Nov. 20, 1928. 1,692,167

L. O. GATES

STRUCTURAL FORM TIE

Filed Feb. 23, 1928

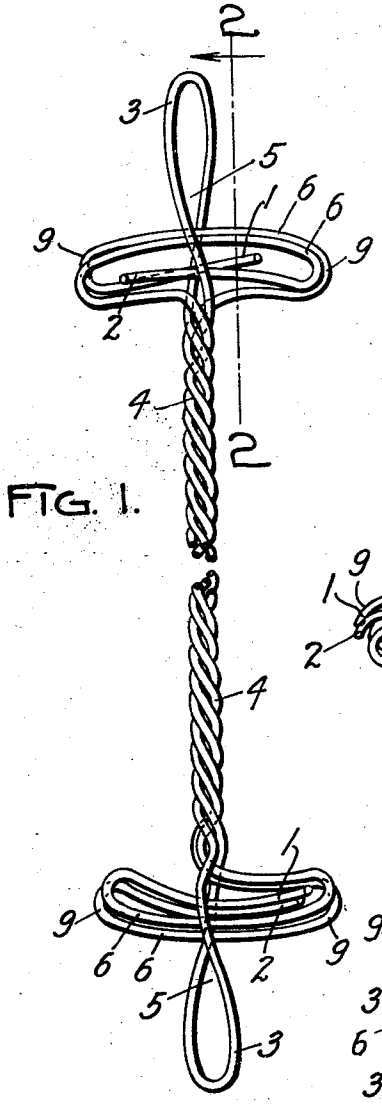


FIG. 1.

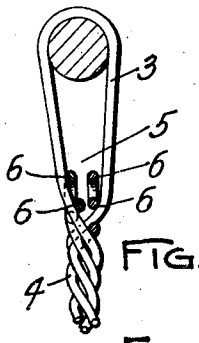


FIG. 2.

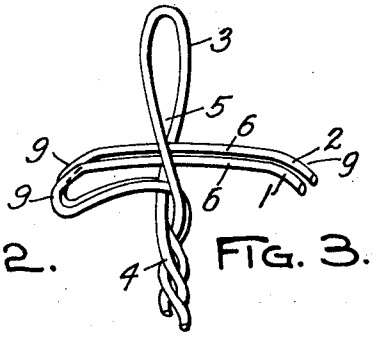


FIG. 3.

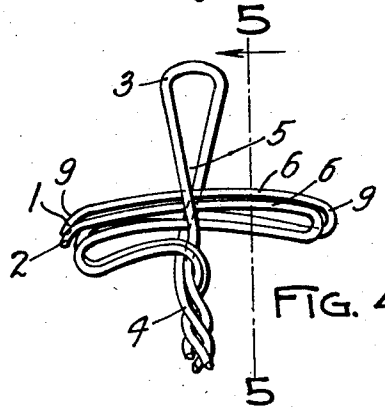


FIG. 4.

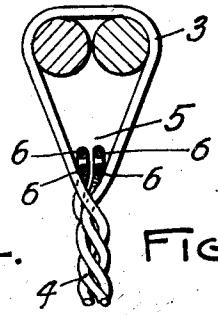


FIG. 5.

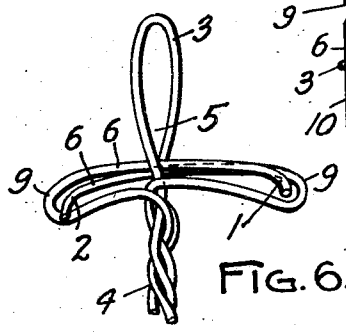


FIG. 6.

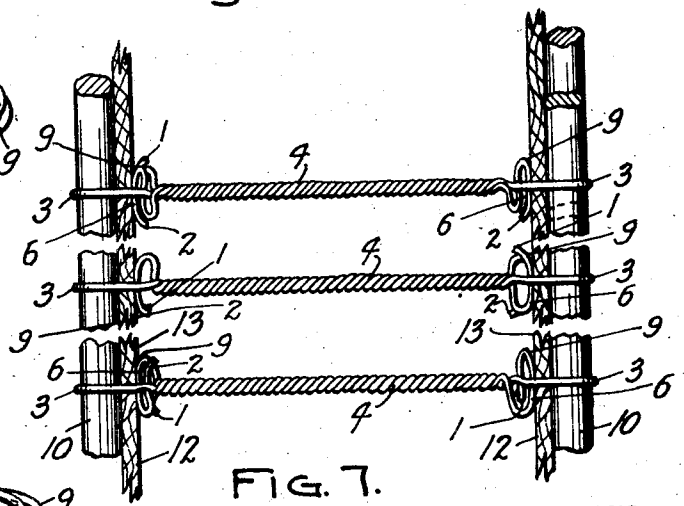


FIG. 7.

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UNITED STATES PATENT OFFICE.

LEE ORVILLE GATES, OF DENVER, COLORADO.

STRUCTURAL-FORM TIE.

Application filed February 23, 1928 Serial No. 256,320.

My invention relates to ties for structural forms, and is an improvement over my former invention, application for Letters Patent, on which was filed January 28th, 1928, the serial number being 250,285.

In my former invention, a single strand of wire was bent into three lengths and twisted together to form a cable with a single strand loop at each end and with a cross piece in the crotch of each loop to hold the side walls of the form from falling inward prior to the pouring of the concrete into the form.

When workmen are building an ordinary form for a concrete wall, it is customary for them to stand at times upon the spacers or ties between the side walls of the form. This allows the workman to attend to both side walls much better than if he were located upon either side on an outside ladder or scaffold.

If wire ties are used to stand upon they must be quite thick and stiff, or they will bend enough to pull the form side walls together to some extent.

After the lumber for the side walls is used once, it is, of course, a great saving if as much as possible of it may be used again. On large jobs it often happens that some of the lumber is used even ten or twelve times.

Since the concrete is very wet when it is poured, the boards of the side walls are often considerably warped when they are removed ready to use again. For this reason, when using wire ties having cross pieces to hold the side walls out in place, it is necessary that the cross pieces be strong and stiff enough to spring the warped boards into place and hold them there firmly.

The object of my present invention is to provide a wire tie with a stronger and stiffer cable portion, able to withstand the weight of a workman without excessive bending. A further object is to provide a wire tie with stronger and stiffer cross pieces which are able to hold the side boards of the form firmly and which are strong enough to spring warped boards out into place and hold them there.

I accomplish the above objects by providing a tie formed of two U-shaped wires, which are twisted together to form a four stranded cable having a single strand loop at each end, and with the two ends of each U-shaped piece bent to form a double strand cross piece in the crotch of the loop formed by the other U-shaped piece.

The construction will be described more in detail below and in the drawings, in which:—

Figure 1 is a view of my tie, with the cross pieces of the upper end shown entering the loop from opposite sides, and those of the lower end entering the loop from the same side, which last construction is my preferred form.

Figure 2 is a fragmentary section on the line 2—2 of Figure 1.

Figure 3 is a fragmentary view of a modified form of cross piece, the cross pieces entering the loop from the same side.

Figure 4 is a view of another modified form of cross piece, the loop shown being that employed where a splice of one of the uprights is located.

Figure 5 is a fragmentary section on the line 5—5 of Figure 4.

Figure 6 is a fragmentary view of a form of cross piece similar to that shown in Figure 3, but with the cross pieces entering the loop from opposite sides.

Figure 7 is a fragmentary vertical section through a form constructed with the various forms of my ties and showing the strong cable portion and the strong and stiff double cross pieces for holding the form walls from falling inward prior to the pouring of the concrete.

In Figure 1, the two U-shaped wires each have lengths 1 and 2, and the loop 3, the lengths 1 and 2 being twisted together to form the cable 4.

The cable 4, therefore, is formed of four strands instead of three as in my former invention, and is correspondingly stronger and stiffer and better able to stand the weight of the workman building the form, without excessive bending, which would tend to pull the side walls of the form together.

The ends of the lengths 1 and 2 are each doubled over and this forms the doubled cross pieces 6 which fit in the crotch 5 formed by the convergence of the two sides of the loop 3 toward the cable portion 4; the doubled cross pieces 6 extending on either side of the loop and with inwardly curving extremities.

The upper loop shown in Figure 1 receives the doubled cross pieces 6 from opposite sides; the lower loop, which is my preferred form, receiving the doubled cross pieces 6 from the same side.

As may be seen in Figure 2, the sides of the crotch 5 support the cross pieces 6. The

adjacent parts of each cross piece are shown separated in the drawings for the sake of clearness. As constructed they are practically side by side, and when put in a form, the pressure against the inner faces of the side walls will generally force the parts of the cross pieces solidly together.

In the form shown in Figure 3 the lengths 1 and 2 pass through the crotch 5 of the loop 3 without being first doubled over, both of the lengths passing through the loop from the same side. In the form shown in Figure 4 the lengths 1 and 2 are doubled over before being passed through the loop 3, but the free ends are placed at the outside, farthest removed from the cable 4. The loop 3 in this particular view is made to receive the form upright where it is spliced, this being more clearly shown in Figure 5.

In the form shown in Figure 6 the lengths 1 and 2 pass through the crotch 5 of the loop 3 without being first doubled over, the lengths passing through the loop from opposite sides.

Figure 7 shows how the ties look when in place in the form holding the uprights together and holding the side boards apart.

When the steel reinforcements often employed are to be used in the wall, it is customary to build one side wall of the form first, with the ties in place between adjacent boards, and with uprights passing through the tie loops.

The steel to be used for reinforcement is then put in place and held together by wires, bolts, rods, screws or in any other proper manner.

The other side of the form is next built, after all the reinforcement is in place, the uprights passing through the tie loops and the tie cross pieces holding the side boards out in place. The ties are all put in their proper places between adjacent side boards, as the side wall is built up.

A section of the form would then appear similar to Figure 7 except that Figure 7 shows none of the reinforcement.

When reinforcement is not used the form is built in the following manner:—

The ties are placed upon the side boards 12, say, at regular intervals, with the loops 3 about the uprights 10. As the ties are put in place, the curves 9 of the tie cross pieces 6 direct and guide the boards 12 to contact with the uprights 10, 10.

The boards 13 are next put in place, the uprights 10, 10 and the curves 9 of the tie cross pieces 6, guiding and directing the boards 13 to perfect alignment with the boards 12 below them.

More boards and ties are used in the same manner in building the form higher and higher.

When an upright is to be spliced, a tie with a loop for that purpose, such as shown in Figure 5 and in the upper right hand portion of Figure 7, is used.

If there is a splice in the upright at the opposite end of the same tie, a tie is used having a loop formed for a splice at each end.

Figure 7 shows the greater strength and stiffness of the cable portion 4, as well as the greater strength and stiffness of the cross pieces 6.

My present invention possesses all the advantages of my former invention plus the increased strength and stiffness at the two points stated.

A multistrand cable, or a wire of two or more strands may be used to form the two U-shaped pieces from which the tie is constructed. But, I prefer to use a single wire for each U-shaped piece, since for the same weight and cost it gives greater stiffness.

When the concrete has set, the loops 3 are cut, the uprights taken away and the boards of the side walls removed, those still good enough to be used again being employed to build the next form.

I am aware that there are many modifications which any intelligent mechanic might make in my tie, once it had been disclosed to him, but in any event, the tie would have a strong and stiff cable portion, strong and stiff cross pieces, and would act to hold the side walls of a form together, and keep them from falling inward prior to the pouring of the concrete, so I do not wish to limit myself to the exact construction shown and described, but what I claim as new, and desire to protect by Letters Patent, is as follows:—

1. A tie for structural forms of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of two U-shaped pieces of wire twisted together to form a cable having a loop at each end thereof, said loops being formed by wire, including the bent and adjacent portions of said U-shaped pieces, the two ends of each U-shaped piece being bent to pass through the loop formed by the other U-shaped piece adjacent the converging sides of said loop and extending on either side thereof.

2. A tie for structural forms of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of two U-shaped pieces of wire twisted together to form a cable having a loop at each end thereof, said loops being formed by wire including the bent and adjacent portions of said U-shaped pieces.

3. A tie for structural forms of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of two pieces of wire twisted together to form a cable of four strands, each end thereof having a loop formed of an extension of material from said cable.

4. A tie for structural forms of a length

to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of two U-shaped pieces of wire twisted together to form a cable, each end thereof having a loop formed of an extension of material from said cable.

5. A tie for structural forms of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of two pieces of wire twisted together to form a cable of four strands, each end thereof having a loop formed of an extension of material from said cable, and a cross piece formed of an extension of material from said cable passing through each loop and extending to either side thereof.

6. A tie for structural forms of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of two U-shaped pieces of wire twisted together to form a cable, each end thereof having a loop formed of an extension of material from said cable, and a cross piece formed of an extension of material from said cable passing through each loop and extending to either side thereof.

7. A tie for structural forms of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of two pieces of wire twisted together to form a cable of four strands, each end thereof having a loop formed of an extension of material from said cable, and a cross piece formed of an extension of material from said cable and positioned inward from the outer end of each loop.

8. A tie for structural forms of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of two U-shaped pieces of wire twisted together to form a cable, each end thereof having a loop formed of an extension of material from said cable, and a cross piece formed of an extension of material from said cable and positioned inward from the outer end of each loop.

9. A tie for structural forms of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of two pieces of wire twisted together to form a cable of four strands, each end thereof having a loop formed of an extension of material from said cable, and a cross piece formed of an extension of material from said cable extending substantially square therewith and adapted to contact with opposed walls of such form and prevent their inward movement.

10. A tie for structural forms of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of two U-shaped pieces of wire twisted together to form a cable, each end thereof having a loop formed of an extension of material from said cable, and a cross piece formed of an extension of material from said cable extending substantially square therewith and adapted to contact with the opposed walls of such form and prevent their inward movement.

11. A tie for structural forms of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of two U-shaped pieces of wire twisted together to form a four strand cable having a loop at each end thereof formed of the bent and adjacent portions of said U-shaped pieces, and a cross piece formed of the free ends of the opposed U-shaped piece and extending substantially square with the cable and adapted to contact with the opposed walls of such form and prevent their inward movement.

12. A tie for structural forms of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie composed of wire twisted together to form a cable including two U-shaped pieces of wire, each end of the cable having a loop and a cross piece adjacent thereto and substantially square with the cable, both loops and cross pieces formed of extensions of material from said cable.

In testimony whereof I affix my signature.

LEE ORVILLE GATES.