No. 815,409. PATENTED MAR. 20, 1906.

R. A. CUMMINGS.

CONCRETE AND METAL STRUCTURE.

APPLICATION FILED OCT. 1, 1904.

2 SHEETS—SHEET 1.

FIG. 1

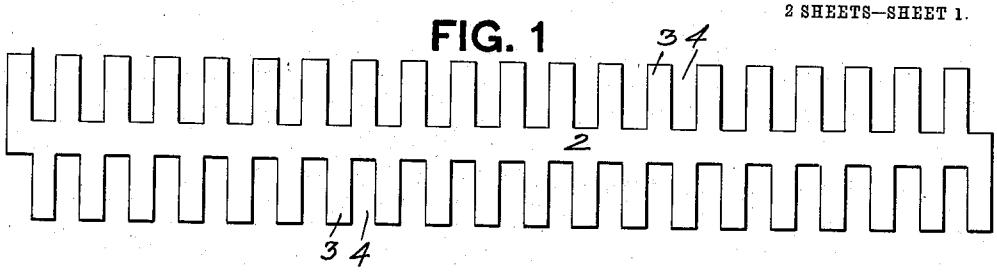


FIG. 2

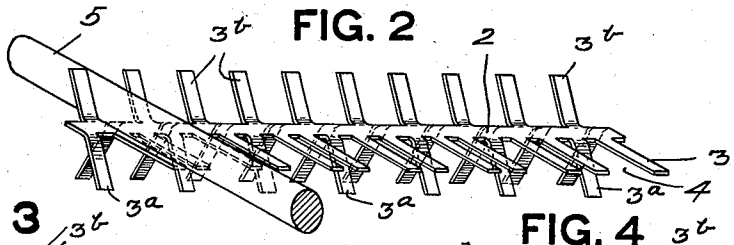


FIG. 3

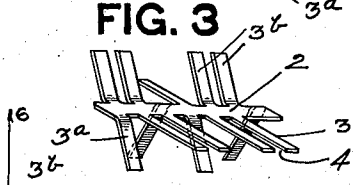


FIG. 4

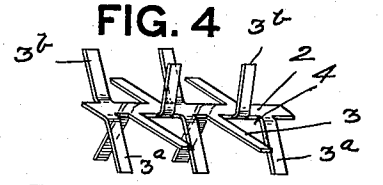


FIG. 5

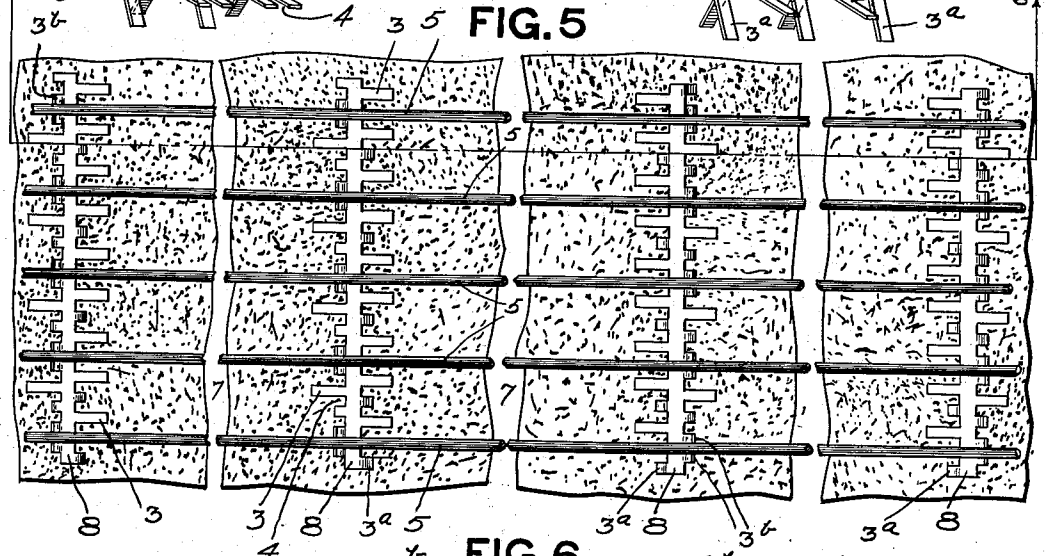
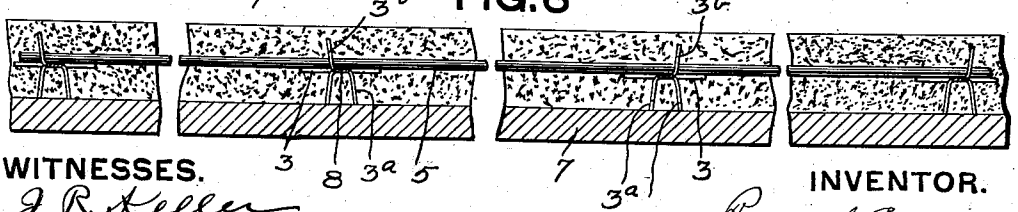


FIG. 6



WITNESSES.

J. R. Keller

Robert C Potter

INVENTOR.

Robert A Cummings

By Ray Potter & Winter

Attorneys

No. 815,409. PATENTED MAR. 20, 1906.

R. A. CUMMINGS.

CONCRETE AND METAL STRUCTURE.

APPLICATION FILED OCT. 1, 1904.

2 SHEETS—SHEET 2.

FIG. 7

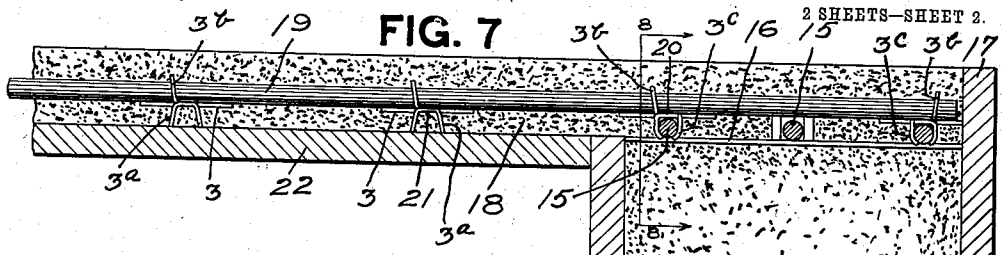
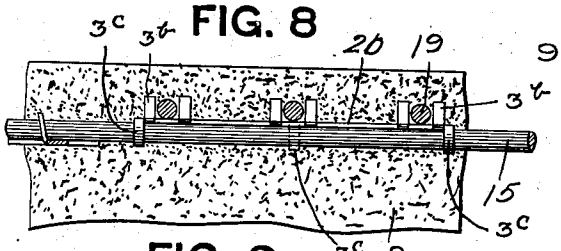


FIG. 8



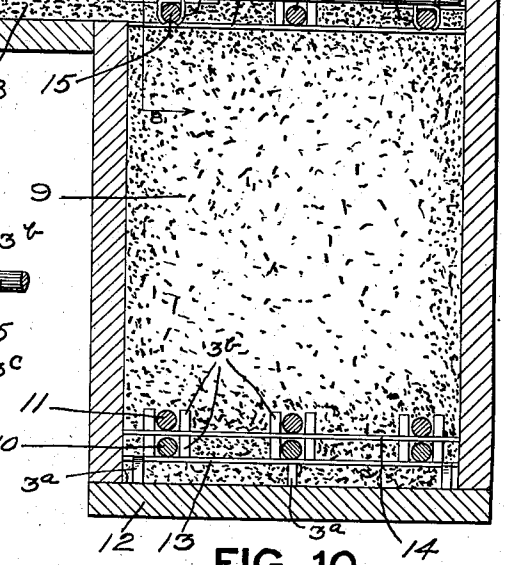


FIG. 9

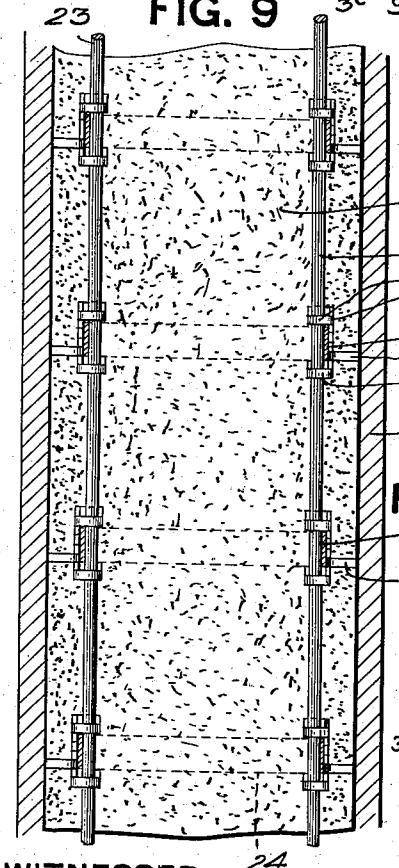


FIG. 10

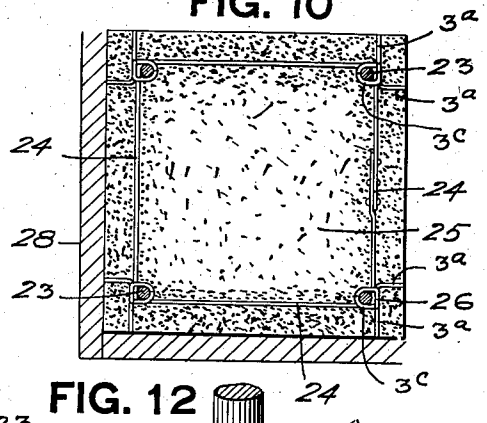


FIG. 11

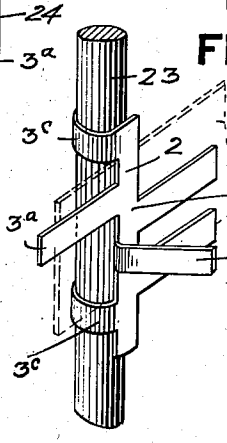
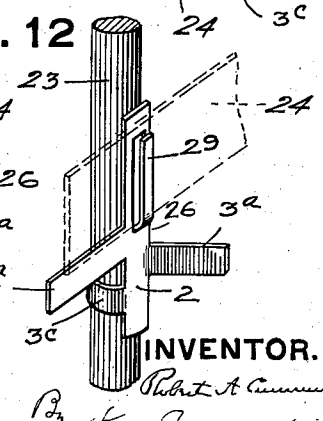


FIG. 12



WITNESSES.

J. R. Keller

Robert C. Totten

INVENTOR.

Robert A. Cummings

By Kay Totten & White

attorneys

UNITED STATES PATENT OFFICE.

ROBERT A. CUMMINGS, OF BEAVER, PENNSYLVANIA.

CONCRETE AND METAL STRUCTURE.

No. 815,409. Specification of Letters Patent. Patented March 20, 1906.

Application filed October 1, 1904. Serial No. 226,821.

To all whom it may concern:

Be it known that I, ROBERT A. CUMMINGS, a resident of Beaver, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Concrete and Metal Structures; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to composite metal and concrete structures, such as bridges, viaducts, reservoirs, floors, roofs, walls, columns, piles, struts, and other portions of fireproof buildings and other structures.

The object of my invention is to provide a spacing and supporting member for holding the metal reinforcements of the concrete in proper position relative to each other and to the centering or casing used in forming the concrete.

Concrete and cement are at present very largely used for building many kinds of structures which formerly were built of metal, masonry, or the like. The concrete possesses great compressive strength when properly constructed and supported and is not affected by fire, water, or other elements and for these reasons is highly desirable in many building constructions. It, however, possesses very little tensile strength, and therefore it is customary to reinforce the same by embedding in it suitable metallic reinforcing members or bars, known technically as "core bars" or "units," which supply the requisite tensile strength to the material. It is the custom to place the metallic reinforcing members in position in the structure and in proper relation with reference to the centering or casing onto or into which the cement is to be filled and then to fill the cement into the casing or onto the centering and around the reinforcing members. These metallic reinforcing members very frequently are of light weight, being either thin metallic bands or rods from one-fourth inch upward in dimensions. They therefore are quite flexible and difficulty is experienced in holding them in proper relative position one to the other and also in proper position with relation to the centering or casing. This is essential in order that these members may be so distributed in the concrete as to give the greatest strength thereto.

My invention relates especially to means for holding the reinforcing members in proper relative position one to the other and to the centering or casing.

The invention consists, generally stated, in a supporting and spacing member formed, preferably, of sheet metal and provided at its edges with projecting tongues or fingers which are adapted to be bent some in one direction and some in the other, those bent in one direction serving to space this member and the reinforcing members supported thereby the proper distance from the centering or casing and those bent in the opposite direction serving to hold the reinforcing members the proper distances apart.

In the accompanying drawings, Figure 1 is a plan view of a metal sheet cut to the proper form for making the supporting and spacing member. Fig. 2 is a perspective view of a completed member, showing the manner of holding the core-bars. Figs. 3 and 4 are similar views showing modifications. Fig. 5 is a plan view showing the manner of applying the spacing members in the formation of floor and similar concrete structures. Fig. 6 is a section on the line 6 6, Fig. 5. Fig. 7 is a section showing the application of the spacing member to girder constructions. Fig. 8 is a section on the line 8 8, Fig. 7. Fig. 9 is a vertical section showing the application of the supporting and spacing member to the building up of a column and the like. Fig. 10 is a horizontal section through the same. Fig. 11 is a perspective detail of the column-work, and Fig. 12 is a similar view showing a modification.

My invention comprises a supporting and spacing member having a body designed to be placed horizontally or vertically, according to the character of work to be performed, and provided on its longitudinal side edges with projecting tongues, fingers, or the like, some of which may be bent in one direction and some in another. This supporting and spacing member may be formed of wire, malleable casting, or other material. Preferably it will be formed of sheet metal of a thickness depending on the character of work. In some cases it may be of exceedingly thin metal—say twenty-eight gage; but for heavier work it will be materially thicker. This sheet metal will be used in the form of narrow strips and of a length varying considerably with the work to be performed. It will have its side edges provided with slits, so as to form tongues or projections.

In Fig. 1 is shown a suitable strip cut to form a spacing member. This strip has the central longitudinal unslitted body portion

2 and on the edges is provided with projecting tongues 3, separated by interdental spaces 4. These spaces 4 might be so narrow as to form mere slits; but it is preferred to have a portion of the metal removed, so as to make comparatively wide spaces. Some of the projecting tongues 3 will be bent in one direction to form the legs or distance members 3^a, and others will be bent in the opposite direction to form the means 3^b for spacing the reinforcing members or core-bars 5. Preferably the projections or tongues will be arranged alternately on the two sides, as shown in Fig. 1, instead of opposite each other, as thereby greater flexibility in spacing the core-bars or a greater range of dimensions of the spaces between the upturned members can be obtained. Any of the projecting tongues may be turned upwardly, as desired or necessary, to form holding means properly spaced apart for the metallic reinforcing members, while other of said tongues can be turned down to form the necessary number of distance pieces or legs. The number turned up will vary according to the number of reinforcing members to be held by the spacing member and the distances between adjacent ones will vary largely. Fig. 3 shows two adjacent fingers on the same side turned up, thus forming a narrow space for holding a small core-bar. Fig. 4 shows one finger on one side and another on the other side turned up to form a wide space for a larger core-bar, and Fig. 2 shows the two turned-up fingers on the same side of the strip, but not adjacent ones, thus making a still wider space for a large core-bar. The number turned down to form the legs will be sufficient to properly support the member and reinforcements in proper position with reference to the centering or casing. All other projections or tongues can be left unbent. The blank shown in Fig. 1 is a standard blank which can be adapted at the place of use to a variety of uses and to various numbers or characters of metallic reinforcing members to be held thereby, the projecting tongues being capable of being bent into place by hand or by a simple tool. It will be necessary only to stamp out the sheet-metal blanks to the form shown in Fig. 1 and then carry the same to the place of use. This one blank will be sufficient for any use to which it can be put. If desired, different sizes or weights of blanks can be manufactured; but a single one will be found suitable for most purposes. This spacing member can be used in a large variety of ways, and in the drawings I have shown several manners of applying the same; but it will be understood that these are for purposes of illustration largely and do not show all manners of using the same.

In Figs. 5 and 6 the spacing member is shown applied in the formation of floors, roofs, and similar structures. The centering is shown at 7, and the spacing members 8 are placed upon the same, having the legs 3^a resting thereupon. The reinforcing members or core-bars are shown at 5, and the spacing member will have as many fingers 3^b turned upwardly as will be necessary to hold the core-bars in the proper relative position with reference to each other. The body 2 of the spacing members lies in a horizontal plane and merely serves as a support upon which the reinforcements rest. The legs 3^b of course can be made of any desired length so as to hold the reinforcements the proper distance above the centering. As many spacing-pieces will be used as necessary to support the reinforcements along their entire length. The concrete is filled onto the centering and around these reinforcements and spacing members in the usual way, and when said concrete sets the centering is removed, thus leaving a reinforced concrete structure in which the reinforcements or core-bars are properly distributed, so as to give the maximum strength to the structure.

In Figs. 7 and 8 I have illustrated the spacing member applied in the building up of main and cross girders. The main girder 9 is shown as provided with rows of reinforcements 10 and 11, located near the bottom thereof. The lower row of reinforcements is held in proper position above the casing 12 and properly spaced one from the other by a spacing member 13. The upper row of reinforcing members 11 is supported by a spacing member 14, laid upon the lowermost row of reinforcing-bars and merely having upward projections 3^b, so as to properly space apart said reinforcing members 11. Near the top of the girder there are also applied several reinforcements 15, which are supported and held apart by a spacing member 16, suitably secured at its ends to the casing 17, or the concrete may first be partly filled in, then the member 18 laid thereon. 18 represents a cross-girder resting partly on top of the main girder 9. This also is provided with a series of reinforcing members 19, which are supported and spaced apart by a member 20, having upturned fingers 3^b for spacing apart the reinforcements 19 and having downturned fingers 3^c bent around one of the core-bars 15. In this manner the spacing member is attached to said core-bar and serves to support and space apart the reinforcements 19 of the cross-girder. Other spacing members 21 support the reinforcements 19 above the centering 22. The concrete in this case is filled into the casing and around the reinforcing and spacing member, and when set the casing and centering is removed. The result is that all of the reinforcements in the main and cross girders are so distributed that the maximum strength is obtained.

In Figs. 9 to 12 I have shown my spacing member applied in the building up of col-

umns or similar structures. The column is provided with vertical strengthening or reinforcing members 23 and with bands 24, which surround the concrete 25, so as to prevent the same from spreading outwardly and fracturing. The spacing-pieces are shown at 26. They have some of their fingers 3^c bent around one of the vertical reinforcements 23 and other of the fingers 3^a projecting outwardly and bearing against the casing 28, so as to hold the vertical members 23 a proper distance away from said casing. The bands 24 are located either between the verticals 23 and body 2 of the spacing member and are thereby prevented from falling down, as shown in Fig. 11, or said bands are held against falling by tongues 29, punched out of the body of the spacing members, as shown in Fig. 12. With the metallic members held in this position the concrete is filled into the casing and around the metallic portions, entirely embedding the same. These metallic portions are held in proper vertical position so that the resultant column has the vertical members properly distributed therein and entirely embedded in the concrete.

The application of the spacing member and clip to column-work, as shown in Figs. 9 to 12, is not claimed herein, but is claimed in my application, filed October 22, 1904, Serial No. 229,635.

Many other applications of my spacing member will suggest themselves to those skilled in the art. In all cases, however, this member serves to properly space the reinforcing members away from the centering or casing, so that said spacing members will be entirely covered by the concrete, and thus not exposed to the air and resultant corrosion, and will also hold said members the requisite distance from the top of the floor, column, or other structure, so as to get the necessary strength. The spacing member also serves to hold the reinforcing members in proper relative positions one to another, so that they will be properly and uniformly distributed in the concrete. The spacing member itself is very simple and can be very cheaply made. It is so constructed that a single size and design of spacing member is adapted for a large variety of uses, in that manner making special dies and designs unnecessary and very greatly reducing the cost of manufacture.

What I claim is—

1. A member for spacing and supporting bars in metal and concrete work, comprising a metal plate having tongues or projections formed on its side edges and separated by interdental spaces, some of its tongues on both edges being bent in one direction and adapted to contact with the centering or casing, and others of said tongues being bent in the opposite direction and serving to space apart reinforcing-bars extending transversely of said member.

2. A member for spacing and supporting bars in metal and concrete work, comprising a sheet-metal strip having tongues or projections formed on its side edges, some of said tongues on both edges being bent in one direction and adapted to contact with the centering or casing, and others of said tongues being bent in another direction and serving to space apart reinforcing-bars extending transversely of said member.

3. A spacing and supporting member for metal and concrete reinforced work, comprising a metal strip having projecting tongues formed on its side edges, said tongues alternating on the two edges, and some on both edges being bent in one direction and others in another direction.

4. In concrete and metal structures, the combination of a member having fingers projecting at an angle to its body and in opposite directions, and metallic members extending transversely of said member held by the fingers projecting in one direction, the fingers projecting in the opposite direction serving to contact with the centering or casing.

5. In concrete and metal structures, the combination of metallic reinforcing members, spacing-pieces comprising metallic strips having projections on the edges, some being bent in one direction to space and support the reinforcing members and others being bent in the opposite direction to contact with the centering or casing, and concrete enveloping and embedding said reinforcing and spacing members.

6. In concrete and metal structures, the combination of metallic reinforcing members, a spacing member comprising a sheet-metal strip provided with projections or tongues on its side edges and arranged alternately, some of said projections being bent in one direction to space apart the reinforcing members and others being bent in the opposite direction to contact with the centering or casing, and concrete or the like enveloping and embedding said reinforcing and spacing members.

7. In metal and concrete structures, the combination of metallic reinforcing members, metallic spacing members having on their side edges fingers or projections, some of which are bent in one direction around one metallic member and others of which are bent in the opposite direction, and concrete or the like enveloping and embedding said reinforcing and spacing members.

8. In metal and concrete structures, the combination of metallic reinforcing members, a spacing member comprising a metal body provided on its edges with projections, some of which are bent in one direction and around a reinforcing member, and others of which are bent in the opposite direction and serve to space apart others of the reinforcing members, and concrete and the like enveloping

and embedding said reinforcing and spacing members.

9. In metal and concrete structures, the combination of metallic reinforcing members, a spacing member comprising a metal body provided on its edges with projections, some of which are bent in one direction and around one of the reinforcing members, and others of which are bent in the opposite direction and serve to space apart others of the reinforcing members, said projections being alternately arranged on the two side edges of said strip, and concrete or the like enveloping and embedding said reinforcing and spacing members.

In testimony whereof I, the said ROBERT A. CUMMINGS, have hereunto set my hand.

ROBERT A. CUMMINGS.

Witnesses:
ROBERT C. TOTTEN,
G. C. RAYMOND.