Nov. 20, 1928. 1,692,166

L. O. GATES

STRUCTURAL FORM TIE

Filed Jan. 28, 1928

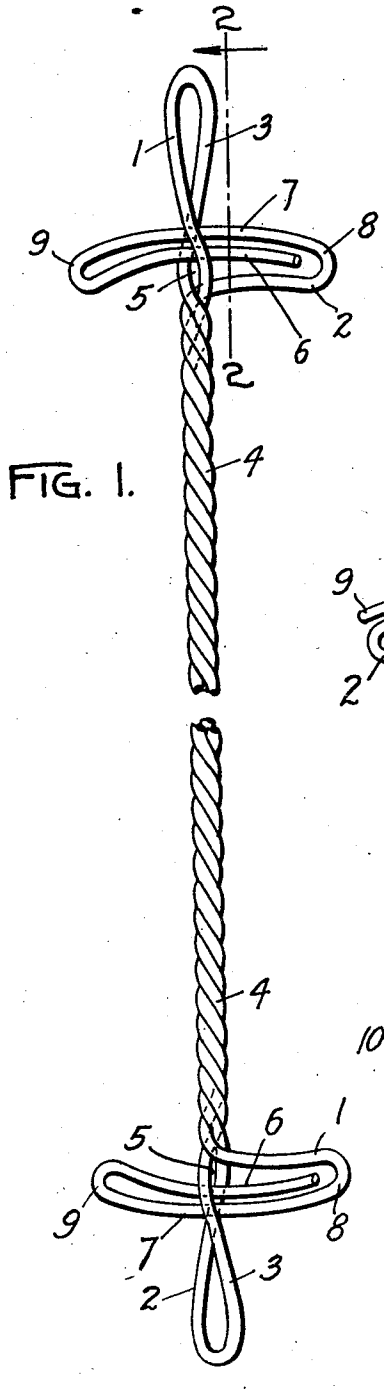


FIG. 1.

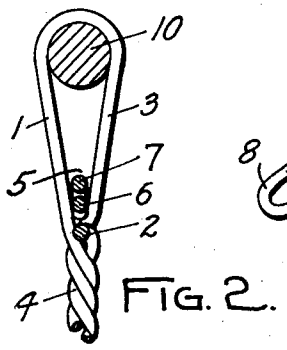


FIG. 2.

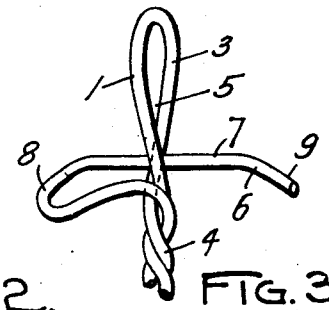


FIG. 3.

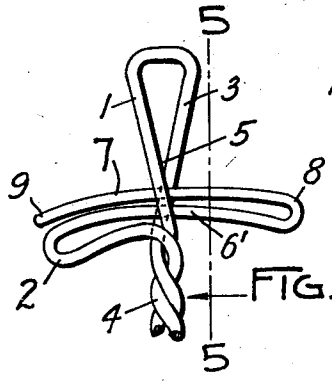


FIG. 4.

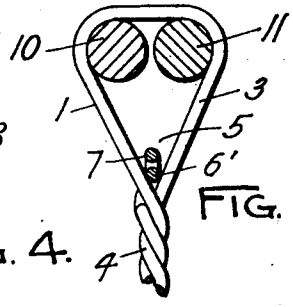


FIG. 5.

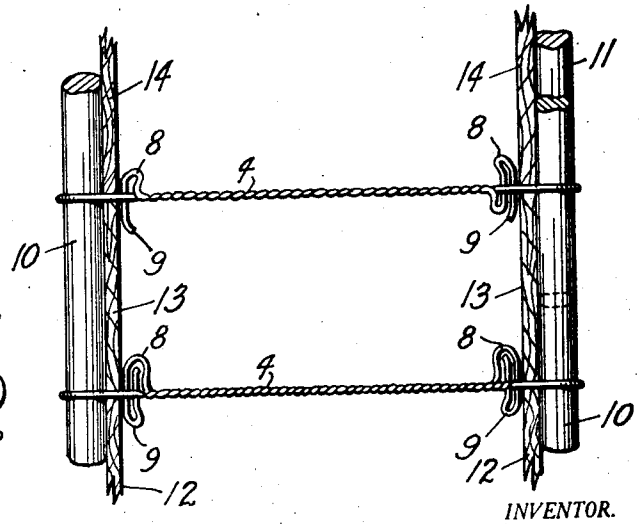


FIG. 6.

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UNITED STATES PATENT OFFICE.

LEE ORVILLE GATES, OF DENVER, COLORADO.

STRUCTURAL-FORM TIE.

Application filed January 28, 1928. Serial No. 250,285.

My invention relates to ties for structural forms, and while it may be used in connection with any structural form having two side walls, it is more especially intended for forms used in the construction of concrete walls for foundations and for buidings, or walls used as fences, dams or retaining walls and the like.

The description therefore, will be confined, for the sake of clearness, to concrete walls and their construction by the use of my tie in buiding the forms, but this is not intended in any way as a limitation of its use.

In the ordinary construction of concrete walls, the form is first constructed and the freshly mixed concrete in a thick liquid condition is poured into the form.

While the concrete is in this liquid condition, before it sets, it acts very much like any other liquid in regard to the hydrostatic pressure it exerts.

The pressure per square inch at any point in the form will depend upon the depth of fresh concrete above that point; that is, the height of the fresh concrete in a form acts as a pressure head, the same as if the form held water instead concrete, except for the amount of pressure per foot of head.

The following example may be taken as substantially correct;—since the specific gravity of concrete is about three, a head of one foot of fresh concrete will mean a pressure of about a pound and a quarter per square inch. And a wall of fresh concrete ten feet high will therefore exert at the base of the form, an outward pressure of twelve and a half pounds per square inch.

This is 1800 pounds per square foot of wall, and shows at once the necessary strength and the resulting cost of such forms.

For this reason it has been found commercially impractical to brace such forms from the outside only, and therefore the standard method among builders is to also tie the two side walls of the form together by wires, which remain in the concrete after it is poured.

It is common practice to use what is called dimension lumber or boards for the form walls, these being held apart by spacers, generally of wood, nailed in place, the walls tied together by wires at regularly spaced intervals, the wires passing between adjacent boards of the side walls of the form and passing around uprights running up along the outside of each form wall, the wires acting as ties between the opposite uprights and form walls.

The uprights, which may have outside braces, keep the side walls true, the wires keep them from being spead apart by the pressure of the fresh concrete, and the spacers keep the side walls of the form from falling inward prior to the pouring of the concrete.

Additional uprights, to which no ties are attached may also be used.

It is obvious that with the present scale of wages, the building of such a form is very expensive, and that much of this expense is due to the time required to prepare, fit and nail the spacers and twist the tie wires in place.

The object of my invention is to provide a tie that can be manufactured cheaply and in quantities and delivered to each workman as required, and ready to use.

A further object is to provide such a tie that will not only act to tie the two side walls of the form together, but which will also do the work of the spacers, and without the expenditure of any time by the workman, will act to properly position the boards of the side walls as they are put in place, and also to hold the side walls of the form out in place and prevent their falling inward prior to the pouring of the concrete, and thus save the time and expense of making and installing spacers.

I accomplish the above objects by providing a tie formed of a single strand of suitable wire, having a loop in each end to receive uprights positioned against the outer faces of the form walls, each loop having a cross piece therethrough adapted to bear against the inner face of a form wall, as will be more clearly explained below and in the drawings, in which;—

Figure 1 is a view of the preferred form of my tie.

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 my tie.

Figure 4 is a view of another modified form of my tie for use 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 vertical section through a form constructed with the various

forms of my ties, showing how the form side walls are securely held in place against either outward or inward movement.

In Figure 1 the end lengths 1 and 2 are returned to form the intermediate length 3, each end length being returned to form a loop, the return side of each loop forming an end portion of the intermediate length 3.

The loop may be of any desired dimensions to take a single or a double upright of metal or any other proper material.

The loop for a single upright is shown in Figure 2 and that for a double upright is shown in Figure 5.

The intermediate length and the two end lengths are twisted together to form a single cable 4, between the loops.

The convergence of the two sides of a loop toward the cable portion 4 of the tie, forms a crotch 5, in which the cross piece 6 bears. In the form shown in Figure 4, the cross piece 6′ bears in the crotch.

The cross piece may be single as shown in Figure 3, or double as shown in Figures 1, 2, 4 and 5, but in any case the section adjacent the cable portion 4 will bear in the crotch 5, and the outer face 7 of the cross piece will have the inward bending curves 8 and 9.

I prefer a double cross piece rather than the single construction shown in Figure 3 since the double cross piece gives considerable more strength for holding the form side walls from inward movement.

I prefer the double cross piece construction shown in Figure 1 over that shown in Figure 4, since the free end of the wire is more protected and is much less liable to catch in a side wall board or become bent out of place.

I am of course aware that heavier wire and a greater curve of the free end in the construction of Figure 3 would largely overcome the objections stated against it; and a sufficient continuation of the curve of the free end shown in Figure 4 would tend to overcome the objection to that construction. But, I prefer the construction shown in Figure 1 from the combination of all considerations.

In Figure 6 the lower tie shown is of my preferred form.

The ties are placed upon the form side boards 12 at regular intervals; the loops being about the uprights 10, 10.

In placing the ties down upon the edges of the boards 12, the curves 9 of the tie cross pieces direct and guide the boards to contact with the uprights 10, 10.

The boards 13, 13 are next put in place, the uprights 10, 10, and the curves 8, 8, of the tie cross pieces guiding and directing the boards 13 to perfect alignment with the boards 12 below them.

The upper tie shown in Figure 6, has the right end similar to the construction shown in Figures 4 and 5, and the left end is similar to the construction shown in Figure 3.

When the tie is placed upon the boards 13 the single loop at the left passes over the upright 10 and the double loop at the right passes down over the spliced uprights 10 and 11, while the curves 9 of the tie cross pieces guide and direct the upper edges of the boards 13 till they contact with the uprights 10 and 11.

The boards 14 are next placed upon the boards 13, the curves 8 of the tie cross pieces guiding and directing the boards 14 till they are in perfect alignment with the boards 13 below them.

The ties and uprights prevent the form side walls from diverging when the concrete is poured into the form, and the tie cross pieces, bearing against the inner faces of the form side walls prevent any inward movement of the side walls prior to the pouring of the concrete.

No spacers have to be fitted and nailed in place; no nails have to be used for any purpose in connection with the ties.

In fact, my tie makes it possible to quickly and easily assemble a strong and reliable form with the least possible labor and expense.

Naturally any desired size of wire may be used, and the length of tie, size and shape of loops and the exact construction of the cross pieces may all be varied in accordance with the requirements of each particular case, whether the forms and uprights be all of wood or all of metal or part wood and part metal or other material.

A multistrand cable, or a wire of two or more strands may be used instead of a single strand of wire, if desired, but I prefer the single strand of wire as shown, since it tends to make stronger and stiffer cross pieces.

When the concrete has set, the loops are cut, the uprights taken away and the boards of the form side walls thereby released for further use, the main body of each tie remaining in the concrete wall.

I am aware that there are various modifications which any intelligent mechanic might make in my tie once it had been disclosed to him, but in any case the tie would act to hold the uprights and side walls together and keep the form side walls apart, so I do not wish to limit myself to the exact constructions shown and described, but what I claim as new and desire to protect by Letters Patent, is as follows:—

1. As a new article of manufacture, a tie for plastic forms formed of a single strand of wire and of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie comprising an intermediate length, the extremities of said intermediate length being continued by returned lengths, each end portion of the intermediate length and the connected portion of the adjacent returned length being separated to provide a loop, the portions of the

three lengths between the loops being wrapped one around the other two, each of the returned lengths terminating inwardly of the opposite end of the intermediate length and passing through the adjacent loop and forming a cross piece substantially square with the portion between the loops.

2. As a new article of manufacture, a tie for plastic forms formed of a single strand of wire and of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie comprising an intermediate length, the extremities of said intermediate length being continued by returned lengths, each of the returned lengths terminating inwardly of the opposite end of the intermediate length, each end portion of the intermediate length and the connected portion of the adjacent returned length being separated to provide a loop, the portions of the three lengths between the loops being wrapped one around the other two, the extremities of each of the returned lengths being bent to pass through the adjacent loop and extend to each side thereof substantially square with the portion of the tie between the loops.

3. As a new article of manufacture, a tie for plastic forms formed of a single strand of wire and of a length to bridge the space between and extend outwardly beyond opposed walls of such form, said tie comprising an intermediate length, the extremities of said intermediate length being continued by returned lengths, each of the returned lengths terminating inwardly of the opposite end of the intermediate length, each end portion of the intermediate length and the connected portion of the adjacent returned length being separated to provide a loop, the portions of the three lengths between the loops being wrapped one around the other two, the extremities of each of the returned lengths being bent to pass through the adjacent loop and form a cross piece the extremities of which are curved inwardly.

4. A tie for plastic forms comprising a center portion composed of a plurality of lengths of wire twisted together to form a cable having a single strand loop at each end thereof, and an extremity of one length passing through the adjacent loop and forming a cross piece extending on each side thereof and substantially square with the said cable.

5. A tie for plastic forms comprising a center portion composed of a plurality of lengths of wire twisted together to form a cable having a loop at each end thereof, and a cross piece extending one either side thereof substantially square with the cable and passing through each loop and formed of a continuation of one of the lengths of said cable.

6. A tie for plastic forms comprising a center portion composed of a plurality of lengths of wire twisted together to form a cable having a loop at each end thereof, and a cross piece formed of an extension of material from said cable passing through each loop substantially square with the cable and extending to either side thereof.

7. A tie for plastic forms comprising a center portion composed of a plurality of lengths of wire twisted together to form a cable having a loop at each end thereof, and a cross piece formed of an extension of material from said cable passing through each loop substantially square with the cable and extending to either side thereof, the extremities of each cross piece being curved inwardly.

8. A tie for plastic forms having opposed side walls and supporting external uprights for the side walls, comprising a center portion composed of a plurality of lengths of wire twisted together to form a cable having a loop at each end adapted to receive one of said uprights, and having a cross piece formed of an extension of one of the twisted lengths of said cable passing through each loop and extending to either side thereof and adapted by contact with the inner face of the adjacent side wall of the form, to prevent inward movement thereof.

In testimony whereof I affix my signature.

LEE ORVILLE GATES.