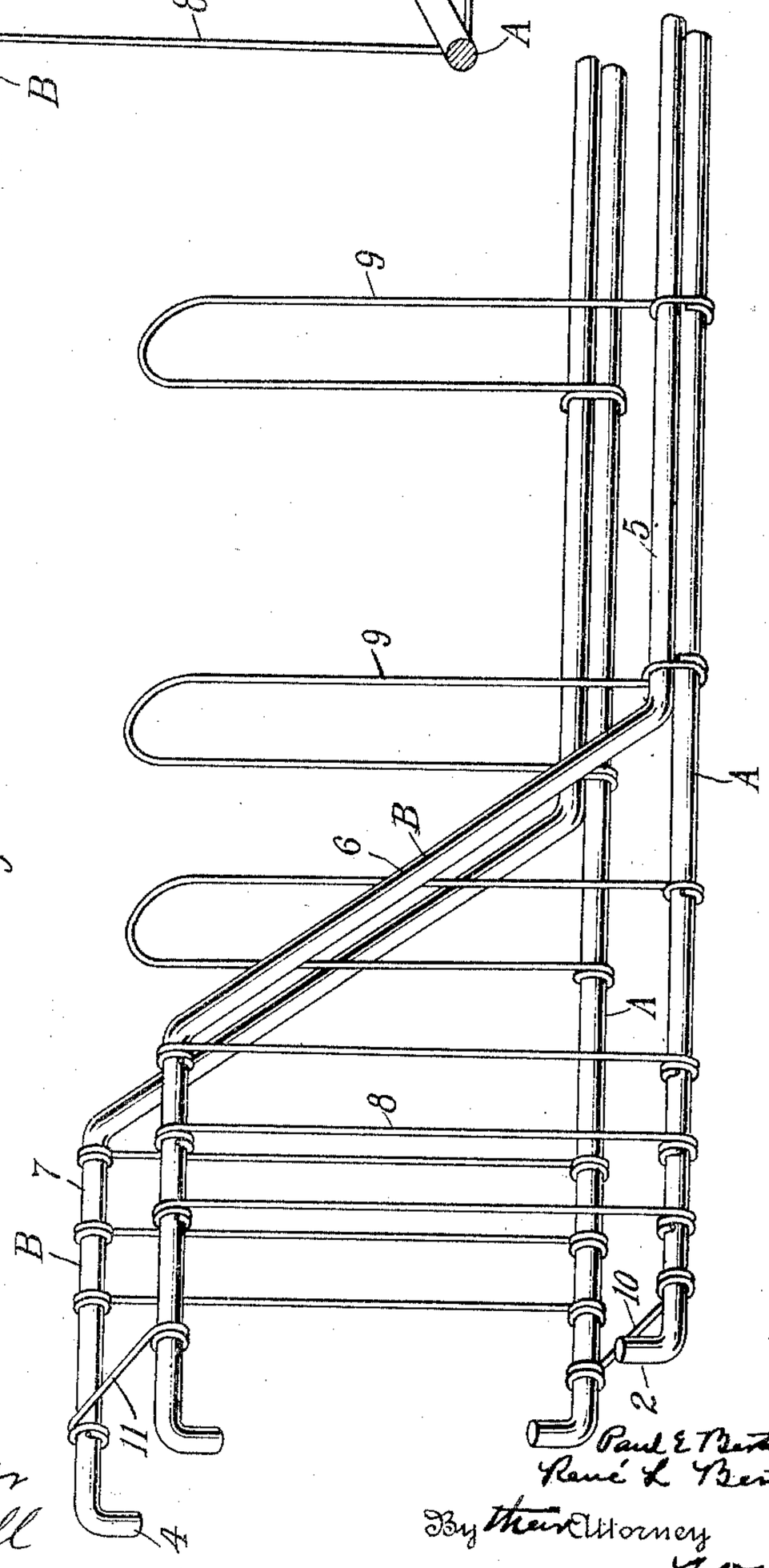


Fig. 8



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UNITED STATES PATENT OFFICE.

PAUL E. BERTIN AND RENÉ L. BERTIN, OF NEW YORK, N. Y., ASSIGNORS TO REINFORCEMENT SUPPLY COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

METHOD OF MANUFACTURING CONCRETE-REINFORCING FRAMES AND THE PRODUCT THEREOF

No. 929,748. Specification of Letters Patent. Patented Aug. 3, 1909.

Application filed July 23, 1906. Serial No. 327,463.

To all whom it may concern:

Be it known that we, PAUL E. BERTIN and RENÉ L. BERTIN, both citizens of the Republic of France, and residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented a new and useful Method of Manufacturing Concrete-Reinforcing Frames and the Product Thereof, of which the following is a specification.

Our invention relates to improvements in concrete building construction, its object being to provide an improved reinforcing unit frame for concrete girders and other supporting members of a building, and consists in the improved method of assembling and uniting the members of such frame and the product of such method, as hereinafter more fully described and claimed.

In reinforced concrete construction two general systems or methods prevail, one known as the "loose rod" system in which the individual reinforcing elements or rods must be placed in designed position and held securely in such position while the concrete is filled in around so as to embed the same, and until the concrete has set, and the other the "unit system", in which the reinforcing elements are first assembled and secured together in the form of a skeleton of the girder or other part of the building which they are designed to reinforce, such skeleton or frame being then set in place as a whole. The "loose rod" system requires the constant presence of experienced engineers and superintendents whose duty it is to see that the reinforcing elements are placed and held in position in exact accord with the engineering requirements and the plans and specifications of the structure. The disadvantages and objections to this method of construction have made increasingly important the devising of a thorough, reliable "unit" system whereby such unit may be set in place in the same manner as a steel beam and the concrete filled in about it by unskilled labor, thus dispensing almost entirely with the necessity for skilled superintendence. In order to make the so-called unit system absolutely reliable and certain to fulfil all of the engineering requirements, it is absolutely necessary that the parts which make up the skeleton frame shall be so interconnected as to absolutely preclude the possibility of their displacement. All beams, girders and like parts of the structure require reinforcing members to resist shearing and tension strains. The numbers, dimensions and location of the various members or bars are calculated with the same precision as the form and dimensions of a steel beam, so that the minimum amount of material, and maximum strength to resist the calculated strains may be secured. Such skeleton frame or unit is made up of longitudinal or tension members, (and in some cases with longitudinal compression members) and transverse vertical or inclined shearing members. Various methods of interconnection of the vertical or shearing members with the horizontal or tension members have been devised, such as by tying as by means of wire, or by bolting them together. It is obvious to any one familiar with such structures that neither of these methods is certain and positive in its results. Handling and transportation of the structure is sure to cause more or less loosening of the unions and displacement of the parts, whereby the structure as a whole becomes deformed and lacking in the prescribed engineering requirements. Rigid union of the parts of such structure may be secured by welding, but that method is objectionable from the fact that it is practically impossible to insure a perfect weld and almost as difficult to avoid burning, either of which would seriously weaken the structure below its calculated strength.

Our invention is designed, and has been proved by active service, to overcome all of these difficulties and provide an absolutely rigid union without weakening of the interconnected parts.

This improvement consists essentially in the so-called "shrinking" of one part or member around the other, and holding the parts in place until the heated member has cooled to normal temperature, its contraction in cooling serving to grip it upon the inclosed member with such force as to prevent shifting or displacement. It also permits the use of round bars as the cheapest and simplest form of rod for both horizontal and vertical members, and the employment of any desired dimensions of such bars to meet the exact requirements of the specifications and engineering plans. In assembling the parts, the longitudinal or tension members

are shaped to proper form and dimensions, and assembled, and held rigidly in position as by means of a suitable clamping rack while the smaller transverse or vertical rods are heated to a high heat, preferably cherry red, and then spirally wound about the tension members in exact designed and calculated positions, such position of the parts being maintained until the heated members have thoroughly cooled, whereby their contraction serves to grip them upon the tension rods so firmly that they cannot be displaced without being unwound or broken.

In the accompanying drawings forming part of this specification, Figure 1 is a side elevation of a single truss or girder unit having a tension bar, a shearing bar and a compression bar; Fig. 2 is a similar view of a double truss or girder unit having two tension bars and two shearing bars; Fig. 3 shows a double truss unit having two tension bars and four shearing bars; Fig. 4 is a cross-section of Fig. 1 on line 2—2; Fig. 5 is a cross-section of Fig. 2 on line *x—x;* Fig. 6 a similar cross-section on line *y—y;* Fig. 7 is a cross-section of Fig. 3 on line *z—z;* Fig. 8 is a partial perspective of a truss unit of the type of Fig. 2; Fig. 9 is a detail showing the manner of applying a vertical tie; Fig. 10 is a similar detail of a horizontal tie, and Fig. 11 is a detail of a stirrup as applied to the longitudinal bars ready for winding thereon.

In the drawings A represents the tension bar or member of the truss, B the shearing bar, C the compression bar. In the type shown in Fig. 3 an intermediate or supplementary shearing bar D is provided. The tension bar has its ends 2 upturned and the ends 3 of the compression bar are downturned as shown, to assist in anchoring the frame in the concrete. Where the compression member is omitted the ends 4 of the shearing member are similarly downturned for anchorage purposes. The tension and compression bars are preferably straight as shown, the shearing bar has a middle or intermediate portion 5 which also is straight, and bears upon the adjacent tension bar A. The ends of the shearing bar are bent upwardly at an angle of less than 90 degrees to form shearing sections 6 which determine the height of the frame. These ends are then bent to form the portion 7 parallel with the tension member. The tension member is connected to the compression member and to the parallel ends of the shearing members by vertical ties 8. The usual dimensions of the tension, shearing and compression bars are from an inch to an inch and a quarter diameter, and the corresponding dimensions of the ties 8 are preferably three-eighths of an inch diameter. In the types of frame shown in Figs. 2 and 3, stirrups 9 are provided, which serve as anchorages in the concrete. The tension members of the double frame as shown in Figs. 2, 3 and 8 are interconnected by horizontal ties 10. Similarly the compression members of the double frame or ends of the shearing members where compression members are omitted are interconnected by horizontal ties 11.

The method of forming and assembling the parts of the frame is as follows: The tension, shearing and compression bars are first bent (preferably cold) into the desired shape and assembled in suitable holding devices for the purpose (not shown), as a single truss. The rods for the vertical ties 8 are cut to proper length and bent cold in the form shown in Fig. 9 to exactly span the bars with which they are to be connected. The ends 12 of the tie are then heated to a high degree, and the tie is then placed upon the bars as shown in Fig. 9, and a suitable tool 13 having lateral hooks 14, or other appropriate device, is then applied to engage the heated end of the tie and quickly to wind it spirally around the bar or bars to which it is to be connected. The bars are maintained by the holding devices in position until the ties have cooled in place, the shrinkage of the spirally wound ends in cooling serving to grip them upon the bars so strongly that the connection is for all practical purposes as solid and immovable as if the parts were welded together. If it is desired to form a double truss, two of the single trusses thus constructed are assembled in suitable holding devices to maintain exact desired distance between them, and their adjacent bars or members are then interconnected by means of the horizontal ties 10 and 11 which are shaped cold as shown in Fig. 10, their ends 15 being then heated and wound about the bars in the same manner as the vertical ties. The intermediate portions of the double truss in which the compression bars are omitted, are united by stirrups 9 which are first shaped while cold into the form shown in Fig. 11, their ends being then heated and wound spirally about the bars and allowed to cool in place in the same manner as the ties are connected to the bars. The unit frame whether of the simple or single truss type or a combined type of any number of single or simple trusses, with its members so united, becomes a practically integral structure throughout.

It will be observed that not only does this improved method possess the practical advantage of enabling the worker to construct from the simple rod form of raw material a complete finished manufactured product in a few moments' time, but also that the flexibility of the method enables the engineer at any time or point in the building operations to re-design and change the form, dimensions and stress resisting requirements of a given frame, and to have a modified structure produced with but brief and negligible delay in the delivery of such frames. It is

also obvious that with the same shop equipment it is practicable by this improved method to produce with practically equal facility reinforcing frames of every possible shape, dimensions and stress resisting requirements to be met with in any building structure, without other raw material than rods of the various requisite dimensions, all such frames being complete integral units requiring absolutely no fittings, attachments or securing devices of any sort, and ready for placing in final and permanent position.

We claim:

1. The method of constructing concrete reinforcing unit frames comprising a plurality of longitudinal and of transverse members, the one being wound around the other, consisting in shrinking each encircling member upon the other.

2. The method of constructing concrete reinforcing unit frames having tension and shearing bars and interconnecting ties, consisting in heating the ties to a high temperature and winding them while highly heated around said bars while the latter are cold, and causing said ties to cool in place.

3. The method of constructing concrete reinforcing unit frames comprising longitudinal bars and interconnecting ties, consisting in first shaping said bars and then assembling them in position while cold, then heating to a high temperature the parts of the ties to be united to said bars and winding said heated parts around said bars and rigidly holding said bars in position until said ties have cooled.

4. The method of constructing concrete reinforcing unit frames having tension and shearing members, and transverse ties, consisting in first shaping said tension and shearing members, then assembling them unheated, then heating the ties and winding them around said members to interconnect them, the parts being kept in position until the ties are cooled.

5. The method of constructing concrete reinforcing unit frames having a plurality of similar trusses, each having a top and a bottom member interconnected by vertical ties, and said trusses being interconnected by horizontal ties, consisting in first shaping, assembling and winding the ties while hot around the members of said truss and allowing said ties to cool in place, and then similarly applying the horizontal ties to the tension members of the different trusses to interconnect said trusses.

6. A concrete reinforcing frame for girders and the like, comprising longitudinal and transverse members, the one member being wound around the connected member and being secured thereto solely by being shrunk thereon.

7. A concrete reinforcing frame comprising longitudinal and transverse members shaped and assembled into the form of a skeleton of the part to be constructed, and rigidly interconnected by the one member being while highly heated wound around the connected member while the latter is unheated, the members being maintained in position until the heated members are cooled.

8. A concrete reinforcing frame comprising tension members and inclined shearing members, consisting of round rods shaped and assembled into the form of a skeleton of the concrete structure, and interconnected by vertical and horizontal ties secured thereto by being while hot wound around said members while cold and allowed to cool in place.

9. A concrete reinforcing frame comprising two top and two bottom tension members, ties connecting each top tension member with its bottom member, and lateral ties connecting the top tension members with each other, and the bottom tension members with each other, all the various parts being interconnected by wrapping heated parts around cold parts, and holding the same rigidly in position during the cooling of said heated parts.

10. A concrete reinforcing unit frame comprising horizontal tension members and vertical shearing members or ties, said ties being rigidly united to and interconnecting the top and bottom tension members by being while heated wound spirally there-around and cooled in place.

11. A concrete reinforcing unit frame, comprising bottom tension members one or more being straight and one or more being bent upwardly and inclined outwardly across the line of shear, the ends serving as tension members over the point of support, and vertical ties constituting shearing members interconnecting the top and bottom tension members, and rigidly secured thereto by being spirally wound around and shrunk thereon.

12. A compound reinforcing unit, comprising two or more sets of top and bottom tension members interconnected by vertical shearing ties, and by horizontal ties, all said ties being secured to said tension members by being wound spirally around and shrunk thereon.

13. The method of making concrete reinforcing frames from raw or stock material, which consists in interconnecting the parts by wrapping heated parts around cold parts and holding the same in position during the cooling of said heated parts.

14. The method of making concrete reinforcing frames from raw or stock material by means of tie rods, consisting in wrapping the heated ends of such tie rods around the cold frame members, and holding the frame members in position during the cooling of the ties.

15. A concrete reinforcing frame, made up of raw or stock material, in which the mem-

bers are interconnected by the wrapping of heated parts around cold parts, and holding the same in position during the cooling of said heated parts.

16. A concrete reinforcing frame made up of raw or stock material united by tie rods, the ends of said tie rods having been while heated wrapped spirally around cold frame members and allowed to cool in place.

In witness whereof, we have hereunto set our hands at the city of New York, this 20th day of July, 1906.

PAUL E. BERTIN.
RENÉ L. BERTIN.

Witnesses:
T. D. MERWIN,
LOUIS O. PIPER.