Sept. 25, 1923. 1,468,790

H. A. ORLOPP ET AL

CONCRETE FORM TIE AND SPACER.

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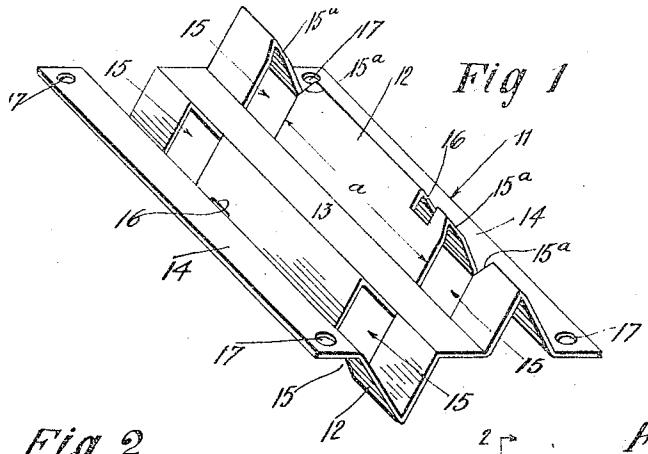


Fig 1

Fig. 2.

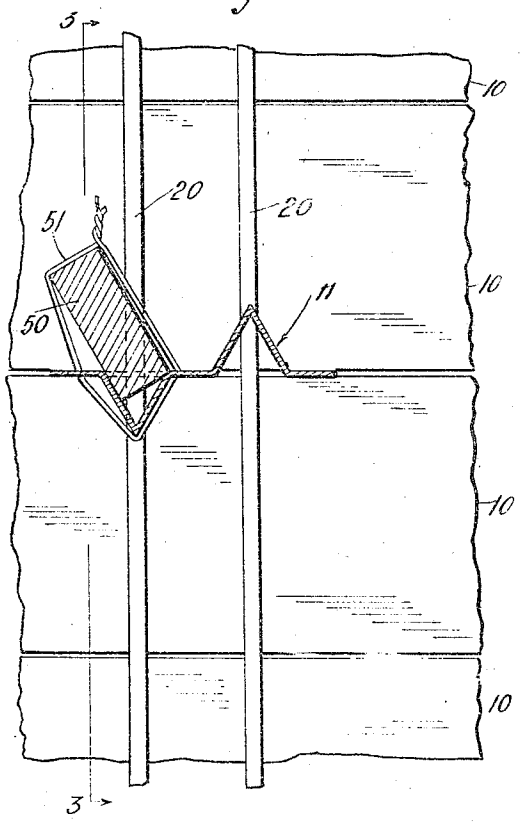
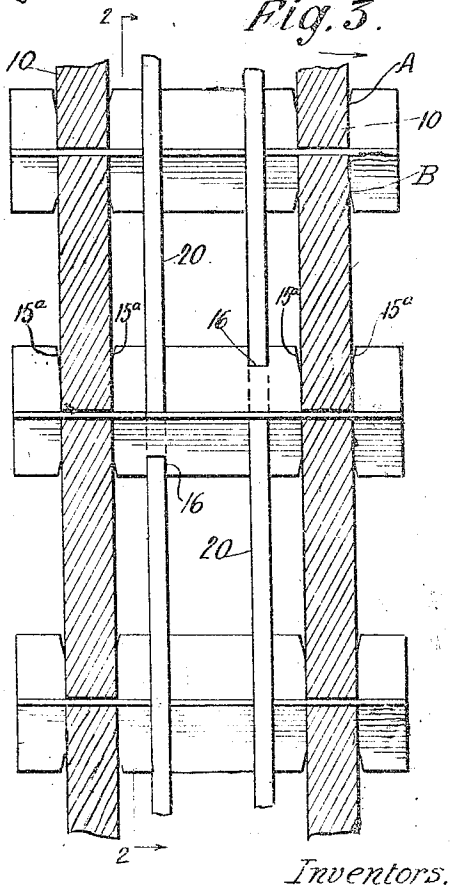


Fig. 3.



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Fig. 5.

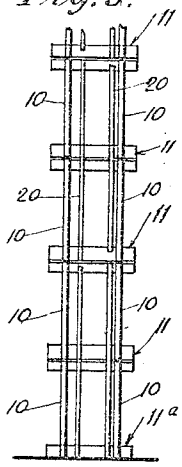


Fig. 4.

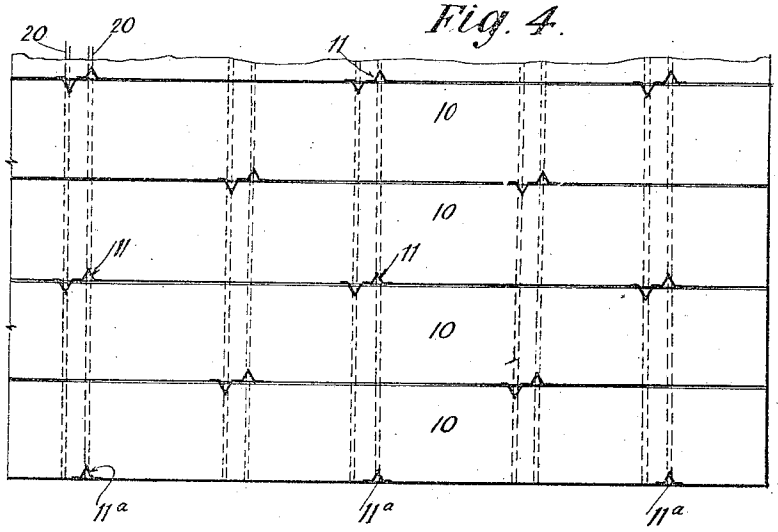
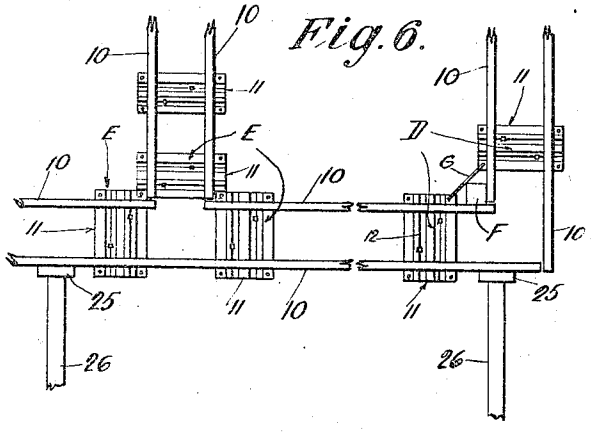


Fig. 6.



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Fig. 6

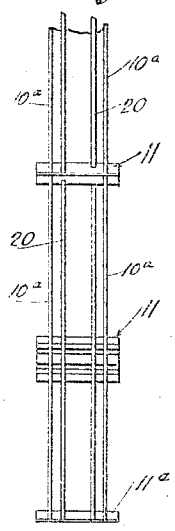


Fig. 7

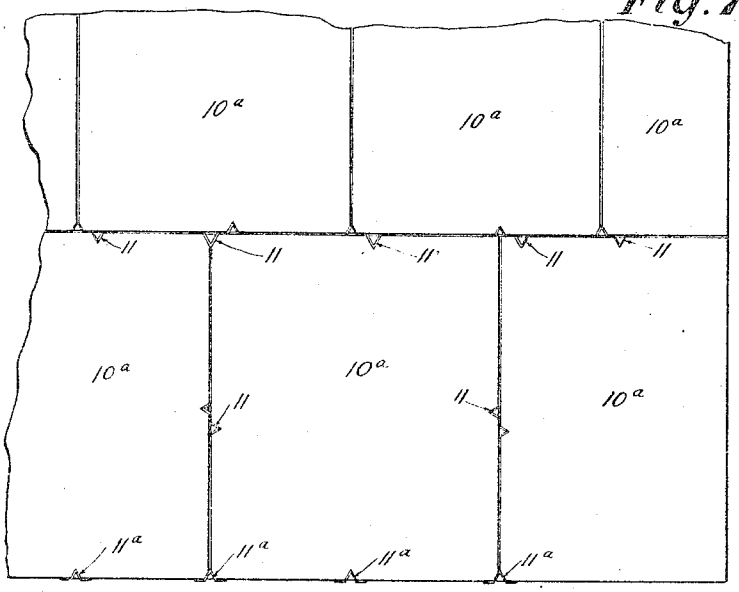


Fig. 9

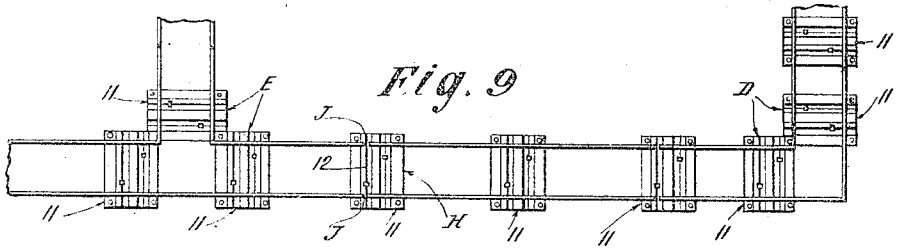


Fig. 10.

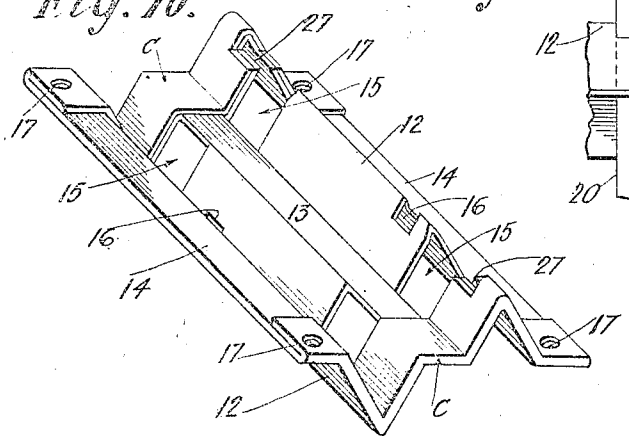
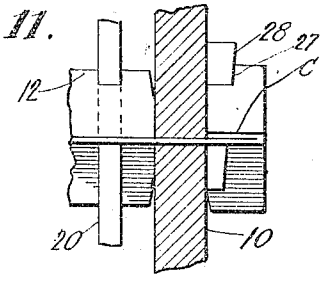


Fig. 11.



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UNITED STATES PATENT OFFICE.

HARRY A. ORLOPP, OF LOS ANGELES, CALIFORNIA, AND DAVID BAKER SMITH, OF EL PASO, TEXAS.

CONCRETE-FORM TIE AND SPACER.

Application filed February 5, 1923. Serial No. 616,946.

To all whom it may concern:

Be it known that we, HARRY A. ORLOPP, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, and DAVID BAKER SMITH, a citizen of the United States, residing at El Paso, in the county of El Paso and State of Texas, have invented new and useful Improvements in Concrete-Form Ties and Spacers, of which the following is a detailed specification.

This invention relates in general to forms for concrete and the like; and although the invention is not necessarily restricted to forms for the pouring of monolithic concrete walls and similar structural forms, it perhaps has its widest utility in that connection. Consequently, without necessarily limiting the invention to such particular uses, we shall describe it as applied specifically to pouring of monolithic concrete walls.

As far as we are aware, forms for concrete walls have usually been made of wooden boards or metal plates; the boards or plates being supported by a suitable framing structure to keep them in proper alinement and position. To prevent the forms from bulging under the internal pressure of the fluid concrete, these form boards or plates have usually either been supported exteriorly by suitable heavy bracing or equivalent structure; or have been tied together interiorly by tie bolts that run across from the form boards at one side of the wall to the form boards at the other side of the wall, short pipes being placed around the bolts to act as spacers between the opposed interior surfaces of the form boards or plates, and also, by fitting loosely on the bolts, allowing the bolts to be withdrawn after the concrete has set; the pipes being allowed to remain in the finished concrete wall.

Both of these procedures involve a great deal of labor and add very materially to the cost of concrete structures. In its specific application to the formation of poured concrete walls and the like, it is one of the objects of our invention to provide an inexpensive form of tieing and spacing means, adapted to tie together boards or plates at opposite sides of a wall form, and easily and quickly placeable so that the labor involved is comparatively small and likewise the labor required to set up the whole form is comparatively small. There are other objects of the invention, but these will be best understood when an understanding is had of the construction and use of the device itself; accordingly we proceed to a detailed description of preferred and specific forms of the tie device that are illustrative of our invention, reference for this purpose being had to the accompanying drawings in which:—

Fig. 1 is a perspective showing the tie plate itself; Fig. 2 is a longitudinal vertical section showing such a tie plate in place in a wall form; Fig. 3 is a transverse vertical section showing the same; Fig. 4 is an exterior elevation showing a typical arrangement of tie plates in a form made up of relatively long members, such as boards; Fig. 5 is an end elevation of the same; Fig. 6 is a fragmentary plan showing the adaptation of our tie plate to tieing forms together at corners; Fig. 7 is an exterior elevation showing a typical arrangement of tie plates in a form made up of metal plates; Fig. 8 is an end elevation of the same; Fig. 9 is a plan showing corner arrangements etc. in a form made up of metal plates; Fig. 10 is a perspective showing a modified form of tie plate; and Fig. 11 is a fragmentary section showing a tie plate of the form of Fig. 10 in use.

In Figs. 1 to 6 we show a tie plate and its adaptation to forms made up of boards, for instance. Here the opposite walls of the forms are made up of boards 10 placed on edge one above the other, spaced apart by a distance equal to the thickness of the wall, and extending horizontally and vertically to any desired dimension. In order to keep these boards in proper alinement, and to prevent their shifting out of alinement at their meeting edges, the boards have usually been framed up exteriorly. In our method the boards are kept in such alinement and in edge register with each other by the tie plates 11. These tie plates are preferably made of comparatively thin sheet metal (sheet iron is most convenient) formed as shown best in Fig. 1. The tie plate has two ridges 12 that project, preferably in staggered relation, on opposite faces of the plate; so that, as shown in Fig. 1, one of the ridges projects up and the other down from

the plate. Between these two ridges (which, in the specific sheet metal formation herein described are formed by bending and punching the sheet metal itself) lies a flat portion 13 of the plate that extends from end to end and outside the two ridges, at the lateral edges of the plate, lie two flat portions 14 likewise extending from end to end of the plate. The length of the plate will of course depend upon the width of the wall being formed. Each ridge has two notches 15; and the dimension *a* in Fig. 1 (the distance between the inner edges of the two notches in either ridge) is the thickness dimension of the wall to be formed. The width of the notches themselves is determined by the thickness of the form boards or plates, the notches being just wide enough to receive the form boards or plates and preferably to hold them relatively snugly. In order that the edges of the boards or plates may easily be inserted in the notches or the notches placed over the edges of the boards or plates as the case may be, the upper corners of the notches are beveled off as shown at 15ª, preferably at each side of each notch. Each ridge also has, preferably at its apex, an opening 16 for a reinforcing rod, and these two openings in the two ridges are preferably arranged one near one end of one ridge and the other near the opposite end of the other ridge. Each tie plate may also preferably have four corner holes 17 for purposes as hereinafter described.

In building up a form in accordance with our method the lowermost boards, as shown in Fig. 4, for instance, are first laid down on tie plates 11ª; the tie plates may be like the one we have just described except that these particular ones have only one upwardly extending ridge. The lower edges of the boards are placed in the notches 15 of this tie plate and thus the lower edges are properly spaced and tied together. Then tie plates of the kind shown in Fig. 1 are laid on the upper edge of these lowermost boards, with the notches 15 of the lower ridge placed over the edges of the boards. The flat parts 13 and 14 of the tie plates rest on the edges of the boards, and when the next course of boards is put in place, their lower edges are placed in the notches 15 of the upper ridges of these plates, and the lower edges of these boards then rest on the flat parts 13 and 14 of the plates. The plates are preferably made of sufficiently thin metal that the boards are not spaced so far apart at their edges as to allow the liquid concrete to run out. The distance between the tie plates may be fixed to suit the particular structure being erected; and the tie plates may be placed in any relation to each other; for instance, they may be placed in staggered relation as is shown in Fig. 4. The complete erection of a wall form will be seen, without further detailed explanation on our part, to involve only a repetition of the operations we have described. Reenforcing rods, as shown at 20 may be run through openings 16 in the plates. The reenforcing rods are thus held in proper spaced relation without the necessity of the large amount of work usually attendant upon the placement of reenforcing rods in a concrete form. This last mentioned feature, together with the simplicity and ease with which the plates are forced in the form structure, constitute mainly the great labor saving qualities of our invention.

With the form structure built up as we have described, it will readily be seen that opposite form boards are properly spaced apart and are tied together by the spaced plates and are held in edge register. They are also held, to some extent at least, in general vertical alinement, because the tipping of any board on its lower edge, for instance, the tipping of right hand upper board in Fig. 3 outwardly in the direction indicated by the arrow, immediately causes that board to press outwardly more heavily at the upper edge of the notch, as at the point indicated A in Fig. 3. Outward movement of the edge of the notch in that direction is prevented by the fact that the outer edge of the lower notch of the same plate bears snugly against the next lower board, as at a point indicated B in Fig. 3. Thus, within the limits of its strength against rupture or deformation, each plate not only spaces and ties the two opposite series of boards but also keeps them in general vertical alinement as well as in edge register. In practice however, it may be desirable to secure general vertical alinement of the form by placing vertical strips 25 and shores 26 against it as is indicated in Fig. 6.

To increase the strength of the end parts of the tie plates, particularly against deformation due to outward pressure on the form boards or due to the tendency of any board to tip on its lower edge, we may double the metal of the plate back upon itself, at the ends, as shown at C in Figs. 10 and 11. This figure also shows, at the apex of the two ridges 12, and at the exterior edge of each notch 15, a notch 27 through which a key 28 may be driven to wedge the boards firmly up against the inner edges of the notches as shown in Fig. 11. The strengthening at the ends also helps the plates to withstand the stresses of this wedging action. In either form of the plate the longitudinal stresses, due to the interior pressure of the poured concrete, are taken mostly by the flat parts 13 and 14. The width of these parts therefore is designed to make them strong enough to withstand the tensile stresses to which they are subjected. The

stresses of compression, due to any force that tends to move opposite form boards inwardly toward each other, are mainly if not wholly taken by the metal in ridges 12. These ridges are of such form as to be relatively stiff under lengthwise compression, and the presence of the flat portions 13 and 14 at their edges also helps to stiffen them.

It is not necessary that the plates be attached to the form boards in any manner other than that described. Once they are in place there is no tendency for them to move out of place. Even if a reenforcing rod should require a considerable restraining force to keep it in proper position, any strain exerted by the rod tending to move a plate lengthwise of the wall is immediately checked by the binding of the plate on the form boards.

In Fig. 6 we illustrate how tie plates may be used at corners of a form structure. The form boards 10 may be abutted in any suitable way. The tie plates are placed, for instance, as indicated at D or at E, close to each other or so that their corners overlap; and then a nail or a small pin can be dropped through their registering holes 17. Or the tie plates can be placed near the corner (allowing room for the corner post F) and tied together by a wire loop or other means as shown at G. In this manner two wall forms meeting each other at an angle are easily and quickly anchored together.

In Figs. 7, 8, and 9 we show the application of the tie plates to a form structure made up of metal plates 10^a. The metal plates are preferably so sized and placed that the joints in successive tiers of plates are relatively staggered; and then the plates 11 are placed so that a ridge of a tie plate will come at each corner meeting of adjacent plates; the opposite ridge of such tie plate engaging its notches with the edge of another plate. All this will be easily understood from the drawings without further detailed description. Also in Fig. 9 we show how a tie plate, for instance, that shown at 4, may be arranged so that one of its ridges 12 comes at joints J between adjacent plates in the same course or tier, thus registering these adjacent edges.

After the concrete has set and the forms are taken away, the projecting ends of the tie plates are cut off flush with the wall surface, the plates being left in the concrete structure. Although we have gone into specific detail in setting out a preferred form of our tie and spacer it will be understood that we do this to make the invention clearly understandable by giving a full specification of one specific form illustrative of the invention. We do not limit the invention to the specific things here set out. Thus, for instance, although we prefer to make a tie with a body thin enough to lie between adjacent board edges, yet we may make the body thicker and notch the board edges to pass the ties, as will be apparent. Neither is it necessary that the ridges (the projections at the opposite faces of the plate or body) be in staggered relation. In forming the devices of sheet metal it is convenient so to stagger the ridges; but in making them of cast metal for instance they may be placed in any relation to each other. Further, the ridges may be of any shape. Their primary function is to form the notches—to form projections from the body or plate surface that form or contain notches to take the boards. Of course, in the simple sheet metal form these ridges effectively reenforce the devices particularly as to compressive strains; but in a heavier construction, as in cast metal, the projections that form the notches may be made in a variety of other manners.

It will be seen, from what we have said, that, regardless of specific formation, one of the main features of our invention is a single unit appliance by which the opposite form boards are tied together and spaced apart as the result of a single simple operation. Furthermore, the devices form a most convenient and simple means of holding and spacing the reinforcing rods, requiring no extra operations for that purpose. And, in the preferred form, no prior preparation of the form boards is required (no notching, etc.) and therefore the tie and spacer devices may be placed wherever practical considerations may require at the time of setting up the forms and placing the reenforcements.

The tie and spacer plate also affords a convenient place to place wooden or other insert blocks as shown at 50 in Fig. 2. Such inserts are durable for forming a means to secure or attach finish, trim, or other things to the completed concrete wall. The insert 50 may be laid in the groove of one of the ridges and secured in place in any suitable manner, as by a wire 51.

Having described a preferred form of our invention, we claim:—

1. In combination with a plurality of boards or plates superimposed edge on edge to form two opposite walls of a concrete or like form, a tie element embodying a flat part extending across the space between the opposite form walls and lying at its ends between edges of adjacent boards or plates, and raised portions on the flat part formed with notches taking the edges of said adjacent boards.

2. In combination with a plurality of boards or plates superimposed edge on edge to form two opposite walls of a concrete or like form, a tie element embodying a flat part extending across the space between the opposite form walls and lying at its ends between

edges of adjacent boards or plates, and raised portions on the flat part formed with notches taking the edges of said adjacent boards, the element also having an opening to pass a reinforcing rod.

3. In combination with a plurality of boards or plates superimposed edge on edge to form two opposite walls of a concrete or like form, a tie element embodying a plate with longitudinally extending ridges one on each of its opposite faces, and flat parts adjacent the ridges, the flat parts lying between edges of adjacent boards or plates and the ridges having notches that take the board or plate edges.

4. In combination with a plurality of boards or plate superimposed edge on edge to form two opposite walls of a concrete or like form, a tie element embodying a plate with longitudinally extending ridges one on each of its opposite faces and staggered with relation to each other, and flat parts adjacent the ridges, the flat parts lying between edges of adjacent boards or plates and the ridges having notches that take the board or plate edges.

5. In combination with a plurality of boards or plates superimposed edge on edge to form two opposite walls of a concrete or like form, a tie element embodying a plate with longitudinally extending ridges one on each of its opposite faces and flat parts adjacent the ridges, the flat parts lying between edges of adjacent boards or plates and the ridges having notches that take the board or plate edges, the ridges having an opening to pass a reinforcing rod.

6. In combination with a plurality of boards or plates superimposed edge on edge to form two opposite walls of a concrete or like form, a tie element embodying a plate formed of relatively metal with longitudinally extending ridges struck up integrally from the sheet metal one at each of the opposite plate faces and staggered with relation to each other, and flat parts adjacent the ridges, the flat parts lying between edges of adjacent boards or plates and the ridges having notches near their ends that take the board or plate edges.

7. A tie for concrete or like forms, embodying a metal plate integrally ridged and the ridge having notches near its ends.

8. A tie for concrete or like forms, embodying a metal plate integrally ridged with flat parts adjacent the ridge and the ridge having notches near its ends.

9. A tie for concrete or like forms, embodying a metal plate integrally ridged with ridges projecting from its opposite faces and in staggered relation, with flat parts adjacent the ridges, and each ridge having form board receiving notches near its ends.

10. A tie for concrete or like forms, embodying a metal plate integrally ridged and the ridge having notches near its ends, the notches being beveled at their openings for the purposes described.

11. A tie for concrete or like forms, embodying a metal plate integrally ridged with ridges projecting from its opposite faces and in staggered relation, with flat parts adjacent the ridges, and each ridge having form board receiving notches near its ends, the notches being beveled at their openings for the purposes described.

12. A tie for concrete or like forms, embodying a metal plate integrally ridged with ridges projecting from its opposite faces and in staggered relation, with flat parts adjacent the ridges, and each ridge having form board receiving notches near its ends, the ends of the plate beyond the notches being double in thickness.

13. A tie for concrete or like forms, embodying a metal plate integrally rigid and the ridge having notches near its ends, and the ridge having a key-receiving notch adjacent the first mentioned notches.

14. A tie for concrete or like forms, embodying a metal plate integrally ridged with ridges projecting from its opposite faces and in staggered relation, with flat parts adjacent the ridges, and each ridge having form board receiving notches near its ends the ends of the plate beyond the notches being double in thickness, and the ridges having key-receiving notches in the double thickness part immediately adjacent the outer edges of the form board receiving notches.

15. A tie for concrete or like forms, embodying a metal plate integrally ridged with ridges projecting from its opposite faces and in staggered relation, with flat parts adjacent the ridges, and each ridge having form board receiving notches near its ends, the ends of the plate beyond the notches being double in thickness, and the ridges having openings therethrough to pass the reinforcing rod.

16. A tie for concrete or like forms, embodying a plate having projections forming notches to take a form board or plate edge, and the tie plate having apertures at its corners whereby two tie plates may be connected together, substantially as desired.

17. A tie for concrete or like forms, embodying a metal plate integrally ridged with ridges projecting from its opposite faces and in staggered relation, with flat parts adjacent the ridges, and each ridge having form board receiving notches near its ends the ends of the plate beyond the notches being double in thickness, the plate having apertures at its corners whereby two plates may be connected together substantially at each end.

18. In combination with a plurality of

boards or plates superimposed edge on edge to form two opposed walls of a concrete or like form, a tie element extending between opposite boards or plates and embodying a single member having shoulders abutting the exterior and interior surfaces of the boards or plates, and having means to engage and hold a reinforcing member.

19. In combination with a plurality of boards or plates superimposed edge on edge to form two opposite walls of a concrete or like form, a tie element embodying a flat part extending across the space between the opposite form walls and lying at its ends between edges of adjacent boards or plates, and raised ridges extending lengthwise of the flat part and formed with notches taking the edges of said adjacent boards.

20. In combination with a plurality of boards or plates superimposed edge on edge to form two opposite walls of a concrete or like form, a tie element embodying a flat part extending across the space between the opposite form walls and lying at its ends between edges of adjacent boards or plates, and raised ridges extending lengthwise of the flat part and formed with notches taking the edges of said adjacent boards, the raised ridges having openings to pass a reinforcing rod.

21. A tie for concrete or like forms, embodying a metal plate integrally ridged lengthwise, the ridge having form board receiving notches and having an opening to pass a reinforcing rod.

22. A tie for concrete or like forms, embodying a metal plate having flat lengthwise extending parts and being ridged longitudinally to reinforce the plate against lengthwise compression, the ridge lying between two flat parts of the plate.

23. A tie for concrete or like forms, embodying a metal plate having flat lengthwise extending parts and being ridged longitudinally to reinforce the plate against lengthwise compression, the flat parts being imperforate so that their tensile strength is not impaired, and the ridge having an opening to pass a reinforcing rod.

24. A tie for concrete or like forms, embodying a metal plate longitudinally ridged and having a reinforcing receiving opening through the apex of the ridge to pass or hold a reinforcing rod.

25. In combination with a concrete or like form, a tie embodying a metal plate longitudinally ridged, and a block seated in the ridge.

26. A tie for concrete or like forms, embodying a metal plate ridged lengthwise and with a notch in the ridge near its end to take the edges of a form board, the end part of the plate outside the board receiving notch being stiffened against deformation due to outward pressure of the form board.

27. A tie for concrete or like forms, embodying a metal plate ridged lengthwise with two ridges one rising from each of its opposite faces and in staggered relation, each ridge having near its end a form board receiving notch, the end part of the plate outside the board receiving notches being stiffened against deformation due to the outward pressure of the form board.

In witness that we claim the foregoing we have hereunto subscribed our names this 24th day of January, 1923.

HARRY A. ORLOPP.
DAVID BAKER SMITH.